REGULATION OF ELECTRICITY NETWORK SERVICE PROVIDERS

PRICE CONTROL ISSUES AND OPTIONS

Discussion Paper

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

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1 INTRODUCTION

This paper discusses the various methods by which regulators may seek to control the prices charged by the providers of electricity network services. In its recent paper on Incentives and Principles for Regulation (Discussion Paper DP 32, January 1999), the Independent Pricing and Regulatory Tribunal (the Tribunal) examines the regulatory framework, its impact on the performance of network service providers (NSPs) and the role that may be played by benefit sharing. These aspects of regulation have a substantial long term dimension, extending across regulatory review periods. Issues of price control, primarily concern the way in which regulation is applied between reviews.

This paper reviews issues associated with price control, considers the alternative approaches available and provides some preliminary conclusions to assist stakeholders and promote discussion. The paper focuses on how network service prices are controlled. This differs from the regulation of retail prices or margins in the franchise customer sector.

IPART is seeking comments on issues raised in this paper by Friday 26 March 1999.

1.1 Industry and regulatory context

1.1.1 Economic regulation, prices and revenues

Economic regulation of NSPs is required because they are the sole providers of network services to customers within their area. As such, NSPs they have the potential to exercise monopoly power. At its most obvious, this could take the form of sustained excess profit, with exorbitant excessive prices charged to customers.

Purchasers of network services expect regulation to control prices set by the NSPs, limiting their charges to efficient costs and reasonable profits. If the number services provided is relatively small and stable, and costs are easily identified, the setting of individual prices may be practical.

Where setting individual prices is not practical (ie, at reasonable cost), or is inconsistent with the preferred economic framework, the point of regulatory control may be applied at a higher level – such as by setting the average charge for a particular group of customers. This maintains a limit on the average price that customers in that group pay across all the services they receive. This can ensure that the regulated entity does not obtain a monopoly rent overall.

The removal of controls on individual prices, allows the service provider the flexibility to vary individual prices within that group (or "basket" of prices), provided the upper limit (or "cap") on the average price is not exceeded. This additional flexibility may have commercial value for the NSP. It may also mean that some customers within the group end up paying proportionally more, while others pay less, or that the structure of prices is changed. For example, the level of fixed or demand (MW) based charges may be increased and the level of throughput (kWh) prices reduced correspondingly.

In some circumstances, the point of control may be further removed from the individual prices that customers pay, and applied to the revenue (or income) that the NSP receives from its regulated activities. Revenue is set by multiplying price by quantity sold. Control of revenue ensures flexibility for the relative levels and structure of individual prices, and

encourages NSPs to provide alternative and new services to better meet customer requirements.

Under a revenue cap the quantity sold may also affect prices. If total revenue is capped and the quantity sold increases more than expected, prices will be lower. If the quantity sold is less than expected, the service provider can increase its prices to bring revenue back up to the level of the cap.

With either an average price or revenue cap scenario, regulators may decide to place side constraints on maximum increases in individual prices. These limit the flexibility that the service provider has to change the structure or relative level of individual prices by applying a second group of controls. For example, the amount that any individual price may change in one year may be limited, either to a maximum dollar amount or a maximum percentage. Likewise, the extent to which throughput prices can be replaced by fixed or demand (MW) based charges may be limited if there is a concern that the commercial interests of the provider will push it too far or too fast in this direction.

These are simplified examples, but they illustrate the methods regulators use to control the monopoly power of NSPs. Methods may vary significantly in the influence they exert on the actual prices that the purchasers of network services must pay. Thus, to describe these methods as "price control measures" is to use the term somewhat loosely.

1.1.2 Industry context

In 1996, 25 NSW electricity distributors amalgamated to create six NSW network service providers. The electricity distributors had operated as combined distributors/retailers, regulated through control of final retail prices. Network charges were not regulated separately.

Each NSW NSP is affiliated with an active retail trading arm which operates in the competitive market, supplying franchise customers at regulated retail prices. The network and retail functions form part of a larger energy service corporation. NSW licence conditions require accounting separation of the network function, but provide for more formal separation requirements to be determined by the Minister for Energy. Another licence condition requires NSW NSPs to conduct investigations into the use of demand management measures before undertaking network expansions. They must report annually on the outcome of those investigations.

Although the turnover of each incumbent retail arm is larger than that of its associated NSP, retailing is a relatively low margin business. The distributors put most of their assets into where they earn the bulk of their profits: network services.

Network services are an intermediate product. The largest ‘user’ of each NSP is its associated retail arm. Other purchasers of services from NSPs are independent energy retail companies, other energy service corporations, and larger end user companies. The majority of these have dealings with a number of NSPs, providing some basis for comparisons of price levels and structures and commercial behaviour.

Of the six NSPs, the largest two have predominantly urban service territories. The other four service extensive rural areas and some regional centres. Cost structures and service charges can therefore be expected to vary between NSPs, perhaps considerably.

NSP cost structures contain a sizeable fixed element. This varies significantly according to the degree of spare capacity present in the part of the system where service demands are increasing. Analysis by NSPs of the principal service drivers of network costs is continuing. However, current assessments are likely to change as the process advances. The number and voltage of connection points, maximum demand levels, and length of network lines appear to be among the more significant cost drivers. The relative importance of service cost drivers can be expected to vary between and within NSPs.

Market studies have indicated that electricity has a relatively low final price elasticity of demand. This means consumption is not particularly responsive to price changes. NSP charges make up around 30-60 percent of retail prices (depending on the nature of the customer's load and connection to the network). Household numbers, real income levels, business activity, investment levels and climatic factors appear to be the primary drivers of electricity consumption, peak demand and new connections. Subject to these market constraints, NSPs, and the energy service corporations of which they form a part, have a commercial interest in growing their business by expanding profitable activities.

1.1.3 The regulatory context

Three main sources of statutory regulation apply to, or may influence, the economic conduct of NSPs:

- *The National Electricity Code* – an authorised code of conduct under the National Electricity Law which, *inter alia*, sets out the principles for transmission and distribution pricing.
- *General competition law* – provided primarily by the Trade Practices Act and administered by the Australian Competition and Consumer Commission (ACCC). With the exception of those matters covered by the Code and authorised by the ACCC, the economic conduct of NSPs and the energy service corporations of which they form a part is subject to the general provisions of the Trade Practices Act.
- *State based licences* – issued by the Minister for Energy under the NSW Electricity Supply Act to operators of distribution systems and retailers of electricity. Current distribution licence conditions include a requirement for licence holders to report annually on their investigations into demand management options as an alternative to network expansion, and a dormant condition directed at enforcing the legal separation of network operations from other business activities. Subject to a number of checks and balances, the Act allows the Minister to vary existing licence conditions and impose additional conditions.

