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Consulting

COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

UTILITY REGULATORS FORUM

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SECTION 1 INTRODUCTION

1.1 TASK

This discussion paper has been prepared for the Utility Regulators Forum.

The discussion paper undertakes an assessment of the relative merits of building blocks and indexed approaches to regulation of monopoly prices, taking into account practical application issues, incentive effects and the objectives of regulation.

1.2 PURPOSE

The purpose of this paper is to assist policy discussion of the potential for future evolution of the approach to CPI-X price and revenue cap regulation ('CPI-X regulation') of monopoly prices for energy networks.

1.3 SCOPE OF REVIEW

The detailed project brief for the review is attached in Appendix 1. The terms of reference, as set out in this project brief, were defined as follows:

1. Assess the relative merit of setting CPI-X price and revenue caps applying to electricity and gas transmission and distribution services through:
 - a) Reliance on an index or other measure of productivity; or
 - b) The establishment of the individual cost benchmarks under a building blocks approach.
2. In assessing the relative merits:
 - a) Have particular regard to the impact of the alternative approaches on:
 - i. The incentives for the utilities to continue to improve efficiency;
 - ii. Risk and incentives for efficient investment in networks;
 - iii. The robustness, transparency, simplicity and administrative of the different approaches; and
 - iv. The cost and availability of information required.

- b) Have regard to the practical application of these approaches including:
- i. The extent to which regulators should consider utility specific factors or costs within, or supplementary to, the external index-based approach;
 - ii. The extent to which regulators should use benchmarks or other tests of the efficiency of costs within, or supplementary to, the building blocks approach; and
 - iii. The transition from one approach to the other and the potential impact on prices.
3. Assess the extent to which each approach promotes the achievement of the statutory objectives and publications commonly placed on regulators such as those in the national electricity and gas codes.

The study should assume that the CPI-X cap:

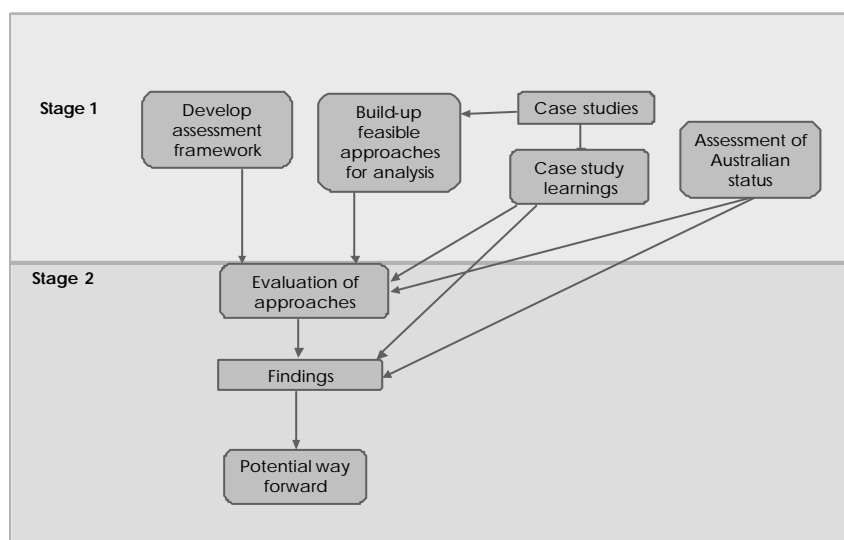
- Continues for a fixed period without intervention or adjustment;
- Incorporates the same quality of service incentive mechanisms under either approach; and
- If set using a building block approach, incorporates the gradual phasing out gains made over the period of the next price review.

In the process of refining the scope of this review, it was agreed that:

- The assessment should consider a range of feasible options rather than being confined to the two approaches depicted in the terms of reference; and
- The report should seek to identify significant inconsistencies between the findings and the current legal and regulatory regime; however, the review was not necessarily to be constrained by the current regime. This would highlight issues that may need to be considered in future reviews of the legal and regulatory regime.

The approach adopted for this review is summarised in Figure 1.

Figure 1 – Approach to Review



The approach was undertaken in two stages. Stage 1 focused on the collection and preliminary analysis of information and the development of a robust assessment framework. The second stage, Stage 2, involved detailed analysis and synthesis of the collated information and consolidation of the review findings.

Box 1 (overleaf) provides further details on the respective steps.

1.4 READING THE DISCUSSION PAPER

This discussion paper is relatively long so readers may wish to consider which sections are relevant to their level of interest. In particular, readers who wish only to gain a high level understanding of this discussion paper could read Section 7. Readers who wish to understand the analysis that has led to these findings should read Section 5 and Section 6.

Box 1 – Details of approach

STAGE 1	Develop the assessment framework Section 3	The assessment framework was developed through an analysis of the economic and practical issues associated with the objectives and principles of network regulation. In total, 19 specific assessment criteria were developed.
	Development of feasible approaches to CPI – X regulation Section 4	<p>The approach set out to define a limited number of approaches that could potentially be used for CPI-X regulation in the gas and electricity network industries in Australia.</p> <p>As a first step, it was necessary to define regulatory parameters and techniques associated with CPI-X regulation. Then the theoretical applicability of techniques to parameters was considered. A set of feasible approaches to CPI-X regulation was then defined. These were then assessed in the Australian context to produce the following four regulatory approaches which were assessed:</p> <ul style="list-style-type: none"> – Building blocks approach; – TFP approaches based on building blocks; – Frontier approaches; – Indexation against basket of comparable services.
	Assessment of status of network regulation in Australia Section 2	<p>To ensure the review took proper account of the context, analysis was undertaken of the key relevant features of network regulation in Australia at this point in time. This included considering:</p> <ul style="list-style-type: none"> – The Productivity Commission’s position paper; – The legal and regulatory framework; – The key features of the current application of price regulation in Australia relevant to our assessment; – Industry participant views on the future of price cap regulation; – Other relevant initiatives, including the Information Collection Project being undertaken by the Australian Utility Regulators forum.
	Case study learnings Section 5	As part of the review, we undertook a number of selected case studies. The case studies focused on understanding the reasons and broader context as to why certain approaches were adopted, and practical issues and lessons that arose in the application of the approaches.
STAGE 2	Assessment Section 6	The assessment drew together the work undertaken in the previous steps. Four regulatory approaches were analysed against the assessment criteria developed (see Section 3). This was then distilled into an overall evaluation of each of the approaches.
	Findings Section 7	The last step in the review required us to draw together the results from the assessment process, the case study learnings and the key features of the Australian context.

SECTION 2

CONTEXT FOR NETWORK REGULATION IN AUSTRALIA

The context to this review was briefly described in the project brief. This section provides further details, particularly on the current status of price cap regulation in Australia.

- Analysis and public debate on the future development of CPI-X regulation – Section 2.1 summarises Productivity Commission proposals and responses to those proposals;
- The competitive status of the industry – Section 2.2;
- The overriding legal and regulatory framework – Section 2.3 below describes the key features of the legal and regulatory framework relevant to this review;
- Section 2.4 provides information on the status of CPI-X reviews in Australia and describes the approach currently being adopted by regulators; and
- Section 2.5 summarises our simplified interpretation of some industry views on the appropriate direction for evolution of CPI-X regulation.

2.1 PRODUCTIVITY COMMISSION PROPOSALS AND RESPONSES

The Productivity Commission (2001) released a position paper in March 2001 as part of its review of the National Access Regime. Box 2 sets out the position paper's findings and proposals relevant to this discussion paper.

Box 2 - Productivity Commission findings and proposals

Finding 8.1

- Greater use of productivity based approaches for setting of price caps governing access to essential infrastructure services would be desirable. Regulators should give priority to developing the external productivity benchmarks necessary to implement such approaches.

Proposal 8.2 (Tier 2)

- Consideration should be given to making explicit provision for productivity-based approaches for setting price caps in the criteria for certification. Specifically if a building blocks approach has been used to set a price cap, the onus could be placed on the regulator to demonstrate why productivity approaches would not be feasible to adjust that cap at least in periods between costs based resets.

The potential problems identified with the building blocks approach are:

- It was considered information intensive and intrusive;
- The need to forecast future costs and validate proposed capital expenditure could lead to the regulator having significant influence over the running of the business; and
- The building blocks approach could merge into rate of return regulation.

The Commission considered that as a result of past building blocks exercises, cost bases should have already been established for most essential infrastructure services in Australia. The Commission considered that there would be significant advantages in taking advantage of this data and relying to a greater extent on productivity based approaches to price capping. Approaches that could be adopted were the approach based on TFP, or to set 'X' based on other measures such as Data Envelopment Analysis (DEA).

The potential advantages and problems of the TFP approach identified by the Productivity Commission (2001) are summarised in Box 3.

Box 3 - Potential advantages and problems of TFP approach identified by the Productivity Commission

Potential Advantages:

- Clear, unambiguous and powerful incentive effects;
- Theoretical foundation and application of objective measures that are transparently based on external data rather than regulatory judgments;
- Creates minimal regulatory risk and has low transaction and administration costs;
- Already widely accepted in telecommunications; and
- Has been applied internationally to electricity and gas.

Potential problems:

- Developing robust productivity benchmarks is not costless;
 - There will always be potential for disputes as to whether the results of a TFP or benchmarking exercise are applicable in a given situation;
 - Productivity approaches inherently involve less precision than cost based approaches and in the short term may not align prices as closely with costs; and
 - Effectiveness undermined if the initial price base significantly diverges from efficient prices.
-

The Office of the Regulator General (ORG) (now the Essential Services Commission) general response to the Productivity Commission proposals is summarised in Box 4. In addition, the ORG noted that there were a number of practical reasons why these approaches had not been adopted in the 2001 Electricity Distribution Price Review, and noted a number of specific legislative instruments that the ORG was obliged to consider (ORG 2001c).

Box 4 - ORG response to Productivity Commission proposals

- Agreement that the methodology for setting of price caps needed to evolve in more efficient directions and that greater use of industry wide productivity indexes and benchmarks are likely to play an important role in the evolution.
 - However, the decision to adopt productivity approaches required the same level of detailed scrutiny as had been applied to the building blocks approach in relation to both the theoretical and operational properties for practical regulatory decision-making.
-

The Project Brief for this review noted that:

“A key question is whether, in practice, the differences are more matters of degree in a spectrum of approaches rather than polar differences:

For example industry trends relied upon by index-based approaches may, in practice be, adjusted before price or revenue cap parameters are established in order to allow for factors specific to individual service providers.”

2.2 COMPETITIVE STATUS OF INDUSTRY

2.2.1 Background

Much of the early literature and practice of price cap regulation over the past twenty years is in relation to industries that are considered to be undergoing

transition from monopoly to competitive markets.¹ Incentive based regulation began in the US telecommunications industry in the mid 1980's. As telecommunication markets become increasingly competitive due to technological change, much lighter handed forms of price regulation are now becoming the dominant form of regulation.² The role of price caps in this context is to provide protection for the interests of consumers in the transition to competition. Regulators expect that the customer's interests are best served by encouraging competition to emerge.

It is only more recently - within the last 10 to 15 years or so - that price caps have been applied more widely to sectors that are considered long-term natural monopolies, (such as much of the electricity and gas distribution networks).

The focus of this discussion paper is not to form views on the extent of current competition in some of the sub markets of the Australian energy market, or the ultimate potential for much higher levels of competition due to technological change. However, the nature and role of price cap regulation does depend on the view that is taken of by regulators and policy makers on the potential for competition in each market.

2.2.2 Assessment of current competitive position

Policy makers in Australia and in other countries consider the core electricity and gas distribution networks to be natural monopolies. However, there has been extensive debate in Australia as to the extent to which some markets for energy network services becoming competitive (see Box 5).

Box 5 - Potential for competition in energy network services

- The Australian Competition Tribunal decision Re: Eastern Gas Pipeline is the most prominent case where a decision has been taken that regulated third party access and process regulation was unnecessary.³
 - The AGA's view is that this decision highlights that gas infrastructure in regional areas face existing competitive pressures from competing fuel sources such as LPG and electricity.⁴
 - Australia is a pioneer in encouraging the development of entrepreneurial transmission interconnectors, (although there is considerable debate as to whether this is an appropriate policy direction to pursue).
 - In Victoria, electricity transmission augmentations are contestable through separation of planning and asset provision.
 - There is also more prospect for competition at the fringes of distribution networks as unit costs increase and the competitiveness of alternative technologies falls.
-

This discussion paper is primarily focused on the application of price caps to sectors that are considered to have a strong ongoing degree of monopoly power into the future. This is likely to cover the bulk of existing assets and a significant level of new capital investment in the foreseeable future.

¹ See for instance Berg, S. V. and R. D. Foreman (1995). Price Cap Policies in the Transition from Monopoly to Competitive Markets. University of Michigan Telecommunications Conference.

² By 2000, 39 states in the US employed pure price cap regulation with no earning sharing mechanism. Price freezes began to be introduced in the late 1980's and the first pure price caps were not introduced until 1992. The first pure price was introduced for telecommunications in 1992 (see Box 21) Sappington, D. E. M. J. Pfeifenberger, et al. (2001). "The State of Performance-Based Regulation in the U.S. Electric Utility Industry." The Electricity Journal: 71-79.

³ The Australian Gas Association (AGA) submission to the National Competition Council considers that coverage of the Moomba-Sydney Pipeline (MSP) under the Third Party Access Code for Natural Gas Pipeline Systems (National Gas Code) should be revoked.

⁴ AGA (2001). Review of the Victorian Gas Access Arrangements: response to Consultation Paper 1. Canberra, The Australian Gas Association.

A related issue is how mature the sectors are. Electricity is reticulated to nearly all areas where reticulation is economically viable, and can be regarded as a mature industry. A potential issue is whether some distribution companies may be facing significant capital expenditure requirements for network replacement, growth and service standard requirements.

While the gas distribution system in the major metropolitan areas and in some regional areas can also be regarded as relatively mature, there are opportunities for greenfields projects (e.g. reticulating gas into regional areas that do not presently have gas).

2.3 OVERVIEW OF REGULATORY FRAMEWORK FOR NETWORK PRICE REGULATION

The current system for regulation of gas and electricity industries in Australia was developed in the context of the umbrella competition legislation (Trade Practices Act, 1974) and, following agreement in 1995, through the Council of Australian Governments (COAG), to implementation of the national competition policy reform package. At the same time, the industry has also undergone significant restructuring, coupled with privatisation in the case of Victoria and South Australia.

In many respects, regulation is still developing. While the overarching statutory framework has been stable, many of the processes are continuing to develop in response to lessons learned in the operation of the regimes.

The current regulatory frameworks for electricity and gas industry are based on a combination of legislation, regulatory instruments and decision-making bodies.

Box 6 summarises the key instruments and bodies imparting on the current system of network price regulation. Appendix 2 summarises the effect of the respective instruments and roles of the bodies in regulation of the electricity and gas industries.

Box 6 – Instruments and bodies imparting on network price regulation

	Gas	Electricity
Instruments	<p>National Gas Code</p> <p>Gas Pipelines Access (South Australia) Act 1997</p> <p>States gas pipeline access application legislation</p> <p>Approved access arrangements</p> <p>State codes, licences and guidelines</p>	<p>Trade Practices Act (Cth) 1974</p> <p>National Electricity Code</p> <p>National Electricity (South Australia) Act 1996</p> <p>State National Electricity Laws</p> <p>Statement of Principles</p> <p>Tariff Orders</p> <p>State codes, licences and guidelines</p>
Bodies	<p>Australian Competition and Consumer Commission</p> <p>Jurisdictional regulators</p> <p>National Competition Council</p> <p>Commonwealth Minister</p> <p>Federal Court</p> <p>Australian Competition Tribunal</p>	<p>Australian Competition and Consumer Commission</p> <p>Jurisdictional regulator</p> <p>State Supreme Courts</p> <p>National Electricity Tribunal</p> <p>NECA</p>

Within this framework, the regulators' approach to price (or revenue) regulation is primarily governed by:

- **Key objectives and principles for network pricing** - these are set out in the National Electricity Code and National Gas Code respectively and cover issues of promoting competition, facilitating a commercial environment, and providing incentives to increase efficiency. Appendix 2 summarises the objectives and principles as set out in Chapter 6.1.1 of the National Electricity Code and Section 8.1 of the National Gas Code.
- **Principles governing regulation of revenues or prices** - these are also set out in the National Electricity Code and National Gas Code respectively. The principles address areas such as the form of economic regulation (for example, revenue cap with a CPI-X incentive mechanism in the case of electricity transmission), and the detailed factors to be taken into account by the regulator in determining a price level (or reference tariff). In general terms, the factors refer to issues such as cost of capital and forecast efficiency gains. Appendix 2 summarises principles for regulation of revenue of prices that we consider particularly relevant to this review.

2.4 CURRENT APPLICATION OF PRICE REGULATION

This section briefly discusses the key features of the current application of price regulation in Australia relevant to our assessment.

2.4.1 Evolution of approach to network price regulation

The approach to regulation of electricity and gas distribution prices to date can be seen as having completed a first stage of evolution. The first electricity price controls in NSW that separated wires and retail prices were implemented in March 1996, and the first Electricity Distribution Price Reviews were completed in December 1999 and September 2000 for the NSW⁵ and Victoria⁶ electricity distributors respectively. The first decisions on Access Arrangements for AGL gas networks were accepted July 1997, and subsequently revised in September 2001.

Parties generally accept⁷ that it was appropriate for regulators to adopt the building blocks approach for the first price review given that:

- This was the first opportunity that regulators had to set distribution prices;⁸
- That there was a lack of well developed data to be able to rely exclusively on benchmarking; and
- Relying on broad measures of productivity growth would not enable a view to be formed on whether the initial prices were reasonable.

Most of the techniques discussed in Section 4 and used internationally have been utilised to some degree by jurisdictional regulators in Australia when forming a

⁵ The NSW distribution network price determination covers the period 1 February 2000 to 30 June 2004.

⁶ Victoria's electricity distribution price review are for the period January 2001 to 2005.

⁷ TXU Electricity Ltd was a significant exception.

⁸ In Victoria the ORG noted that this was also the first full review of distribution prices following the privatisation of the distribution businesses.

view on setting of regulated prices. These include frontier techniques (DEA, SFA), econometric techniques, TFP, partial benchmarking, and independent consultant reports.

The approach being proposed by the ESC for the Victoria Gas Distribution Price Review represents an evolution of the approach adopted for the Electricity Price Review (see Box 7).

Box 7 - Proposed approach for 2003 review of gas access arrangements in Victoria

The proposed approach is to use the building blocks approach. Operating expenditures are proposed to be assessed using an operating expenditure benchmark. This will involve the actual operating expenditure in the initial year being extrapolated using an annual rate of change for expenditure over the regulatory period proposed by the distributor. This would then be adjusted to account for changes in obligations and functions.

Some gas distributors were concerned that this approach would not adequately reflect their actual expected costs.

2.4.2 Regulatory decision-making approach

The Australian regulatory decision-making approach can be characterised as follows:

- The regulator prepares an issues paper and consults on the methodology to be adopted in reviewing the costs and parameters (e.g. demand forecast);
- Regulated companies are requested to submit forecast costs within the building blocks format specified by the regulator;
- The regulator prepares an issues paper to canvass how they will review the costs and parameters;
- In relation to certain parameters and costs, the regulator will engage experts to provide a review of those components that will be released for consultation. For costs and parameters not subject to review the regulator seeks comment;
- Following consultation the regulator releases a draft determination;
- Following consultation on the draft determination the regulator releases a final determination; and
- In gas, a service provider is required to submit their revised access arrangement consistent with the final determination.

There is active consultation throughout the process leading up to the draft decision. The regulator both manages the price review process and makes the final decision.

In both electricity and gas, legislative provisions restrict judicial review, or provide alternative recourse for parties affected by administrative decisions. For example, in electricity, the National Electricity Tribunal is established to review “reviewable decisions” as defined in the National Electricity Code: section 17(1)(a) and section 43 of the National Electricity Law refer. In gas, a limited right of merits review arises only where the regulator drafts and approves its own access arrangement: section 39 of the Gas Pipelines Access Law.

2.4.3 Data collection and availability

While numerous parties undertake data collection, including industry associations and regulators, as yet there is no established regime for nationally consistent collection, reporting and auditing of data.

The key initiative in this area seems to be that of the Utility Regulatory Forum through the 'Steering Committee on National Reporting Requirements'. This Committee was established to:

“oversight the development of the requirement for reporting of:

- Service performance of electricity distributors;
- Financial performance of electricity distributors; and
- Service performance of electricity retailers” (URF 2002: 1).

The Committee report of March 2002 (URF 2002) discusses implementation of the agreed framework but notes that power for implementation lies with the regulators and that there may be gaps in the data base for some years (as a result of industry system constraints).

2.5 VIEWS ON FUTURE EVOLUTION OF PRICE CAP REGULATION

From our review of industry papers and commentary, together with limited discussions with regulated companies, it is possible to identify two distinct schools of thought as to how price regulation for electricity and gas should evolve. In simplified terms these can be described as:⁹

- Retain the building blocks approach and change the way it is applied (see Box 8).
- Adopt an approach based on TFP indexation (drawing on US experience with performance based regulation (PBR) plans). Implementation is by way of competing evidence put forward by the regulated companies, the office of the public advocate and any other interested parties (see Box 9).

In our view, the key difference between these two views is in relation to the treatment of firm specific costs, and the ability for the different approaches to provide for regulatory commitment for efficient long-term investments. The view that the building blocks approach should be replaced by a TFP based approach flows from a perspective that the efficiency gains from shifting to a TFP based approach would outweigh any benefits gained from being able to account for firm specific costs and circumstances (or implicitly, that firm specific issues are not material).

⁹ Description of these two sets of approaches in this way assists in clarifying our assessment. Note these are not necessarily the formal or final views or the writers or their organisations. They are put forward here for the purpose of assisting discussion and debate.

The view that building blocks should be retained and modified reflects a focus on reducing uncertainty and risk, which is considered to provide better incentives to undertake investment and continue in business.

While there is apparently a tension between the desire for greater certainty for the recovery of costs (reflected in the first view) and the focus on greater rewards and incentives for taking risks (reflected in the second view), it may be that there could be hybrid approach that reflects aspects of both views.

Box 8 - Regulated company views (1): Retain building blocks approach and change the way it is applied

- The problem is not the building blocks approach per se but the way it is being applied.
 - There should be reduced emphasis on estimation of efficient costs. Benchmarking techniques used for the purpose of estimating efficient costs are approximate at best and face too many practical problems for regulators to place reliance on.
 - There is too much uncertainty as to the objectives for regulation. Clearer guidance is required to regulators as to objectives for regulation.
 - Greater emphasis needs to be given to providing incentives for efficient investment.
 - In relation to setting of rates of return:
 - Allowed rates of return are not sufficient to cover risks;
 - Greater certainty is required on allowed returns for new infrastructure beyond the term of the first regulatory period;
 - Greater certainty required on the risk component in the allowed return for successful projects; and
 - There should be greater certainty on the ongoing retention of tax incentives provided by the federal government.
 - There should be limitations on the ability of regulators to strand investments in the future.
 - There should be greater certainty on the basis for sharing efficiency gains. Regulated prices should not be set at efficient cost levels as this provides 100% of the gains in achieving the efficient level to customers and inappropriately penalises the company.
 - There need to be greater certainty on greenfields investments. One proposed approach is based on the Petroleum Resource Rent Tax (PRRT). An investor would be free to set prices until such time as the project recovered its costs. Thereafter the net benefit would be shared on a predetermined basis between investor and users.
-

Box 9 - Regulated company views (2): adopt approach based on external benchmarks such as TFP

- Consider adopting models based on external benchmarks, such as TFP.
 - It is recognised that further work is required to attempt to ensure company specific costs are adequately reflected. Suggested research includes:
 - Econometric analysis;
 - Undertake both DEA analysis and econometric analysis and comparing the results against specified criteria; and
 - Developing larger samples particularly for rural based utilities.
-

SECTION 3

ASSESSMENT FRAMEWORK

This section sets out the background to the assessment framework developed for this review (Section 3.1). It then works through each assessment area in detail, discussing the economic context and concluding with the ‘assessment criteria’ for each respective area (Section 3.2). In Section 3.3 we summarise the assessment criteria; these criteria are subsequently applied in the assessment process set out in Section 6.

