Form of Economic Regulation

For NSW Electricity Network Charges

Discussion Paper

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1   INTRODUCTION

The Independent Pricing and Regulatory Tribunal (the Tribunal) is the Jurisdictional Regulator for Distribution Network Service Providers (DNSPs) in New South Wales. As such, it regulates DNSPs' network tariffs and/or allowed network revenues.

Before the current determination on these tariffs and revenues[1] expires on 30 June 2004, the Tribunal will conduct a review and make a new determination. As part of its preparation for this process, it is conducting a review and making a decision on whether it will continue to use the current form of economic regulation, or to change to an alternative form. If the Tribunal does decide to change, the National Electricity Code (the Code) requires it to give stakeholders two years notice, which would mean it must make its decision and inform stakeholders by 1 July 2002.

An indicative timetable for these reviews is provided below.

Action	Date
Release discussion paper on form of economic regulation	August 2001
Decide on form of economic regulation and inform stakeholders	June 2002
Release discussion papers on 2004 network tariff determination	From 1 July 2002
Release 2004 network tariff determination and rules	March 2004

The purpose of this discussion paper is to assist stakeholders in making submissions to the Tribunal in relation to its review of the form of economic regulation for NSW DNSPs. It is structured as follows:

* Chapter 2 defines the scope and objectives of the review

* Chapter 3 describes the various options for the form of economic regulation

* Chapter 4 discusses some of the factors the Tribunal is likely to consider in assessing the appropriateness of these options

* Chapter 5 describes the process and timetable for the review[2] and explains how interested parties can make a submission.

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[1]   IPART, *Regulation of New South Wales Electricity Distribution Networks, Determination and Rules under the National Electricity Code*, December 1999.

[2]   in accordance with the Tribunal's obligations under clause 6.10.3(d)(2) of the Code.

2   SCOPE AND OBJECTIVES OF THE REVIEW

In the current determination, the Tribunal has used a pure revenue cap to regulate network tariffs charged by NSW DNSPs. The purpose of this review is to examine whether the Tribunal should retain a revenue cap or adopt some other option at the next network tariff determination.

The options the Tribunal can consider and its objectives in selecting the most appropriate option must comply with the framework for the regulation and operation of the national electricity market that is set out in the Code. In particular, they must comply with Chapter 6, Part D of the Code, which provides the framework for regulating the electricity distribution networks.

2.1   Options for the form of economic regulation

Although the Code does not confer a precise meaning on the term 'form of regulation', it does specify (in Clause 6.10.5(a)) that:

> … economic regulation shall be of the prospective CPI minus X form, or some incentive-based variant of the CPI minus X form which is consistent with the objectives and principles outlined in clauses 6.10.2 and 6.10.3.[3]

Thus, the Tribunal must regulate DNSPs' tariffs using a CPI-X approach. Under this approach the Tribunal sets prices, or revenues, at the beginning of the regulatory period, and allows DNSPs to adjust these prices each year by the general rate of inflation, as measured by the consumer price index (CPI), minus an adjustment factor X. The Tribunal sets the X factor at the time of the determination for the duration of the regulatory control period. In determining an appropriate level of X, the Tribunal has regard to a number of relevant factors, such as forecast changes in industry demand, costs and underlying industry efficiency.[4]

In addition to a requirement to use CPI-X, clause 6.10.5(b) of the Code requires that the Tribunal use one of three forms of economic regulation—either:

1.   a revenue cap

2.   a weighted average price cap, or

3.   some combination of the above.

Thus, the options the Tribunal can consider as the form of economic regulation are limited to the various manifestations of these three forms. In addition, the Tribunal wishes to make it clear that the final outcome of this review of the form of economic regulation is limited to a decision on which of these three forms it will use. It will decide on the specific formulation and detail of the form of economic regulation as part of its deliberations for the 2004 network tariff determination. It will decide on other issues that are related but not integral to the form of economic regulation (such as whether to adopt a building block or a yardstick approach to calculate the regulatory cap) as part of its review for the network tariff determination.

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[3]   Clauses 6.10.2 and 6.10.3 of the National Electricity Code.

[4]   The X factor may also be influenced by past financial outcomes, for instance where there is a glide path.

2.2 Objectives in selecting the most appropriate option

The Tribunal's aim in undertaking this review is to determine which of the three possible forms of economic regulation will best achieve the objectives for regulating network tariffs listed in Part D of Chapter 6 of the Code. These include:

- to provide an equitable allocation of efficiency gains (clause 6.10.2(b)(1))

- to provide a fair and reasonable return on efficient investment, given efficient operating and maintenance practices (clause 6.10.2(b)(2))

- to prevent the extraction of monopoly rents (clause 6.10.2(c))

- to foster an efficient level of investment within the distribution sector, and upstream and downstream markets (clause 6.10.2(d))

- to foster efficient operating and maintenance practices (clause 6.10.2(e))

- to foster efficient use of existing infrastructure (clause 6.10.2(f))

- to permit the balancing of interests of owners, users and the public (clause 6.10.2(k)).

In addition, clause 6.10.3 of the Code requires the Tribunal to administer its regulatory regime for distribution network owners and service providers according to a number of principles. These include providing distribution network owners with:

- incentives and reasonable opportunities to increase productivity (clause 6.10.3 (e) (1))

- an environment in which generation, energy storage, demand side options and network augmentation options are given due and reasonable consideration (clause 6.10.3(e)(2))

- a fair and reasonable risk-adjusted cashflow rate of return on efficient investment, given efficient operating and maintenance practices on the part of distribution network owners (clause 6.10.3(e)(5))

- reasonable certainty and consistency over time (clause 6.10.3(6)).