The Terms of Reference for this review require the Tribunal, *inter alia*, to base its recommendations on the National Electricity Code. Consistency with the objectives and principles of economic regulation stated in the Code is therefore a key consideration in selecting the form of control. In summary[1], the Code requires that the regulatory regime seek to:

a) establish an efficient and cost-effective regulatory environment

b) establish an incentive-based regulatory regime which

   (1) provides an equitable allocation between network users and network owners of efficiency gains reasonably expected to be achievable by the network owners

[1] The regulatory objectives relating to transmission and distribution can be found in sections 6.2.2 and 6.10.2 respectively of the National Electricity Code.

(2) provides for a sustainable commercial revenue stream which includes a fair and reasonable rate of return to network owners on efficient investment, given efficient operating and maintenance practices

c) prevent monopoly rent extraction by network owners

d) create an environment which fosters an efficient level of investment within the network sector, and upstream and downstream of the network sector

e) create an environment which fosters efficient operating and maintenance practices

f) create an environment which fosters efficient use of existing infrastructure

g) give reasonable recognition to pre-existing policies of governments regarding network asset values, revenue paths and prices

h) promote competition in upstream and downstream markets and promote competition in the provision of network services where economically feasible

i) ensure reasonable regulatory accountability through transparency and public disclosure of regulatory processes and the basis of regulatory decisions

j) achieve reasonable certainty and consistency over time of the outcomes of regulatory processes, recognising the adaptive capacities of Code participants in the provision and use of network assets

k) accept reasonable and well defined regulatory discretion which permits an acceptable balancing of the interests of transmission network owners.

The Tribunal will base its report on the provisions of the Code. In addition, the Terms of Reference require the Tribunal to report on matters to be considered under section 15 of the IPART Act. This section sets out the factors that the Tribunal must consider in making determinations on electricity pricing matters referred to it. In summary it requires the Tribunal to consider:

a) the efficient costs of providing the relevant services

b) the protection of consumers from the abuse of monopoly power

c) the appropriate rate of return and payment of dividends to the owner

d) the impact of pricing policies and required capital expenditure on capital structure and funding requirements

e) the promotion of competition in the supply of electricity services

f) standards of quality, reliability and safety of services

g) the social impacts of its determinations and recommendations

h) the impact of pricing policies on ecologically sustainable development and considerations of demand management and least cost planning.

These considerations are broadly compatible with the Code objectives. The IPART Act refers specifically to environmental and social factors. Although the Code refers more generally to the "public interest"[2], this encompasses environmental and social factors.

[2] Sections 6.2.2(k) and 6.10.2(k).

To ensure consistency with the Code and as a matter of public interest, the Tribunal is required to consider environmental and equity issues associated with the regulation of NSPs.

2 OPTIONS FOR PRICE OR REVENUE CONTROL

As discussed briefly in section 2.1, constraints on the monopoly power of NSPs may be applied through controls on the prices charged or the revenues earned.

2.1 Price-based controls

Price-based controls operate on actual prices charged. Prices may be controlled individually or grouped into "baskets".

2.1.1 Individual price controls

This is the most direct form of control, with the regulator setting the level or rate of change for each price. In general, its practicality is limited to situations where the goods or services being regulated are relatively simple and where standard, publicly posted prices apply.

2.1.2 Average price controls

Prices may be grouped into baskets on the basis of the services to which they apply. A representative weighted average price for the basket is calculated. A maximum value (or "cap") is then applied to the weighted average price. This allows for some variation between the changes that can be made to individual prices within the basket, provided that the weighted average for the basket is within the regulated cap.

The weights are typically based on either the revenue or quantity shares of each service in the basket. These may be fixed at the start of the regulatory period and then held constant, or alternatively, reset at suitable intervals.

Controls like these, which are based on existing price structures can have the effect of limiting price or product development. Although some rebalancing of prices within the basket may occur, a more substantial restructuring of prices or services offered may have to wait until the next regulatory review before it can be reflected in a new basket.

This form of control is sometimes referred to as a “tariff basket” or “weighted price control”[3].

2.2 Revenue-based controls

Revenue-based controls are applied to the revenue earned from the regulated services, rather than to the prices charged. Unless secondary price controls are applied (such as side constraints), revenue-based controls mean decisions on price structures and individual price levels are left to the discretion of the NSP. A revenue control gives the NSP flexibility to vary both the level and structure of individual prices, provided the revenue constraint is met. At the option of the NSP, redundant price structures may be removed and new services and prices developed.

[3] They are also equivalent to what would be termed in US price cap plans, a "Laspeyres-form Actual Price Index".

Like price caps, revenue caps can be applied to segments of the regulated business rather than to the business as a whole. For instance , separate revenue caps may be established for household and business customers, or for different categories of service.

Any overshoot or undershoot of the revenue target will accrue to an 'unders and overs adjustment account'. This account should be kept as close to zero as possible. For example, if a NSP's revenue cap was $100m and they recovered $110m, the additional $10m would be placed in the unders and overs account and returned to consumers through lower prices in subsequent years.

There are two basic forms of revenue-based control: fixed revenue caps and variable revenue caps.

2.2.1 Fixed revenue caps

A fixed revenue cap sets a maximum for total revenue that may be collected from the regulated services over a period of time (normally a year). The cap is set at the beginning of the control period as an absolute amount. Adjustment in subsequent years is then limited to the rate of inflation and the value the regulator places on the value of X in the CPI-X formula. Since X is set at the start of the period, in inflation adjusted (real) terms, the level of allowed revenue for each year of the control period is fixed and known.

For the NSP, a fixed revenue cap operates as both a guarantee of future revenue and a ceiling. If customer demand is less than allowed for in the cap, prices will rise to make up the shortfall in revenue, and vice versa if demand exceed expectations. Similarly, any unexpected changes in costs will be transmitted directly into either increased or reduced profits.

In practice, exceptions may be made for some types of cost. For example, changes in taxes which result in additional costs may be allowed to be passed through to customers, resulting in an offsetting increase in revenue.

Fixed revenue caps are sometimes referred to as "pure" revenue caps.