3.1 BACKGROUND TO ASSESSMENT FRAMEWORK

3.1.1 Regulatory principles set out in terms of reference

The terms of reference identified regulatory principles that need to be taken into account in the assessment of the approaches; these are set out in Box 10.¹⁰

Box 10 - Terms of reference – regulatory principles

Regulatory principles set out in the terms of reference:

Issues to have regard to:

- Incentives to improve efficiency;
 - Risk and incentives for efficient investment;
 - Robustness, transparency, simplicity and administrative cost;
 - Cost and availability of information; and
 - Practical application of approaches.
-

In addition, our review of the literature and case studies has highlighted the importance of considering the industry and market context for regulation and the over-riding regulatory objectives (see RAP (2000)).¹¹

3.1.2 Market context and concepts of competition

The approach to assessment of building blocks approaches and indexed approaches can usefully be considered within the context of two different economic approaches that economists use to analyse public policy and regulation. These can be described as:

- The neo-classical approach; and
- The critique of the neo-classical model (sometimes called the Austrian approach).

¹⁰ An earlier Utility Regulators Forum discussion paper, (URF (1999). Best Practice Utility Regulation: Discussion Paper. Canberra, Utility Regulators Forum.) discusses best practice principles, processes and organisation.

¹¹ RAP (2000) notes the importance of the regulatory environment: “*The same PBR applied to two utilities may have very different results attributable to differing market conditions, personalities, or politics.*” The report also notes that the first step in designing or evaluating a PBR is to “*articulate the goals to be achieved*”. The report notes that “*this step may sound trivial but it is not. It is surprising how many PBRs start out with an implied goal of sharpening the incentives to cut costs but end up with a scheme that demonstrably reduces incentives to cut costs relative to the pre-existing method of regulation*”(5).

These concepts are summarised in Box 11.

Box 11 - Alternative approaches to competition¹²

Neo-classical approach:

- A static approach that assumes a perfectly competitive market:
 - Technology, products, costs and demand in a market are given;
 - There are many buyers and sellers.
- In the equilibrium state all prices will just equal costs including an allowance for return on capital.
- The existence of natural monopoly represents market failure.
- Regulation can solve market failure problems by ensuring prices are set so that they just equal cost to replicate outcomes of perfect competition.
- Allocative efficiency is achieved when return on capital is just sufficient to attract capital investment.

Critique of the neo-classical approach:

- The potential for government failure needs to be considered.
 - There is a need to recognise importance of incentives in promoting dynamic efficiency.
 - In undertaking regulation, there is a lack of complete, accurate information on current and future costs to set be able to prices exactly at the competitive level.
 - Price controls may limit the emergence of competition.
 - Allocative efficiency therefore needs to take into the account long-term benefits to consumers of providing incentives for companies to improve efficiency.
 - The primary justification for regulation of 'long-lived' assets is to provide a stable environment for efficient investment through ensuring that prices are reasonable, thereby limiting the risks of future politically opportunistic regulatory interventions.
-

CPI-X regulation in practice incorporates elements of both approaches. It would aim (ideally) to delink the prices set for an individual firms from its own costs and it emphasises the importance of incentives. At the same time prices over time must be regulated at levels that are politically acceptable, and which ensure financial sustainability in the setting of regulated prices. Therefore, it would not seem possible to totally disregard actual costs in the long-term.

The debate over the right approach for implementing CPI-X regulation can be seen as reflecting different emphasis being given to these concepts.

3.1.3 Scope of assessment framework

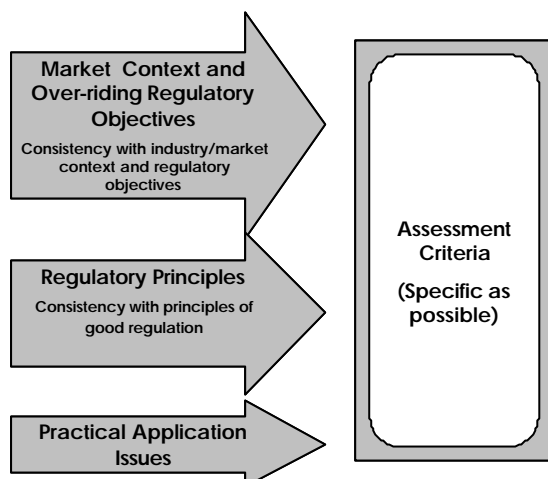
Therefore, the assessment framework (see Box 12) developed for this study covers the following areas:

- Market context and the scope for competition;
- Regulatory context and over-riding objectives; and
- Regulatory design principles and objectives.

Practical application issues are considered within each assessment criteria, rather than separately.

¹² For further discussion see Littlechild, S. C. (2001). Regulators, Competition and Transitional Price Controls: a Critique of Price Restraints in Electricity Supply and Mobile Telephones.

Box 12 - Assessment framework



3.2 DETAILED ASSESSMENT CRITERIA

3.2.1 Extent of competition in the market

The approach to CPI-X regulation should be consistent with the assessed potential for competition in the market¹³, including whether it is undergoing transition to a competitive market or considered to be a long-term monopoly.

This review focuses on the approaches to CPI-X regulation of services that are considered ongoing monopolies (at least for the foreseeable future).

The review does not carry out a detailed review of potential approaches for 'regulation' of emerging competitive services.

Therefore, the first question in our assessment framework relates to distinguishing between monopoly services (the subject of this review) and other services.

The remaining assessment criteria then apply to CPI-X regulation of services assessed as ongoing monopolies. Approaches for regulation of services undergoing transition to competition and greenfields investments are discussed briefly in Section 6.1.2 and 6.1.3 respectively.

Assessment criteria

1. Is the regulatory approach appropriate given the assessed scope for competition?

3.2.2 Regulatory objectives

Ultimately the success of a regulatory approach needs to be considered with reference to the specific regulatory objectives and outcomes at a particular point in

¹³ International experience needs to be considered in the context of the relevant policy-maker's and regulator's views on the extent the market is considered to be a natural monopoly or alternatively the extent price cap regulation is seen as a transitional mechanism towards future competition.

time (Berg 1999). Specific regulatory objectives should be distinguished from the general objectives set out in the relevant legislation. Potential specific regulatory objectives are set out in Box 13. RAP (2000) notes the importance of clearly articulating and, where necessary, prioritising the specific objectives for the regulatory instrument.¹⁴ A regulatory instrument designed to give priority to one objective is clearly likely to differ from an instrument designed to give priority to another objective.

Box 13 – Potential regulatory objectives

- RAP (2000) note that there is a long list of objectives that could potentially be set for a regulatory approach in a particular situation that could include:
 - Cutting costs;
 - Innovation;
 - Improving customer service and satisfaction;
 - Reallocating risks; and
 - Encouraging investment in cost-effective distributed resources.
 - This report has been carried out in the context of the existing Australian regulatory framework and objectives. However, examples of regulatory objectives which may be relevant at the present time include:
 - Ensuring that downstream industries benefit from efficiency gains;
 - Enhancing the scope for competition in competitive services; and
 - Encouraging investment.
-

The literature highlights that there is no single 'best approach' to the design of regulatory mechanisms and regulatory structures, and that account needs to be taken of the particular context of the market (see Box 14.)

This discussion paper assesses the approaches to CPI-X regulation in the context of generic regulatory objectives, rather than specific objectives or requirements established under various legislative instruments and codes.

Consideration of the constraints or potential inconsistencies between the existing statutory instruments (for example, the National Electricity Code and National Gas Code) and the potential approaches is carried out as a second step and is set out in 7.4.2e). As noted in Section 1.3, this two stage process is designed to highlight issues that may need to be considered in future reviews of the legal and policy regime.

Box 14 - Market context

- Levy and Spiller (1994) emphasise that the design of regulatory mechanisms must take account of the constitutional, legal and political characteristics of the country.
 - RAP (2000) highlight the approach designed to achieve a given objective in a particular set of market conditions, personalities and politics may not be appropriate in a different environment.
-

Assessment criteria

2. If the market is considered a monopoly, is the approach consistent with the overriding regulatory regime. Is the effectiveness of the approach dependent on the specific objectives of the CPI-X cap mechanism?

¹⁴ We note that this also raises the issue of 'matching of instruments and objectives'.

3.2.3 Economic efficiency

Economic efficiency can be defined as:

“A state of affairs in which, given the values of resources utilised, one has taken advantage of every available opportunity to increase the economic welfare of consumers through the provision of larger quantities of outputs, better products, or a mixture of outputs better adapted to consumer preferences” (Kahn 1992).

Three dimensions of economic efficiency are typically identified:

- Allocative efficiency;
- Productive efficiency; and
- Dynamic efficiency.

While efficient investment in networks is simply part of productive efficiency, special attention is paid to investment because decisions to invest in networks involve long-term investment decisions that extend over time frames long beyond the regulatory period for setting price caps.

Allocative efficiency is maximised where resources are allocated such that the value in the use of the product at the margin is equal to the increment in the cost of supplying the product at the margin.

There are four aspects of allocative efficiency that need to be considered in this paper and for which assessment criteria can be developed:

a) Allocatively efficient average pricing (or revenue) levels

A CPI-X approach based on the neo-classical perspective would require that over time and on average, the return on capital for the industry should be only just sufficient to attract investment. Highly efficient firms would be able to earn above average returns for a period and inefficient firms would earn below average returns.

A CPI-X approach based on the Austrian perspective would highlight that it will be very difficult for the regulator to assess allocative efficiency in advance because of the lack of information and the inability to predict how the future will change. This approach would rather place emphasis on regulating prices in a way that ensured returns earned in the industry were politically sustainable and that there were strong incentives for long-term efficiency.

Assessment criteria

3. To what extent in theory is the regulatory approach consistent with static allocative efficiency?

b) Allocatively efficient pricing structures

The Productivity Commission has stressed the importance of efficient pricing structures. The Essential Services Commission, however, has argued that responsibility for efficient pricing structures should be with the regulated firms. The ESC states that *“price caps apply to a basket of network tariffs and regulated firms have*

the freedom and incentives to rebalance tariffs towards more efficient structures within the constraints of any particular price cap” (ORG 2001c: 11).

We tend to agree with the ESC’s reasoning and have therefore assumed in our analysis that the form of regulation for setting price caps should not have any impact on allocative efficiency for the structure of prices.¹⁵

c) Allocatively efficient cost structure

Allocative efficiency is concerned with ensuring that regulated firms do not face ‘distortionary’ incentives as between investing in capital or undertaking maintenance or other operating expenditure.

Assessment criteria

4. To what extent does the regulatory approach create distortions between capital and operating expenditures?

d) Efficiency in service offerings, capital and business structures

Allocative and productive efficiency is concerned with whether companies have incentives to provide all the services that customers demand that have a value to customers equal to or in excess of cost. This raises issue around convergence, for example the ability for electricity and gas companies to utilise their assets to offer other services such as telecommunications services.

Another issue is the incentives for companies to adopt efficient business and capital structures. For example, there are increasing trends for companies to separate asset ownership and to arrange for the provision of services from either affiliates or third parties. These arrangements might improve efficiency (e.g. through increased specialisation and accessing improved economies of scale and scope), but they might also make effective regulation more difficult. Different regulatory approaches may have different impacts on the efficiency of business structures.

e) Safety

Safety is a further aspect of allocative efficiency. Safety, in particular in gas networks is affected by the adequacy of investment and maintenance programmes. Safety is subject to separate system of regulatory oversight. Consideration needs to be given to whether different regulatory approaches may affect safety.

Assessment criteria

5. To what extent does the regulatory approach distort decisions on service offerings, business structure or capital structure?
6. To what extent does the regulatory approach affect regulation of safety?

Service quality is another aspect of allocative efficiency and much of the literature and application of incentive based regulation is concerned with ensuring

¹⁵ We note that Government or regulator policy decisions may impose constraints that are not allocatively efficient but these are policy decisions that seem to lie outside the setting of pricing caps.

appropriate levels of service quality. The terms of reference state that it should be assumed that the same quality of service incentive mechanisms would be incorporated under either approach. Service quality is not considered in our assessment framework.

Productive efficiency is where a given output is produced at the minimum possible cost, given the available production technology and input prices.

The theory of price regulation suggests that incentives for productive efficiency will be maximised where the regulated firm treats prices as they would in a fully competitive market. That is, regulated firms that can operate more efficiently than their peers will earn higher returns, with increases in productivity only gradually feeding through into lower prices as more efficient technologies of production methods are adopted across the industry. Conversely, less efficient firms would earn lower returns.

Dynamic efficiency relates to processes of technological and managerial innovation - the ability of producers to improve the quality and cost of their goods and services and to respond to emerging market developments. It includes attention to technological change, capital investment, research, product innovation, and other preparations for the future.

Assessment criteria

7. To what extent does the regulatory approach delink prices from an individual firm's own costs?
8. What evidence is there that the regulatory approach gives rise to dynamic and productive efficiency gains in practice?

3.2.4 Risk and incentives for efficient investment in networks

The concept of regulatory commitment addresses the risks and incentives for efficient investment in networks. This is discussed further in Box 15.

Box 15 - Regulatory commitment

- Levy and Spiller (1994) found in a comparative study of regulatory systems that *"performance can be satisfactory with a wide range of regulatory procedures as long as arbitrary administrative action can be restrained"*.
 - Williamson (1999: 12) states that *"the incentive properties of any regulatory mechanism depend on how the regulated utility expects to be treated in the future. Uncertainty about the behaviour of the regulator is arguably as important as the stated methodology in shaping the utilities' responses. There are two aspects to this uncertainty:*
 - *Pure regulatory uncertainty or "noise"; and*
 - *The risk of regulatory opportunism (opportunism involves the overturning of previous decisions to systematically remove value from the regulated company)."*
 - Pure uncertainty will introduce 'noise' into the signals for regulated utilities and can raise hurdle rates for investment. Thus, good regulatory systems reduce arbitrariness while maintaining regulatory discretion only where it contributes to better outcomes.
 - Opportunism relates to the temptation to overturn previous commitments to regulated companies once they have made irreversible decisions.
-

Assessment criteria

9. To what extent does the regulatory approach introduce pure regulatory uncertainty?
10. To what extent does the regulatory approach constrain or encourage regulatory opportunism?

3.2.5 Financial sustainability

Regulation must enable regulated utilities to attract capital to support investment.

Gas and electricity networks are 'long-lived' and the effects of regulatory approaches on investment will be determined by shareholder and lender perceptions of the operation of the regime over several periods.

While, in any given year, returns can fluctuate, investors need to consider that the regulatory regime offers a credible promise that returns offered by companies in the sector will be comparable to companies that face similar risks and achieve similar levels of efficiency in other sectors.

Financial insolvency and lack of investment that is brought about by a price cap that, ex-post, is too tight or perceived ex-ante as being tight would damage the interests of customers of that firm, and might also raise the cost of finance for all firms subject to that form of regulation.

An issue to be considered in relation to financial sustainability is whether ownership matters (see Box 16).

If, in order to ensure financial sustainability, prices would need to be increased, this may be politically sensitive. Consideration needs to be given to how the approaches compare in this situation.

Box 16 – Does ownership matter?

- One view is that regardless of ownership, all transmission and distribution businesses in Australia operate on a commercial basis under the requirements of the Corporate Law and that therefore ownership does not matter.
- However it might be argued that, in practice, state owned firms would not be allowed to go bankrupt and would either be provided with financial support from government to ensure adequate investment, or the government would take steps to reopen the price cap.
- Privately owned firms may not have access to financial support and would have greater difficulty in seeking a reopening of the price cap.
- Another view would be that even if there are differences between private and public firms, as a matter of policy the regulator should operate as if all firms are privately owned.

Assessment criteria

11. What are the risks that the regulatory approach could lead to an inability to finance investment or continue to operate the business?

3.2.6 Equity and customer impacts

The literature on regulation highlights the importance of the political sustainability of pricing. If the outcomes of price cap regulation are perceived as 'unfair' (that is

there is a perception of excessive profits being earned) political pressures might develop to change the regulator or change the regulatory regime. Legal challenges for breach of the regulators duties might also be possible.

The statutory frameworks within which each of the Australian regulators operates do not provide any guidance as to when profits are 'too high'. This judgement is left to the discretion of each regulator.

Assessment criteria

12. What are the risks that the regulatory approach could lead to profits becoming too high and hence politically unsustainable?

3.2.7 Transparency and replicability

"Transparency requires regulators to be open with stakeholders about their objectives, processes, data and decisions. Regulators should establish viable decisions making processes that are fair for all parties and establish rationales for decisions" (URF 1999: 9).

The need for transparency arises from:

- The inevitable need for the regulator to exercise judgement;
- A desire to limit the risk of arbitrary decision-making;
- Requirements for procedural fairness;
- The need to ensure the political acceptability of regulatory decisions;
- The potential effect of lack of transparency on the cost of attracting private investment; and
- Potential legislative or statutory requirements.

Regulation inevitably involves judgements. Such judgements may concern:

- The methodologies to be employed;
- The data to be used; and
- The regard given by the regulator and the regulated companies to the advice of various kinds of experts in determining methodologies and analysing data.

The extent and level of judgement required depends on the underlying regulatory approach.

Transparency is in large part a question of the regulators processes and procedures, which, to some extent, are independent of the form of regulation. Our assessment focuses on whether the underlying features of the regulatory approach affect transparency.

Replicability is concerned with the ability for another party to repeat analysis that is undertaken. This requires that the details of any analysis are made public, that data is effectively managed and data definitions are clear.

Assessment criteria

13. What is the nature of the judgments that need to be made under each regulatory approach?
14. To what extent can the judgments be made that are replicable?

3.2.8 Simplicity

The benefits of simplicity are likely to be in reducing administrative costs and improving transparency. The potential disadvantages of simple approaches are that they may not provide sufficient information to enable regulatory decisions to strike the right balance between efficiency, financial sustainability and customer impact and equity objectives.

Assessment criteria

15. How simple is the regulatory approach?

3.2.9 Administrative cost

Economic regulation imposes administrative costs on governments and regulated companies with these costs ultimately falling on the community (through taxes and prices). Administrative costs may also fall on shareholders of regulated companies to the extent some costs cannot be recovered through fees and charges.

Administrative costs fall into the following categories:

- Development and agreement on regulatory approaches and mechanisms;
- Collection and analysis of data;
- Determination of regulated prices; and
- Disputes.

Some forms of regulation may require information that is useful to the regulated companies and therefore does not impose additional costs; other approaches may require information that has no commercial use.

Assessment criteria

16. What are the costs involved in development and agreement on regulatory approaches and mechanisms?
17. What are the costs involved in collection and analysis of data?
18. What are the costs involved in the determination of regulated prices?
19. What is the potential for disputes?

3.3 SUMMARY OF ASSESSMENT CRITERIA

1. Is the regulatory approach appropriate given the assessed scope for competition?
2. If the market is considered a monopoly, is the approach consistent with the overriding regulatory regime. Is the effectiveness of the approach dependent on the specific objectives of the CPI-X cap mechanism?
3. To what extent in theory is the regulatory approach consistent with static allocative efficiency?
4. To what extent does the regulatory approach create distortions between capital and operating expenditures?
5. To what extent does the regulatory approach distort decisions on service offerings, business structure or capital structure?
6. To what extent does the regulatory approach affect regulation of safety?
7. To what extent does the regulatory approach de-link prices from an individual firm's own costs?
8. What evidence is there that the regulatory approach gives rise to dynamic and productive efficiency gains in practice?
9. To what extent does the regulatory approach introduce pure regulatory uncertainty?
10. To what extent does the regulatory approach constrain or encourage regulatory opportunism?
11. What are the risks that the regulatory approach could lead to an inability to finance investment or continue to operate the business?
12. What are the risks that the regulatory approach could lead to profits becoming too high and hence politically unsustainable?
13. What is the nature of the judgments that need to be made under each regulatory approach?
14. To what extent can judgments be made that are replicable?
15. How simple is the regulatory approach?
16. What are the costs involved in development and agreement on regulatory approaches and mechanisms?
17. What are the costs involved in collection and analysis of data?
18. What are the costs involved in the determination of regulated prices?
19. What is the potential for disputes?

SECTION 4

APPROACHES TO CPI-X CAP REGULATION

There is a range of approaches to CPI-X regulation and a myriad of associated techniques and methodologies. However, the terminology and jargon associated with CPI-X regulation is sometimes loosely applied and differs between regulators and countries.

Therefore, it is necessary to carefully define the details of the alternative approaches that are to be subject to assessment as part of this review. This includes defining the regulatory techniques and the role of these techniques in decision-making.

This section defines a limited number of approaches that we consider could potentially be used for CPI-X regulation in the gas and electricity network industries in Australia.

Sections 4.1, 4.2, and 4.3 define the terms, regulatory parameters and regulatory techniques associated with CPI-X regulation.

Section 4.4 reviews the theoretical applicability of techniques to parameters, with further discussion on selected issues. Section 4.5 describes a set of operationally feasible approaches to CPI-X regulation. Of these, we consider it is useful to evaluate four approaches which could potentially be applied in the Australian context; these approaches are described in Section 4.6.

4.1 DEFINITION OF TERMS

Our review of the literature associated with CPI-X regulation indicates a lack of clarity and consistency both in the definition of concepts and use of terminology. This has the potential to confuse and potentially mislead discussion.

The following terms and meanings have been adopted for the purposes of this review.

- **Parameters:** the individual parameters associated with regulatory mechanisms and on which regulators are required to make decisions, including: the starting price P_0 , the productivity offset 'X', the regulatory period, the basis for setting new P_0 (i.e. ' P_{0+t} '), offramps granting stakeholders the right to review the parameters, and earnings sharing mechanisms to distribute excess earnings.
- **Techniques:** methods used in the process of regulatory analysis and setting parameters. These include; a review of individual components within the building blocks approach; TFP; frontier methods (DEA, SFA); and engineering reviews.
- **Approaches:** feasible groupings of techniques.

4.2 REGULATORY PARAMETERS

The following section describes the parameters on which regulators need to make decisions as part of implementing particular regulatory approaches.

4.2.1 P_0

P_0 is the initial level of a price or revenue cap (or starting point). The regulator evaluates the appropriateness of P_0 (with reference to regulatory objectives) on the basis that is fair and equitable while encouraging efficient and effective operation.

4.2.2 'X' - the 'productivity offset'

The 'X' factor, or 'productivity offset', is an adjustment to the inflation factor used to calculate price (or revenue) caps for subsequent years in the regulatory period based on the initial P_0 . A different 'X' may be specified for each year in the regulatory period; alternatively, a single 'X' may be set for the entire regulatory period. The decision on 'X' is usually set based on whether the pricing outcome is judged as financially, politically and economically sustainable, fair, equitable and efficient. 'X' can be set in either a direct or indirect fashion.

4.2.3 Regulatory period

The length of the regulatory period may be 'hardwired' in the regulatory framework or triggered by certain defined events (such as the rate of return (ROR) exceeding a defined level).

4.2.4 'New' P_0 – ' P_{0+t} '

We have defined the starting point price (or revenue) cap at the outset of the next regulatory period as P_{0+t} . The basis for the regulatory decision for P_{0+t} may relate back to the P_0 for the preceding regulatory period. Alternatively, P_{0+t} may be set following a standalone review, based on costs or with reference to other parameters (such as industry averages).

4.2.5 Exogenous 'Z' factors

The Australian building blocks regimes typically provide for "pass throughs" for defined events such as changes in taxes. In the US, the term 'Z' factor is used to describe the conceptually identical provision – specifically, those items which are excluded (either in whole or in part) from the operation of CPI-X. Given this discussion paper draws on US experience in TFP approaches, we use the term "Z" factor to refer to mechanistic adjustments for exogenous events beyond the control of the company.

Examples of 'Z' factors in the US include: changes in income tax or other laws, changes in accounting standards, changes in environmental laws (RAP 2000). Thresholds could be established to ensure only material items are passed through. For example, Central Maine Power's PBR plan allows recognition for items that are individually in excess of US\$150,000 and in aggregate more than US\$3million.

A similar feature within the UK electricity and gas sector is called the error correction mechanism (ECM). ECMs also adjust for situations where a company

may have misled the regulator by providing incomplete or inaccurate information when the price control was set.

Clearly specified mechanistic approaches for dealing with exogenous factors are required to avoid unnecessary regulatory costs

4.2.6 Offramps

The objective of offramps is to address situations where the terms of the existing regulatory arrangement are no longer applicable.

Offramps are specific circumstances that cause the re-opening or review of a regulated company's price or revenue cap arrangement such as the following:

- Actual returns significantly different from those anticipated;
- Major industry restructuring takes place; and
- Force majeure events.

Where offramps are specified, they do not necessarily include return criteria. However, in the event return criteria are included, these are likely to be set as a 'band' around a target return (see Box 17).