These objectives and principles do not directly translate into a tangible set of criteria for assessing which form of regulation is most appropriate. In theory, most methods of price control would seem suitable for meeting these broad objectives. The Tribunal believes, however, that the success of a regulatory regime depends on how effectively and efficiently the regulation can be implemented. Thus, the Tribunal's objective for this review is to determine which form of economic regulation will best achieve these objectives and accord with these principles *in practice.*

3 UNDERSTANDING THE OPTIONS

This chapter provides a brief explanation of each option for the form of regulation the Tribunal will consider—a pure revenue cap, a weighted average price cap (and a variant of this option known as a revenue yield price cap), and a hybrid revenue cap.[5] For each of these price control mechanisms, it describes how the mechanism works, provides an example of it in operation and an overview of the Tribunal's and other regulators' experience with using it.

3.1 Pure revenue cap

The pure revenue cap is the pricing control mechanism the Tribunal currently uses to regulate DNSPs. Using this mechanism, the Tribunal determines the total maximum regulated income that each DNSP is permitted to earn. Each DNSP then develops a set of prices that will allow it to earn this amount.

In the Code's terminology, the Tribunal determines the Annual Aggregate Revenue Requirement (AARR) of each DNSP for the first year of the regulatory control period.[6] It also determines a CPI-X formula for adjusting this amount in each subsequent year of this period. In addition, it can set limitations on the amount by which some or all prices can increase during the regulatory period. Each DNSP is informed of its AARR, the adjustment formula, and any limitations prior to the beginning of the regulatory period, at the time of the Tribunal's determination.

DNSPs are then required to develop a set of prices that will produce overall revenue that is equal to the AARR (based on its forecasts of volumes for each price category) and that comply with any limitations on price increases imposed by the Tribunal. Each year, they must report to the Tribunal on what their actual revenue was.

However, if, in any year, the level or composition of its sales volume varies from the DNSP's demand forecasts at the time it developed its pricing proposal, the actual level of revenue it collects will either exceed or fall short of its AARR, or revenue cap. This means that when using a revenue cap mechanism, a regulator will also usually need to use a correction mechanism to adjust for forecast errors. The Tribunal currently uses a correction mechanism known as an unders and over account. Any variation between the AARR and actual revenue is monitored and recorded in a notional account. The money in this account is cumulative from year to year, and an interest charge or credit (depending on whether the account balance is positive or negative) applies. If the amount in a DNSP's unders and overs account exceeds, or falls below, certain level prescribed by the Tribunal,[7] the DNSP is required to take action to rectify the situation. A surplus would be returned to customers.

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[5] There is also another form of price cap—a pure price cap, under which the regulator sets individual prices. This form of economic regulation is not consistent with the Code, and the Tribunal is not considering using it to regulate DNSPs. However, in the interests of completeness, Attachment 2 provides an explanation of pure price cap.

[6] There are a variety of methods that can be used to arrive the initial AARR. Consideration of these mechanisms are beyond the scope of this paper, however, at the previous determination the Tribunal adopted a 'building block approach'. Using this approach, the Tribunal set the base revenue requirement as the sum of estimated efficient operating costs, depreciation and a risk adjusted return of capital.

[7] The specified levels are usually expressed as a percentage of the AARR.

3.1.1 Experience using a pure revenue cap

The Tribunal has used a pure revenue cap to regulate NSW DNSPs for the current regulatory control period only.[8] During this period, problems have arisen because:

- The volume forecasts used in setting AARRs have varied markedly from actual volumes, leading to large over and under recoveries.

- The Tribunal can only assess actual compliance with the determination after the year end, which may be too late to prevent the accumulation of large unders and overs account balances.

- The Tribunal has concerns about the way in which some DNSPs have managed their unders and overs account balances.

3.2 Weighted average price cap

Under a weighted average price cap, the Tribunal sets a cap on the maximum average price per kilowatt hour (kWh) of electricity distributed for each DNSP's group of prices for the first year of the regulatory control period.[9] The Tribunal also determines a CPI-X formula for adjusting this average price in each subsequent year of the regulatory period. In addition, it can set limitations on the amount by which some or all individual prices within the group(s) can increase during the regulatory period. DNSPs then have freedom to rebalance prices (increase or decrease individual prices), so long as the weighted average of the prices is less than or equal to the maximum average price, and they comply with any limitations imposed by the Tribunal.

The maximum average price will be different for each DNSP. The Tribunal determines this price based on an assessment of the DNSP's revenue requirement and its forecast kWh sales.

The Tribunal assesses whether the DNSP's proposed prices comply with the maximum average price by calculating the weighted average of the DNSP's proposed prices. It is necessary to apply a weight to each individual price because a DNSP will not sell equal volumes of electricity at each price within its group of prices.[10]

To calculate the weighted average price, the Tribunal applies a weight to each individual price category, and then sums these weighted prices in order to calculate the weighted average price charged by the DNSP. The weights are usually based on estimates (or forecasts) of the volume of electricity the DNSP expects to sell in each price category. These volume forecasts may be fixed at the start of the regulatory period, and then held constant or reset at suitable intervals.

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[8]   Prior to this it used a hybrid revenue cap.

[9]   Alternatively, it could set more than one maximum average price per DNSP: for instance, one maximum average price for households and another for businesses. In this case the DNSP's prices would be separated into two or more price groups, or tariff baskets.

[10]   For example, assume a DNSP has only two prices, 5 cents per kWh and 15 cents per kWh. The DNSP sells 100 kWh per annum on the 5 cent tariff, and 3000 kWh per annum on the 15 cent tariff. In this case, the pure average of the prices is 10 cents. The weighted average is 14.7 cents — which is much closer to the price actually paid by most customers.