2.2.2 Variable revenue caps

Under a variable revenue cap allowed revenues are linked by a predetermined formula to another variable or group of variables (in addition to CPI-X), for example, level of demand, selected cost drivers or performance measures. Allowed revenues are therefore not known in advance, but are determined by the formula once the values of the independent variables are known.

Two broad forms of variable revenue control can be identified. These are commonly referred to as a 'revenue yield' and a 'hybrid revenue cap'.

A *revenue yield* control places a cap on the amount of revenue that may be earned for each unit of output. Thus, revenue varies directly with output. The question which arises is what is a suitable measure of output for NSPs. In practices regulators have typically used the volume of energy carried over the network, measured in kWh. Under this arrangement, allowed revenues for an NSP increase as the volume of energy transported over their network rises. Energy consumption therefore becomes a driver of revenues for the NSP.

Under certain conditions there may be little material difference between a revenue yield control and a price cap. Indeed revenue yield controls are sometimes referred to as a form of average price control. This can be confusing when the relative merits of price and revenue caps are discussed. The point of distinction is whether variations in the volume of services supplied to customers have the same (or similar) impact on revenues. Since network charges typically contain a significant demand (MW) component, an energy-based (kWh) revenue yield control is not equivalent to a price-based control.

As a simple check on the terminology that is used, controls that are described as price caps should be queried if they do not apply to actual prices charged.

Hybrid revenue controls come in a variety of forms. Typically, they contain a fixed revenue component combined with annual revenue drivers which may be based on service volumes, cost or performance related variables. They may be directed at revenue control and, by means of revenue incentives, specific aspects of NSP performance. For example, customer numbers, energy consumption, energy demand, length of network lines and system losses are among the variables included in hybrid revenue control formulae currently in use.

As the name suggests, hybrid revenue controls have emerged in response to perceived shortcomings in the various alternative approaches.

2.3 Comparison of current forms of control for networks

A brief review of current practice suggests that regulators currently favour some form of variable revenue cap.

2.3.1 New South Wales

NSW distributors are currently subject to a hybrid revenue control. Allowed revenues are adjusted each year by a formula that takes into account energy distributed, customer numbers and, for the non-metropolitan distributors, changes in line length.

In its 1996 determination, the Tribunal adopted the following revenue path formula:

$$DUSC = [a + (b_1N_1 + b_2N_2 + b_3N_3) + cM + dL + K] * (1 + (CPI-X))$$

where

N	=	customer number by customer size		
	N_1 =	small	=	0 to 20,000 kWh per annum
	N_2 =	medium	=	20,000 to 200,000 kWh per annum
	N_3 =	large	=	above 200,000 kWh per annum
M	=	MWh sales		
L	=	circuit kilometres		
K	=	loss adjustment factor		
a	=	residual fixed term capturing other costs ($'000)		
b	=	dollars per customer for each customer size		
c	=	dollars per MWh		
d	=	dollars per circuit kilometre		

The coefficients vary between rural and urban distributors and each distributor has a different residual ('a' factor). The Tribunal adopted an approximate 70/30 weighting in the formula for customer numbers and MWh sales for metropolitan distributors and an approximate 75/25 weighting between customer numbers and MWh for the rural distributors. The coefficient relating to kilometres of line applies only to rural distributors, reflecting the significant costs associated with maintaining new extensions, which may relate to relatively small numbers of customers and/or low consumption.

2.3.2 Victoria

In Victoria the allowed revenue for the transmission NSP, GPU PowerNet, is dependent on the forecast of summer maximum MW demand.

A revenue yield control is applied to the network operations of Victorian distributors. A maximum average charge in c/kWh is set by the regulator each year. Distributors must ensure that network charges are set so that expected revenue per kWh of electricity forecast to be distributed during the year does not exceed the maximum average charge. A correction factor is applied to adjust for under or over recovery of revenue during the year. A side constraint is also applied to limit the annual increase in average revenue for any individual class of customer to CPI+2 percent.

2.3.3 United Kingdom

Following privatisation, a revenue yield control was applied in the United Kingdom. The allowed revenues of the distribution businesses were dependent on the volume of electricity distributed, measured in kWh. In 1994 OFFER moved towards a hybrid revenue cap by varying the revenue formula, reducing the influence of volume to 50 percent and introducing customer numbers as the revenue driver for the remaining 50 percent. Although actual volumes distributed are used, customer numbers are set in advance, based on forecasts made at the start of the review period. As a performance incentive, a link is also drawn between allowed revenues and distribution system losses. This allows the distributors to retain a proportion of the benefit from any reduction in losses.

2.3.4 United States

Regulators in the Unites States have commonly set price caps. However, in order to overcome the barriers to demand management a number of regulators have sought to establish regulatory-driven demand management programs. Whilst some state regulators allow cost pass through, others allow a rate of return on demand management investment. Some even allow a higher rate of return on demand management programs as in incentive to invest in demand management and lost revenue recovery. In some cases, most notably California and Maine, the regulators adopted revenue regulation to reduce the tension between the form of regulation and demand management initiatives.

The Tribunal seeks comments on the appropriate options for price or revenue control.

3 FRAMEWORK FOR CHOICE OF CONTROL

3.1 General considerations

3.1.1 An integrated approach

In developing a regulatory framework for NSPs, decisions must be made regarding:

- the general form of regulation, covering such matters as the choice between incentive-based and cost of service regulation, use of individual utility or industry data, and benefit sharing principles (if any)
- the primary price control mechanism, whether this is price-based or revenue-based, with or without cost driver links
- the use of secondary price controls, such as limits on the annual change in individual price levels or the structure of prices
- the nature of any licence conditions, such as requirements for accounting separation, more formal business separation, and DM investigations prior to undertaking network expansion.

These work in combination. In particular, the general form of regulation and the primary price or revenue control mechanism clearly have a number of areas where consistency is an issue. Thus, it is desirable that the choice of control be made as part of the broader regulatory approach.

3.1.2 Objectives and risks

Prices play a central role in the economic system - they provide information to consumers and producers on costs, relative value, consumption and production possibilities and the balance of supply and demand. Regulatory intervention in the price setting process can have significant impacts.

Economic welfare is maximised when prices are based on efficient (marginal) costs. This is most likely to occur when there is active competition. However, the market place is highly dynamic and rarely in equilibrium. When concerns over the level of market power suggest that economic regulation is required, regulation endeavours to promote the two main beneficial characteristics of competition: incentives for efficient, customer responsive behaviour, and prices based on efficient costs.