Box 17 - Examples of offramps

-
- 5% departure from target ROE (500 points basis points on either side of the target ROE) is a reasonable amount to trigger an offramp (a 5% offramp is) well within the range of common practice" (NERA 2001b: 27).
 - 6% (600 basis points) from target ROE triggers a rate review in Southern California Edison (1999) (Jamash and Pollitt 2000b).
-

Offramps tend to be determined based on existing precedents, with adaptation or, in some cases, 'negotiation' for particular circumstances.

4.2.7 Earnings Sharing Mechanism (ESM)

Earnings sharing mechanisms (ESMs), sometimes called "*sliding scale mechanisms*" (Kaufmann, Lowry et al. 2000b: 34) are a means through which customers receive benefits if a utility earns excessive rates of return, and shareholders are protected in the event returns are inadequate. "*A primary purpose of earnings sharing is to align company and consumer interests and to keep a company's earnings at politically and operationally acceptable levels during the plan's commitment period.*" (Sappington, Pfeifenberger et al. 2001: 72).

Excess earnings are typically distributed through lower prices to customers or direct payments. ESMs can take several forms – one sided, two-sided, a/symmetrical, regressive and progressive (RAP 2000: 17). Refer to Box 18 for examples of specific ESM types.

It is evident that ESMs "*tend to blunt the incentive to cut costs*", therefore reducing the power of performance based regulation (RAP 2000: 4). The final outcome of an

ESM depends on the width of the deadband and on how excess earnings are shared between the utility and its customers.¹⁶

“The wider the deadband, the greater is the preservation of the incentive mechanism, but at a cost of a greater risk of recontracting” (NERA 2001b: 27).

Makholm in NERA (2001b) recommends a 2% (200 basis points) departure from target ROE with customers sharing 40% and shareholders 60% of earnings outside the deadband. This *“represents a reasonable attempt to strike a balance between providing full incentives and minimising recontracting risk”* (NERA 2001b: 28).

Box 18 - ESM examples (Source: RAP 2000: 17-18; NERA 2001b)

- A ‘wide’ band is generally based on +200 to -300 basis points of a target (generally ROE).
 - UtiliCorp proposed a graduated ESM around a target ROE with a ‘deadband’ of +200 basis points. From +200 - +500 basis points, customers share 40%, shareholders 60%.
 - SCE - +/-50 basis points shareholders receive all revenues/losses; -/50 - 300 basis points shareholders’ marginal share 25 to 100%; -/+300-600 basis points shareholders receive the gains/losses (Jamash and Pollitt 2000b).
 - SDG&E (from 1999 on) 25 basis point deadband with nine additional rate bands.
-

4.3 REGULATORY TECHNIQUES

This section provides a brief description of the main techniques used by regulators, industry and other stakeholders.

4.3.1 Building blocks approach

The building blocks approach establishes the benchmark revenue requirement for a year based on a build up of separate benchmarks for the component costs (including operating expenditure, depreciation, cost of capital etc.). In forming a view of the level of each cost component a variety of different approaches can be taken, including setting of benchmarked WACC, and use of secondary techniques. These techniques may include DEA, yardstick benchmarking and econometric analysis. Partial productivity factor analysis can also be used as an alternative to derive forecasts for particular cost component (e.g. opex).

Where the building blocks approach is used to calculate ‘X’, the regulator may use one of at least two approaches. One approach involves determining the “target” price or revenue for the end of the regulatory period, agreeing the starting point price or revenue and then setting ‘X’ to achieve this target end point. Another approach involves determining the net present value (NPV) of the benchmark revenues for each year in the regulatory period. Once a decision on P_0 is made, ‘X’ is then ‘backsolved’ to achieve the target NPV. In theory, this means that there can be multiple combinations of P_0 and ‘X’.

The building blocks approach is currently the dominant method of determining the P_0 and ‘X’ factor by Australian regulators.

¹⁶ The deadband is the range *“in which prices are insensitive to ROE fluctuations”* Kaufmann, L., M. N. Lowry, et al. (2000b: 34). The dead-band range is generally determined through negotiations between stakeholders – primarily the regulator and organisation.

Australian regulators aim to ensure that the resultant price caps reflect the regulators assessment of 'efficient costs'. The process focuses on identifying *"efficient forward looking costs...while also protecting the medium-term interests of consumers and facilitating a financially viable industry"* (ORG 2001c: 14).

To effectively implement the building blocks approach (assess revenue needs) regulators require a high degree of company specific information. Consequently this method has earned a reputation for being information intensive and intrusive, subsequently providing the potential for a regulator to have a high degree of influence in the administration of a business. It is also commonly argued that the building blocks approach can tend to merge into ROR regulation (ORG 2001c).

4.3.2 Index methods – application of TFP and basket of services

a) TFP

Total factor productivity (TFP) is a non-statistical productivity growth measure that accounts for all factors of production, primarily capital, energy, raw materials and labour. TFP techniques set 'X' directly based on historical analysis of a TFP index. TFP techniques involve definition and measurement of the agreed index over an appropriate period.

There is often debate about the methodology to employ, the time period over which to undertake the study, the basis for including or excluding firms or sectors in the base data, obtaining a sufficiently large sample size, and addressing gaps in data – for example the calculation of the capital component is typically the most complicated part of the TFP study.

Ultimately, the decision on the TFP methodology and index requires a judgement based on an assessment of the options available. Ideally, this decision should be made as part of the design of the approach, rather than as part of a decision in relation to the setting of a particular 'X'. However, where new approaches are being developed and implemented, the debate tends to occur simultaneously, for example, as a part of a rate case hearing.

This paper does not consider these issues in any further detail. However, one of the first steps in further developing a TFP approach is to review the methodology and data requirements associated with calculating a TFP index and to consider the materiality of associated issues.

Makholm and Quinn (1997), and Kaufmann and Beardow (2001b) provide an overview of the perceived strengths and weaknesses of the TFP methodology.

b) Indexation against basket of services

A regulated company's prices are indexed to prices for a basket of comparable services (e.g. the prices charged for a comparable basket of services provided by similar companies).

4.3.3 Frontier methods – DEA, SFA

Frontier methods for price cap regulation include data envelopment analysis (DEA) and stochastic frontier analysis (SFA). Eggen, Buchner et al (2001?) provide a succinct definition of frontier methods.

“Frontier methods are based on the concept that given a certain sample, all companies should be able to operate at an optimal efficiency level which is determined by other efficient companies in that sample. These efficient companies are usually referred as the ‘peer firms’ and determine the ‘efficiency frontier’. The ‘efficiency frontier’ is formed from the observed performance of the companies in the analysed sample, determined by the relationships between the inputs and outputs of the sample distributors. The companies that form the ‘efficiency frontier’ use the minimum quantity of inputs to produce the same quantity of outputs. The ‘efficiency frontier’ is used as a yardstick against which the comparative performance of all other companies (that do not lie on the frontier). The distance to the ‘efficiency frontier’ provides a measure for the (in)efficiency” (Eggen, Büchner et al. 2001?: 5).

Frontier methods have been widely employed by corporations in many sectors to assist management in identifying operational and strategic opportunities. However, they are sensitive to the choice of techniques; these can affect the efficiency scores as well as the rank order of firms, *“which is not reassuring from a regulatory point of view”* (Jamasp and Pollitt 2000a:22).

However, while DEA and SFA operate on similar principles and assume organisations are not technically efficient, the techniques have some significant differences.

a) **DEA**

“DEA is an efficiency modelling approach that...uses linear programming to calculate an ‘efficient frontier’. The distance an organisation is from the frontier provides a yardstick against which to judge the comparative performance [viz inputs vs. outputs] of all other distributors that do not lie on the frontier” (IPART 1999b: 15 - 16).

DEA can account for different sources of efficiency (allocative, technical, scale), does not require price information, can identify relevant peers for comparison and can accommodate organisational idiosyncrasies. However, DEA is sensitive to outliers and does not provide information on statistical significance or confidence intervals (IPART 1999b: 9 - 10).

DEA is non-parametric, that is it *“does not impose any functional form of relationships between input and outputs and requires a large sample of firms”* (Kaufmann and Lowry 2000a; Eggen, Büchner et al. 2001?: 5).

b) **SFA**

“SFA is an econometric parametric method that can be used to measure efficiency in a similar way to DEA...[but can accommodate] ‘noise’ and statistical tests” (IPART 1999b: 27). SFA “attempts to estimate an efficient cost frontier which does incorporate the possibility of measurement error or chance factors in the estimation of the efficient frontier. This method first allows the adjustment of individual costs for stochastic factors and then calculates efficiency scores” (Eggen, Büchner et al. 2001?: 5 - 6).

As it is a parametric method, SFA requires the specification of a functional form (e.g. production or cost function) for the efficient frontier and a distributional form (probability function) (Coelli, Rao et al. 1997).

The use of frontier methods for regulation is a comparatively recent phenomenon, but has been the subject of debate following the implementation of a DEA based approach in the Netherlands (refer Section 5.2).

A detailed discussion of DEA and SFA is set out in 'Efficiency and Benchmarking study of the NSW distribution business' (IPART 1999b). An evaluation of the strengths and weaknesses of the frontier methods is set out in 'External Benchmarks, Benchmarking Methods, and Electricity Distribution Network Regulation: A Critical Evaluation' (Kaufmann and Beardow 2001b).

4.3.4 Econometric benchmarking

Like the frontier methods (Section 4.3.2), econometric benchmarking methods use statistical and mathematical methods to describe functional relationships between cost and outputs, input prices, and other business conditions (Kaufmann and Beardow 2001b). Econometric benchmarking is therefore parametric in nature and has the ability to account for 'noise'.

Variables that are included are selected through economic theory, and parameters are estimated using historic data on the variables used in the cost function. Performance is then measured by *"comparing a company's actual cost with the cost predicted by the model"* (Kaufmann and Beardow 2001b: 34).

Kaufmann and Beardow (2001b) discuss the perceived strengths and weaknesses of this methodology.

4.3.5 Engineering economic analysis

Engineering economic analysis (EEA) is based around development of a standard model for the costs associated with a 'model company' (for particular outputs, network characteristics, geography etc.) drawing on engineering and economic analysis.

This approach is currently used by ACCC in regulation of telecommunications.

An engineering approach is used in Chile (Rudnick and Donoso 2000; Parada, Saraiva et al. 2001). An optimisation of an actual distribution company is undertaken to determine a model company. The model company is then benchmarked with all the distribution companies. In this case, the model considers the following cost components: infrastructure and equipment costs, energy and power losses and operational costs. The value of these costs components varies depending on distribution density; standard zones are determined to represent distinctive distribution densities.

"The relative performance of the industry is then assessed, assuring in theory a specific minimum return to those companies that have a performance similar to the model company" (Rudnick and Donoso 2000: 1428). Within the model, annual investment costs take account of the New Replacement Value (NRV). NRV in this case is *"a hybrid between the substitution and replacements costs"* (Rudnick and Donoso 2000: 1429).

Treatment of technological progress and optimisation, leading to stranding of assets is a controversial issue in the application of this technique.

The implementation of this approach is highly dependent on negotiation between consultants engaged by the regulator and the companies, and price determinations have involved appeal to the courts.

4.3.6 Yardstick

Yardstick techniques represent a rudimentary, generally partial (uni-dimensional) performance measurement technique. This technique relies on simple data and ratios (e.g. MWh distributed per employee, company's costs relative to average of industry/sample) to provide indicative information on relative performance of organizations. Yardstick methods are cheap and simple to implement, but do not account for relationships between the different input and output factors (Eggen, Büchner et al. 2001?: 4). A differentiation can be made between macro- and micro-yardstick comparisons. Regulators generally employ macro-yardstick comparisons, an aggregate level review, for general modelling; micro-yardstick methods are predominantly used by organisations to identify areas of improvement (Eggen, Büchner et al. 2001?: 2).

4.4 APPLICABILITY OF TECHNIQUES TO PARAMETERS

Box 19 summarises the potential applicability of the techniques described in Section 4.3 to analysis and decision-making on the regulatory parameters set out in Section 4.2. A technique is rated as being applicable if, in theory, it could be used as the primary method to set the parameter in question. In many cases, techniques are used as secondary methods to apply 'checks and balances'.

The box distinguishes between methods used to set 'X' directly versus indirectly. Direct approaches to setting 'X' are those where indexes can, at least in theory, be used directly to set the productivity factor. Indirect approaches involve calculating the target revenue path and 'backsolving' for 'X'.

Box 19 - Techniques and parameters

	P ₀	'X'		P _{0+t}
		Direct	Indirect	
Building blocks	✓	×	✓	✓
DEA	✓	×	✓	✓
TFP	×	✓	×	✓
Econometric	✓	×	✓	✓
Engineering economic analysis	✓	×	✓	✓
Yardstick	✓	×	✓	✓

4.5 DESCRIPTION OF FEASIBLE APPROACHES

The techniques described in Section 4.3 can be grouped together to form eight operationally feasible approaches. Each of these could be used as the primary approach for regulation. Within each of these approaches, a number of the techniques listed in Box 19 could also be used as secondary approaches, outlined in Box 20.

Box 20 – Operationally feasible approaches

	Approach	P ₀	'X'	P _{0+t}
Building blocks	A – Building blocks	Building blocks	Building blocks (indirect)	Building blocks
Index methods	B1 – TFP with fixed regulatory period and reset based on building blocks	Building blocks	TFP	Building blocks
	B2 – TFP ongoing with options to trigger a cost based review	Building blocks	TFP	TFP from P _{0+t}
	B3 – Indexation against a comparable basket of services	Building blocks	Indexation against a comparable basket of services	As for B1 or B2
Frontier methods	C1 – Pure DEA	DEA	DEA (indirect)	DEA
	C2 – DEA from building blocks	Building blocks	DEA (indirect)	Building blocks or DEA
EEM	D1 – Engineering Economic Model (EEM)	Building blocks?	EEM	Building blocks or EEM

4.6 POTENTIAL REGULATORY APPROACHES FOR ASSESSMENT

Of the operationally feasible approaches to CPI-X regulation described in Section 4.5, we have identified four approaches which we consider could potentially be applied as the primary approach in the Australian context.¹⁷

- Building blocks approach (the status quo) – reference A;
- TFP approach based on building blocks approach – reference B1/B2;
- Indexation against a basket of comparable services – reference B3; and
- Frontier methods from building blocks approach – reference C2.

The key features of each of these approaches, if they were to be implemented in an Australian context, are presented below.

4.6.1 Building blocks approach (the status quo)

The building blocks approach is the current method employed by Australian regulators in determining price caps.

¹⁷ Note that we address implementation issues in 7.4.2. It is possible that one or more of these approaches could be implemented in parallel.

Section 4.3.1 describes the application of the building blocks technique to setting 'X' and P_0 parameters. Other features of the building blocks approach are described below.

- The regulatory period is fixed, and generally it is determined that a similar building blocks review will be undertaken for the next regulatory period, although some of the specific techniques that are used may evolve.
- Efficiency gains in the previous period may be allowed for through a glide path or efficiency carry-over mechanism that provides an increment to a distributor's revenue benchmark. This mechanism acts as an incentive for distributors to pursue efficiency gains as it allows them to retain an additional share of the benefits gained through such improvements during the previous regulatory period (2001e).

4.6.2 TFP approaches based on a building blocks approach

This approach is typically a component of what is called a Performance Based Regulation (PBR) plan in the US. It should be noted that 'PBR' is a broad concept that will typically include incentives for quality, and may include other approaches to the setting of 'X' (Sappington, Pfeifenberger et al. 2001).

Features of this approach are described below:

- A forecast of costs for the initial year of the regulatory period is undertaken. The regulator needs to make a decision that these costs are reasonable.
- 'X' is based on an analysis of the expected rate of change of TFP (refer Section 4.3.2 for a discussion on the data and methodological issues to be addressed in setting 'X'.) Hence, 'X' is calculated directly and is an entirely separate decision from the decision on P_0 .
- The approach is likely to include a 'Z' factor to take account of factors that are out of the control of the firm (see Section 4.2.5).
- Risks of actual returns and prices deviating significantly from those anticipated at the outset of the arrangements may be addressed through offramps and ESMs.
- There are a number of options for setting the parameters (primarily P_{0+t}) for the next regulatory period. These options differ in the level of scrutiny undertaken by the regulator and in the degree of flexibility as to the approach: A review could be undertaken of actual costs using the building blocks approach to establish a new P_0 . This approach could include a glide path to enable carry over of efficiencies in the previous period.
- The default position¹⁸ would be to roll forward the prices based on a reset of 'X', unless a high level review by the regulator determined that a cost based review (which may focus on particular issues and may either be undertaken at a high level or in a detail) should be undertaken. Detailed criteria or general terms for this high level review could be set out in advance.

¹⁸ The regulator could only commit to rolling forward without the right to undertake a cost based review if they were confident that the regulated business was becoming competitive.

4.6.3 Frontier methods from building blocks

The general features of this approach are described below:

- A forecast of costs for the initial year of the regulatory period is undertaken. The regulator needs to make a decision that these costs are reasonable.
- In order to establish a proposed 'X', the regulator undertakes DEA studies (or other frontier techniques). The DEA studies are intended to define estimates of the efficient frontier for each company. The regulator then makes a decision on the speed at which prices or revenues should be adjusted to bring the company in line with the efficient frontier (refer Section 4.3.3).

4.6.4 Indexation against basket of comparable services

Features of this approach are described below:

- A regulated company's prices could be indexed to prices for a basket of comparable services.
- Under this approach, the responsible regulator would assume that the form of regulation adopted by other regulators would produce price trends that are consistent with that responsible regulator's objectives and that the definition of the comparable services was stable. There would also need to be a consistent treatment of any excluded factors.
- There could be arrangements, such as offramps or ESMs to manage risks of excessive or inadequate profitability.

SECTION 5

CASE STUDY LEARNINGS

This section presents a highly abridged summary of findings on the objectives, influences and outcomes of CPI-X regulatory approaches that emerged from a series of case study investigations. Section 5.1 outlines the context for the case study investigations and the manner through which each case was selected. Section 5.2 outlines the specific context and findings for each case study. Section 5.3 synthesises these findings to discuss a series of general learnings.

5.1 CASE STUDY SELECTION

This review places significant weight on learning from the practical experience of other jurisdictions in the application and operation of the various approaches to network price regulation. Case studies enable the assessment process to draw on practical experience of the detailed issues arising through implementation of the various approaches. By taking a 'deep and narrow' approach in our examination of cases, we were able to identify the influence that contextual (social, political and historical) issues have had on the development and implementation of approaches to utility price regulation.

A conscious decision was taken at the outset of the review to undertake targeted case studies following a wider scan of literature documenting different regulatory approaches. For further publicly available international survey information readers are referred to (NZIER 2000; Jamasb and Pollitt 2000b; Kaufmann, Lowry et al. 2000b; Sappington, Pfeifenberger et al. 2001) - proprietary surveys are also available, e.g. EEE Limited. In particular, we sought and selected international cases for their ability to provide:

- A significant description of how and where each of the potential regulatory approaches has been applied;
- An example of an advanced application of each regulatory approach;
- Evidence of a 'track record' with the regulatory approach; and
- Examples of where notable problems have been encountered.

The cases selected on this basis are set out in Box 21.

	Approach	Case
Building blocks	A – Building blocks	United Kingdom electricity and gas sector by OFGEM (formerly by OFFER and OFGAS): Electricity transmission; 12 regional electricity distribution companies; Gas transmission and distribution (Transco).
Index methods	B1/B2 – TFP with reset based on building blocks	United States and Canada – electricity and gas distribution: San Diego Gas and Electricity; Central Maine Power Company; Boston Gas Company; UtiliCorp Networks (Alberta).
	B3 – Indexation against a comparable basket of services	United States – electricity transmission and distribution: National Grid USA Massachusetts Electrics, Rhode Island, New Hampshire; Niagara Mohawk electricity and gas distribution.
Frontier methods	C2 – DEA from building blocks	Netherlands – electricity distribution: 20 distribution companies. Norway – Electricity Distribution: Over 200 distribution companies.
EEM	D1 – Engineering economic model (EEM)	Spain – electricity distribution: 350 electricity distribution companies dominated by Iberdrola and Endesa (80%). Chile – electricity distribution: 23 electricity distribution companies.

The EEM approach has been studied because of its ability to consider company specific costs and its potential role as a secondary approach.

In addition, we also briefly consider the case of performance-based methodologies as used in the US telecommunications industry.

5.2 SPECIFIC CASE STUDY LEARNINGS

The following table attempts to synthesise our views on the key contextual issues and findings that emerged from each case study. The information presented has been purposely selected to provide a basic understanding of the key contextual and regulatory issues. More complete cases studies were undertaken as a basis for these findings.

UTILITY REGULATORS FORUM

COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

	Context	Findings
<p>A – BUILDING BLOCKS</p> <p>United Kingdom Electricity and Gas sector by OFGEM (formerly OFFER and OFGAS)</p> <p>Electricity Transmission; 12 Regional Electricity Distribution companies; Gas Transmission and Distribution (Transco))</p>	<p>Energy sector regulatory arrangements were established in the mid to late eighties in the context of a large scale and politically sensitive reform and privatisation programme. There was a strong aversion to US style ROR regulation and judicial processes. CPI – X regulation first proposed by Littlechild in 1983 for the regulation of British Telecom was proposed to play a central role in price regulation.</p> <p>Regulatory framework:</p> <ul style="list-style-type: none"> – Office for Electricity and Gas Markets (OFGEM): Separate gas and electricity regulators (OFGAS and OFFER) were established with a high degree of regulatory freedom under the Gas Act 1986, and the Electricity Act 1989 respectively. OFFER and OFGAS were merged in 2000 to form OFGEM (The Utilities Act 2000). – Competition Commission Utilities can appeal price regulation decisions and licence changes to the Competition Commission (formerly the Monopolies and Mergers Commission.) The other function of the Competition Commission is to carry out inquiries into matters referred to it by other UK competition authorities concerning monopolies, mergers and utility economic regulation of companies. 	<p>Building blocks method:</p> <p>A revenue level considered appropriate to finance a reasonably efficient business is set by OFGEM, derived by considering projections of operating costs, allowances for depreciation and the appropriate level of return for capital already invested in the business. The original floatation values are taken as the starting point for determining capital employed (OFGEM 2001b).</p> <p>Scope of regulation.</p> <p>There is a trend towards increased unbundling of price controls. For example in gas, the most recent price review applied separate price controls for the National Transmission System, the 12 local distribution zones, and metering and meter reading.</p> <p>Regulatory period:</p> <p>Five years.</p> <p>Data Requirements:</p> <p>Data required includes forecast capital expenditure, WACC, allowances for corporation taxes, with all forecasts conducted by OFGEM based on company data.</p> <p>Setting of 'X':</p> <p>'X' is determined indirectly and therefore P_0 and 'X' need to be considered together. For electricity distribution, OFGEM sets the same 'X' for each company and allows the P_0 reset to vary to reflect company specific differences. Price reviews have utilised a variety of different methods:</p> <ul style="list-style-type: none"> – Electricity transmission: Transmission prices for the 1997-01 regulatory period were benchmarked using TFP, DEA and an international survey of 15 transmission utilities. – Electricity distribution: High level benchmarking for total opex as well as an activity level benchmarking of specific types of operating costs; and benchmarking of capital expenditures for average replacement cost across the companies for a particular asset age profile. – Transco: Consultant reviews were commissioned to examine specific areas of Transco's operation and capital expenditures. <p>'Error Correction Mechanisms' have emerged recently. These adjust for changes in elements of cost over which the company has little control or where the company misled the regulator when a price control was set through the provision of incomplete or inaccurate information. Transco's 2001 price control allowed for cost pass throughs arising from changes in health and safety regulation, tax changes and actuarial reviews of pension schemes.</p>