The accuracy of the volume forecasts will significantly affect the overall revenue that the DNSP is able to earn while keeping within the weighted average price cap. If a volume forecast (and hence weighting) underestimates the proportion of revenue attributed to a particular price class, customers in that class could legitimately be charged a higher price than if the volume forecast was correct. Thus, if the Tribunal uses this approach, it would need to address the inherent uncertainty surrounding volume forecasts in some way. In practice, this could entail adopting one of the following:

1.   the Tribunal determining the volume forecasts that DNSPs use to calculate prices

2.   DNSPs developing their own volume forecasts (in conjunction with using some correction mechanism, such as an unders and overs account)

3.   relying on a rule of thumb to set the weights, such as the past volumes the DNSP sold

4.   using a combination of the above approaches — for instance, given problems of information asymmetry, the Tribunal may prefer to determine the volume forecasts itself and also use a correction mechanism.

In Victoria, the Office of the Regulator General (ORG) relies on past volumes to set the weights. It requires DNSPs to set weights equal to the quantity sold in each tariff class in the previous year (see the example set out in 3.2.1 below). This approach eliminates the need for a correction mechanism, and simplifies the process of estimating volumes during the regulatory control period. However it potentially gives rise to other problems which are discussed in section 4.6.3.[11]

A weighted average price cap has the potential to become difficult to administer if there are many network tariffs. Further complexities arise as customers switch between tariffs and as DNSPs introduce new tariffs and obsolete old ones. The NSW distribution sector is characterised by a large number of network tariffs, each of which contains several different components.

3.2.1   Example

In its detailed proposal on the tariff basket form of price control, the ORG proposed using the equation below to determine whether a DNSP's proposed prices comply with its weighted average price cap. The equation compares the percentage increase allowed under the CPI-X formula (shown on the left hand side) with the percentage increase in proposed prices relative to current prices (shown on the right hand side):[12]

$$\left(1+\left(\frac{CPI_t - X}{100}\right)\right) \geq \frac{\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{m} p_{ij}^{t+1} * q_{ij}^{t-1}}{\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{m} p_{ij}^{t} * q_{ij}^{t-1}} \qquad i=1,\ldots,n \text{ and } j=1,\ldots,m.$$

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[11]   It would still be necessary to use volume forecasts where DNSPs seek to introduce new tariffs, as in this case there are no past volume figures to rely on.

[12]   Office of the Regulator General, *2001 Electricity Distribution Price Review Consultation Paper No. 5 — Tariff basket form of price control detail proposal,* December 1999, p 5. The ORG ultimately adopted a formula that included a service adjustment mechanism, which makes it more complex and less suitable for demonstrating how a weighted average price cap works.

where the DNSP has n tariff categories, which each have up to m components, and where:

p_{ij}^{t} is the price currently being charged for component j of tariff i

p_{ij}^{t+1} is the proposed price for component j of tariff i in the coming year

q_{ij}^{t-1} is the quantity of component j of tariff i that was sold in the previous year

CPI_{t} is the inflation rate for year t

X is a productivity factor that varies for each distributor, determined by the ORG.

The prices proposed by the DNSP would be seen as complying the weighted average price cap if this equation holds. For the equation to hold, the sum of weighted prices must increase by no more than CPI-X. DNSPs may rebalance prices within price limits determined by the ORG.

The weight applying to each tariff is set according to the quantity sold in the previous year. In effect, the ORG has adopted a rule of thumb where q_{ij}^{t-1} act as a proxy for q_{ij}^{t}. Under this model, the ORG does not determine volume forecasts, nor does it use a correction mechanism.

3.2.2   Experience using a weighted average price cap

The Tribunal has not used a weighted average price cap in the past. As discussed above, the ORG has only recently adopted this type of price control mechanism to regulate DNSPs. Therefore, it is too soon to draw much from the Victorian experience

3.3   Revenue yield price cap

The revenue yield price cap is a form of weighted average price cap. Using this kind of price cap, the Tribunal calculates each DNSP's maximum average price by dividing its total revenue by its total output. It sets a cap on the maximum average revenue each DNSP is allowed to earn per unit of output (that is, its maximum average charge per kWh of electricity distributed) for the first year of the regulatory period. It also determines a CPI-X formula for adjusting this average revenue per unit in each subsequent year of the period, and can set limitations on the amount some or all individual prices can increase.

As under the weighted average price cap, a DNSP is then able to rebalance prices (increase or decrease individual prices), so long as the weighted average of its distribution prices did not exceed the set maximum average charge per kWh, and it complies with any limitations imposed by the Tribunal.

Once again, the Tribunal or the DNSPs have to estimate volume forecasts so the DNSPs can set individual prices that will allow it to comply with the cap. Thus, this revenue yield price cap also needs to involve one of the mechanisms for dealing with volume forecasts described in section 3.2 above.

The key difference between the weighted average and revenue yield price caps is the way in which allowed revenue per additional unit is treated. Under a weighted average price cap, the allowed revenue a DNSP can earn from each additional unit varies according to the actual price for that unit. Under a revenue yield price cap, the allowed revenue per additional unit is fixed.

3.3.1　Example

During the period 1996-2001, the ORG calculated the maximum average charge per kWh for a financial year (the MAC_t) according to the following formula:[13]

$$MAC_t = (CPI—X)*P_{t-1}—K_t$$

Where:

CPI　is the inflation rate

X　　is a productivity factor that varies for each distributor, determined by the ORG

P_{t-1}　is the weighted average for each distribution category in the base year (weighted by the volume of electricity forecast to be distributed in each category in each year, *t*)

K_t　　is a composite correction factor that adjusts for under or over recovery of revenue as a result of actual prices being found not to have complied with the MAC_t ex post.