These are desirable objectives for regulation. However, translating them into regulatory mechanisms that work as intended can be difficult. Whilst it may be simple to determine whether or not incentives are altered by the form of regulation, assessing the nature of the change and its effect on outcomes is considerably more difficult. Without a thorough understanding of the processes and agents involved, regulatory incentive mechanisms carry the risk of failing to achieve the desired outcome. They can produce unintended consequences as well.

Given the uncertainties involved, any analysis of the incentive effects of particular price or revenue controls should be heavily qualified. Consequentially, regulatory control should be as simple as possible, and directed at clear, first order outcomes.

3.2 Criteria for assessing controls

Price or revenue control mechanisms will affect:

- the incentive to consider all options in meeting the energy needs of end-users
- the incentive to set efficient prices
- the path of prices or revenues within the regulatory period
- the allocation of risk – particularly volume risk – between the NSP and end-user
- flexibility and the scope to introduce new products or price structures
- information asymmetry and opportunities for gaming.

3.2.1 Preserving end-user choice

Under competitive market conditions, end-users can choose their preferred means of satisfying their energy requirements. For example, they may opt for: energy efficiency, demand management, supply from local generation, or supply from the interconnected grid. Suppliers of energy services must consider all their options and endeavour to meet end-users' needs to meet needs by the most efficient means (for a given quality, at **lowest** cost, or for a given cost at **highest** quality).

Their decision this affects dynamic and allocative efficiency. Customer preferences, (based on the options available to them), flow through into consumption choices and, ultimately, the investment decisions made by producers and suppliers. If the form of price or revenue control influences the options available to the end-user, inefficient consumption patterns and investments may be induced, leading to increased economic costs. If unintended regulatory incentives cause the NSP to favour increased energy consumption at the expense of more economically efficient demand management or energy efficiency measures, there is potential for environmental as well as economic costs.

3.2.2 Efficient prices

Correct price signals are a key determinant of economic efficiency. Network prices affect the level of final electricity prices and their geographic variation. Downstream, there are impacts on the competitiveness of commercial users and on household real incomes. Upstream, the influence of network prices on electricity consumption affects generation levels and investment decisions. Within the network sector, the structure of prices affects service and investment decisions.

Prices that accurately reflect costs of production encourage the efficient use of resources and efficient investment decisions. If the form of regulation creates an incentive for an NSP to weaken the relationship between price and cost when structuring its prices, consumption and investment patterns may be distorted.

3.2.3 Price and revenue paths

At the conclusion of a regulatory review, the Tribunal makes decisions concerning the appropriate path for prices or revenues over the regulatory control period. To give expression to those decisions, the Tribunal applies price or revenue controls. How the prices on revenue controls perform over time influences the effectiveness and durability of the regulatory framework.

In the Tribunal's Discussion Paper DP 32, *Regulation of Network Service Providers: Incentives and Principles for Regulation*, considers various approaches to incentive regulation and benefit sharing. At present, given the relative infancy of unlinked approaches, the preferred approach is to link individual NSP aggregate revenues to projected efficient costs by means of a building block analysis. This approach allows for a commercial level of profitability given reasonable cost performance. Provision can be made for benefit sharing if the expected level of performance is exceeded, thereby creating powerful incentives for improved outcomes over the longer term.

Within this framework, target revenues are based on expected demand conditions. Given the length of the control period (in the order of five years), the likelihood of actual conditions varying from those forecast is high. A key requirement of the price or revenue control mechanism is that it be able to cope with change, without triggering a situation where reintervention becomes necessary. Thus, the control mechanism must maintain the sensitivity of profit to variations in demand conditions within manageable limits.

The extent of the problem will depend on the variability of costs with respect to demand conditions relative to the variability in revenue created by the control mechanism. Increased profit volatility will impact on the NSPs' cost of capital, as well as increasing the pressures for intervention or substantial price adjustments at the time of the next review. Any increase in the cost of capital, if acknowledged by the regulator, will flow through into higher target revenues and therefore prices. If the risk of intervention increases, it may undermine confidence in the regulatory framework. This may seriously weaken the effectiveness of the incentive-based approach to regulation, and thus have longer term consequences for the performance of the sector as a whole[4].

3.2.4 Volume risk

A related issue concerns the allocation of volume risk between customers and networks. The risk of variations in electricity sales volumes (measured in kWh) lies with the network if its revenues move in response to sales. If revenues are fixed, changes in volume will be reflected in price adjustments. Therefore the risk is said to lie with the customer. The impact of variations in volume on prices is a distinguishing feature of the various forms of control.

3.2.5 Flexibility

As noted in section 2.2, the requirement for separate network charges is a relatively recent development in the NSW electricity industry. The process of price reform and refinement is likely to continue for some time as the networks consolidate their operations. New price structures and products may also be required as the market in energy services develops.

Provided excessive price shocks are avoided, regulation should not constrain the development of more efficient or customer responsive prices.

3.2.6 Data constraints

The effectiveness of price or revenue controls will be determined partly by information requirements. Information asymmetry and opportunities for gaming are a major

[4] The critical influence of regulatory commitment on the effectiveness of incentive-based regulation is discussed in detail in the Tribunal's Discussion Paper DP 32, *Regulation of Network Service Providers: Incentives and Principles for Regulation.*

consideration in the selection of regulatory options. In the case of price or revenue controls, the role that information about sales forecasts plays in establishing baseline revenues, and the use that is made of revenue drivers, may create particular incentives for NSPs to forecast data.

The variables included in formulae which form part of regulation must be robust. This means they must be accurate, and capable of providing data over the entire regulatory period. They must also be able to be verified and audited.

3.3 Secondary price controls

A second set of economic issues concerns the level and structure of individual prices. The Tribunal does not want to set individual prices directly. However, the decoupling of individual prices from the primary form of control raises questions about the possible need for secondary price controls. The general form of regulation will set the context for considering the use of secondary controls, eg the extent or type of intervention that is regarded as desirable. However, the selection and assessment of options, must focus more specifically on the price setting processes employed by NSPs, their record of performance, and the outcomes that may be expected over the control period.

As part of the previous regulatory controls, the Tribunal determined the total revenue cap, but the derivation of network tariffs was left largely to the DBs' management. Although the Tribunal believed tariff design was the responsibility of management, it did feel it was necessary to place some discipline on this process. Two caveats were added to management's freedom to derive tariffs: first, a requirement to publish the tariff setting methodology, and second, constraints on the amount of movement in any given tariff in any one year.