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	Context	Findings
<p>A – BUILDING BLOCKS</p> <p>United Kingdom Electricity and Gas sector by OFGEM (formerly OFFER and OFGAS)</p> <p>Electricity Transmission; 12 Regional Electricity Distribution companies; Gas Transmission and Distribution (Transco)</p>	<ul style="list-style-type: none"> – Judicial review: A company can request judicial review on narrow legal grounds as to whether the regulator has acted reasonably. <p>Regulatory objective:</p> <p>OFFER has statutory objectives for setting price controls and standards for monopoly services to ensure the interests of customers are protected in regard to price, quality and security of supply.</p> <p>Key issues:</p> <p>In recent years, a significant focus of regulatory activity has been on unbundling potentially competitive activities and increasing competition in other markets (eg competitive supply, gas balancing, gas storage). Providing incentives for quality of service has also received considerable attention.</p>	<p>Volume adjustments:</p> <p>The 2001 Transco price control introduced a volume deadband to reduce the benefit to Transco of achieving volumes growth in excess of those assumed.</p> <p>Implementation issues:</p> <ul style="list-style-type: none"> – Consultation and transparency: While there is extensive consultation and publication of information, a number of commentators criticise OFGEM for lack of transparency in the selection of methods to translate the outcomes of analysis into their final decisions. Commentators state that <i>“Assumptions made and inconsistent decisions taken by ‘opportunistic’ regulator do not appear to be objective, fully transparent nor replicable”</i> (Jones 1999; Makhholm 1999; Shuttleworth 2001). – Appeals: Recourse to the Competition Commission is possible. However they can be costly for the company, tie up scarce managerial time, and prejudice any opportunity for negotiations (see Newbery (2000: 400)). <p>Outcome:</p> <p>Significant productivity improvements and price reductions have been achieved. The London Economics study undertaken for IPART (IPART 1999b: 80) calculated that the average improvement in total factor productivity for the 12 England and Wales electricity distributors have been around 3.5% p.a. between 1990/91 and 1996/97. There were wide variations in levels of productivity improvement around the average.</p> <p>However, it is difficult to separate the effects of the specific approach to regulation from other factors such as high levels of previous inefficiency, change in ownership and technological change.</p>

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	Context	Findings
<p>B1/B2 – TFP WITH RESET BASED ON BUILDING BLOCKS</p> <p>United States and Canada – Electricity and Gas Distribution</p> <p>San Diego Gas and Electricity, Central Maine Power Company, Boston Gas Company, UtiliCorp Networks (Alberta)</p>	<p>Regulatory framework:</p> <p>Network regulation is undertaken by state Public Utility Commissions (PUCs), typically with responsibility for regulating all utility services. PUCs have full regulatory discretion but decision-making is constrained by a judicial system and established legal precedents, particularly in relation to the protection of investor rights. PUCs make decisions with input from politically sanctioned public advocates responsible for representing consumer/public interests.</p> <p>Regulatory objective:</p> <p>Emphasises ‘just and reasonable’ outcomes for stakeholders; consumer protection through direct regulation where open markets cannot or have not yet developed; and a safe, reliable service at reasonable cost.</p> <p>PBR is generally introduced with the objective of achieving long run economic efficiency and reducing regulatory costs while ensuring just and reasonable prices; there is less emphasis on short run allocative efficiency.</p> <p>General:</p> <p>Restructuring in the USA and Canada is being undertaken in an industry that has a long history of predominately private ownership. Regulatory approaches vary by state, with some form of PBR plan for electricity and gas distribution introduced</p>	<p>Regulatory period:</p> <p>Regulatory periods vary and are defined as part of PBR plan. Some plans provide for mid-term reviews.</p> <p>Data requirements:</p> <p>The Federal Energy Regulatory Commission (FERC) filings facilitate TFP studies. Establishing appropriate data for capital costs is recognised as the most difficult task in any TFP study, but <i>“auditing data was not an issue because the government data is accepted by all parties”</i> (Welch 2002).</p> <p>Setting of ‘X’:</p> <p>‘X’ has been set in a number of ways, including:</p> <ul style="list-style-type: none"> – Based on a proposal for ‘X’ made by the utility based on a TFP study commissioned from consultants (the case studies have all utilised this approach); – Subjectively; or – Through a rate freeze (‘X’ equal to CPI). <p>Implementation issues:</p> <p>PBR plans typically include:</p> <ul style="list-style-type: none"> – Earnings sharing mechanisms: viewed as a ‘quasi’ insurance policy to guard against significant and unforeseen circumstances (RAP 2000: 42). One perspective is as that <i>“they are really inconsistent with the basic PBR theory, and are used most often as a political sop to those who prefer cost of service regulation”</i> (Welch 2002). – Offramps: triggered by exceeding limits above/below ROE – different for each organisation. – Decision-making: TFP based PBR plans are settled through a ‘non-mechanistic’ legal decision-making process. For example <i>“The issues just had to be resolved – in one or two of the cases the matter has been settled among the parties, and we have had only to determine whether the resolution as a whole was within a broad range of reasonableness” “The process (of rate setting) was no different than any other litigated case”</i> (Welch 2002). – Translating raw TFP studies into ‘X’: areas of contention include the time period to measure TFP trends; the range of comparable companies included in the sample (e.g. regional vs. national data; weighting of larger urban vs. smaller companies); whether to measure output growth, output per customer; whether an additional stretch factor should be included.

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	Context	Findings
<p>B1/B2 – TFP WITH RESET BASED ON BUILDING BLOCKS</p> <p>United States and Canada – Electricity and Gas Distribution</p> <p>San Diego Gas and Electricity, Central Maine Power Company, Boston Gas Company, UtiliCorp Networks (Alberta)</p>	<p>electricity and gas distribution introduced in a number of jurisdictions. At least 28 electric utilities in 16 states have introduced some form of PBR (Sappington, Pfeifenberger et al. 2001). At this stage however many states continue to use cost of service plans. PBR plans have tended to be implemented where:</p> <p>Organisations and regulators desire alternatives to cost of service regulation;</p> <p>Regulators are comfortable with existing price levels;</p> <p>Reducing regulatory costs is an objective (Welch 2002).</p> <p>Assessment of how PBRs have been implemented in this context must account for the legal and political framework in which it is embedded. The process often involves significant debate around the interests of various stakeholders. There is a tendency to be explicit about potential trade-offs, particularly in the context of any one decision.</p>	<p>additional stretch factor should be included.</p> <ul style="list-style-type: none"> – Benchmarking: in most cases benchmarking is not undertaken with the exceptions being: Central Maine 1995-1999, where the allowed ROE was benchmarked (this was not done for the 2001-2008 plan); Boston Gas ROE is benchmarked and companies costs are considered; Southern California Gas, cost of capital is benchmarked. – Transparency: court appeals play an important role in setting TFP. The Massachusetts DTE decision to include a 1% accumulated inefficiency factor was overruled on appeal to the Supreme Judicial Court on the grounds that not enough evidence was provided. <p>Outcome:</p> <p>The experience with PBR in electricity utilities is presently too limited to permit conclusions based on empirical evidence (Sappington, Pfeifenberger et al. 2001). Those regulatory commissions that have introduced some form of PBR note the following advantages of PBR over traditional cost of service regulation:</p> <ul style="list-style-type: none"> – Reduced administrative costs; – Improved incentive effects; and – Increased pricing flexibility. <p><i>“The price cap style of regulation...has worked quite well, both economically and politically. The incentives and rewards of price cap regulation are superior to those of cost of service regulation” (Welch 2002).</i></p>

UTILITY REGULATORS FORUM

COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

	Context	Findings
B3 – INDEXATION AGAINST A COMPARABLE BASKET OF SERVICES National Grid: United States Electricity Transmission and Distribution Massachusetts Electric, Rhode Island, New Hampshire, Niagara Mohawk	See B1/B2 Above	<p>The parameters for regulation of rates (prices) are set out in a rate plan.</p> <p>Initial prices are based on the company's costs. Prices are then adjusted by an index of regional electricity distribution companies' charges. The companies or the regulator can file a complaint at any time.</p> <p>Incentives are provided for cost control and good customer service.</p> <p>The Massachusetts Electric plan covers a nine -year period from 2000 to 2009; prices are frozen for the first five years and subsequently indexed to prices of similar investor-owned distribution companies.</p>

UTILITY REGULATORS FORUM

COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

	Context	Findings
<p>C2 – DEA FROM BUILDING BLOCKS</p> <p>Netherlands</p> <p>20 Electricity Distribution Companies</p>	<p>Regulatory framework:</p> <p>A new framework was established with a new regulator (DTe) that “<i>intended to transform the previous interventionist regime into regulated competitive markets in the pursuit of a more light-handed role</i>” (Hulsink 2001). DTe has a large degree of regulatory discretion (Jamasb and Pollitt 2001).</p> <p>Regulatory objective:</p> <p>DTe’s focus is on promoting efficiency and cost reduction, as there was a perceived wide variation in organisational performance and efficiency. The initial regulatory approach was recognised as not necessarily appropriate in the medium-term. DTe intends to move to ‘yardstick regulation’, (which we understand will index operating costs based on average industry performance).</p> <p>General:</p> <p>All distribution companies were municipally owned, and many were considered to be charging high prices to subsidise other public services. To circumvent the tradition of lengthy consultation a tight timeframe was imposed on DTe to implement change (Hulsink 2001). DTe appears to have been comfortable to have decisions subject to judicial appeal.</p>	<p>Regulatory period:</p> <p>Three years</p> <p>Data requirements:</p> <p>DEA was selected as: there was only one year of data which ruled out TFP; the sample size of 20 companies ruled out techniques (econometric approaches and SFA) that required large sample sizes.</p> <p>Setting of ‘X’:</p> <p>Initially the assessed DEA scores were applied to total costs in a relatively mechanistic manner to derive allowable price levels. ‘X’ was set for each network company to bring prices down to ‘efficient price levels’ by the end of the regulatory period. This was subsequently refined to apply only to total controllable costs.</p> <p>‘Z’ factors:</p> <p>The regulatory system began with the 1996 tariffs, corrected for ‘exogenous factors’ (DTE 2000b).</p> <p>Implementation issues:</p> <ul style="list-style-type: none"> – Transitional period: the first price control period (and arguably the current) was viewed as a transitional period intended to squeeze out excess returns and get the companies to approximately the same level of efficiency by the second period (DTE 2000b; Cherchye and Post 2001). “<i>The Netherlands exhibits in its regulatory policy making a step-by-step process of continuous finetuning of the policy instruments and seeking to gain stakeholder support for reform</i>” (Hulsink 2001: 24). The system is continuing to evolve to take account of learnings/issues. The system has not been in place for long enough to determine the ultimate effectiveness of the approach in achieving the regulators objective. (Note: Regulation of service quality was not addressed in the first period but is intended for incorporation in the future). – Transparency and decision-making: companies could argue through the court system why the results of the rate setting process was not appropriate. Over the course of the appeal, process companies provided a number of justifications that DTe considered were valid, which led to some changes. An interpretation of this approach is that it was a relatively cheap method of identifying underlying efficiency levels through ‘incentivising’ companies to reveal more information than they otherwise would have (DTE 2000a). From this perspective, the process could be seen as successful. However, the approach has been criticised for lacking sound analysis and developing a mechanistic/adversarial process where the burden of proof lies with the organisation (Shuttleworth 1999; NERA 2000). <p>Outcome:</p> <p>DTe deduced that the main cause of the price differentials was not efficiency, but significant differences in the excess returns earned by each company. In a purely economic sense, the approach DTe adopted to extract relevant information from the companies was a success, and gave DTe a good understanding of the causes of price differences, that were subsequently reflected in the revised ‘X’ factors that followed the first set of appeals.</p>

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COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

	Context	Findings
<p>C2 – DEA FROM BUILDING BLOCKS</p> <p>Norway</p> <p>Over 200 Electricity Distribution Companies</p>	<p>Regulatory framework:</p> <p>The legal framework is based on the Norwegian Energy Act of 1991. The regulator, the Norwegian Water Resources and Energy Directorate (NVE) has a large degree of regulatory discretion (Jamasb and Pollitt 2001).</p> <p>Regulatory objective:</p> <p>NVE's focus is on the reduction of costs by ensuring that <i>"tariffs for transmission and distribution of electricity reflect the cost of efficient investments, operation and maintenance of the network while not incurring significant regulatory costs"</i> (Jordanger, Lehtonen et al. 2000: 8; IEA 2001).</p> <p>Context:</p> <p>There are over 200, generally municipally and county-owned, distribution companies with the majority serving less than 5000 customers. The Norwegian reform did not affect ownership structure (Jamasb and Pollitt 2001). The distribution sector operates on a concession holding basis with associated delivery requirements. Agrell, Bogetoft et al. (2000b) note that there is <i>"substantial evidence of inefficiency in the industry; the natural monopoly - and ownership - status of the industry has in this case lead to a disguised inefficiency rate in excess profits"</i>. Page 4.</p>	<p>Regulatory period:</p> <p>Five years.</p> <p>Approach</p> <p>Between 1992-1996, the distributors were subject to rate of return regulation. The CPI-X revenue cap system commenced in 1997. The revenue 'floor' for the new system was established taking account of the capital base and a minimum prescribed rate of return.</p> <p>Setting of 'X':</p> <p>'X' is calculated through a mechanistic DEA cost model, based on reported performance in 1994-95. 'X' includes a general productivity term and an individual component. Thus it reflects the balance between a prevalent inefficiency among all distributors and the individual, relative inefficiency compared to other operators (Agrell, Bogetoft et al. 2000b).</p> <p>Implementation issues:</p> <ul style="list-style-type: none"> – Earnings sharing mechanism: <i>"a restriction (15%) was placed on ROC, where if the maximum permitted rate of return has been exceeded, the excess profit will be distributed to the customers through tariff reductions"</i> (Agrell, Bogetoft et al. 2000b: 11). – Violations of the revenue cap: windfall profits or losses are regulated with interest after a one-year delay.

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COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

	Context	Findings
<p>D1 – ENGINEERING ECONOMIC MODEL (EEM)</p> <p>Spain – 350 Electricity Distribution Companies dominated by Iberdola and Edesa (80%)</p> <p>Chile – 23 Electricity Distribution Companies</p>	<p>Regulatory framework:</p> <p>Spain: history of central planning and focus on system performance. Regulator the ‘Comisión Nacional de Energía’ (CNE) has full discretion in setting revenue cap (Grifell-Tatje and Lovell 2001; Jamasb and Pollitt 2001).</p> <p>Chile: similar history of central planning and focus on system performance. Regulator ‘Comisión Nacional de Energía de Chile’ (CNE) focuses on maintaining equity between and equitably treating companies. CNE has full regulatory discretion (Vignolo 2000; Jamasb and Pollitt 2001).</p>	<p>Regulatory period:</p> <p>Spain – three years. Chile – four years.</p> <p>Data requirements:</p> <p>Spain – Annual data on opex and capex are reported, no audits have been undertaken, lack of homogeneous measurement procedures, small distributors do not report data (Lastra 2001).</p> <p>Chile – Annual data on fixed costs, standard investment costs, operating and maintenance (O&M) costs for distribution per unit of power supplied, and mean distribution losses.</p> <p>Implementation issues:</p> <ul style="list-style-type: none"> – Relies on engineering based costing undertaken through third party (engineering) input (Grifell-Tatje and Lovell 2001). Optimisation of an actual distribution company is undertaken to determine a model company. The distribution companies are then benchmarked against the model company; – The method inherently recognises firm specific factors. The effectiveness of the rate in addressing these depends on the standard firm model (Basañes, Saavedra et al. 1999); – This method is expensive due to the need for third party involvement and is highly litigious. Judicial appeals have been undertaken (Rudnick and Donoso 2000); – Penalties: Spain – compensation payments if quality standards are not met. <p>Chile: effectiveness of regulatory systems affected by CNE independence (ministerial involvement), skills, resourcing, and ability to access necessary data from companies (Vignolo 2000: 27).</p>

UTILITY REGULATORS FORUM

COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

	Context	Findings
B1/B2 TFP US Telecommunications	Telecommunication reforms in the USA provide an example of a relatively more mature PBR system. PBR rather than cost of service regulation is now the dominant form of regulation for the telecommunication sector.	There are indications that PBR in telecommunications may deliver lower prices, increased investment, higher earnings for companies and no pronounced reduction in service quality. However, empirical evidence is lacking to <i>"justify definitive conclusions about effect of incentive regulation"</i> . <i>"Limited experience with incentive regulation, the short experimental nature of most plans and the imperfect commitment powers of regulatory bodies suggest that incentive regulation in practice may not be radically different from traditional rate-of-return regulation"</i> . <i>"It is difficult to distinguish the effects of incentive regulation from the effects of increased competition"</i> (Kridel, Sappington et al. 1996: 275).

5.3 GENERAL LEARNINGS

This section highlights the general learnings that can be drawn from the case studies. These general points and specific learnings associated with the approaches are discussed in more detail in the next section.

5.3.1 Assessment of performance of approaches against regulatory objectives

The first issue raised is whether the case studies provide any discernable evidence that any of the particular approaches we have considered is superior in achieving the objectives of economic regulation.

At this stage, experience with incentive-based regulation in utility sectors is too recent to properly compare the outcome of different approaches. Sappington, Pfeifenberger et al in a review undertaken in 2001 concluded that the experience of PBR is too limited to permit general conclusions. In the UK, marked improvements (in the form of reduced distribution prices and indication of rapid productivity growth) have been achieved under the building blocks approach. While we are aware that the issue of relative regulatory outcomes is gaining prominence, (partly as are result of increasing data and experience as time elapses), we were unable to identify any studies that gave us an insight into how well each of the different approaches performs. Furthermore, it is difficult to disentangle the impact of other effects – for example the extent of previous inefficiency, the impacts of reforms such as privatisation, and technological progress. This conclusion is supported by a comprehensive review of studies into the effects of introduction of PBR in the US telecommunications sector compared to traditional cost of service regulation (Kridel, Sappington et al. 1996).

In their comparative study, Levy and Spiller (1994) stressed that in order for a regulatory system to promote sustainable and efficient outcomes, the most important characteristic of the system is the restraint of ‘arbitrary administrative action’. This study supports this assertion and found that, provided such restraint was achieved, performance could be satisfactory with a wide range of regulatory approaches.

Based on their observations of the implementation of incentive regulation in the US telecommunications context, Kridel and Sappington et al (1996) suggest that incentive regulation in practice may not be radically different from traditional ROR regulation, due to limited experience with such approaches and a degree of imperfect commitment powers on the part of regulators.

These observations suggest that, to undertake an assessment of the different regulatory approaches, one must pay considerable attention to the local context, economic theory, and issues of practicality. In the final analysis, the choice of approach must be based on informed policy judgement.

5.3.2 Evolution of regulatory approaches

In all the case studies, it is apparent that regulation is undergoing a process of evolutionary changes in repose to broader restructuring within the industry and in more mature regimes, objectives to improve regulatory effectiveness and efficiency.

5.3.3 Local context

The case studies highlight the importance of local context in the selection and implementation of regulatory approaches. For example:

- In Norway, which has over 200 small and mostly council owned distribution companies, adopting a cost of service or building block approach was considered excessively costly and impractical to. At the same time, the regulatory approach needed to address inefficiencies in the existing industry. Agrell (Agrell, Bogetoft et al. 2000b) identified the situation as one of *“disguised inefficiency rather than excess profits”* (4). The apparently successful application of the DEA approach – in combination with an appeal system and earnings sharing mechanism – needs to be seen in that light of this context.
- In the US and Canada there is a significant variation between jurisdictions in the extent to which PBR plans have been implemented and the individual details of different PBR plans. These variations reflect local circumstances, differing views and stances on the part of utility owners and views on the degree of competitiveness of the local industry. Personalities, politics, and the views of senior regulators on the effect of traditional cost of service regulation all play a significant role in this assessment. Furthermore, recent experience of PBR in the telecommunications sector by regulatory commissions has been important in their evaluation of the appropriateness of these approaches to electricity and gas networks. RAP (2000: 3) noted that: *“Even if a PBR improves incentives and risk allocation, do not expect miracles or even immediately noticeable changes. The judgments and actions of a utility manager are made in a very complex business and political environment. The current state of flux in the industry practically guarantees that it will be difficult to discern the effect of a PBR in a real world context. The same PBR applied to two utilities may have very different results, attributable to differing market conditions, personalities, or politics”*.
- In the Netherlands, the DEA approach may appear in part to have been driven by the tight timeframes imposed on regulators to institutionalise change, a strong desire to avoid the problems perceived to be associated with the US cost of service regulation approach, and a view as to the role that appeal to the courts could play.

5.3.4 Economic theory

The case studies highlighted the following theoretical debates:

- The feasibility of ‘frontier methods’ to stimulate competitive behaviour; and
- The important role of regulatory commitment.

The Netherlands case study highlighted an important difference in perspective on the feasible role of economic regulation. It appears that the regulator considered it feasible to use frontier methods to try to stimulate competitive behaviour. Critics of this approach questioned whether the information generated through frontier methods could ever be utilised for this purpose given the difficulty in distinguishing between error and genuine differences in efficiency levels. Similar debates occur in regard to the UK system of economic regulation.

The US case studies highlighted that cost of service concepts (in the form of offramps and ESMs) still play an important role in ensuring that investors are able

to achieve the minimum returns necessary to ensure financial viability, and that high returns could be limited.

5.3.5 The regulatory decision-making process

The case studies highlight the importance of the decision-making process including:

- The approach adopted by the regulatory decision makers;
- The representation of the consumer/public interest;
- The role played by the regulatory staff;
- The role of appeal to the courts and other bodies; and
- The role of common law vs. statutory protections to investors.

While this may be an oversimplification, we can distinguish between two distinct approaches:

- In the UK and in other countries, the regulator has a high level of discretion and seeks to protect the consumer interest directly through their decision-making process. Appeal to the courts is limited with common law playing a limited role, but appeals to an economic regulator are allowed.
- In the US, the regulator plays a more judicial role and makes decisions based on the competing evidence put forward by the regulated companies, the Office of the Public Advocate (OPA) and any other interested parties. The consumer interest is represented directly by a body resourced by the regulator for this purpose (the OPA). The regulatory agency undertakes analysis for the regulatory decision makers and undertakes an administrative role. Appeal to the courts is permitted and the common law and legal precedent plays a significant role.

5.3.6 Regulatory accounts

The US case studies highlight the continued importance of regulatory accounts. The past US cost of service system required robust regulatory accounts. The uniform accounting system implemented in support of rate of return regulation appears to have facilitated effective implementation of offramps and ESMS within PBR plans.

Makholm (1999: 13) notes that:

“the early history of regulation in the US was characterized by notorious accounting abuses... Such abuses were effectively ended with the adoption by the federal government in 1938 of the Uniform System of Accounts. [This] rarely leaves US energy utilities and their regulators in major dispute over financial issues (like profitability, depreciation expenses, customer contribution, the admissibility of particular costs or the treatment of unregulated affiliates)”.

In a joint consultation paper (RAIWG 2001), the UK regulators considered the role of regulatory accounting, including issues such as the purpose of regulatory accounts, the principles for allocation of costs and the role of auditors. Jamasb and Pollitt (2001) note that most regulators rely on independent audits.

SECTION 6

ASSESSMENT OF APPROACHES

This section summarises our assessment of the four feasible approaches developed in Section 4 against the assessment framework developed in Section 3.

The first issue to be addressed in the assessment framework is that of market context and the scope for competition (Section 6.1).

We then assess the four approaches to CPI-X regulation on the assumption that the services being regulated are an ongoing monopoly (at least for the foreseeable future) (Section 6.2).

We also carry out a high level assessment of the building blocks approach using partial indexation (Section 6.3).

6.1 MARKET CONTEXT

This section is concerned with the questions discussed in Section 3.1.1 as to whether particular approaches are appropriate given the assessed scope for competition, including:

- Whether the activities are considered to be a long-term monopoly (Section 6.1.1).
- Whether the activities are undergoing transition to competition (Section 6.1.2).
- Addressing greenfields investments (Section 6.1.3).

6.1.1 Services assessed as ongoing monopolies

All four approaches (building blocks, TFP, frontier, indexation against a basket of comparable services) are appropriate to the regulation of services that are considered ongoing monopolies. There are examples internationally of each of these approaches being applied.

6.1.2 Potentially competitive services

In Australia, services that are regarded as potentially competitive are often treated as excluded services (e.g. metering). The key objectives for CPI-X price caps in managing the transition to competition are to create sufficient headroom to enable competition to emerge, and to provide transitional protection to consumers on price and service. Sharing of efficiency gains would not be an immediate objective, since competition is regarded as a superior way of providing long-term efficiency benefits to customers.