Each Victorian DNSP was required to ensure that the weighted average of its distribution prices (in c/kWh) did not exceed the maximum average charge (MAC_t) set by the ORG for that year. Rebalancing of prices between various customer classes could take place, subject to a limitation on price increases of CPI+2% in any given year.

3.3.2　Experience using a revenue yield price cap

The Tribunal has not used a revenue yield price cap in the past. The ORG, however, used this type of price cap to regulate Victorian DNSPs for several years up until its most recent determination. The ORG decided to switch to an alternative form of economic regulation because it believes the revenue yield price cap:

- does not provide an incentive to set efficient prices

- discourages appropriate demand management practices

- creates incentives for strategic forecasting

- leads to volatility in profits resulting from changes in demand

- relies on forecasts and a correction mechanism, which are complex to develop and administer.[14]

The Tribunal believes these criticisms are valid, but notes that they also apply to other forms of economic regulation (including, in some cases, the weighted average price cap — the form of economic regulation that the ORG used to replace the revenue yield price cap).

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[13]　Office of the Regulator General, *2001 Electricity Distribution Price Review Consultation Paper No. 3 — The form of price control*, December 1998, p 4.

[14]　Office of the Regulator General, *Consultation Paper No. 5* December 1999, pp 21-24.

3.4 Hybrid revenue cap

Under a hybrid revenue cap, the Tribunal sets the maximum allowed revenue for each DNSP for the first year of the regulatory control period. The allowed revenue is linked to one or more parameters, which are observable cost drivers (such as the DNSP's number of customers and energy sales in MWh). In effect, a hybrid revenue cap is a weighted average of a price cap and a revenue cap, where the coefficients applying to the parameters determine the sensitivity of revenue to changes in those variables. It allows DNSPs to reflect changes in certain costs in their prices (and therefore revenue) during the regulatory period, rather having to wait until the next determination.

As under a pure revenue cap, a hybrid revenue cap mechanism relies on the DNSPs to forecast demand for their services during the regulatory period. It is necessary to forecasts volume so that DNSPs can develop pricing proposals to accord with the maximum allowed revenue. If these forecasts are inaccurate, the revenue they collect will be more or less than the set maximum allowed revenue. Thus, the Tribunal needs to use a correction mechanism to adjust for these inaccuracies.

3.4.1 Example

The Tribunal used a hybrid revenue cap to regulate DNSPs in its 1996 and 1997 determinations. During the review prior to its 1999 Determination, the Tribunal considered retaining a hybrid revenue cap. In its report to the Premier on *Pricing for Electricity Networks and Retail Supply,* it proposed the following hybrid revenue cap:[15]

$$MAR = [(a+bN+cM+dL)*(1+(CPI-X))] + Y + GST$$

where:
MAR is the maximum allowed revenue
N   is customer numbers
M   is MWh sales
L   is circuit kilometres (rural distributors only)
Y   is Y2K costs, NEMMCO fees and full retail contestability costs
GST   is the net impact of the GST on the business
CPI   is the inflation rate
a   is a residual fixed term capturing other costs ($'000)
b   is dollars per customer
c   is dollars per MWh
d   is dollars per circuit kilometre

Under a hybrid revenue cap, the MAR is calculated annually. DNSPs have flexibility in setting prices, so long as the MAR —and any limitation on price increases— is not exceeded.

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[15]   IPART, *Pricing for Electricity Networks and Retail Supply*, Rev99-5.1, June 1999, Vol I, p 21. It should be noted that the Tribunal did not adopt a hybrid cap but instead implemented a fixed revenue cap.

3.4.2　Experience using a hybrid revenue cap

As mentioned above, the Tribunal used a hybrid revenue cap in its 1996 and 1997 determination. During its review for the 1999 Determination, the Tribunal decide to switch to a pure revenue cap. The main reason for the Tribunal's decision was that the fixed component accounted for the vast majority of revenues, and the kWh component was very small. Therefore, the MAR would vary only very slightly as a result of changes in volumes. The Tribunal judged that the benefits arising from the additional flexibility were not so great as to justify the additional complexity involved in recalculating the MAR on an annual basis. Further, DNSPs had started to accumulate significant unders and overs account balances under the hybrid revenue cap. Another important factor in the Tribunal's decision was that there was industry support for a pure revenue cap at that time.

The Tribunal seeks comment on the appropriate form of regulatory cap and how each of these meet the objectives and principles set out in the Code.

4   ASSESSING THE OPTIONS

There is no obvious choice among the various options — each has advantages and disadvantages. Each is likely to be more effective for meeting some objectives, while less effective for meeting others. Therefore the Tribunal will need to make a judgement about which form of economic regulation is most likely *in practice* to produce the best overall outcome, in line with the intentions of the Code.

This chapter discusses the various forms of economic regulation in relation to a range of issues that the Tribunal will consider in assessing the options.   These issues have traditionally been given high priority by regulators, and include:

- Does the mechanism provide DNSPs with incentives to set efficient prices?

- Is the mechanism unbiased in relation to demand management?

- Does the mechanism provide flexibility in pricing design, so that it is easy for DNSPs to incorporate new prices into the cap?

- Is volume risk allocated in a manner that minimise the overall cost of risk?

- How critical are accurate volume forecasts, and what are the consequences of inaccurate forecasts?