3.3.1 Requirements for public disclosure

The NSPs have been required to publish a booklet outlining to customers the basis of their pricing structures. With one exception, there have been lengthy delays in the preparation of information booklets, and the extent of disclosure varies.

3.3.2 Side constraints

The side constraints address a considerably different objective than the maximum allowable revenue (MAR) formula. Whilst the MAR formula acts to cap total revenues, the side constraints act to reduce the incidence of rate shock to particular customers. Whereas the MAR formula is a control on total revenues, the side constraints place a control on movements in particular prices.

Over the current regulatory period, side constraints have proven to be the more restrictive control, particularly in cases where rebalancing of tariffs to remove embedded cross subsidies has been required. In some cases, side constraints have not become operative, as market forces or pricing strategies have proven to be more constraining on particular prices.

The Tribunal seeks comments on the extent and application of secondary price controls.

3.4 Summary - criteria for assessment

Consistent with the National Electricity Code, three criteria can be identified, against which the options for controlling prices or revenues can be assessed. These are:

- neutrality between alternative options for meeting customer needs, including
  - demand and supply side options
  - interconnected and independent supply side options
  - existing and emergent service options and price structures
- incentives for establishing efficient price structures, including the scope for continued price reform
- regulatory robustness, simplicity and cost, including
  - sensitivity to changes in external conditions
  - data requirements
  - opportunities for gaming
  - potential for disputes.

The Tribunal seeks comments on these or other appropriate criteria for assessing price control options.

4 ASSESSMENT OF OPTIONS

4.1 Weighted average price cap (tariff basket)

Under a weighted average price cap, the allowed revenue received for each additional unit of electricity distributed varies according to the actual price for that unit. Returns are therefore driven by the structure of prices relative to costs and the volume of electricity distributed. If prices reflect underlying fixed and variable costs, revenues will move in line with volumes. In these circumstances, returns will not be distorted by variations between forecast and actual demand conditions. Thus, the risk of intervention is minimised.

To the extent that prices vary from marginal costs, the sensitivity of profit to variations in demand will increase. As noted in section 2.2, most network costs do not vary with the volume of electricity distributed. However, most revenue is derived from volume-based prices. Since revenues and costs vary in different proportions as volumes change, the level of financial risk for networks increases under price control.

The use of volume-based prices under price control also creates incentives for distributors to respond to customer needs by adopting options that lead to increased volumes. Demand management options exercised to reduce volumes will lead to a loss of revenue for the distributor. In these circumstances, it is difficult for a commercially-oriented distributor to treat the demand management option fairly for its broader economic and environmental merits. To do so would run counter to commercial objectives under a price cap.

Further, each distributor is affiliated with an active retail trading business as part of a larger energy service corporation. Whilst the turnover of each incumbent retail arm is larger than that of its associated NSP, retailing is a relatively low margin business. Within the incumbent distributors the bulk of the assets are employed in, and profits earned from, network services. If the distribution company is driven by the profitability of the combined

entity, the form of regulation on the network may influence its retail strategies. For example, under a network price cap:

- it may be profitable for the retail company to subsidise load-increasing products, such as air-conditioning, as under a price cap any retail losses may be offset by increased network revenues
- energy management services offered by the retail company will be unprofitable unless prices cover not only the costs of energy management, but also network revenue foregone due to lower volumes of energy transported.

Except under very specific circumstances, price-based controls are, in general, not well suited to regulatory approaches where the primary focus is on maintaining a relationship between aggregate revenues and efficient costs over an extended regulatory review period. The translation of revenue targets into weighted average price controls is often complex and may be subject to substantial error. Large ex post adjustments are likely to be required if substantial differences between actual and target revenues are to be avoided[5].

The need to specify individual prices and weights in the revenue basket can constrain the development of new services and prices. Where the structure and scope of services is relatively stable, this may not be a concern. In the context of the emerging market in energy and network services, it is arguably a relevant consideration.

Price-based controls appear to be used extensively by regulators in the United States. There, average price caps are combined with a regulatory approach in which efficiency factors are determined by the industry, rather than by the individual utility. Measures such as total factor productivity are used to estimate trends in industry unit costs and set the value of X in the CPI-X price indexation formula. Individual utility revenues have no special relevance and are not considered explicitly. This approach, as described by Kaufmann and Lowry (1997, 1998) appears to be favoured by majority of the United States regulators.

If concerns regarding some of the unresolved issues associated with this approach are put aside, its combination with a price-based control may offer some worthwhile benefits. For example, a less intrusive form of regulation, with lower costs and stronger incentives for productivity and pricing efficiency may be achievable. In Discussion Paper DP 32 the Tribunal suggests that there is sufficient potential benefit in an unlinked approach to warrant a systematic program of research, design and evaluation. In the interests of the continuing advancement of good regulatory practice, this program should investigate price-based controls. In particular, the investigation should consider whether a methodology can be developed which avoids the apparent volume bias in average price cap formulations.

4.2 Fixed revenue caps

Revenue-based controls have the advantage of being directly linked to the primary output of the building block approach, that is, target aggregate annual revenues.

Under a fixed revenue cap allowed revenues are set equal to target revenues for the duration of the review period (typically five years).[6] Other than adjusting for changes in the general level of inflation, allowed revenues remain equal to target revenues.

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[5] However, price-based controls perform very well in this role if the prices in the basket reflect efficient marginal costs.

[6] In practice, the value of X in the CPI-X revenue indexation formula is calculated to equate allowed revenues and target revenues in real (inflation adjusted) terms.

This is a very simple form of control, with low implementation and administration costs. It provides the NSP with guaranteed revenue, regardless of the volume or level of service it is called upon to provide to customers. If in any year customer demand varies from the level expected at the time that the target revenues were set, the actual level of revenue collected will either exceed or fall short of the cap. A correction mechanism will then return the surplus to customers or make up the shortfall.

Under this control method, the impact of unexpected variations in costs is borne by the NSP, at least until the next review. In the circumstances where this may create an incentive for more prudent cost risk management, it accords with the general regulatory approach. However, when variations in costs are the result of unexpected changes in customer demand, there is clearly the potential for perverse incentives to be created, with risk of unintended consequences. During the establishment of revenue targets, NSPs will have an incentive to inflate their estimates of demand growth, as a way of minimising the risk of higher than expected growth's depressing profits. Once revenue targets have been set, there will be an incentive for NSPs to minimise customer-related costs, particularly any costs related to unexpected customer demand. This may lead to a decline in service levels, or to demand's remaining unsatisfied.