An assessment of how each of the approaches addresses potentially competitive services as follows:

Building blocks	<p>Building blocks (or cost of service) approach enables the costs of the particular potentially competitive service to be estimated. This may make it easier to ensure the price cap is set at the appropriate level that would support competition.</p> <p>A difficulty with building blocks is ensuring appropriate allocation of costs between the monopoly services and excluded service.</p>
TFP approaches based on building blocks	<p>Measures of TFP growth relying on aggregated industry data (which is most likely in practice), will reflect the average rate of productivity growth of all the monopoly services in that part of the industry.</p> <p>Services that are subject to potential competition may have different rates of productivity growth (due say to different volume growth or different technological effects) that would not be caught in a broadly based TFP study.</p> <p>However, use of a TFP approach avoids difficulties in cost allocation between monopoly and competitive services.</p>
Frontier approach	<p>Frontier methods may be complex to use relative to the benefits.</p> <p>Data is unlikely to be available for estimation of prices caps for competitive services using frontier methods.</p>
Indexation against basket of comparable services	<p>This may be a feasible and simple approach.</p> <p>For example, a regulator could index the rate of change in prices for a competitive service (such as metering services) to a rate of change of basket of comparable services. Optionally a 'Y' factor could be added to this index to enable competitive 'headroom' to emerge under the price cap.</p> <p>This approach may particularly appropriate for smaller regulators and smaller regulated companies where there is a concern with regulatory costs of dealing with excluded services.</p>

6.1.3 Is the approach consistent with efficient development of greenfields investments

The issue with greenfields investments is that in the early years of the investment, volumes and revenue growth are starting from a low base. The investment may not become profitable for many years – beyond the end of the next regulatory period. A greenfields investment will generally need to charge competitive prices initially (in order to encourage new load or switching from other fuels). As part of the assessment of whether monopoly pricing for the greenfields investment becomes a potential concern at some point in the future, prices need to be assessed over a long period of time (in particular to determine whether the firm has been able to recover its initial investment cost).

An assessment of how each of the approaches addresses greenfields investment follows.

Building blocks	<p>Lends itself to unbundling of the greenfields investment costs so that any specific regulatory treatment (e.g. of WACC, asset valuation) can be applied.</p> <p>There are potential difficulties with allocation of joint costs between the greenfields investment and the remaining parts of the regulated business.</p>
TFP approaches based on building blocks	<p>Whether TFP based approaches are appropriate depends on the relative significance of the greenfields investment in the total services.</p> <p>If the greenfields investment is not significant compared to the rest of the regulated asset base:</p> <ul style="list-style-type: none"> ▪ A TFP based approach could be applied. This has the benefits of avoiding cost allocation problems; ▪ The company is free to rebalance prices within the overall CPI-X price cap; and ▪ Commitments could be given as to the treatment of new investment costs if there is a subsequent cost based review. <p>If the greenfields investment is significant compared to the asset base, then a TFP based approach applied to the entire company may not be appropriate:</p> <ul style="list-style-type: none"> ▪ Industry TFP growth rates may not adequately reflect the circumstances of the greenfields investment; ▪ An option would be to unbundle greenfields investment projects and treat these separately. The remaining mature assets could be regulated under a TFP based approach; and ▪ Initially prices of greenfields investments would not need to be regulated given they are disciplined by competition. As the greenfields investments became mature, and price caps were required, the price caps would be assessed on a building blocks approach. Once the investors had recovered their investment, the asset could then be rolled in to the rest of the asset base and regulated under a TFP approach.
Frontier approach	<p>These approaches do not lend themselves to greenfields investments that are significant compared to the rest of the regulated asset base.</p>
Indexation against basket of comparable services	<p>This is similar to the discussion of TFP approaches.</p>

6.2 ASSESSMENT OF APPROACHES FOR REGULATION OF MONOPOLY SERVICES

6.2.1 If the market is considered a monopoly, is the approach consistent with the overriding regulatory regime? Is the effectiveness of the approach dependent on the specific objectives of the CPI-X cap mechanism?

Building blocks	<p>This approach is most appropriate in situations where:</p> <ul style="list-style-type: none"> ▪ There are believed to be significant differences in cost structures between firms and there are no other techniques considered adequate to account for these cost differences; ▪ There is a need for the regulator to be satisfied, to the extent practicable, that costs are close to the efficient level because either: <ul style="list-style-type: none"> - The process of priced regulation is new; or
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	<ul style="list-style-type: none"> - New issues are emerging (such as concerns over whether prices are adequate to meet cost pressures related to providing for network replacement, growth and service standard requirements). ▪ The regulator has access to the necessary expertise, resources, and has sufficient time; ▪ The number of individual companies that need to be reviewed is not too large; ▪ There is a need to provide high levels of certainty about how the sharing of efficiency gains is to be achieved; and ▪ Statutory requirement or regulatory objectives require or imply a need to refer to actual costs.
TFP approaches based on building blocks	<p>TFP based approaches are most appropriate in situations where:</p> <ul style="list-style-type: none"> ▪ The objective of regulation is to place greater importance on strengthening the incentives for dynamic and productive efficiency (TFP approaches with triggered (rather than inbuilt) cost reviews are consistent with an intention to lengthen the period of time between cost-based reviews); ▪ The issue of whether there are significant differences between companies (in respect of relative efficiency levels or excess profits) is: <ul style="list-style-type: none"> - Not considered a material issue (because of the previous history of regulation); or - Dealt with through an accepted method for handling company specific differences; or - Willingly accepted (see discussion Section 6.4.2 b). ▪ There is a tolerance by regulators (and the political environment) for reasonable levels of fluctuation in returns around target returns; ▪ There is a willingness by the regulator to be explicit about the levels of 'high' rates of return that are considered acceptable (this is necessary for the transparent design of off-ramp criteria and ESMS); ▪ There is a desire for the regulator to: <ul style="list-style-type: none"> - Focus resources on information collection and analysis at a more aggregated level; and - Minimise the extent to which the regulator is drawn in to micro management. ▪ There is an objective to reduce the costs of regulation; and ▪ There is adequate data available.
Frontier approach	<p>Frontier approaches may be most appropriate in situations where:</p> <ul style="list-style-type: none"> ▪ There are believed to be significant differences in relative cost efficiency or in excess profits; ▪ Data is of sufficiently good quality and there are enough comparator companies; and ▪ The regulator has effective processes to resolve likely disputes. <p>Frontier methods cannot be used in a mechanical fashion. There are likely to be adjustments required to the results of frontier studies. As discussed above some commentators believe that frontier methods are never appropriate due to the inability to make these adjustments on a sound and transparent basis.</p>
Indexation against basket of comparable services	<p>This approach is most appropriate in situations where:</p> <ul style="list-style-type: none"> ▪ There is information available on comparable services provided by comparable companies; ▪ The regulator believes that the trend in prices charged by the comparable companies will be reasonable over the regulatory period; and ▪ The regulator wishes to minimise regulated costs by applying a simple method.

Issue: Objectives for regulation: efficiency/performance gaps

Our review of the literature assessing international experience highlights that frontier approaches are perceived as:

“more suitable at the initial stages of a regulatory reform when a priority is to reduce the performance gap between utilities. Average benchmarking methods may be used to mimic competition among firms with relatively similar costs or where there is lack of sufficient data and comparators for the application of frontier methods” (Jamash and Pollitt 2001: 108).

This highlights that consideration should be given to what a regulator considers to be the priority objective in the price review. Most electricity and gas distribution business in Australia have either had at least one price review, or are well advanced in the process of undertaking the first price review.

When considering the objective for the future price reviews (where flexibility is still available as to the approach to select) the following key questions arise:

- Is the regulator satisfied that previous price reviews have substantially reduced the relative performance gap between different companies?
- Is the priority in future to try and mimic competition among firms rather than seek to eliminate relative performance gaps?

6.2.2 To what extent in theory is the regulatory approach consistent with static allocative efficiency?

Building blocks	<p>Gives greater emphasis to static concepts of allocative efficiency.</p> <p>The starting point is to set a WACC at the efficient level and to allow actual returns to rise above the target level if efficiencies are greater than assumed. Over a period, returns are brought back to the efficient level through the operation of a glide path mechanism.</p> <p>In principle, the building blocks approach enables efficient prices to be set more ‘accurately’ from a static allocative efficiency perspective.</p> <p>Given the level of error that is involved in the process of estimating efficient prices, some commentators question whether the building blocks approach is as allocatively efficient as it might seem in principle.</p> <p>On the other hand, given the importance of the cost of capital in setting prices, there does seem a reasonable argument that specific benchmarking of the cost of capital is likely to bring prices closer to allocatively efficient levels than through the TFP approach.¹⁹</p>
TFP approaches based on building blocks	<p>Gives relatively less emphasis to static concepts of allocative efficiency and more emphasis to dynamic and productive efficiency.</p> <p>TFP approaches are likely to produce a price path that is less allocatively efficient within a framework of perfect competition than a building blocks approach.</p> <p>There is likely to be longer periods of deviation of actual profits from the minimum level of return required to provide a return on capital that is just sufficient to attract investment; this depends on the detailed design of the approach, particularly the definition of offramps and</p>

¹⁹ Under the building blocks approach, the allowed cost of capital is set for a known regulatory period. The company is therefore able (if it chooses) to hedge a significant portion of its cost of capital (particularly the cost of debt). So while there may be debate over the parameters of the allowed cost of capital, the actual cost of capital can be stabilised to a significant extent. Under the TFP approach, the period of time until the next cost based reset may not be necessarily known so the cost of capital cannot be hedged as effectively.

	the width of ESMs, if these are part of the approach.
Frontier approach	Gives more emphasis to static allocative efficiency. In principle, seeks to set prices for all firms at (or relative to) the efficient frontier.
Indexation against basket of comparable services	Gives less emphasis to static concepts of allocative efficiency and more emphasis to dynamic and productive efficiency. There are likely to be longer periods where actual profits deviate from the minimum level of returns required to provide returns sufficient to attract investment.

6.2.3 To what extent does the regulatory approach create distortions between capital and operating expenditure?

Building blocks	Because the building blocks approach considers costs on a disaggregated basis (even where regulators attempt to understand trade-offs between operating and capital costs), it is difficult to remove all opportunities for 'gaming' by the business of choices between capital and operating expenditure to gain the most favourable regulatory outcomes.
TFP approaches based on building blocks	Does not distort capital and operating cost decisions.
Frontier approach	When applied to total costs would not create distortions. When applied only on a partial basis (e.g. to opex as in the Netherlands) it would create concerns for distortions between capital and operating expenditures.
Indexation against basket of comparable services	Does not distort capital and operating cost decisions.

6.2.4 To what extent does the regulatory approach distort decisions on service offerings, business structure or capital structure?

This assessment is concerned with situations where:

- A regulated company is providing other services (e.g. telecommunications) through shared utilisation of infrastructure and company overheads;
- A regulated company is purchasing services from an affiliate (for example an asset trust purchasing services from an affiliated service company); and/or
- There are opportunities to improve efficiency through enhanced economies of scale or scope, (for example through a merger of two adjoining distribution networks).

Building blocks	Provision of other services: <ul style="list-style-type: none"> ▪ If there is an implicit or explicit regulatory objective to ensure that customers of the monopoly service benefit from efficiencies arising from improved utilisation of the companies' assets, then there is a need for the regulator to oversee the attribution of joint costs to different services. ▪ This is difficult and controversial because there is no unique method of efficiently allocating joint costs. ▪ The effect on incentives for providing other services depends on the proportion of
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	<p>efficiencies the regulator wishes to pass to the consumers of the monopoly service, and the degree of intrusiveness in the regulatory review of joint cost allocations.</p> <p>Business structure:</p> <ul style="list-style-type: none"> Where affiliate companies are supplying services, it may be more difficult for the regulator to ensure that the costs of services are efficient. <p>Enhanced economies of scale and scope:</p> <ul style="list-style-type: none"> If there is an implicit or explicit regulatory objective to ensure that customers benefit from efficiencies arising from, for instance, a merger, then the assessment by the regulator of these efficiencies can be controversial.
TFP approaches based on building blocks	<p>Some commentators²⁰ believe that this approach can enable lighter handed regulation of the non-monopoly services and reduce the need to address controversial issues such as affiliate transfer prices. This would therefore promote improved incentives for provision of other services and adoption of efficient organisational and business structures.</p> <p>However, as we believe that such a TFP based plan is likely to need to incorporate offramps related to measurement of profits, the advantages are not so clear-cut. This is discussed further below.</p> <p>A further issue to consider is the incentives for undertaking mergers and restructuring under the TFP approach. This is considered further below.</p>
Frontier approach	<p>Under a pure application of this approach, there are strong incentives to promote efficiency in service offerings, business structure and corporate structure. There is no need to address issues such as cost issues, joint cost allocation, affiliate transfer pricing or mergers.</p> <p>(It should be noted that Frontier Approaches are promoted by consultants as a method to identify opportunities for companies to undertake mergers or take overs (see Nillesen, Pollitt et al. (2001)).</p>
Indexation against basket of comparable services	<p>Similar to TFP approach.</p>

Issue: TFP based approach - regulation of joint costs for provision of other services, regulation of transfer pricing

We believe it is likely that any TFP plan will require offramps related to accounting measures of profit associated with the core monopoly services. This would then seem to raise the same the need to establish 'rules' for the allocation of joint costs, and the regulation of transfer pricing as with the building blocks approach.

However, it is arguable that there will be a lesser burden placed on these 'rules' under the TFP approach, because they are used to trigger cost based reviews that would (hopefully) occur less frequently than under the building blocks approach, and these rules would not be used regularly to set regulated prices for monopoly services.

A supplementary approach that could be considered would be to establish (as a specific term of the offramp arrangements) that the regulator and the company have the ability to trigger an investigation into the allocation of joint costs or transfer pricing.

²⁰ Kaufmann, L., M. N. Lowry, et al. (2000b). A Survey of Performance Based Regulation Plans and Benchmarking. Madison, WI and Sydney, Pacific Economics Group Benchmark Economics.

This may create greater flexibility to address new or unforeseen circumstances or concerns as they arise. For example:

- If a company wished to have greater regulatory certainty about how joint costs of a new service would be treated in any future price review, the company could request a specific review; and
- The regulator could observe other indicators (such as revenues from non-monopoly services achieved by the company and other companies, the companies share price etc) and trigger a review if it had concerns that there should be greater efficiencies shared with customers, and that the regulatory effort involved was worthwhile.

In relation to treatment of efficiency gains from mergers, these should be captured over time through measurement of accounting profits. An alternative approach that could be considered might be to define as a trigger for an off-ramp certain significant corporate restructurings such as mergers. The effects on incentives for companies to pursue these restructurings would need to be considered.

Issue: Impact of TFP approach on incentives for mergers and restructuring

An issue to consider is what incentives a TFP approach might have for mergers or other forms of restructuring, and whether any problems might arise.

Specifically there is the question as to whether or not a TFP approach that did not systematically account for company specific factors might provide artificial incentives for mergers.

Let us consider the situation where the specific design of the TFP approach does not adequately take account of company specific factors and assume that there is some systematic bias that favours one type of firm (say metropolitan Distribution Businesses) over other types of firms (say rural Distribution Businesses).

In this case it might be argued that there could be artificial incentives to seek to merge the better performing firm with the poorly performing firm so that the firm is more “average” in structure, and profitability and thus less likely to approach off-ramps or ESMs.

Are there economic efficiency problems that could arise? One problem may be distortions created in the market for corporate control, for example, a less well performing management team might displace a better performing management team.

It is possible that this problem could be controlled to some extent if the regulator continued to treat each company separately for the purposes of its price controls. However, there may still be the potential for cost shifting between the companies.

These issues could potentially be considered in any review of a proposed merger by the ACCC, and a decision taken based on consideration of the overall public benefit.

6.2.5 To what extent does the regulatory approach affect regulation of safety?

Building blocks	Reviews of maintenance and capital expenditure programs typically undertaken as part of the regulatory process provide opportunities for safety regulators to comment on and influence company proposals.
TFP approaches based on building blocks	Reviews of maintenance and capital expenditure would not be undertaken on a regular basis. They would only be undertaken when and if there is a cost based review. This may have implications for the administration of safety regulation that may need review.
Frontier approach	As for TFP approaches.
Indexation against basket of comparable services	As for TFP approaches.

6.2.6 To what extent does the regulatory approach delink prices from an individual firm's own costs?

Building blocks	<p>Temporarily delinks prices from the firm's own costs (between reviews).</p> <p>The extent this occurs depends on details of the glide path mechanism, particularly its duration and the level of sharing efficiency gains between customers and the company.</p>
TFP approaches based on building blocks	<p>The extent that TFP based approaches delink prices from an individual firms costs will depend on:</p> <ul style="list-style-type: none"> ▪ The detailed design of the offramps, including both the basis of the offramps (that is, the offramp parameters, for example whether they include a rate of return offramp(s)) and the threshold levels set with respect for each offramp parameter (that is, the deadband within which the approach operates mechanistically and without triggering a review); ▪ Whether there are ESM mechanisms, and the detailed design of any ESM; and ▪ The level of error in the initial setting of P_0 compared to the company's actual costs. <p>If P_0 is set so that it deviates significantly from actual costs, then it is more likely that offramps and ESM mechanisms would be triggered.</p> <p>A TFP based approach that:</p> <ul style="list-style-type: none"> ▪ Had relatively wide deadbands for the trigger of offramps; ▪ No ESMs; and ▪ Was able to set P_0 close to actual costs; <p>would go the furthest along the path to delinking prices from costs.</p> <p>A TFP based approach with relatively narrow rate of return (or cost based) deadbands for triggering offramps and ESMs would delink prices to a much lesser extent, and is likely to have very different incentive effects.</p>
Frontier approach	<p>This approach does delink prices from a firm's own costs, assuming the sample of comparable companies used in studies is sufficiently large.</p> <p>The criticisms of mechanical application of frontier approaches are that the inherent imprecision in the approach may cause prices to be delinked from the firm's own costs to such an extent that the firm could be financially unsustainable, and/or alternatively delinks costs in a manner that does not mimic competitive markets.</p>

Indexation against basket of comparable services	<p>This approach does delink prices from a firm's own costs until the end of the regulatory period.</p> <p>At the time of the price review at the conclusion of the regulatory period, the extent of cost delinking will depend on the approach adopted (i.e. whether there is a cost based review, or whether prices are reindexed).</p>
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6.2.7 What evidence is there that the regulatory approach gives rise to dynamic and productive efficiency gains in practice?

We are unaware of any clear empirical evidence in the electricity and gas industries that demonstrates that any one of these approaches is clearly more effective than another in encouraging dynamic and productive efficiency.

6.2.8 To what extent does the regulatory approach introduce pure regulatory uncertainty?

Our assessment is that, at the level that we have defined the approaches, it is not possible to compare how each approach introduces pure regulatory uncertainty. The level of pure regulatory uncertainty depends on the detailed application of the approaches, as well as the legal process and appeal systems within which the regulators decision-making operates.

As a general comment, frontier approaches may introduce a higher level of regulatory noise because of the need for the regulator to make company specific adjustments to the results of efficiency scores and the likely inability to set out rules in advance as to how these adjustments might be made. However, once the nature of any appeal process is considered this assessment may be different.

6.2.9 To what extent does the regulatory approach constrain or encourage regulatory opportunism?

Building blocks	<p>Regulatory opportunism can potentially arise in the review of costs associated with 'long-lived' assets, to the extent that rules for treatment of costs (in particular WACC and depreciation) are not established in advance. Features that can constrain regulatory opportunism are as follows:</p> <ul style="list-style-type: none"> ▪ Certainty can potentially be established for the treatment of certain costs (e.g. rules for greenfields projects, establishment of WACC) in future regulatory periods; ▪ Well defined processes and procedures for identification and review of other individual cost components; ▪ Glide path design that avoids claw back of efficiencies from previous periods; and ▪ Appeal processes.
TFP approaches based on building blocks	<p>Issues to be considered:</p> <ul style="list-style-type: none"> ▪ In the initial stages of implementation there may be a degree of experimentation that might limit the extent of regulatory commitment (see further discussion below); ▪ Well-defined processes in the longer-term process of setting TFP estimates would constrain regulatory opportunism. It is not clear whether this will be feasible; ▪ The extent to which decision-making processes could protect against regulatory opportunism when making judgements on X based on TFP estimates; and ▪ The nature of any appeal processes.

Frontier approach	<p>Issues to be considered:</p> <ul style="list-style-type: none"> ▪ A DEA approach requires a number of steps to be undertaken; <ul style="list-style-type: none"> - The selection of a preferred model specification that relates inputs and outputs; - Verification and screening of data including removal of 'outliers' that may distort the efficiency frontier; - Adjustment of performance scores to account for operating environment conditions; - Translation of DEA efficiency scores to determination of 'X'. ▪ Each of these steps involves judgments that could give rise to regulatory opportunism; and ▪ The nature of the decision-making process needs to be considered.
Indexation against basket of comparable services	<p>This approach has the advantage that it is forward looking and based on easily measurable information. While there may be scope for regulatory opportunism in the process of selecting the comparable services, the future performance of basket of prices cannot be predicted with certainty. This would constrain the potential for regulatory opportunism.</p>

Issue: Regulatory commitment in the initial stages of implementation of TFP approaches

As mentioned above, in their study of telecommunications in the US, Kridel, Sappington et al. (1996) noted that:

"The limited experience with incentive regulation, the short experimental, nature of most the plans and the imperfect commitment powers of regulatory bodies suggest that incentive regulation in practice may not be radically different from traditional rate of return regulation" (302).

This highlights the question of whether TFP based methods can in practice become sufficiently stable to enable regulators to provide reasonable levels of commitment so that promised improved incentive properties of TFP based regulation can be achieved in practice.

A key issue is whether stable processes, (including data collection, analysis and review processes and detailed methodologies), can be developed and implemented in the Australian context to determine sufficiently 'robust' TFP estimates. Experience in the US, and the lack of data available to undertake TFP studies in Australia, indicates that there would probably be a need to undertake significant analysis and debate in establishing a TFP index acceptable by all parties, at least for the first application of the approach.

If an accepted set of processes could be developed prior to the first application of the approach to determine the methodology that should be adopted, the data and time period to be used etc., then this would constrain uncertainty and regulatory opportunism. If this cannot be achieved and there needs to be a debate each time over the TFP growth rate methodology, then this leaves open the potential for regulatory opportunism.

In telecommunications in the US there do seem to be evolving precedents as to how TFP estimates should be calculated.

Issue: Appeal rights in TFP approvals

Rights of appeal are designed to constrain opportunistic behaviour by the regulator. The degree to which appeal processes could constrain opportunistic

behaviour by the regulator when making judgements on the basis of technical TFP growth studies is questionable.

One protection against opportunistic behaviour that could be considered would be the right for the regulated company to call for a cost based review during a reset of 'X' based on a TFP study.

6.2.10 What are the risks that the regulatory approach could lead to an inability to finance investment of continue to operate the business?

Section 3.2.5 above sets out the reasons why regulation needs to give attention to financial sustainability.

In our view, the need to ensure financial sustainability means, firstly, that there needs to be a system of regulatory accounting in place. This is required so that returns on capital and return of capital (depreciation) are able to be measured on an agreed basis. Secondly, there need to be provisions that enable returns on capital and of capital to be taken into account in the regulatory decision-making process.

This analysis implies that under the TFP based approach, offramps would need to be incorporated that are triggered by reference to some minimum rate of return or other proxy for a minimum level of financial sustainability.

This means that attention needs to be given to:

- The initial price cap;
- The length of the regulatory period;
- The rules for triggering cost based reviews;
- The rules and perceived impact of the approaches to be adopted in reviews of cost, including allowed rates of return; and
- The system of regulatory accounting used to assess returns.

Building blocks	<p>Issues to be considered are:</p> <ul style="list-style-type: none"> ▪ The initial price caps; and ▪ Investor perceptions as to how building block price reviews will be undertaken. <p>(Note that under the building blocks approach the length of the regulatory period and the timing of the cost reviews are known).</p>
TFP approaches based on building blocks	<p>Issues to be considered are:</p> <ul style="list-style-type: none"> ▪ The design of offramps: <ul style="list-style-type: none"> - Minimum returns (or some other proxy for financial sustainability) are likely to be set as one of the triggers for a cost review requested by the company; - These triggers would provide a 'floor' to investors' returns; - The relationship of this 'floor' to investors required level of returns would affect incentives for investment; and ▪ The 'rules' for how cost based reviews are triggered;

	<ul style="list-style-type: none"> Investor perceptions as to how cost based reviews will be undertaken; The perceived length of the regulatory period which is affected by the likelihood of cost based reviews being triggered; Perceptions of how the TFP based 'X' would be set. (Perceptions that 'X' set on the basis of a TFP study could be set arbitrarily may adversely affect investment); and Whether ESMs are put place and the design of any ESM.
Frontier approach	<ul style="list-style-type: none"> A mechanical approach to utilising DEA is criticised for adversely affecting incentives for investment.
Indexation against basket of comparable services	<ul style="list-style-type: none"> The issues to be considered are similar to those for TFP based approach.