- Is there an effective approach that can be used to minimise the administrative problems associated with reconciling forecast and actual sales?

- Is the mechanism (and any formula it involves) easy to understand?

- Does the mechanism require the cap to be reset each year?

The Tribunal seeks comment on the extent to which each of the possible forms of regulation address these issues.

4.1   Does the mechanism provide DNSPs with incentives to set efficient prices?

Efficient prices exist where a DNSP's prices reflect the marginal costs incurred in distributing electricity. From a regulator's point of view, efficient pricing is desirable because it promotes an efficient allocation of resources.

In theory, the different forms of economic regulation available to the Tribunal create different incentives for DNSPs in setting their prices. Price caps are generally considered to provide better incentives to set efficient prices than revenue caps:[16]

- Under a weighted average price cap, DNSPs can increase their profits by increasing sales. This creates a relatively good incentive for them to set prices efficiently, as in theory, if they price too high above cost they are likely to sell less and so receive lower profits.

- Under a revenue yield price cap, profits are also linked to sales. However, this mechanism also creates distortion as DNSPs have an incentive to price below cost to

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[16]   These points consider the effect of efficiency of pricing for the provision of network services to end users and do not consider the impact of pricing for energy efficiency services, or network services for embedded generation.

segments of the market to which they can provide more electricity for low incremental cost.

- Under a pure revenue cap, a DNSP's income is fixed, regardless of how much electricity it sells. Thus, this mechanism does not create an incentive for it to price efficiently in order to maximise sales.

- Under a hybrid revenue cap, the incentives for DNSPs will vary, depending on the formula that is used to set the cap.

In practice, however, a DNSP's behaviour will not necessarily accord with the incentives created by the form of economic regulation. Indeed, recent research in the United Kingdom suggests that using a form of economic regulation that encourages efficient pricing is unlikely to have a major effect on businesses' pricing decisions.[17] This research looked at a number of UK industries that are subject to CPI-X regulation and found that regulated businesses tend to focus on attaining the maximum regulated revenue at the time of the regulator's decision rather than setting prices in response to short-term signals. The CPI-X structure overarches the incentives created by the form of economic regulation, which potentially last only for the duration of the regulatory control period.[18]

In addition, DNSPs may have commercial or public relations reasons for choosing to adopt inefficient price structures, regardless of the incentives created by the form of regulation. For instance, DNSPs' price structures tend to be biased against fixed charges, since customers dislike having a high fixed component in their tariffs. Many DNSPs derive a large proportion of their revenue from variable charges — even though the proportion of their costs that is variable is relatively small — to foster good relations with their customers. They may continue to do so even if higher fixed charges will increase their profits.

Therefore, when assessing the options for the form of regulation in relation to incentives for pricing efficiency, the Tribunal will need to consider the extent to which such incentives are likely to influence DNSPs' behaviour and the potential impact on customers. It will also consider whether alternative mechanisms to encourage efficient pricing practices by DNSPs might be more effective. For example, its *Pricing Principles and Methodology*[19] for DNSPs are aimed at promoting efficient pricing practices, even if the form of regulation does not create incentives to do so. In addition, it could use its price approval powers to move DNSPs towards more efficient pricing.

4.2   Is the mechanism unbiased in relation to demand management?

Transmission and distribution of electricity generated in large central power stations is one means of meeting customers' energy requirements. Alternatively, these requirements may be met, in part, through demand management or distributed generation. It is important that the form of regulation is not biased against demand management or distributed generation as this may, in some cases, be the most efficient option. It can avoid or delay the need for

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[17]   Giulietti & Waddams Price, "Incentive Regulation and Efficient Pricing: Empirical Evidence" *Centre for Management under Regulation Research Paper Series,* March 2000.

[18]   For example, the information asymmetry surrounding demand forecasts at the time of the regulatory reset may provide an incentive for the utility to give greater weight to the variable components of tariffs.

[19]   IPART, *Pricing Principles and Methodologies for Prescribed Electricity Distribution Services - Developed Pursuant to clause 6.11(e) of Part E, Chapter 6 of the Code,* April 2001.

DNSPs to invest in expensive network augmentation or expansion, and prevent excessive network investment that could result in a larger than optimal electricity market (ie dynamic inefficiency). It also has environmental benefits.

Some of the options the Tribunal is considering are biased in relation to demand management and distributed generation. Both the weighted average price cap and revenue yield price cap would create a clear financial disincentive for DNSPs to use appropriate demand management practices, as under these forms of regulation their income is linked to the amount of electricity they distribute. As a result, DNSPs may choose to augment their network even though demand management strategies may be more efficient.

Revenue caps are not biased against demand management, as under these forms of regulation DNSPs income is not linked to the amount of electricity they sell. Under a pure revenue cap, allowed revenue is completely independent of the volume of sales. Under a hybrid revenue cap, the link between revenue and sales is determined by the coefficients adopted and so can be controlled by the regulator.[20]

In practice, however, the incentives to engage in demand management under a revenue cap may not be especially strong. Once again, the incentives created by the overarching CPI-X regulatory structure may exceed any short-term incentives created by the form of economic regulation. Forward-looking DNSPs may seek to increase the size of their network to increase their asset base and thus obtain a better outcome at the next regulatory reset (although the Tribunal would subject their investment decisions to a prudency test).

The Tribunal notes that in choosing one form of regulation over another, there may be a direct trade-off between pricing efficiency and demand management, in that the options that provide incentives for pricing efficiency for network services are biased against demand management and vice versa.