There is potential for the difference between actual revenues and the level warranted by service volumes to increase progressively toward the end of the control period, adding to the risk of demands for regulatory intervention and inter-period price adjustment problems.

Unless it can be argued that the probable demand forecast error for the primary service cost drivers will be small, fixed revenue caps appear to carry material financial risks for NSPs. As a consequence, there is a likelihood of introducing regulatory distortions into the provision of services.

4.3 Variable revenue caps

A variable revenue cap is defined as any revenue-based control that links allowed revenue to another variable or group of variables. Variable revenue drivers are introduced into the control mechanism for two main purposes. Firstly, and perhaps most importantly, they are used to lessen the distortions created when customer driven changes in costs cannot be recovered by the NSP, as occurs under a fixed revenue cap. Secondly, and to a lesser extent, they are used to strengthen the incentives for particular outcomes (eg in the case of reduced system losses).

4.3.1 Customer driven costs

In this context, the term, "customer driven" changes in costs refers to the variations in costs during a review period created by changes in the level of customer demand. Customer demand includes the numbers and type of new connections, the volume of energy distributed, and levels of peak demand.

With active support from the industry, it should be possible to develop relatively accurate hybrid revenue cap formulae for each NSP that will track possible variations in customer-sensitive costs over the review period. This would best be done by beginning with baseline estimates of customer demand and associated capital and operating costs, and conducting a set of cost studies for a plausible range of demand scenarios. Each NSP will be required to consider the impact on its capital and operating costs of varying levels and, perhaps, locate demand over the review period.

To rectify information asymmetry, the regulator may require independent verification of the NSPs' estimates. Differing levels of capacity utilisation, for example, would mean that the use of generalised estimates of long run incremental costs would not be appropriate in all circumstances. Where spare capacity exists, incremental costs may be negligible. Baseline capital expenditure levels may have already incorporated on allowance for unanticipated demand growth as a risk management measure. In this case, the regulator would need to make a judgement on these and possibly other related questions.

The operation of the formula would also require testing to ensure that it was unambiguous and not open to dispute. For instance, data inputs would need to be verifiable and available on a consistent basis for the full period.

Clearly there is a benefit/cost trade-off in the effort that may be required to develop a cost tracking formula which performs well. Most existing hybrid revenue caps have very simple formulae, with no more than two or three service cost drivers. Although these have been subject to some criticism for not tracking costs with sufficient accuracy, the NSW distributors have commented that:

> … the value of the revenue cap formula which might apply between reviews lies only in enabling minor variations in growth expectations to be absorbed without requiring intermittent regulatory intervention.[7]

The distributors have concluded, *inter alia*, that:

> … the formula should be simple, reflect general cost drivers, may vary between DNSPs and should be targeted to deliver the revenue requirements for future years relative to projected growth rates.[8]

4.3.2 Neutrality and price incentives

Another issue arising from the use of service cost drivers in a revenue formula is their effect on incentives. If, in response to an increase in customer demand, revenue is guaranteed to rise by an amount which covers all costs and provides a profit margin, there will be a natural incentive on the part of the service provider to stimulate increased demand. Provided this is neutral in its effect on the range of options which might be used to satisfy customer demand, there is no cause for concern. However, if profit is determined on the basis of assets employed, there will be an incentive to promote the more asset intensive options. Even if an NSP genuinely saw itself as a provider of a range of energy services, some of which were cheaper for the customer, its short term financial interests would be best served by the asset intensive option.

The level of distortion will be heightened if the effect of the formula for a particular measure of demand is to increase revenue proportionately more than cost. The initial revenue yield formula used in the UK allowed revenue to increase in line with kWh distributed. Because costs had a much weaker connection with kWh, distributor profit became very sensitive to the level of energy distributed, creating a strong incentive to increases in electricity consumption, with associated increased economic and environmental costs.

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7 *Pricing for Electricity Networks. Submission by the NSW Distribution Network Service Providers.* Submission to IPART, 1998, p60

8 *Op cit*, p 62.

The incentive effects of a revenue yield control are similar to those noted for average price caps in section 5.1. There is a clear bias in favour of increased consumption via the network and against demand management or independent supply options. Particularly where the distribution and retail businesses are linked, the impact, if anything, may be greater, given that average revenue is likely to be substantially less cost reflective than prices set under an average price control. In contrast to a price control, a revenue yield creates additional incentives to price inefficiently in order to increase the volume of electricity distributed.

For distributors, the downside of a revenue yield control is that reductions in energy consumption could lead to large declines in profit, since reductions in revenue are not matched by reductions in costs. These are inherent weaknesses in the revenue yield form of control.

The net effect of such distorting influences is difficult to judge. Where responses are partially under the control of the NSP, such as the choice between network extension and local independent generation, the potential for increased cost is present. As noted in section 2.2, the ability of NSPs to influence levels of customer demand appears in general to be relatively low. However, retail businesses are in a much better position to influence demand, raising the potential for coordinated retailer / distributor pricing strategies. Where known distorting incentives can be minimised or avoided, it is probably best to do so.

Where a revenue-based control is to be applied, there would appear to be a strong case for selecting a hybrid formula. Preferably this should be based on a limited number of service variables. These should be able to reflect changes in efficient costs arising from feasible variations in customer demand over the control period. A hybrid formula would substantially limit the incentive for artificially promoting energy consumption, with its attendant economic and environmental costs. Whilst a correctly specified hybrid formula reduces regulatory bias against particular service options, it does not remove it entirely. In this regard, the treatment of asset-intensive service options relative to options which are less asset-intensive may require particular consideration.

4.3.3 Regulatory robustness

The increased sensitivity of profit to changes in demand conditions under a revenue yield control leads to a higher risk of mid-period intervention. The lack of a systematic link between revenues and costs in response to variations in demand conditions increases the danger of excess profits or losses. If sustained, these may lead to pressure on the regulator to reopen the price determination.

The incentive to understate energy volume forecasts, and so gain a larger upside benefit to revenue from the volume driver is substantially greater under the revenue yield control than with a correctly specified hybrid formula.

However, hybrid formulae are considerably more constrained by data quality and availability. There is little practical value in deriving “best fit” cost formulae if accurate and reliable data for the independent variables cannot be provided as required. Data quality and availability are key tests that should be applied to hybrid formulae.