Issue: Financial sustainability and political issues

It is possible under any approach that errors are made in the setting of the initial prices and the price path, such that prices are too low and price increases are subsequently found to be required. Alternatively, circumstances might have fundamentally changed from the time when the price caps were set. It is important to consider how each approach manages this risk, given that raising prices may be politically sensitive.

Building blocks	<p>Price reviews occur regularly (every five years) enabling regular opportunities for review of costs and prices.</p> <p>If the regulator agrees that price rises are required and a rigorous review of costs has been undertaken then this may be more able to be accepted and justified.</p>
TFP approaches based on building blocks	<p>If prices have been set too low, then this should trigger an offramp which creates rights for a cost based review that would enable any necessary price rise to be justified and accepted.</p>
Frontier approach	<p>A weakness of this approach is that it avoids review of individual firms costs. If there have been errors in the decisions based on the frontier methods then it may be difficult to detect these and/or unwillingness to open regulated prices for review.</p>
Indexation against basket of comparable services	<p>Same as TFP approach.</p>

Issue: Investor perceptions as to how cost based reviews will be undertaken in TFP based approach

The key factors that investors will consider in any cost based review process (under any of the approaches outlined above) are:

- The basis of the setting of the allowed WACC in any future review;
- The exposure of companies to stranding risk in any future cost based review (including depreciation policy); and
- The treatment of volume growth.

Issue: Investment incentives in TFP approaches

There seems to be no reason why similar levels of certainty could not be provided in relation to how these matters would be dealt with under any approach. If this is the case, the only effective 'difference' in relation to investment incentives between the TFP approach and the building blocks approach could be that a TFP approach enables potentially longer periods between building block reviews and reduced regulatory costs.

If at the beginning of the regulatory period, regulated companies and investors perceive that a TFP approach was likely to result in significantly longer period until the next building block review, then their investment behaviour will be less distorted by the nature of the building block review process, and they would start to behave more like an unregulated business.

Over time however, as the company perceive that a building block based review is more likely to be triggered, their investment behaviour would revert more to that of a regulated business and their investment behaviour will be affected by the expected rules of the cost based review.

This implies that the definition of the rules for building block based reviews has an important effect on the incentives for investment.

Issue: Volatility in earnings in TFP approaches

At a theoretical level, for a TFP scheme to provide enhanced incentives it should enable more divergence between the company's own costs and regulated prices. This would produce greater volatility in earnings.

The extent to which volatility in earnings translates into higher costs of capital depends on the framework used for assessing the cost of capital. Under the assumptions of the Capital Asset Pricing Model (CAPM), greater volatility in earnings would be treated as a risk that investors could eliminate through diversification.

Issue: Design of off-ramp triggers in TFP approaches

As discussed above, the relationship between the 'floor' and the investor's required level of return may affect incentives for investment.

If this 'floor' is set too low, then investors could be at risk of being trapped at a level of returns that is too low but be unable to trigger a cost review. This could damage incentives to undertake investment.

If this 'floor' is set too high, and is above investors required rate of return, then investors would be encouraged to 'gold plate' since all investments would be given (in effect) a guaranteed return.

As it might be difficult to set the 'right' level of returns far in advance and enable flexibility for adjustment to changes in circumstances, a possible approach would be to set fixed quantitative trigger levels for (say) the first five years of the regulatory period, and then to supplement these with triggers that are defined by qualitatively defined criteria.

The definition of off-ramp triggers may also include other events that could affect required returns such changes in legislation or other regulations.

Issue: Design of ESM

The design of the ESM mechanism will affect investment. The issues are similar to the design of off-ramp triggers as discussed above.

Issue: Investment and frontier approaches

As discussed above, Shuttleworth (NERA 2000) believes that the frontier methods as implemented in the Netherlands may have the result that:

- Some regulated companies that are efficient may never be able to recover their costs; and
- Regulators may be denying investors in utilities returns that are comparable to those available in other industries. This may conflict with statutory duties and general regulatory objectives to ensure financial sustainability.

6.2.11 What are the risks that the regulatory approach could lead to profits becoming too high and hence politically unsustainable?

Under some approaches, errors might be made in setting the CPI caps, resulting in profits becoming too high and hence politically unsustainable. How does each approach manage this risk?

Building blocks	<p>Does not make explicit the level of 'high' profits that is politically unacceptable.</p> <p>Even though 'high' profits have not been made explicit, there are examples where prices have been set at a level that is later considered to be 'too high' leading to reopening of the price cap (as evidenced by the reopening of the 1994 electricity distribution review in the UK).</p> <p>Concern with this risk may be a significant factor in the approach adopted by the regulator to implementation of this approach.</p>
TFP approaches based on building blocks	<p>TFP based approaches could make high levels of profit that are acceptable explicit through:</p> <ul style="list-style-type: none"> ▪ Design of off-ramp triggers; ▪ Decisions on whether or not to include ESMs; ▪ Detailed design of the ESMs; and ▪ Alternatively, a TFP based approach could provide no explicit cap on prices. In this case consideration needs to be given to the possibility of political intervention, or future regulators acting to cap levels of profit that are considered too high.
Frontier approach	<p>In principle, this approach seeks to eliminate excess profits.</p> <p>In practice, risks of high profits arise because:</p> <ul style="list-style-type: none"> ▪ DEA (and other frontier methods) will involve estimation error; ▪ DEA analysis is not forward looking and hence may not reflect performance improvement over the regulatory period; and ▪ DEA is unlikely in practice to be implemented mechanically and there are likely to be adjustments made, which could result in error.
Indexation against basket of comparable services	<p>The issues to be considered are similar to those for TFP based approach.</p>

Issue: Importance of the design of a TFP based approach

In order to make shifting to a TFP based approach 'worth the effort' then there must be increased tolerance to seeing companies achieve 'high' profits, on the assumption that the ability to earn high profits drives dynamic and productive efficiency.

If there is low tolerance to 'high' profits and a need for 'tight' deadbands in the design of ESMs, the more the TFP scheme would face problems from the gaming of ESMs, and the more likelihood there will be for cost based reviews. This form of TFP scheme would start to revert to cost of service regulation. The incentive effects could be equivalent or worse than a well-designed building blocks regime that includes a generous glide path.

6.2.12 What is the nature of the judgements required to be made under each regulatory approach?

Building blocks	<p>Requires a significant number of judgements to be made at both a disaggregated and then ultimately at an aggregated level. The regulator is required to form a view as to the appropriate level of each cost component (disaggregated level) including;</p> <ul style="list-style-type: none"> ▪ Operating costs; ▪ Parameters to establish the cost of capital; ▪ Asset base; and ▪ Additions to the asset base. <p>In addition, the regulator needs to make decisions on forecast demand assumptions. This raises issues such as demand growth, correcting for weather effects and the relationship between demand and underlying economic growth.</p> <p>Taking account of the detailed decisions, the regulator then needs to make higher level decisions (judgements) about the level of P_o, the level of 'X' and efficiency carryovers (glide path).</p>
TFP approaches based on building blocks	<p>Case studies of United States' experience indicate that in the initial review, there can be significant dispute over the appropriate TFP measures to use, including decision over what time period to measure, comparable regions to consider etc. (Section 5.2).</p> <p>Once the TFP methodology is established (including any adjustments for company specific costs), the regulators' judgements are at a high level and relate to setting P_o and 'X'. Decisions are required on any adjustments to the TFP-set 'X' in the way of 'Z' factors.</p>
Frontier approach	Requires significant level of judgement (Section 5.2).
Indexation against basket of comparable services	Judgement is required in selecting the comparable services and companies.

6.2.13 To what extent can judgements be made that are replicable?

Building blocks	It is difficult for the building blocks approach to be fully replicable because of the number of different judgements that need to be made. However, a number of the more important parameters are able to be defined in ways that are capable of being replicable.
TFP approaches based on building blocks	<p>Depends on:</p> <ul style="list-style-type: none"> ▪ Whether over time there is relatively automated and systematic processes for determining 'X' based on TFP studies and whether agreement has been reached on the TFP index

	<p>methodology; and</p> <ul style="list-style-type: none"> ▪ The extent that allowing for company specific differences is considered an issue: <ul style="list-style-type: none"> - The process would not be replicable where ad hoc adjustments are found to be necessary at each price review to allow for company specific differences and weaknesses in TFP studies; - A key issue is whether systematic approach to accounting for company specific differences in cost can be developed.
Frontier approach	It appears difficult to replicate the analysis undertaken at each step given the judgements required at each stage.
Indexation against basket of comparable services	We have not considered to what extent a systematic (and replicable) process could be developed when selecting comparable services and companies.

6.2.14 How simple is the regulatory approach?

Building blocks	This approach is not simple. It requires a relatively detailed examination of costs at each regulatory review.
TFP approaches based on building blocks	<p>The TFP approach in it's own right is relatively simpler and involves decisions at an aggregated and a relatively easily understood level. The approach is rendered less simple to the extent it builds in judgements to the TFP index or other adjustment factors.</p> <p>The TFP index methodology required as input to the overall approach is technically complex and often contentious. Therefore, the simplicity of the overall approach depends on the extent to which agreement can be reached on the TPF methodology.</p>
Frontier approach	This approach is not simple. It requires an understanding of the various mathematical and statistical methods, agreement of methodologies and needs to address resolution of complex data issues.
Indexation against basket of comparable services	<p>This approach would require a building blocks approach to set initial prices.</p> <p>Thereafter, the process of selecting a basket of comparable services appears a relatively simple approach.</p>

6.2.15 What are the costs involved in development and agreement on regulatory approaches and mechanisms?

In the initial stage of developing a new regulatory regime, costs are incurred in development, consultation and agreement on the approaches.

Building blocks	<p>Significant costs have already been incurred in the development and agreement of the regulatory approaches and mechanisms, and can be regarded as largely sunk costs.</p> <p>This approach is now relatively well understood.</p>
TFP approaches based on building blocks	<p>The cost of development of the regime depends on availability of standard data on which TFP studies can be undertaken and parameters developed for ESMs etc. In the United States, this was facilitated through a uniform accounting system.</p> <p>Appropriate data collection and verification processes would need to be established for Australia. There is likely to be a moderate level of one off costs incurred.</p> <p>Significant work would be required on the part of the industry (or companies wishing to be subject to such an approach) and regulators on the definition and design of offramps, ESMs</p>

	and on the TFP index methodology. This would include undertaking work such as modelling to understand the potential medium and longer-term effects of the approach and the workings of the various parameters.
Frontier approach	Significant costs would be incurred to enable primary reliance on this approach. NSW however has already had experience of the use of these approaches.
Indexation against basket of comparable services	The cost of developing this approach would not be significant.

6.2.16 What are the costs involved in collection and analysis of data?

Implementation of any approach requires collection and analysis of data. In comparison we use a scale of 'low'/'medium'/'high' to assess the relative costs of each approach.

Building blocks	Costs of collection and analysis of data are high.
TFP approaches based on building blocks	<p>The processes used for collecting data are summarised below.</p> <p>Setting the initial prices may involve similar costs as a building blocks approach although the regulator may choose to adopt a less rigorous review process on the grounds that the incentives established by the TFP approach will benefit consumers over time.</p> <p>Price resets would involve a resetting of 'X' based on TFP studies, and a review of 'Z':</p> <ul style="list-style-type: none"> Costs of collecting data and analysis for a TFP study would be modest initially and might become low over time; and Collection and analysis of data related to setting 'Z' factors would be low. <p>Cost based reviews:</p> <ul style="list-style-type: none"> Costs of collection and analysis of data at the time a cost based review is triggered are likely to be similar to the building block approach, although it may be possible to design the review to focus on the area which trigger the review. For example, the review may focus on a specific area of costs; and Depending on the detailed design including offramps and ESMs, it would be the intent to undertake cost based reviews less frequently.
Frontier approach	Costs of collection and analysis of data are low to medium.
Indexation against basket of comparable services	Once a comparable set of services had been identified, costs of collecting data would be low. Very little analysis of data should be required.

Issue: Collection of data for TFP studies

Makholm and Quinn (1997) provides a detailed discussion of the empirical methodology and data requirements for calculating TFP. The paper discussed the alternative approaches to calculation of TFP, but concentrates on calculation of TFP using a Tornqvist Divisia Index for the electricity distribution industry. The data requirements include:

- Labour quantity (workers);
- Labour total cost;

- Capital quantity (time series, taking account of additions and retirements);
- Capital total cost;
- Other operating cost quantities; and
- Other operating total cost.

Much of this data is sourced from 'FERC Form 1', which contains financial and operational data in a uniform format.

The capital calculations are the most complicated part of a TFP study. See Makhholm and Quinn (1997) for a discussion in the context of the US. The London Economics study undertaken for IPART (IPART 1999b: 36) discusses the calculation of capital inputs in Australia. Calculation of monetary measures of capital inputs was difficult in the London Economics study because of differences in revaluation and accounting policies.

6.2.17 What are the costs involved in the determination of regulated prices?

The costs involved in determining regulated prices at the beginning of a regulatory period typically include:

- Work undertaken by the regulators and the companies, and consultation leading up to the preparation of final price determinations;
- The development and finalisation of the detailed methodology for determining prices for the regulatory period;
- Preparation of draft determinations by the regulator;
- Submissions by the regulated company on the draft determination; and
- Preparation of the final determination.

Building blocks	Costs in the process leading up to the preparation of the final determination are relatively high.
TFP approaches based on building blocks	<p>Setting the initial prices may involve broadly similar costs as a building blocks approach. However, the regulator may choose to adopt a less rigorous process on the grounds that the incentives established by the TFP approach will benefit consumers over time and/or because the overall approach builds in mechanisms to dynamically address situations where the initial price is set at an incorrect level.</p> <p>Setting of the initial 'X' could involve costs that range from modest to significant depending on the level of debate there will be around the interpretation of TFP studies and other adjustments such as stretch factors.</p> <p>Review of the 'X' factor will involve modest to significant costs depending on whether a systematic approach can be developed for undertaking TFP studies.</p> <p>Cost based reviews would involve similar costs to a building block review, but the regulator may choose to adopt a less rigorous process on the grounds that the incentives established by the TFP approach will benefit consumers over time. See also discussion under Section 6.2.16.</p>

Frontier approach	<p>Costs incurred in the process of leading up to preparation of the final determination are medium to high.</p> <p>While less intensive for the regulator than the building blocks approach, companies that wish to dispute the proposed draft prices may face significant costs that may be similar to that under the building blocks approach.</p>
Indexation against basket of comparable services	<p>The issues are similar to that for the TFP based approach.</p> <p>However, there may be a need to consider more fundamental cost reviews. While the rate of change of prices for the basket of comparable services may follow a broadly similar trend to the relevant TFP measure, there may be divergences between them. Reasons may include differences in regulatory approach adopted by regulators of the companies, and the impact of different firm specific factors.</p>

6.2.18 What is the potential for disputes?

Under any approach, disputes can arise in the process of determination of prices and can result in appeals following the final price determination.

Building blocks	<p>Disputes may arise in relation to the regulators review of allowances made for individual costs.</p> <p>The scope for disputes is significant initially, but the scope of disputes is likely to be narrowed down as the approach becomes more established.</p>
TFP approaches based on building blocks	<p>The scope for disputes over the initial selection of 'X' based on TFP study could be significant.</p> <p>The scope for future disputes over the ongoing resting of 'X' based on TFP depends on whether an accepted method can be developed.</p> <p>The scope for disputes for the setting of initial prices and future cost based reviews could perhaps be similar to a building blocks approach. However it is possible that the parties may be more inclined to settle disputes because of the greater flexibility created by the offramps and ESMS.</p>
Frontier approach	The potential for disputes is high.
Indexation against basket of comparable services	<p>If there is divergence between the trends in costs of the regulated firm and the trend in prices of the comparable services, then the approach might revert back to building blocks approach.</p> <p>The process of going back to a building blocks review may generate disputes.</p>

6.3 ASSESSMENT OF BUILDING BLOCKS - PARTIAL INDEXATION

Partial indexation involves an approach where only a component of a company's revenue requirements or one or more of its prices are adjusted using indexes. This can be seen as a subset of the building blocks approach.

An example of partial indexation is the indexation of allowed operating and maintenance expenditures. Such an approach might be adopted where there is not a consensus to adopt a full TFP based approach.

The assessment of this approach is as follows:

- Provides strong incentives for productive efficiency in the targeted area;

- It may distort company performance, for example to create distortions between capital expenditure and operating expenditure, and therefore may not encourage productive efficiency overall; and
- It does not encourage provision of non-monopoly services.

6.4 OVERALL EVALUATION OF TFP APPROACHES

6.4.1 Assessment of TFP based approach

From a theoretical perspective, it appears that TFP based approaches have economically desirable properties and a lower regulatory cost.

This view has been accepted by a number of state regulators in the US and Canada who have ultimately made the judgement that adopting a PBR approach based on TFP would better achieve the objectives of protecting the interests of consumers over the long-term than the alternative – in this case, cost of service regulation.

However, the actual efficiency and investment incentives for a particular approach to TFP will depend on the details of each element, including any offramps and ESMs and the supporting legal and decision-making framework.

The investment incentives of a particular TFP approach may be worse, or no better, than those of alternative approaches. In our view, a TFP approach will provide the strongest incentives for efficiency where:

- The deadbands associated with off-ramps are sufficiently wide (so that the approach is allowed to operate ‘mechanistically’ without triggering ‘excessive’ reviews;
- Earnings sharing mechanisms are either not incorporated or, if they are, have wide bands; and
- The approach is implemented within an appropriate and robust decision-making framework, including providing for regulatory independence from government.

Compared with the building blocks approach, a TFP based approach (which involves a larger number of instruments) can be more specifically targeted towards achieving the various regulatory objectives. For example, offramps or earnings sharing mechanisms can potentially be used to explicitly address particular risks.

The question of whether the TFP approach needs to systematically address company specific costs is a key issue that we consider will need to be addressed in future if TFP is to be applied across the board as an enduring methodology for regulation of ongoing monopolies.

6.4.2 Key decisions for the application of TFP in Australia

The key decisions required to determine whether application of a TFP approach in Australia is feasible are:

- The willingness of regulators and companies to rely on judgement in the determination of ‘X’ based on TFP studies;

- Whether it will be necessary to develop mechanisms that systematically take account of company specific costs, and if so whether it will be viable to develop these;
- The acceptability of different regimes evolving in parallel, particularly if an acceptable mechanism for systematically taking account of firm specific costs is required and cannot be developed;
- Whether it is necessary to specify explicit rate of return thresholds as off-ramp mechanisms or whether there are other feasible off-ramp mechanisms that may have better incentive properties;
- If there is a need for off-ramps or ESM trigger mechanisms to be defined in terms of rate of return thresholds (upper and lower limits) whether regulators are willing to define these explicitly;
- The willingness of regulators to set parameters that facilitate the incentive effects of TFP based price caps; and
- The willingness of utilities to accept variations in rates of return (potentially constrained within a band if rate of return thresholds are set for ESMs and off-ramps), with no glide path mechanism for the adjustment of excess or inferior returns.

The following sections discuss each of these decisions in turn.

a) *Willingness to use judgement in application of TFP studies*

As discussed above, experience in the US highlights that setting 'X' through a TFP approach involves significant judgement, particularly when a new PBR plan or regime is being established. This is not necessarily a barrier to the use of a TFP approach. However, the regulator and companies must be willing to engage in the required analysis, review and debate, (within an appropriate decision-making framework) to reach agreement on the TFP methodology and application of the methodology. Further, there needs to be confidence that this judgement can be exercised without government intervention.

Given that there is much less data available in Australia to undertake TFP studies, the need for judgement will be at least as high, and probably higher, than in the US.

The process of setting 'X' within a TFP approach involves decisions on issues such as:

- The methodology for the TFP study including:
 - The time period over which to measure productivity growth;
 - Which group of firms should be the accepted comparators;
 - Methodological issues where there are gaps in data (e.g. measurement of capital inputs);

- Whether or not to include arbitrary 'stretch factors'; and
- Whether recent productivity growth has been higher or lower than could be expected in future.

These latter two issues are likely to be areas of significant debate.

'Stretch factors' have been justified in the US because of the improved performance expected from the shift from cost of service regulation. However, in the case of Australia, the shift in regulation would be from building blocks regulation, which regulators argue has better incentive properties than traditional cost of service regulation.

There has been significant improvement in the performance of the industry over the past few years, but some may argue that this is a one-off improvement resulting from the reforms undertaken in the 1990's.

An issue to be considered is whether it is possible to develop a relatively automatic process for undertaking a TFP study and calculating any adjustments required to set 'X'. While this may be difficult for the first application, it may be possible for subsequent price resets. This would be desirable to limit the scope for opportunistic behaviour and uncertainty.

b) *Viability of developing mechanisms that take account of company specific costs*

Differences in company specific costs are a significant issue.

For example, it is clear that rural electricity distribution companies in Australia are likely to have significantly different cost structures and capital expenditure requirements compared to urban distribution businesses. Another issue might be whether some distribution companies may be facing significant cost pressures related to providing for network replacement, growth and service standard requirements.

Significant cost differences may be able to be corrected in initial prices. However, the ongoing potential for productivity growth may vary between the companies. Aside from the rural/urban mix, other factors may cause ongoing differences in rates of productivity growth.

The need to make adjustments for company specific costs arise because of the regulatory objectives related to setting regulated prices for each company (setting of regulated prices must take into account efficiency and should ensure financial sustainability). However, it should be noted that equity of treatment between companies is not in itself an explicit regulatory objective.

Our review of the case studies where PBR had been implemented in the US highlighted that, to date, company specific factors are addressed on a case-by-case basis. For some companies that are believed to be more efficient as a result of the shift to PBR, 'stretch factors' (for example) can be applied. In other words, in the US there is no attempt to ensure that all companies are dealt with 'equitably', or any attempts to 'mimic' competition in a systematic manner. Therefore, it is possible that a relatively inefficient company (when compared to its peers if this could actually be known) could be provided with a relatively favourable price cap that enabled it to achieve above average returns; while a relatively efficient firm may receive a less favourable price cap and could achieve below average returns.

We are not aware of either:

- an agreed methodology (in the US or elsewhere) that is systematically able to take account of differences in firm specific costs or differences in potential for productivity growth (such as an econometric cost function), or
- an agreed standardised process for making explicit additional adjustments so that the TFP approach could be applied to all companies on a consistent basis without analysis of each company's own costs.²¹

When considering changes from the status quo approach to regulation, the issue of whether the lack of a comprehensive and systematic treatment of company specific factors matters must be considered.

One argument is that it does not matter. Provided that:

- Regulated prices and off-ramp mechanisms are set for each company that are sufficient to maintain the financial viability of each; and
- The improved incentive effects are believed to be better than the status quo;

then it would not seem an absolute necessity for there to be equitable treatment between the companies.

In the Australian context, if the option of moving to a TFP based regulatory regime was optional for the regulator and each individual company, then arguably there is the basis for agreeing the relevant company specific factors as perceived by the regulator and the company. These solutions could include:

- 'Stretch factors' – for companies that are believed to benefit significantly from the switch to TFP; and
- Investment allowances – for example for rural based distributors that are concerned that TFP studies would not properly account for the productivity potential of rural companies.

Conversely, it could be argued that the lack of a systematic approach will matter. This is because any initial 'pragmatic' solutions, developed on a case-by-case basis that recognise agreed company specific factors, will over time require change to reflect changing circumstances. This may then lead to the potential for pure regulatory uncertainty and opportunistic behaviour on behalf of both the companies and the regulator at the time that any future cost based review is undertaken.

This suggests that it would appear highly desirable to attempt to reach agreement on a systematic approach to recognising company specific differences that is not reliant on individual company costs. Unfortunately, the experience to date is that this problem has not been satisfactorily solved.

²¹ The Mergers and Monopolies Commission (1997) said: "It appears to us that the application of econometric and other techniques on the present circumstances has not been capable of generating useful results... if techniques can be developed to the point where robust results are generated, such work would be undoubtedly be a useful tool for future price reviews" MMC (1997). Northern Ireland Electricity plc: A report on a reference under Article 15 of the Electricity (Northern Ireland) Order 1992. Cited in Jones, S. (1999). Comparatively Poor? A Comment on the Ofwat and Ofgem Approaches to the Assessment of Relative Efficiencies. London, NERA. (Page 1).

In this regard, we note the work being undertaken by Margaret Beardow and Lawrence Kaufman, on behalf of the National Electricity Distributors forum. This work has highlighted the potential role that econometric cost functions might play in enabling company specific cost differences to be taken into account.