In selecting the form of regulation, the Tribunal will also consider whether it could use alternative mechanisms to encourage DNSPs to adopt appropriate demand management practices, even if they are subject to a price cap. At the request of the Premier, the Tribunal is currently reviewing demand management and energy efficiency.[21] Its decision on the form of economic regulation will have important consequences for that review. Likewise, the demand management review could be used to develop a regulatory regime that promotes appropriate demand management even if the form of economic regulation is biased against it.

Demand management in electricity is usually regulated using license conditions. A more radical approach would be to incorporate an 'E factor' into the price/revenue cap formula so that a DNSP would be penalised if consumption grew above forecast levels and rewarded if consumption fell. This option would have a number of side effects relating to risk and incentives for gaming that the Tribunal would need to consider carefully.

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[20]   In the past, the Tribunal (and also Ofgem) has chosen to adopt a formula that has a neutral effect on demand management.

[21]   This inquiry is being conducted under s12A of the IPART Act. See IPART *Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services — Issues Paper,* July 2001.

4.3   Does the mechanism provide flexibility in pricing design?

If there is flexibility in pricing design, DNSPs are able to introduce new tariff classes and modify the internal structure of their prices (ie the split between the fixed and variable components) during the regulatory control period. Such flexibility could benefit both DNSPs and customers, as DNSPs could develop new tariffs that have attractive features for customers, or that align more closely with their marginal costs.

Under a pure revenue cap or a hybrid revenue cap, it is easy to incorporate new pricing structures into the cap. With weighted average price caps and revenue yield price caps, it may or may not be problematic, depending on how volume forecasts are treated.

If the volume forecasts (and hence weights) are re-calculated annually using forward-looking data, it is relatively easy to incorporate new pricing structures into the cap. If the volume forecasts are fixed for the duration of the regulatory control period, or are derived from historical data, pricing structures become rigid. This makes it difficult for DNSPs to introduce new prices and services.

The ORG uses historical quantities as a proxy for the quantities to be consumed in a given year. If a DNSP proposes to introduce a new price, however, no historical data exists. This means a special provision is needed within the weighted average price cap to permit innovation in pricing design. The ORG requires Victorian DNSPs to estimate how much electricity would have been sold (under both the new and existing tariffs) if the proposed price had been offered in the previous year.[22] Calculating these estimates could be complex and contentious. Further, unless there is a correction factor associated with the estimates, DNSPs must bear the upside and downside risk of the estimates proving incorrect.

4.4   Do customers or the DNSPs bear the volume risk?

All forms of CPI-X regulation require the regulator to make a judgement about what volume of electricity a DNSP will distribute during the regulatory control period at the start of that period. This judgement is embedded in the cap and reflected in the X factor.

There is a financial risk associated with these volume estimates,[23] which either the DNSPs or their customers must bear, depending on what price control mechanism is used. Most of a DNSP's costs are constant, no matter what volume of electricity it distributes; however, most of its revenue is derived from volume-based prices. Since the difference between total revenues and costs will vary as volumes change, there is financial risk associated with changes in volumes. If a DNSP's actual volumes differ from the regulator's estimates, either it or its customers will receive a windfall gain or loss, depending on the form of regulation:

- Under a weighted average price cap and a revenue yield price cap, DNSPs bear the volume risk. If a DNSP sells a higher volume of electricity than the forecast level, it will receive higher than expected profits; if it sells a lower volume it will receive lower profits.

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[22]   Office of the Regulator General *Electricity Distribution Price Determination 2001-05,* September 2000, p 193.

[23]   The discussion in this section focuses on risk associated with changes in volume. There is also risk associated with uncontrollable supply-side costs, such as NEM fees or Y2K costs. The risk associated with these costs is borne by the DNSP under any form of regulation, unless a cost pass-through mechanism is built into the cap. This regulatory response transfers the risk associated with these uncontrollable costs to consumers.

- Under a pure revenue cap, a DNSP's allowed revenue remains the same, whatever volume it sells, so its customers bear the volume risk.

- Under a hybrid revenue cap volume risk is shared between the DNSPs and their customers.

4.5   How critical are accurate forecasts?

Under a weighted average price cap and a revenue yield price cap, a DNSP's total revenue depends on its volume of sales. If actual volumes differ from those forecast at the regulatory reset, the result may be:

- inappropriately high profits for DNSPs, leading to public perceptions of unfairness and pressure to re-open the decision,[24] or

- inadequate revenue for DNSPs, compromising their capacity to provide an appropriate level of service.

Under a pure revenue cap the accuracy of volume forecasts is less critical because a DNSP's regulated revenue is not linked to the volume of sales, but to its estimated revenue requirements. However, in practice, revenue received by the DNSP is dependent on sales, leading to an under/over recovery if forecasts are inaccurate.

Under a hybrid revenue cap, revenue is related to volume of sales;[25] however, because the cap is adjusted over the course of the regulatory period, the accuracy of volume forecasts at the time of the regulatory reset is less important than it is under price caps. Forecasts are still necessary, however, as expected sales volumes are one of the factors the Tribunal considers to determine what the X factor should be in the CPI-X formula.

In addition, although a hybrid revenue cap reduces the pressure at the time of the regulatory reset, the ongoing adjustments it involves increase administrative costs throughout the regulatory period. The other forms of economic regulation involve more pressure at the regulatory reset, but less pressure between resets.[26] Therefore, the Tribunal will need to weigh the benefits of not having to make an adjustment during the period of the cap against the costs of the additional pressure that will arise at the reset.