5 PARAMETERS FOR THE REGULATORY FORMULA

Under the hybrid form of variable revenue cap, a formula is used to link allowed revenue with selected independent variables. The two main reasons for using a formula are to:

- adjust allowed revenues for cost impacts arising from variations between actual and forecast customer demand during the control period
- provide incentives for improved NSP performance in areas of high priority.

5.1 Customer-based cost impacts

Maximum allowed revenues are established on the basis of forecast levels of customer demand for the period of the control. Over the course of the control period, which may be five years or more, variations between forecast and actual demand can be expected, with consequent cost impacts. To maintain the proportional relationship between allowed revenues and costs established by the determination, revenues must be adjusted in line with the movement in costs.

To select variables for a revenue formula, information on incremental customer driven costs is required, involving:

- identifying the main customer-based cost drivers
- estimating the quantitative relationship between changes in the main customer demand variables and costs
- assessing the forecast risk (volatility) of the main customer demand variables
- estimating the materiality of the risk to allowed revenues
- testing the regulatory robustness of the formula.

5.2 Cost drivers

The current formula applied to distributor revenues uses customer numbers (split into three categories on the basis of size of annual consumption), MWh sales and, for the rural distributors, line length (measured in circuit kilometres). Some distributors have proposed the following alternatives, based on studies of key cost drivers affecting their networks:

- customer numbers, annual energy consumption (MWh) and low voltage line length
- customer numbers, annual energy consumption and maximum demand (MW)
- customer numbers and maximum demand.

Customer numbers are viewed as contributing mainly to operating costs (call centre and billing costs). LV line length contributes to both operating and capital costs, and also tends to be directly related to customer growth. Energy is a surrogate for diversified and non-diversified demand, which is a primary driver of overall network expansion. Maximum demand is viewed as mainly contributing to capital expenditure through its impact on the peak capacity requirements of network assets.

5.3 Cost driver parameters

Since the purpose of the revenue formula is to track changes in costs relative to the baseline forecast, cost driver coefficients should be based on incremental cost impacts applicable to the control period in question. Differing levels of capacity utilisation, for example, would mean that the use of generalised estimates of long run incremental costs would not be appropriate in all circumstances. Where spare capacity exists, incremental costs may be negligible. Baseline capital expenditure levels may have already incorporated an allowance for unanticipated demand growth as a risk management measure.

Incremental cost estimates may be made by starting from baseline forecasts of customer demand and associated capital and operating costs, and conducting a set of cost studies for a plausible range of demand scenarios. Each distributor be required to consider the impact on its baseline capital and operating costs of varying levels and, perhaps, patterns of demand over the control period. Given that circumstances are likely to change over time, the coefficients may not be applicable to later periods.

Through the use of scenario analysis, EnergyAustralia has estimated the following incremental cost coefficients for its system:

Table 5.1 EnergyAustralia cost driver parameters

Attribute	Value	Total Cost Contribution
Customer numbers	$41 per customer	7%
Energy	$13 per MWh	38%
Low voltage line length	$7,300 per circuit kilometre	15%
Fixed	residual	40%

Approximately 40 percent of total costs are assessed as being fixed over the control period.

EnergyAustralia notes that the period-specific marginal cost associated with energy consumption is $24/MWh (compared with an estimate of long run marginal cost of $28/MWh). However, the customer number and line length coefficients account for approximately half the variance to avoid double counting. This amount is excluded from the energy coefficient.

By comparison, Integral Energy estimates its costs on an activity basis to be allocated as shown below.

Table 5.2 Integral Energy cost driver parameters

Attribute	Activity Based Costs	Proposed MAR Weighting
Customer numbers	11%	30%
Energy	24%	20%
Maximum demand	55%	30%
Fixed	10%	20%

Advance Energy estimates its costs as shown below.

Table 5.3 Advance Energy cost driver parameters

Cost driver	Percentage of costs
Network assets[9]	59
Fault and emergency	14
Customer numbers	27

NorthPower and Great Southern Energy have indicated that they prefer a total revenue cap with no revenue formula.

The Tribunal is seeking comments on the merits of a revenue formula and appropriate cost drivers and corresponding coefficients.

5.4 Forecast risk

Relevant to the selection of customer demand variables as revenue drivers is the range within which actual demand may be expected to vary from that forecast. All else being equal, variables with high forecast risk take priority over variables with low forecast risk.

5.4.1 Correcting for forecast risk

The current MAR formula operates alongside a forecasting error correction mechanism known as the 'unders and overs' account. This account acts to correct forecasting errors by including any forecasting errors in the revenue caps of subsequent periods.

Operation of 'unders and overs' account

At the commencement of each year within the regulatory control period, distributors and franchise retailers forecast the coefficients of their respective MAR formulae. Under the

[9] Includes the cost of line and pole maintenance, substation maintenance, system planning and design, quality and reliability of supply, and system operations.

current network MAR formula, the distributor forecasts its customer numbers by size, its total electricity throughput, and its line length. These forecasts form the basis for the distributor to estimate its revenue cap for the forthcoming year. The distributor then adjusts its tariffs to recover this forecast amount of revenue. A similar process is followed for franchise retailers.

At the end of the year, inputs to the MAR formula are revisited and actual customer numbers, load and line kilometres are substituted for the previous forecast inputs. This 'actual' revenue cap is then compared to actual revenue collected. The difference, either positive or negative, is added to the unders and overs account. This forecast and review process is repeated each year, with each forecast revenue cap including a proportion of recovery or refund from the unders and overs account.

Two important features of an unders and overs account act to reduce the financial impact of forecast risk for the utilities. First, in Determination 5.3 of 1997, the Tribunal places limits on the deviations of forecast and actual revenue before action is required to be taken. This acts to ensure that the disparity between forecast and actual revenues should be managed within narrow bounds. Second, also in Determination 5.3 of 1997, the Tribunal includes an interest adjustment on the balance in the unders and overs account. This ensures that, in present value terms, the distributor is neither advantaged nor disadvantaged by deviations from the revenue forecast.

These two features act to virtually eliminate the medium term financial impact of forecast risk for those factors included in the MAR formula. To the extent that the MAR formula reflects the key cost drivers of the business, the residual forecast risk borne by the utility companies will be minimal. Ultimately, the reduction in forecast risk will have an effect on the appropriate rate of return allowed in the determining the revenue cap.