If a systematic approach to allowing for company specific costs is considered necessary, but it is not possible to make allowances independently of company specific costs then it would appear that, in practice, something like the Building Blocks approach will still be required.

There would then be difficulties and potential uncertainties in understanding the interrelationship between the trend rate of productivity growth and the allowances for company specific cost differences.

c) *Acceptability of different regimes evolving in parallel, particularly if an acceptable mechanism for taking account of firm specific costs cannot be developed*

It appears unlikely that a TFP type approach could be imposed on companies without agreement of their respective shareholders - at least in the short to medium term – without the issue company specific costs being satisfactorily addressed.

If a systematic approach to addressing company specific factors is required, then we consider it is unlikely that an acceptable mechanism could be developed in the short term.

This means that early decisions to adopt the TFP approach (and any company specific adjustments that are required) would need to be undertaken on a case-by-case basis. This is consistent with the experience in the US.

This gives rise to an issue of the acceptability of different regimes potentially applying to different companies in one jurisdiction, and nationally.

If the issue of company specific costs is significant, and, if it is not acceptable for multiple regimes to emerge in a jurisdiction, then it seems unlikely that TFP approaches could be implemented in that jurisdiction in the foreseeable future.

d) *Offramps and ESM : Rate of return thresholds*

In our view, at least initially, it would not be feasible for TFP approaches to be implemented without an offramp mechanism that, at a minimum, provided assurance that companies were able to remain financially sustainable.

Based on our review of case studies and literature, PBR plans in the US and Canada address this issue through an offramp or an ESM that are defined in terms of minimum threshold rates of return.

It also appears likely that offramps or ESMs would be required to address situations where excessive returns emerge. The US and Canadian examples we reviewed all have this feature. Such mechanisms may be required in Australia to address the regulators statutory objectives to protect the interests of consumers. In addition, explicit offramp or ESMs reduce the potential for regulatory opportunism – in other words, future regulators or governments intervening to

cap returns. However, whether or not such an offramp mechanism is required is a matter of policy judgement.

There appear to be at least two reasons why offramps in the US and Canadian cases typically include a rate of return threshold:

- accounting measures of rate of return are well understood and accepted measures of financial position; and
- the history of cost of service regulation.

One issue that may be worth exploring in the Australian context is whether other measures or 'proxies' for minimum financial sustainability and excessive profitability exist that would have better incentive properties.

Possible parameters, that are largely outside the control of any individual company, include:

- Movements in interest rates,
- Adverse changes in average credit ratings in the sector;
- Changes in market equity premiums; and
- Changes in volume growth outside particular bands.

A further point is that it may be desirable to consider the movement in parameters on a cumulative or smoothed basis over time. Such an approach has the advantage of limiting the use of mechanisms to instances of material aggregate departures from normal levels.

The main problem with parameters, such as the above, may be that they do not pick up all the factors that may give rise to the need for a review, in particular errors in providing for company specific costs.

Further analysis, financial modelling and consultation with regulated companies would be required to explore this issue further.

e) Willingness of regulators to define rate of return thresholds

Following consideration of the issues outlined above, there may be a need to explicitly define rate of return thresholds as part of an offramp or ESM mechanism. If regulators and policy makers are unwilling to explicitly specify threshold rates of return, then this may make implementation of a TFP arrangement impractical. Both regulators and companies must also then be comfortable that actual rates of return will vary within the threshold bands.

Further:

- Regulators must be comfortable with the possibility that returns could be consistently just below the upper threshold for long periods; and
- Companies must be comfortable with the possibility that returns could be consistently just above the lower threshold for long periods.

As above, there may be advantages in measuring returns on a cumulative or smoothed basis over time, rather than measuring returns in any one year.

f) Willingness of regulators to set parameters that facilitate the incentive effects of TFP based price caps

The incentive effects of a TFP approach depend on the detailed design and combined effect of the various parameters.

As discussed in Section 6.2.6 in our view a TFP based CPI-X cap with ‘narrow’ deadbands for triggering offramps and ESMs could provide less incentive for efficiency than a building blocks approach with a generous glide path and other incentives for quality.

Therefore, in our view, for TFP based approaches to be ‘worth the effort’ there needs to be willingness to tolerate ‘high(ish)’ profits on the part of regulators and ‘low(ish)’ profits on the part of the companies.²² Further, both parties need to accept variations in returns within the band and the lack of glide path mechanism for variations to be adjusted at the next review period.

We consider that it is difficult to understand the effect of the design of different parameters of a TFP based price cap on profitability, pricing and incentive outcomes without undertaking some form of simulation modelling. Therefore, we suggest it may be beneficial to develop high level modelling tools to help better understand the potential incentive properties of different detailed designs (and to compare these with other regulatory approaches).

6.5 OVERALL EVALUATION OF BUILDING BLOCKS APPROACHES

6.5.1 Assessment of building blocks approaches

The building blocks approach is an established and well-understood approach. As discussed in Section 6.3, the debate over whether this approach is more or less effective in achieving its objectives than the alternatives is ultimately one of informed judgement as there is so far no clear evidence available.

The assessment and case studies suggest that building blocks approaches:

- Allow company specific cost factors to be dealt with as part of the process;
- Of necessity, require the regulator to have access to specialist skills and significant resources, partly as a result of the associated decision-making framework (which characteristically involves a high degree of regulatory discretion and limited appeal). This can be compared with TFP approaches that, when implemented within an appropriate framework (such as a judicial framework), rely more on the specialist skills of the stake-holders and on the associated appeal protections;
- Theoretically could produce the same (or better) incentives for investment and efficiency as other approaches, depending on the details of, for example, the WACC calculation and glide path; and

²² Refer Section 4.2.7 for a discussion on the width of deadbands.

- Are consistent with a situation where the interpretation of regulatory objectives implies a need for the regulator to undertake a close focus on costs.

6.5.2 Implications for development of building blocks approaches

The review highlights a number of issues for consideration and decision by regulators:

- Whether secondary methods (such as partial indexing or benchmarking analysis) should be formalised within the benchmarking framework; and
- Whether explicit strategic objectives should be set for a given review period.

As discussed in Sections 6.2.9 and 6.2.10 the extent to which a building blocks approach potentially encourages or constrains regulatory opportunism and produces appropriate investment incentives, in our view, depends partly on the certainty around the regulator's assessment and treatment of certain costs. Currently this matter is addressed through publishing and consultation on guidelines for upcoming price reviews, etc.

However, to the extent secondary methods such as DEA or partial indexing were to be used on an ongoing basis, we consider that there may be benefits in formalising the detailed methods. This may involve, for example, collaborative approaches with the industry to develop and agree on a methodology.

6.6 OVERALL EVALUATION OF FRONTIER APPROACHES

6.6.1 Assessment of frontier approaches

The case study learnings and assessment process suggest that frontier approaches:

- Are potentially most useful during the establishment of a new regulatory framework where there are significant variations in performance, the absolute efficiency levels are unknown and there are a large number of relatively similar companies;
- Are accepted as involving judgement; therefore, the associated appeal protections and mechanisms play an equally important role in the overall regulatory process (this is the case in both Norway and the Netherlands); and
- May not be consistent with providing sound incentives for investment. This issue has been subject to strong debate and suggests risks for the ongoing use of frontier approaches in isolation.

6.6.2 Decisions related to potential use of frontier approaches

The first decision to take is whether there is any scope for adopting frontier approaches as a principle regulatory approach rather than, at most, a secondary method.

This decision is dependent on resolution of the following issues:

- Is there a view that there may be significant gaps between the efficiency of some firms in Australia and the efficient frontier and, if so, is reducing these gaps an important regulatory objective?
- Is there a willingness to use frontier approaches as a means to improve the regulators ability to solicit information?
- Are frontier approaches consistent with financial sustainability, where the regulator seeks to set price/revenue caps at the frontier?
- Is there agreement on the most appropriate frontier approach(es).

The following sections discuss each of these issues in turn.

a) *Is there a view that there is that there are significant gaps between some companies and the efficient frontier?*

We have not sought to analyse this point. However, we note that most regulated distribution businesses have already undergone (or are about to undergo) their first price review. If frontier approaches were to be considered as a primary means of price regulation then the benefits of this approach would seem to be largest during the first price review.

b) *Willingness to use frontier approaches to solicit information*

As discussed above, a possible interpretation of this approach is that it is relatively low cost method of identifying underlying efficiency levels through ‘incentivising’ companies to reveal more information than they otherwise would. This approach however has been strongly criticised. Shuttleworth (1999) argues that:

- It is unreasonable to require companies to find out what company specific factors are, that are not due to inefficiency;
- That the burden of proof is too onerous since it may be impossible for a company to fully explain what the relevant factors are; and
- As a result, some regulated companies that are efficient may never be able to recover their cost.

c) *Are frontier approaches consistent with financial sustainability*

Shuttleworth (1999) also argues that, in a competitive market, highly efficient firms would earn above normal returns and firms with average efficiency would earn average returns. Frontier approaches however involve revenues being set equal to efficient costs levels but they only allow firms to earn normal rates of return. This it is argued, means that the regulator would be denying investors in utilities, returns which are comparable to those available in other industries. This may conflict with statutory duties and general regulatory objectives to ensure financial sustainability.

d) *Selection of methods*

DEA is the most widely used frontier method internationally.

Jamasb and Pollitt (2001) note that the issue of choosing the most practical method cannot be settled on theoretical grounds. If regulators wish to use frontier methods such as DEA, COLS, SFA and partial benchmarking techniques then all these techniques should be used to examine the consistency of results and robustness of the rank orders.

SECTION 7

REVIEW FINDINGS

7.1 OVERVIEW OF REVIEW FINDINGS

This section sets out the overall review findings.

The terms of reference required an assessment of the relative merits of indexed and building blocks approaches.

Relevant debate in Australia has occurred on a number of different levels (i.e. conceptual, practical, etc) and it is therefore helpful to present the findings as follows:

- What is the conceptual assessment?
- What practical issues affect the conceptual assessment and findings?
- What do the findings from the conceptual and practical assessment mean within the Australia context?
- What are the immediate implications for the way forward?

The structure of this section is as follows:

- Section 7.2 sets out a conceptual assessment of the approaches. This analysis concludes that the merit of any regulatory approach must be assessed against its specific target objectives. If high priority is given to promoting productive and dynamic efficiency (by mimicking competition) and reducing regulatory costs, then TFP based approaches have advantages over the building blocks approach. Indexation against the price of a “basket of comparable services” also has advantages in some situations.
- Section 7.3 discusses the generic practical issues associated with the conceptually -attractive TFP based approach. This analysis commences by describing a “strawman” TFP based approach; this enables a more tangible discussion of the following practical issues:
 - starting point price levels;
 - methodology and data for determining TFP estimates;
 - regulatory accounting, data collection and reporting mechanisms;
 - addressing company specific cost issues;
 - the regulatory framework and decision making process; and
 - ensuring detailed design is consistent with the regulatory objectives and other constraints.

The section concludes with a checklist of practical issues that need to be addressed to successfully implement a TFP based approach.

- Section 7.4 considers the conceptual findings and practical issues within the Australian context. This involves discussion of:
 - objectives for regulation;
 - data availability for undertaking TFP studies;
 - regulatory accounting and data collection;
 - company specific cost issues;
 - the legal and regulatory framework and decision making process; and
 - tools for considering incentive effects, customer impacts, etc.
- Section 7.5 draws on the assessment within the Australian context to identify possible immediate steps for the way forward.

7.2 CONCEPTUAL ASSESSMENT

Our conceptual findings cover two issues:

- Design of regulatory frameworks and approaches in general; and
- The merits of alternative approaches to CPI-X regulation.

7.2.1 Matching regulatory design with objectives

Our conceptual assessment highlights that there is no single “best approach” to regulation.

Regulatory approaches (and the component instruments) are most likely to be effective where they are designed to achieve specific objectives and take account of market and contextual factors.

Therefore, regulators and policy makers need to clearly identify, articulate and prioritise the specific regulatory objectives to apply at a point in time.

Setting objectives requires an assessment of the issues and pressures facing the industry; the external political and social factors; and the outcomes that have been achieved.

For example, if the objective to ensure revenue adequacy has a higher priority than the objective to enhance incentives for efficiency, this suggests the regulatory approach should give greater weight to review of costs. On the other hand, if the priority objective is to enhance dynamic efficiency, then regulatory approaches that are more independent of the company's own costs, are more appropriate.

Finding:

- Regulatory objectives should be clearly identified, articulated and prioritised.
- A regulatory approach should be designed to achieve specific objectives in a particular context.

7.2.2 Relative conceptual merits of approaches

The findings from our conceptual assessment of the alternative approaches to CPI-X regulation are as follows:

- On theoretical grounds, and dependent on the details of the component instruments, TFP based approaches appear to create superior economic efficiency incentives. In particular TFP based approaches:
 - do not distort capital and operating decisions;
 - provide superior market-like incentives to provide other services, adopt efficient business and capital structures, and to pursue efficiencies in economies of scope and scale;
- All approaches can be designed to ensure financial sustainability;
- All approaches can be designed to achieve equity objectives;
- No approach is completely transparent and replicable;
- TFP analysis is in itself complex. However, the level of regulatory analysis is more aggregated than with building blocks and frontier approaches, and the decision making process can be designed to be simpler;
- Depending on the detailed instruments and processes, TFP based approaches inherently have lower regulatory costs than other approaches: they avoid the need for detailed analysis of projected costs and efficiency gains over the regulatory period, and potentially increase the period between reviews; and
- A TFP based approach provides many instruments that can be targeted to achieve the various regulatory objectives.

Therefore, our conceptual assessment is that, in principle, TFP based approaches are likely to be superior.

However, the economic incentive effects of the various approaches are affected by details of component instruments and parameters as much as by the approach *per se*. Accordingly, we cannot draw categorical conclusions about the absolute effectiveness of general approaches without considering detailed design.

In addition, it should be noted that we have not tested the assumption (noted in the Project Brief) that the same quality of service mechanisms can be incorporated under either approach.

In some situations, there may be conceptual merit in indexing regulated prices to the price of a “basket of comparable services”.

Finding:

- In principle, the TFP based approaches are likely to be conceptually superior.
- Indexing of prices to the price of a “basket of comparable services” has merit in some circumstances.

7.3 PRACTICAL ISSUES

While TFP based approaches have conceptual merits, the next step is to consider the practical issues that arise in applying these approaches.

The case studies highlight that the practical issues depend on the details of the TFP based approach. Therefore, it is difficult to usefully discuss practical issues without at least defining a “strawman” TFP based approach.

Box 22 sets out a “strawman” TFP to assist the following discussion.

Box 22- TFP based approach – Strawman

- Establishment of a starting point price (P0), which is judged to adequately reflect costs (noting that ideally the process needs to build-in mechanisms which allow this matter to be readdressed if such a judgment turns out to be made in error).
 - The review period to be ‘hard-wired’ initially (e.g. five yearly as at present), with potential to increase the period and ultimately for the review to be based only on well-specified trigger events (e.g. offramps).
 - Price or revenue caps for each year between reviews to be determined based on a TFP index together with a number of adjustments, including:
 - ‘Z’ factors that are clearly specified and mechanistic;
 - Most likely firm specific cost adjustments; and
 - ‘Stretch factors’ if there is a view that the relative efficiencies of the companies at the starting point are not equal, and adjustments are required to correct for this over the regulatory period.
 - Offramp criteria established which trigger a review of the arrangements.
 - The basis of reviews would be flexible, (reflecting the specific circumstances triggering the review), but allowing for a full building blocks review to be undertaken if the regulator (or the company) considered this necessary. Review would tend to focus on actual cost levels rather than forecasts.
 - ESMs are optional.
 - Decision-making on the setting of the ‘X’ factor would be carried out within a robust framework
-

7.3.1 Starting point prices (P₀)

TFP approaches assume that:

- the starting point price adequately reflects future efficient costs; and
- if errors are made in setting starting point prices, then ultimately these will be addressed through mechanisms such as off ramps which trigger a cost-based review (for example, off-ramps could be triggered if any of the key assumptions on which the plan is based proved in hindsight to be in error).

Therefore, TFP approaches generally do not focus on the absolute level of costs or the relationship between the level of costs and prices at a point in time.

In setting starting point prices, regulators balance the implications of setting prices too high with those of setting prices too low. Prices set too high may result in excess profit taking or significant inefficiencies. Prices set too low may not cover capital expenditure needed to meet required service standards.

If a regulator is concerned about the relationship between costs and prices at a point in time, then this can only be addressed through a cost based review that focuses on the areas of concern; appropriate adjustments can then be made to P_o .

Practical issue:

- What approach should be taken by the regulator to ensuring the starting point price adequately reflects costs?

7.3.2 Methodology and data for determining TFP estimates

TFP approaches require a robust methodology for undertaking estimates of TFP growth, and a systematic approach for collecting input data.

Methodologies for undertaking TFP studies are well understood.

The key issue is the adequacy of the time series and sample size of data available. The case studies highlight that, in the initial process of setting X based on a TFP study, often there is significant debate over such issues as the relevant period for measuring TFP, and the selection of comparable companies.

Over time it may be possible to agree a systematic approach, thereby limiting the scope for dispute.

Practical issue:

- Availability of data for TFP studies.

7.3.3 Regulatory accounting and data collection

The case studies and literature review highlight the importance of:

- robust regulatory accounting, reporting and auditing processes; and
- collecting consistent and appropriate data, potentially including international data.

a) Regulatory accounting

“Effective regulation requires absolutely that regulators define the consistent and sustainable accounting procedures to be used... Without a detailed set of accounts... regulators are unable to ensure consistent reporting among regulated companies, are incapable of preventing pricing mistakes or abuses by the company (such as undue cross subsidies between customers), and cannot uncover illicit affiliate transactions or the subsidization of unregulated subsidiaries” (Makholm 1999: 12).

This requirement holds for all approaches, including building blocks based regulation. However, the inclusion of off-ramps and ESM mechanisms under the

'strawman' TFP approach increases the importance of regulatory accounting rules and reporting.

Regulatory accounting rules and standards feature prominently in the US PBR plans, in the UK regulatory environment, and in the other case studies.

b) Data collection

The issues of data collection and the role of benchmarking apply to all approaches.

Internationally, benchmarking and data collection is attracting increased interest, most notably in Europe.²³ In most cases, the primary function of benchmarking is recognised as one of decision support, rather than a replacement for regulatory judgment (for further discussion see Jamasb and Pollitt (2001: 128)).

Jamasb and Pollitt (2000a) consider it important for regulators to collect national and international data through formal co-operation and exchange. They state that a pre-condition would be to focus on improving the quality of data collection processes, auditing, and standardisation within and across countries. They consider this could *"be facilitated by co-operation with bodies involved in international utilities data such as the US Federal Energy Regulatory Commission (FERC), Secretaria General de la Comision de Integracion Electrica Regional (CIER) in Latin America, and the Australian energy regulators"* (Page 24).

Practical issues:

- The need for robust regulatory accounting to support setting parameters and operation of regime.
- Data collection and benchmarking to support regulatory decision-making.

7.3.4 Addressing company specific cost issues

The case studies indicate that currently company specific cost issues, including provisions for geographic differences or "abnormal" capital expenditure requirements, are addressed on a case-by-case basis; no systematic approach is available.

The key issues are:

- whether a systematic approach to account for company specific cost differences is needed and, if so, achievable; and
- if a systematic approach is not possible, whether it is acceptable for different regimes to operate in parallel within a regulatory jurisdiction (as occurs in the United States).

²³ Refer to Eurelectric initiatives including the recent European project on 'Benchmarking of Distribution Companies' being undertaken by the industry in co-operation with PA Consulting. The project involves 43 distribution network companies across Europe. It was initiated in the context of the wide use of benchmarking by national regulators. The objective of the exercise is to help the industry gain experience in benchmarking and also to develop a strategic discussion tool in relation to authorities". (Eurelectric Annual Activity Report 2001)

- whether, in practice the difficulties and uncertainties in incorporating company specific factors are significantly different from that under the building block approach.

Practical issues:

- Do company specific costs need to be dealt with on a systematic basis?
- Is a systematic approach achievable?
- Is it acceptable for different regimes to operate in parallel?

7.3.5 The regulatory framework and decision making process

The case studies emphasise the link between the legal and regulatory framework (and associated decision-making processes) and the regulatory approaches adopted in a particular regime.

At the highest level, the legal and regulatory framework must support the approach, and allow the techniques to be utilised and decision-making to occur at the appropriate levels.

At the next level, robust decision-making needs to occur at the degree of disaggregation appropriate to the regulatory approach. Compared to the building blocks approach, decisions are made in TFP approaches on relatively aggregated information, and are therefore more susceptible to debate and challenge.

The case studies indicate that in the US and Canada, evidence-based, judicial-style processes tend to be adopted to translate the outcomes of TFP studies into a decision on the X factor. These processes incorporate input and advocacy from the customer's perspective.

Practical issues:

- Does the legal and regulatory framework support TFP approaches?
- Is the regulatory decision-making approach suitable for the level of decisions required?

7.3.6 Ensuring detailed design is consistent with the regulatory objectives and other constraints

The detailed design of the TFP based approach has a significant effect on its incentive properties. The component instruments must be selected and the parameters set consistent with the objectives and taking account of the interaction between incentives created.

ESMs and offramps, where these are included, significantly affect incentives.

The case studies indicate that, in practice, most TFP based approaches incorporate ESMs. ESMs are often desirable, at least in the first period, to generate confidence in the regime (i.e. increased commitment).

The literature emphasises the importance of undertaking analysis during the design phase to understand the incentives created. In our experience, financial modelling greatly assists such analysis.

Practical issues:

- Can the detailed design achieve the regulatory objectives and provide the desired incentives?
- Are ESMs required?

7.3.7 Checklist

A checklist of practical issues that need to be addressed to successfully implement a TFP based approach is summarised in Box 23.

Box 23 Checklist of issues for successful implementation of TFP based approach

- Do starting point price adequately reflects costs?
 - Availability of data for TFP studies?
 - Robust regulatory accounting to support setting parameters and operation of regime?
 - Data collection and benchmarking to support regulatory decision-making?
 - Do company specific costs need to be dealt with on a systematic basis?
 - Is a systematic approach achievable?
 - Is it acceptable for different regimes to operate in parallel?
 - Does the legal and regulatory framework support TFP approaches?
 - Is the regulatory decision-making approach suitable for the level of decisions required?
 - Can the detailed design achieve the regulatory objectives and provide the desired incentives?
 - Are ESMs required?
-

7.3.8 Practical issues associated with indexation of prices against a basket of comparable services

Indexation of prices against a “basket of comparable services” lends itself to situations where there are limitations on resources, such as for regulators in smaller jurisdictions, or where price caps are needed for small companies. Many of the same practical issues apply, including decisions on offramps and ESMs.

7.4 ASSESSMENT WITHIN THE AUSTRALIAN CONTEXT

This section considers the conceptual findings and checklist of practical issues within the Australian context.

7.4.1 Conceptual findings

a) Objectives for regulation

Our review highlights that decisions on the approach to network price regulation depend on the current and future objectives for network price regulation in Australia.

The key questions that need to be considered are summarised in Box 24:

Box 24 Consideration of current and future objectives for network price regulation

- To what extent is the priority objective for regulation:
 - To mimic competition; or
 - To focus on reducing performance gaps and moving companies towards the efficient frontier.
 - To what extent is there an objective to reduce regulatory costs; and
 - To what extent is the relative priority for regulation:
 - To promote productive and dynamic efficiency; or
 - To promote static allocative efficiency.
-

b) Applicability of TFP approaches

A firm conclusion on the merits of TFP approaches for a particular industry and jurisdiction in Australia cannot be reached in the absence of objectives that have been clearly articulated, prioritised and agreed as appropriate for that particular instance.

We suggest that regulators, policy makers and other stakeholders consider the relative weight that should be given to specific regulatory objectives. This consideration should include some evidence-based analysis of the current performance of the sector, and the potential for future improvement.

c) Options for applying TFP

If analysis of objectives confirmed the merits of TFP in a particular circumstance, decisions are then required on the overall regulatory approach. The “strawman” TFP based approach developed for discussion and analysis is one option. However, a number of techniques and elements within this approach could be incorporated and blended together with the current building blocks approach. For example:

- A TFP study could be used to cross check the setting of X within the current building blocks framework; or
- A TFP study could be used to set X within the building blocks approach, with five yearly cost-based reviews continuing.

As discussed above, the detailed design of a TFP approach needs to be consistent with the incentive effects that are being sought.

d) Applying indexation against a basket of comparable services

We consider that there are situations in Australia where indexation against a basket of comparable services could provide an effective regulatory option.