4.6   Is there an effective mechanism for reconciling forecast and actual volumes?

Under all the price control mechanisms the Tribunal is considering, the extent to which a DNSP complies with the regulatory cap depends how much electricity it sells across all tariff classes. In any given year, a DNSP must set its prices so that it will comply with the cap before it knows what volume of electricity it will sell at each price. Inevitably there will be some difference between its actual and forecast sales volumes, and thus some degree of non-

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[24]   This occurred in the UK, in both the telecommunications industry and the electricity industry.

[25]   The impact of volumes on revenue depends on the relevant coefficient. Often this coefficient is very small.

[26]   There are reasons why hybrid revenue cap may prove to be complicated at the time of the regulatory reset. Issues arise as to which parameters to use, or the precise definitions to adopt. For example, is a customer measured by the number of electricity accounts, persons or households? Further, marginal cost is difficult to specify and the coefficients will inevitably include a measure of guesswork.   In the Tribunal's experience, it has been difficult to obtain agreement on the construction of the MAR formula.

compliance. To minimise or rectify this level of inaccuracy and thus enforce compliance, the Tribunal needs to use another approach in association with the form of economic regulation.

These approaches include:
1.   having the Tribunal determine the volume forecasts that DNSPs use to calculate prices

2.   having DNSPs develop their own volume forecasts, and using some mechanism (such as an unders and overs account) to correct inaccuracies

3.   using a rule of thumb or proxy to estimate volumes

4.   using a combination of the above approaches.

Although any of these approaches could be used with any of the options for the form of economic regulation, it can be argued that under revenue caps approaches that use a correction mechanism[27] are more appropriate, while under price caps the more prescriptive methods of estimating volumes are better.

4.6.1   Tribunal determines volume forecasts

The Tribunal could develop a system of pre-agreed volume forecasts under which it must approve the volume forecasts DNSPs use to set to each tariff in each year. However, as it would probably have inadequate or asymmetrical information with which to make its decision, this is likely to be a difficult regulatory task. If the Tribunal decides to use pre-agreed volume forecasts, it must also consider whether to set the forecasts for the duration of the period at the regulatory reset or conduct an annual review.

4.6.2   Correction mechanism

DNSPs can be permitted to estimate their own volume forecasts on the understanding that they will be required to recoup or return any over- or under-recovery in the following year. This involves the use of a correction mechanism, such as an unders and overs account (see section 3.1).   This approach has the advantage of allowing the party with the best information to set volume forecasts.   However, it can lead to compliance problems in practice, as DNSPs may not have sufficient incentive to set accurate forecasts.

The Tribunal is considering methods of increasing such incentives. The UK regulator, the Office of Gas and Electricity Markets (Ofgem) uses a 'forecasting accuracy adjustment' to provide more incentive for DNSPs to set accurate forecasts. If Ofgem believes a business has used inappropriate forecasts, it imposes a penalty by deducting a percentage from that business' allowed revenue at the next regulatory reset.   Ofgem adopted this approach because of its "continuing concerns that companies have an incentive to distort their forecasts of key elements of information at a price control review".[28]

At the most recent UK regulatory reset, Ofgem made a forecasting accuracy adjustment to three businesses that it considered had submitted unrealistic capital expenditure forecasts. The Tribunal intends to consider whether a similar mechanism could be used to give NSW DNSPs incentive to improve the accuracy of their volume forecasts. It will need to take into

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[27]   In the absence of a correction mechanism, the incentives for demand management that are associated with a revenue cap are lost.

[28]   Ofgem, *Distribution Price Control Review Final Proposals,* December 1999, p 55.

account the benefits of this approach in terms of better compliance and reduced administrative problems, and the costs in terms of increased regulatory uncertainty.

4.6.3   Tribunal uses a rule of thumb to estimate volumes

The Tribunal could structure the form of economic regulation so that it uses some rule of thumb or proxy to estimate future volumes, rather than using forward-looking data.[29] For example, the ORG requires Victorian DNSPs to set weights equal to the quantity of electricity they sold in each tariff class in the previous year. This approach assumes that electricity consumption across each tariff class will occur in the same proportions as it did two years previously. It eliminates the need for both volume forecasts (apart from those for new tariffs) and a correction mechanism.

There are, however, some problems associated with this approach. First, it is more difficult for DNSPs to introduce new tariffs, as there is no historical data available to set weights. This matter is discussed in section 4.3. Second, this option introduces a lag into the price setting process that can be exploited by DNSPs. It may be possible for DNSPs to set higher prices in the tariff classes where the estimated weights (ie last year's quantity) understate the true weights. If DNSPs do this, the actual maximum average price will exceed the regulatory cap. That said, the Tribunal's price approval powers could be used to address such behaviour.

4.6.4   The Tribunal uses a combination of the above approaches

The Tribunal could combine a correction mechanism (ie an unders and overs account) with one of the other options. This approach increases complexity, but reduces the risk of an adverse outcome if the estimates generated by the pre-agreed volume forecasts/rule of thumb prove incorrect.

4.7   Is the mechanism (and any formula it involves) easy to understand?

While it is impossible to state conclusively which form of economic regulation is most easy for stakeholders to understand, in general:

- pure revenue caps are relatively straightforward

- weighted average price caps and revenue yield price caps use algebraic formula which can be complex and difficult to understand

- hybrid revenue caps involve a large number of variables so can be complex.

However, any form of regulation can be complex if it incorporates 'regulatory add-ons' (such as a quality of supply S factor). For example, a complex pure revenue cap may be more difficult to understand than a simple weighted average price cap.

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[29]   Except in the case of new tariffs (see section 4.3).

4.8   Does the mechanism require the cap to be reset each year?

Under a weighted average price cap, a revenue yield price cap and a pure revenue cap, the cap is set at the time of the regulatory reset for the duration of the regulatory period. It is not necessary to adjust the cap during the regulatory period. However, this is not the case under a hybrid revenue cap.