The operation of an unders and overs account should be managed to ensure that it does not act to limit risk where an element of risk is desired. For example, where the MAR formula is designed to include incentives for loss reduction or system reliability, the effect of those incentive components should be removed from the operation of the unders and overs account.

The Tribunal seeks comments on:

- ***the inclusion in the regulatory regime of an unders and overs account or other mechanism to correct forecasting errors***
- ***the operation of such a mechanism, particularly in regard to incentive factors***
- ***the effect of such a mechanism on the risks borne by the utility company, and on the utility companys required rate of return.***

5.5 Revenue risk

The materiality of the risk to revenues will be determined by the quantum of the revenue impact of the selected customer variables and the assessed level of forecast risk for each variable.

Using its preferred formula, EnergyAustralia has estimated that a difference of one percentage point in the rate of annual customer demand growth over a five year period has an impact of less than 1 percent on the present value of allowed revenues. That is, a halving

of the annual rate of growth from 2 percent to 1 percent reduces allowed revenue in present value terms by less than 1 percent. On the basis of this analysis, EnergyAustralia has concluded that customer-based revenue adjustments are of second order significance.

This view is supported by the majority of NSW distributors, prompting NorthPower and Great Southern Energy to propose the adoption of a fixed revenue cap as their preferred form of control.

5.6 Regulatory robustness

In addition to their behavioural properties, revenue formulae can be assessed against operational criteria. These include:

- the availability, accuracy and reliability of data for the selected customer-based cost drivers
- the acceptability to each distributor of using a standard formulation, compared with the additional costs and complexity associated with individual distributor-specific formulae
- the contribution (positive or negative) that the use of a revenue formula may make to the overall acceptability or performance of the regulatory framework.

5.7 Performance incentives

Where additional revenue-based performance incentives are considered desirable, they may be included within the revenue formula for ease of administration. In all other respects, they should be considered as separate from and unrelated to the use of a formula for adjusting revenues in response to changes in costs.

As discussed in section 5 of the main paper, the use of revenue-based incentives directed at specific areas of distributor performance is a difficult area on which to obtain broad agreement. EnergyAustralia is particularly concerned that, in its view, the present system of regulation provides little incentive for efficient network design, development and operation. It proposes using allowed revenue coefficients as an incentive for distributors to increase the value which customers receive from existing systems. Specifically, EnergyAustralia proposes a revenue incentive for improved reliability performance, measured in terms of the system average interrupt duration (SAID) index. Concurrently, they suggest that the present system loss adjustment be removed on the grounds that it is ineffectual.

Dissatisfaction with the loss adjustment factor would appear to be general across distributors. However, some distributors have raised concerns over the use of the SAID index as a representative measure of reliability. In particular, there may be circumstances in which movements in the index are outside the control of the distributor, raising the possibility of windfall gains or losses.

5.7.1 Secondary incentive mechanisms

The system loss adjustment factor which is part of the current NSW revenue formula is an example of a secondary incentive mechanism. NSPs receive an increase in allowed revenue if system losses fall relative to economic trends, and vice versa. EnergyAustralia has suggested that an incentive mechanism directed at standards of service should be included

in future revenue formulae.[10] It has proposed that initially this should be targeted at system reliability.

Secondary incentive mechanisms should meet three general criteria:

- the targeted outcome should be of sufficient importance to justify its inclusion in the revenue formula ahead of other potential targets
- the degree of leverage on the targeted outcome which may be gained through the use of a revenue-based incentive should be sufficient to make the exercise worthwhile
- the incentive mechanism should be accurately directed, effective and have acceptable costs (including those associated with the risk of unintended consequences).

As mentioned above, primary and secondary incentive mechanisms must work in concert. Inconsistent signals in the mechanisms will invariably fail to elicit the desired response and may inadvertently promote inappropriate behaviour. For example, the MAR formula may include a variable which is designed to encourage activities and reduce line losses. Loss reduction may require the DBs to undertake capital expenditure. If the regulatory regime includes a regular optimisation procedure, the risk that loss reduction capital expenditure may not be accepted for inclusion in the capital base may act contrary to the loss reduction incentive in the MAR formula.

Secondary incentive mechanisms tend to be controversial. This is in large part because these criteria are so difficult to satisfy. Most NSW NSPs have argued in their submissions for the removal of the system loss factor from the revenue formula on the grounds that it is poorly directed and inconsistent with other aspects of the regulatory regime. And yet, OFFER in 1994 not only retained its system loss factor variable in the distributors' revenue formula, but doubled the weight applied to it.

Under the EnergyAustralia proposal, specific incentives for NSPs to improve their standards of service would be established. Thus, service performance would be treated similarly to efficiency within the incentive framework. NSPs would receive increased profits through an increase in the revenue cap (allowing higher prices) when key service performance measures increased. Allowed revenues (and prices) would decline if performance deteriorated.

EnergyAustralia specifically proposes the inclusion of a system reliability factor in the revenue cap formula. Reliability would be measured by the SAID Index. The revenue coefficient would be based on customer valuation of reliability improvements (for which the value of lost load set in the National Code may act as a proxy).

This reliability adjustment factor has the same functional form as the current loss adjustment factor and may, arguably, be subject to similar problems in practice.

As noted in Discussion Paper DP 32, some initial considerations regarding this approach include:

- risking the possibility of double counting if service improvements are incorporated into operating and capital cost projections as well as the revenue cap formula
- understanding the causes and effects of potential movements in the SAID Index
- clarifying customers' service priorities and incremental price / service trade-offs

[10] *1999 Electricity Pricing Review – EnergyAustralia Submission to IPART*, September 1998.

- assessing the value to be attributed to improved reliability by the regulatory formulae or in evaluating network investments.

Any analysis of the incentive effects of particular formulae should be heavily qualified. Whilst it may be relatively straightforward to determine whether or not incentives are altered by the formulate used, assessing the nature of the change and its effect on outcomes, including the risk of unintended effects, is more difficult. In the interests of good regulatory practice, this suggests that the use of revenue-based incentives to achieve specific (closely defined) outcomes should be approached with caution.

Another approach which may offer an alternative is to clarify the basis for incorporating service quality and loss impacts in the evaluation of capital expenditure proposals. However, NSPs have suggested that, unlike losses, service quality is dependent on operating expenditure as well as capital expenditure.

The Tribunal seeks comments on the appropriate parameters for a maximum allowable revenue (MAR) formula, and the criteria to assess the reasonableness of those parameters.