7.4.2 Practical issues

a) Availability of data for TFP studies

If it were decided to utilise TFP studies as part of the approach to regulation, then considerable work would be required including:

- .Developing and agreeing the TFP methodology and defining the data to be collected, including developing an approach to estimation of capital costs; and
- Establishing data collection and verification processes.

Ideally, TFP studies are based on a long time series of data. Therefore, if it is decided that TFP studies will or may be used in the future, steps should be taken as soon as possible to establish the necessary data collection processes.

A further decision required is who should be responsible for undertaking TFP studies. In the United States and Canada, consulting firms such as NERA and Pacific Economics Group on behalf of the regulated companies undertake TFP studies. However, there are other options. This issue may warrant further debate.

b) Regulatory accounting

We note the Regulators Forum's current initiatives on achieving consistency in regulatory reporting within Australia. We believe further effort is likely to be required to develop and maintain a robust regulatory accounting framework to support the evolution of regulatory approaches.

c) Data collection and international benchmarking

Given that Australia is a relatively small participant in an international context, it may be questionable whether Australia should seek to take a more pro-active or leadership role in developing an international database.

In our view, Australia should at least monitor developments in international benchmarking, particularly developments in data classification, and consider joining international benchmarking exercises and international studies of TFP.

d) Company specific cost issues

Section 6.4.2 discussed the issues arising in addressing company specific costs in Australia. These issues include differences between cost structures and capital expenditure requirements as a result of geography (rural versus urban) or the need for network replacement (potentially to meet required service standards).

The first step is to determine whether company specific costs are a significant issue in the relevant jurisdictions and industry sectors.

If company specific costs are significant, there are two potential approaches:

- Company specific costs could be addressed on a case by case basis, with:
 - for each company, regulated prices and off-ramp mechanisms set sufficient to maintain the financial viability of each;
 - regulation potentially evolving in parallel: TFP based approaches would be used for some companies and building blocks would be used for other companies; and

- company specific costs could be addressed on a systematic basis (for example through an econometric cost function) and the same regulatory approach is used for all companies.

The National Electricity Distributors Forum has been working on this issue.

We suggest that further work is required to better understand whether this is an issue and, if so, the extent of the issue.

e) Does the legal and regulatory framework support TFP approaches?

The efficacy of a TFP based approach will depend largely on the quality of the enabling regulatory framework and supporting instruments.

At present, Australian legal and regulatory frameworks for gas and electricity do not explicitly allow for TFP based approaches. The current regulatory requirements were developed within a paradigm of regulators scrutinising individual companies to apply a building blocks approach to network regulation. Accordingly, though the frameworks provide some discretion for regulators in both gas and electricity, they do not clearly allow for all the detailed features of TFP based approaches²⁴. Specifically, impediments exist in the National Gas Access Code, and National Electricity Code²⁵.

These impediments could be addressed through:

- a comprehensive review of the electricity and gas codes; or
- targeted enabling provisions (that is, changes would be made that explicitly allowed specific features of the TFP based approaches).

In introducing any such new concept, practical problems arise in that:

- code changes generally require considerable detail in order to secure stakeholder support and regulatory approvals. This detail is not yet available;
- TFP would require a period of practical testing in the Australian context; and
- any transition to TFP would be gradual, and would not necessarily supplant building blocks for all entities or industries. Rather, it would run in parallel with the existing approaches.

These problems suggest that the second approach is most practical, with a comprehensive review of the codes being a possible longer term approach.

²⁴ Implementation of aspects of the TFP approach (for example using TFP studies for the setting of X within the current building blocks framework) may not require significant changes.

²⁵ Clauses 6.2.4(c) and 6.10.5(d) of the National Electricity Code state that the regulator *must* consider certain matters (such as the demand growth, the regulator's judgment of the potential efficiency gains in expected operating, maintenance and capital costs).

Chapter 8 of the Gas Access Code proceeds on the premise of a cost-based approach. For example, pursuant to section 8.2(a) and section 8.4, the total revenue must be calculated according to one of a number of cost-based methodologies (costs of service, IRR, NPV), all of which require the regulator to consider the forecast costs for services to be provided by the company.

f) Is the regulatory decision-making approach suitable for the level of decisions required?

As discussed above, evidence-based, judicial-style processes appear to lend themselves to the type of decision-making required in applying the outcome of a TFP study to the determination of X.

We suggest that this issue warrants further consideration.

Customer advocacy arrangements would need to be reviewed to ensure that they were appropriate.

g) Can the detailed design achieve the regulatory objectives and provide the desired incentives?

It is difficult to consider the effects of instruments and parameters without “hard” analysis or modelling. We suggest high level modelling tools would be needed to enable:

- Different options to be defined and analysed; and
- Incentive effects, customer impacts, etc to be better understood.

h) Are ESMs required?

ESMs, or similar mechanisms, may be required to generate confidence in the regime (i.e. increased commitment). This raises a question about the parameters for ‘triggering’ the ESM; while thresholds are typically based on rate of return, alternative or additional triggers (such as actual volumes deviating from forecast) could be investigated.

7.5 WAY FORWARD

Each regulator in Australia is independent: ultimately each makes its own decisions on the approach to regulation, within the parameters of relevant jurisdictional instruments (e.g. legislation and the relevant national codes) and taking account of the specific objectives. Also, the timeframes for making decisions on regulatory approaches may be influenced by the program of forthcoming price reviews in each jurisdiction.

As discussed above, the potential role of TFP in future network price regulation raises various practical and implementation issues. Analysis of these issues in the Australian context identified a number of suggested work areas and actions: these are summarised below.

Summary of future work areas and actions

- Consideration of future objectives and priorities (refer Section 7.4.1a))
- Development of options for incorporating TFP in specific regulatory regimes and reviews (specific to jurisdiction and industry sector) (refer Sections 7.4.1b) and 7.4.1c))

- Consideration of indexing against basket of comparable services (specific to jurisdiction and industry sector) (refer 7.4.1d))
- Agreeing and establishing data collection and TFP estimation methodologies (refer Section 7.4.2a))
- Refining regulatory accounting and reporting (refer Section 7.4.2b))
- Participating in international data collection and benchmarking initiatives (refer 7.4.2c)
- Undertaking analysis to determine whether company specific cost issues are significant and, if so, deciding whether these can be addressed systematically or whether a case-by-case analysis is needed. (Refer Section 7.4.2d))
- Identifying specific legal and regulatory impediments and developing potential enabling provisions (refer Section 7.4.2e))
- Reviewing the customer advocacy and decision-making processes (refer Section 7.4.2f))
- Development of modelling tools to support detailed design and analysis of incentive effects of potential regulatory approaches (including comparison with building blocks) (refer Section 7.3.6)
- Considering options for ESMs and Offramps if these are likely to be required (refer Section 7.4.2h))

To progress these issues, regulators and policy makers may need to establish consultative or collaborative working arrangements with regulated companies and other stakeholders.

We suggest that, in the short term, a decision should be made on whether to initiate data collection processes and to agree a methodology to calculate TFP estimates.

As discussed above, TFP studies could be used for a number of purposes ranging from cross checking the outcome of the current building blocks approach, through to being the primary means for setting companies' X. TFP information also provides useful economic information to gauge the performance of the industry.

Early decisions would enable necessary data collection to commence. Given the number of useful purposes that TFP estimates could serve, it does not seem necessary to agree the approach to regulation to make these decisions. A decision to establish a system of TFP studies could be seen as a worthwhile investment to improve the options available to regulators in the future.

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APPENDIX 1

PROJECT BRIEF

Project Brief

Comparison of Building Blocks and Index-Based Approaches to Regulation of Monopoly Prices

Background

The issue of the approach to the derivation of the CPI-X price and revenue caps applying to electricity and gas transmission and distribution services has been a matter of considerable controversy.

To date regulators have set the CPI-X parameters by establishing a benchmark revenue requirement for service providers, which in turn is based on separate benchmarks for expenditure, depreciation and the cost of capital. While current and forecast actual costs can form a starting point for the establishment of these benchmarks, the ultimate point of reference is typically the costs that would be incurred by an efficient firm to meet the service obligations of the service provider, having regard to the particular operating circumstances of that service provider (e.g. environmental factors). This includes an assessment of the potential productivity gains that could be expected. This approach aims to ensure that price caps reflect the regulator's assessment of 'efficient costs'. Regulators have used various approaches to assessing the potential efficiency gains including: examination and modelling of costs by independent experts; partial performance indicators (adjusted to varying degrees for environmental factors); formal efficiency estimation techniques such as DEA, Stochastic Frontier Analysis and TFP.

However, a number of utilities have been highly critical of this approach. They consider that it is overly intrusive and costly and reduces the incentives for utilities to pursue efficiency gains that would benefit the economy and all stakeholders. They also argue that regulation is becoming a barrier to efficient investment, especially in greenfields networks that are exposed to greater risks. Utilities have argued for a more 'light-handed' form of regulation that would index prices by a broad measure of productivity such as trend rates of growth in TFP.

The issue has also been the subject of a broader policy discussion including by the Productivity Commission in its recent Position Paper on its review of Part IIIA of the Trade Practices Act. In that paper the PC expressed a preference for regulatory methodologies that use external benchmarks (such as TFP) in the determination of CPI-X price caps.

Questions have been raised about the robustness of such an approach, its practicality at this point in time and whether or not it would be less information intensive than the building blocks approach. However, the Regulators Forum is interested in exploring further the feasibility and relative merits of alternative approaches to the current 'building blocks' methodology applied by most Australian regulators. A key question is whether, in practice, the differences are more matters of degree in a spectrum of approaches rather than polar differences. For example, industry trends relied upon by index-based approaches may, in practice, be adjusted before price or revenue cap parameters are established in order to allow for factors specific to individual service providers.

Notwithstanding the controversy there have been a number of points of common agreement. The form of regulation should be tested against the objectives of:

- Economic efficiency, (encompassing productive, allocative and dynamic efficiency, and the incentives provided to service providers to achieve efficiency gains)
- Financial sustainability
- Equity or customer impacts
- Transparency and replicability
- Simplicity
- Administrative cost

It is also common ground that once set the CPI-X caps should not be re-opened between reviews and that price regulation should be linked to service standards with the possibility of the incorporation of quality of service incentives.

Terms of Reference

The report of the consultant is to:

1. Assess the relative merits of setting CPI-X price and revenue caps applying to electricity and gas transmission and distribution services through:
 - a. reliance on an index or other measure of productivity; or
 - b. the establishment of the individual cost benchmarks under a 'building blocks' approach
2. In assessing the relative merits:
 - a. have particular regard to the impact of the alternative approaches on:
 - i. the incentives for the utilities to continue to improve efficiency
 - ii. risk and incentives for efficient investment in networks
 - iii. the robustness, transparency, simplicity and administrative cost of the different approaches
 - iv. the cost and availability of information required
 - b. have regard to the practical application of these approaches including:
 - i. the extent to which regulators should consider utility specific factors or costs within, or supplementary to, the external index-based approach.
 - ii. the extent to which regulators should use benchmarks or other tests of the efficiency of costs within, or supplementary to, the building blocks approach.
 - iii. The transition from one approach to the other and the potential impact on prices.
3. Assess the extent to which each approach promotes the achievement of the statutory objectives and obligations commonly placed on regulators such as those in the national electricity and gas codes.

The study should assume that the CPI-X cap:

- Continues for a fixed period without intervention or adjustment;
- Incorporates the same quality of service incentive mechanisms under either approach; and
- If set using a building block approach, incorporates the gradual phasing out of gains made over the period of the next price review.

Output

The output of the Consultancy will be a report to the Regulators Forum assessing the relative merits, in principle, of the two approaches. Authorship will be clearly attributed to the Consultant. The report may subsequently be released for public discussion by the Regulators' Forum.

Reference Material

There is considerable material on the issue of cost linked and delinked approaches to regulation. Particular regard should be had to:

- Relevant reports/studies on the application in practice of the index-based approaches to the determination of CPI-X price caps.
- The obligations and duties of the regulator as outlined in the national gas and electricity codes (in particular sections 6.2 and 6.10 of the Electricity Code and section 8 of the Gas Code).

UTILITY REGULATORS FORUM

COMPARISON OF BUILDING BLOCKS AND INDEX-BASED APPROACHES

- The reports/determinations on these issues by the various regulators
- The submissions and reports prepared for the utilities and other interested parties such as the submissions to the ORG and IPART reviews and discussion papers prepared by CitiPower
- The judgement and material presented (where publicly available) in the TXU appeal of the ORG's 2000 electricity determination

Timetable

Task		
Issue of Consultancy Brief		23 January
Submission of Proposal		8 February
Appointment of Consultant		15 February
Draft of Discussion Paper		30 April
Seminar with representatives of regulators		Mid May
Final of Discussion Paper		31 May

Proposed Fees

Proponents will supply a fixed price quote based on their understanding of the brief and commitment to the timetable and outputs as specified in this contract. The proposal should specify the methodology to be employed and the staff who will undertake the study, including details of their expertise in the area.

Administration

The contract for the study will be administered by IPART for the Regulators' Forum. The consultancy will be overseen by Greg Wilson (Essential Services Commission), Sebastian Roberts (ACCC) and Eric Groom (IPART). The day-to-day contact person for the Consultant will be Eric Groom.

Responses to this brief should be forwarded to:

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APPENDIX 2

LEGAL AND REGULATORY FRAMEWORK

GAS REGULATION

The main legislation, regulatory instruments and decision-making bodies relevant to gas network pricing in each jurisdiction are:

Instrument	Gas
National Gas Code	Requires transmission and network service providers to submit access arrangements to the ACCC/ jurisdictional regulators for approval
Gas Pipelines Access (South Australia) Act 1997	South Australian legislation is 'lead legislation' for national gas access
Gas pipeline access application legislation	Applies SA lead legislation (except in WA, which enacted corresponding legislation based on the national model)
Approved access arrangements	Establish the benchmark applied by an arbitrator in an access dispute
State codes, licences and guidelines	May provide additional regulatory guidance, or set service standards for industry participants

Body	Role
Australian Competition and Consumer Commission	Regulator and arbitrator for transmission pipelines
Jurisdictional regulators	Regulator and arbitrator for distribution pipelines
National Competition Council	Code advisory body; certifies effective state-based access regimes
Commonwealth Minister	Makes decisions on coverage
Federal Court	Judicial review
Australian Competition Tribunal	Administrative appeal

ELECTRICITY REGULATION

The main legislation, regulatory instruments and decision-making bodies relevant to electricity network pricing in each jurisdiction are:

Instrument	Effect
Trade Practices Act (Cth) 1974	Applied by the ACCC in assessing Part VII authorisation applications, or access undertakings
National Electricity Code	Provides a set of market oriented rules authorised by the ACCC governing market operations, power system security, network connection and access and network services pricing
National Electricity (South Australia) Act 1996	South Australian legislation is 'lead legislation' for the national electricity market
State National Electricity Laws	Apply SA lead legislation in NEM member jurisdictions
Statement of Principles	E.g. ACCC Draft Statement of Principles for the Regulation of Transmission Revenues released in May 1999
Tariff Orders	The Victorian Tariff Order and South Australian Electricity Pricing Order (as derogations from the National Electricity Code) stipulate transitional price paths
State codes, licences and guidelines	May provide additional regulatory guidance, or set service standards for industry participants
Body	Role
Australian Competition & Consumer Commission	Enforces <i>Trade Practices Act</i> Assesses applications for authorisation of potentially anti-competitive conduct under Part VII of the <i>Trade Practices Act</i> including, where relevant, changes to the National Electricity Code Assesses applications for acceptance of changes to the National Electricity Market Access Code Assesses access undertakings (and proposed changes) submitted to the Commission by individual network service providers Regulates the revenues of transmission network service providers, including formulating a Draft Statement of Principles for the Regulation of Transmission Revenues released in May 1999
Jurisdictional regulators	Regulate distribution network companies in accordance with National Electricity Code Issue and enforce licences, codes and guidelines
State Supreme Courts	Limited appeals on questions of law
National Electricity Tribunal	Administrative appeal Reviews a decision of NECA to impose a civil penalty for a Code breach, or a decision of NECA or NEMMCO that, under the national electricity legislation or the Code, is a reviewable decision Hear and determine applications by NECA under the national electricity legislation alleging that a Code participant has breached a provision of the Code

ELECTRICITY OBJECTIVES AND PRINCIPLES

Box 25 - Key principles and Core Objectives for Electricity Network Pricing

Chapter 6.1.1 of the National Electricity Code summarises the key principles and core objectives of network pricing as follows:

1. The key principles underlying the transmission and distribution pricing provisions in [this] Chapter 6 are intended to:
 - (a) Promote competition in the provision of network services wherever practicable
 - (b) Facilitate a commercial environment which is transparent and stable, and which does not discriminate between users or network services; and
 - (c) Regulate the non-competitive market for network services in a way that seeks the same outcomes as those achieved in competitive markets.
 2. The core objectives intended to be achieved by the application of the transmission and distribution pricing provisions in [this] Chapter 6 are:
 - (a) Efficiency in the use and operation, a and maintenance of, and investment in, the network, and in the location of generation and demand;
 - (b) Upstream and downstream competition;
 - (c) Price stability; and
 - (d) Equity
-

Box 26 - National Electricity Code Principles Governing Regulation of Transmission Revenues

The National Electricity Code establishes the following objectives and principles for the transmission revenue regulatory regime:

1. The transmission pricing regulatory regime must achieve outcomes which:
 - (a) Are efficient and cost effective;
 - (b) Are incentive based, including the sharing of efficiency gains between network users and owners as well as the provisions of a reasonable rate of return (without monopoly rents) to network owners;
 - (c) Foster efficient investment, operation, maintenance and use of network assets;
 - (d) Recognise pre-existing government policies on asset values, revenue paths and prices;
 - (e) Promote competition; and
 - (f) Are reasonably accountable, transparent and consistent over time.
2. The regulation of aggregate revenue of transmission networks must:
 - (a) Be consistent with the regulatory objectives (see 1 above);
 - (b) Address monopoly pricing concerns, wherever possible, through the competitive supply of network services but otherwise through a revenue cap;
 - (c) Promote efficiency gains and a reasonable balance between supply and demand side options;
 - (d) Promote a reasonable rate of return to network owners on an efficient asset base where:
 - (i) The value of new assets are consistent with take-or-pay contracts or NEMMCO augmentation determinations;
 - (ii) The value of existing assets are determined by jurisdictional regulators and must be lower than their deprival value; and
 - (iii) Any asset revaluations undertaken by the ACCC are consistent with COAG decisions.
3. The form of economic regulation shall:
 - (a) Be a revenue cap with a CPI-X incentive mechanism, or some other incentive based variant, for each network owner;
 - (b) Have a regulatory control period of at least 5 years;
 - (c) **Take into account expected demand growth, service standards, weighted average cost of capital, potential efficiency gains, a fair and reasonable risk adjusted return on efficient investment and ongoing commercial viability of the transmission industry; and**
 - (d) Only apply to those assets the ACCC does not expect to be offered on a contestable basis;
4. The transmission network service providers must provide the ACCC with annual financial statements, and other information as required, so the ACCC can monitor compliance with the revenue cap and asset allocation.

Source: National Electricity Code, Version 1.0, 2002, clauses 6.2.2 – 6.2.5, as summarised in the ACCC's Overview, Draft Statement of Principles for the Regulation of Transmission Revenues, 27 May 1999

Note: Similar provisions are included in clause 6.10 of the National Electricity Code in relation to distribution network regulation.

GAS OBJECTIVES AND PRINCIPLES

Box 27 - Pricing principles and objectives in the National Gas Code

General principles - Section 8.1

A Reference Tariff and Reference Tariff Policy should be designed with a view to achieving the following objectives:

- (a) Providing the Service Provider with the opportunity to earn a stream of revenue that recovers the efficient costs of delivering the Reference Service over the expected life of the assets used in delivering that Service;
- (b) Replicating the outcome of a competitive market;
- (c) Ensuring the safe and reliable operation of the Pipeline;
- (d) Not distorting investment decisions in Pipeline transportation systems or in upstream and downstream industries;
- (e) Efficiency in the level and structure of the Reference Tariff; and
- (f) Providing an incentive to the Service Provider to reduce costs and to develop the market for Reference and other Services.

To the extent that any of these objectives conflict in their application to a particular Reference Tariff determination, the Relevant Regulator may determine the manner in which they can best be reconciled or which of them should prevail.

Section 8.2

The factors about which the Relevant Regulator must be satisfied in determining to approve a Reference Tariff and Reference Tariff Policy are that:

- (a) The revenue to be generated from the sales (or forecast sales) of all Services over the Access Arrangement Period (the Total Revenue) should be established consistently with the principles and according to one of the methodologies contained in this section 8;
 - (b) To the extent that the Covered Pipeline is used to provide a number of Services, that portion of Total Revenue that a Reference Tariff is designed to recover (which may be based upon forecasts) is calculated consistently with the principles contained in this section 8;
 - (c) A Reference Tariff (which may be based upon forecasts) is designed so that the portion of Total Revenue to be recovered from a Reference Service (referred to in paragraph (b)) is recovered from the Users of that Reference Service consistently with the principles contained in this section 8;
 - (d) Incentive Mechanisms are incorporated into the Reference Tariff Policy wherever the Relevant Regulator considers appropriate and such Incentive Mechanisms are consistent with the principles contained in this section 8; and
 - (e) Any forecasts required in setting the Reference Tariff represent best estimates arrived at on a reasonable basis.
-

Box 28 - Form of Regulation under National Gas Code

Section 8.3

Subject to these requirements and to the Relevant Regulator being satisfied that it is consistent with the objectives contained in section 8.1, the manner in which a Reference Tariff may vary within an Access Arrangement Period through implementation of the Reference Tariff Policy is within the discretion of the Service Provider. For example, a Reference Tariff may be designed on the basis of:

- (a) A "price path" approach, whereby a series of Reference Tariffs are determined in advance for the Access Arrangement Period to follow a path that is forecast to deliver a revenue stream calculated consistently with the principles in this section 8, but is not adjusted to account for subsequent events until the commencement of the next Access Arrangement Period;
- (b) A "cost of service" approach, whereby the Tariff is set on the basis of the anticipated costs of providing the Reference Service and is adjusted continuously in light of actual outcomes (such as sales volumes and actual costs) to ensure that the Tariff recovers the actual costs of providing the Service; or
- (c) Variations or combinations of these approaches.

Section 8.4

The Total Revenue (a portion of which will be recovered from sales of Reference Services) should be calculated according to one of the following methodologies:

- Cost of Service: The Total Revenue is equal to the cost of providing all Services (some of which may be the forecast of such costs), and with this cost to be calculated on the basis of:
 - (a) A return (Rate of Return) on the value of the capital assets that form the Covered Pipeline (Capital Base);
 - (b) Depreciation of the Capital Base (Depreciation); and
 - (c) The operating, maintenance and other non-capital costs incurred in providing all Services provided by the Covered Pipeline (Non-Capital Costs).

- IRR: The Total Revenue will provide a forecast Internal Rate of Return (IRR) for the Covered Pipeline that is consistent with the principles in sections 8.30 and 8.31. The IRR should be calculated on the basis of a forecast of all costs to be incurred in providing such Services (including capital costs) during the Access Arrangement Period.

The initial value of the Covered Pipeline in the IRR calculation is to be given by the Capital Base at the commencement of the Access Arrangement Period and the assumed residual value of the Covered Pipeline at the end of the Access Arrangement Period (Residual Value) should be calculated consistently with the principles in this section 8.

- NPV: The Total Revenue will provide a forecast Net Present Value (NPV) for the Covered Pipeline equal to zero. The NPV should be calculated on the basis of a forecast of all costs to be incurred in providing such Services (including capital costs) during the Access Arrangement Period, and using a discount rate that would provide the Service Provider with a return consistent with the principles in sections 8.30 and 8.31.

The initial value of the Covered Pipeline in the NPV calculation is to be given by the Capital Base at the commencement of the Access Arrangement Period and the assumed Residual Value at the end of the Access Arrangement Period should be calculated consistently with the principles in this section 8.

The methodology used to calculate the Cost of Service, an IRR or NPV should be in accordance with generally accepted industry practice.

However, the methodology used to calculate the Cost of Service, an IRR or NPV may also allow the Service Provider to retain some or all of the benefits arising from efficiency gains under an Incentive Mechanism. The amount of the benefit will be determined by the Relevant Regulator in the range of between 100% and 0% of the total efficiency gains achieved.