An advantage of the hybrid revenue cap is that because it adjusts in line with actual volumes throughout the regulatory control period, pressure for the Tribunal to develop accurate forecasts at the time of the regulatory reset is reduced. However, this advantage has creates an ongoing requirement to reset the cap each year. The hybrid revenue cap depends more than other forms of economic regulation on data availability and data quality. The Tribunal must rely upon DNSPs' annual regulatory accounts to determine their maximum allowed revenue, rather than establish a fixed outcome at a single major review. As it is important to obtain reliable and consistent data for the various parameters on an annual basis, a hybrid revenue cap is likely to result in higher ongoing compliance costs during the regulatory control period.

5 THE WAY FORWARD

The Tribunal's process for this review is designed to encourage stakeholder involvement and debate on which form of economic regulation is most appropriate. The Tribunal would like to understand the range of viewpoints stakeholders hold on the issues it is considering, and thus ensure it receives balanced inputs to its decision making process. For this review, it intends seeking stakeholders views by:

- holding a public forum

- consulting extensively with interested organisations and the parties affected by investigations

- publishing this discussion papers and a draft report

- inviting submissions from interested parties.

The Tribunal's consultation process is more rigorous than the minimum standard set out in clause 8.9 of the Code.

5.1 Timetable

So that the Tribunal can notify interested parties of the form of regulation by no later than 30 June 2002, the Tribunal will follow the timetable below.

Action	Date
Release discussion paper	July 2001
Receive submissions	21 September 2001
Hold public forum	November 2001
Release draft report	February 2002
Receive submissions and feedback on draft report	30 April 2002
Notify stakeholders of the form of economic regulation	June 2002

5.2 How to make submissions

The Tribunal seeks submissions on all issues stakeholders consider relevant to the form of economic regulation discussion, including the specific issues raised in this discussion paper.

Submissions to the Tribunal must be made in writing, although there is no standard format. Submissions longer than 15 pages should also be provided on computer disk in word processor, PDF or spreadsheet format.

If you require any part of your of your submission to be treated in confidence, you should clearly indicate those parts. However, please note that confidentiality cannot be guaranteed, as the *Freedom of Information Act 1989* allows public access to certain documents.

Submissions should be sent to the following address by 21 September 2001:

Electricity Distribution Network Form of Economic Regulation Review
Independent Pricing and Regulatory Tribunal of NSW
PO Box Q290
QVB Post Office
SYDNEY NSW 1230

The Tribunal can also be contacted by email at ipart@ipart.nsw.gov.au. Telephone enquiries should be directed to Michael Seery on (02) 9290 8421 or Kumi Cuthbertson on (02) 9290 8479.

ATTACHMENT 1   CRITERIA USED BY OTHER REGULATORS

The Tribunal has considered the criteria used by other regulators to assess the strengths and weaknesses of alternative forms of economic regulation.

The Office of the Regulator General, Victoria

In deciding on a form of economic regulation for its recent determination, the Office of the Regulator General (ORG), Victoria, listed its key criteria as:

- the form of economic regulation should provide businesses with incentives for efficient behaviour

- the form of economic regulation should ensure that total revenues track total costs

- the form of economic regulation should have the capacity to manage and allocate risks of demand uncertainty in an efficient way

- the form of economic regulation should minimise the complexity cost and intrusiveness in its administration and

- the form of economic regulation should not preclude cost recovery from prudent discounting of tariffs (eg where a discount has been offered to prevent uneconomic by-pass).[30]

Queensland Competition Authority

The Queensland Competition Authority (QCA) recently produced its first determination as Jurisdictional Regulator. The QCA was of the view that "provided there is a mechanism to recognise unanticipated changes in demand, an (otherwise) fixed revenue cap would seem the most appropriate form of revenue control".[31]   The QCA's reason for adopting this approach was that:

- it put the greatest incentive in place for DNSPs to minimise costs

- it places significantly less emphasis on the need for accurate demand forecasting than that required under other forms of regulation (namely, a revenue yield cap).

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[30]   Office of the Regulator General, *Consultation Paper No. 5: Tariff Basket Form of Price Control Detailed Proposal,* December 1999, pp 3-4.

[31]   Queensland Competition Authority, *Regulation of Electricity Distribution, Final Determination,* May 2001, p 30.

ATTACHMENT 2   PURE PRICE CAP

Another important form of economic regulation —but one that is not available to the Tribunal under Chapter 6 Part D of the Code— is the pure price cap. Using this approach would involve the Tribunal setting the individual prices that DNSPs may charge. Thus, it would only be practical if the product being regulated is relatively simple and where standard, publicly posted prices apply.

At present, there are a large number of network prices applying in New South Wales. Consequently, a pure price cap would be relatively difficult to implement. Under this form of economic regulation, the Tribunal would need to either

- re-set the level of each price, or

- expose customers to price shocks if it chose to consolidate prices, or

- have a uniform adjustment rate, in which case each and every price (and price component) would be required to change by CPI-X.

A pure price cap is a heavy-handed form of regulation relative to the other options, as DNSPs have no autonomy over the prices they charge.

Experience using a pure price cap

The Tribunal uses a form of pure price cap in regulating the water and transport industries. This is possible as the number of tariffs to be set is limited.

In the Tribunal's experience, a pure price cap is relatively easy to administer during the regulatory period, so long as the product being regulated is relatively simple. However, it requires very detailed analysis at the time of the determination. Given the large number of network tariffs, the Tribunal believes it would be very difficult to apply a pure price cap to DNSPs.