

Australian Energy Market Commission

**Review into the use of Total  
Factor Productivity for the  
determination of prices and  
revenues**

Framework and Issues Paper

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**Commissioners**

Tamblyn

Ryan

Woodward

## **Inquiries**

The Australian Energy Market Commission  
PO Box A2449  
Sydney South NSW 1235

**E:** [aemc@aemc.gov.au](mailto:aemc@aemc.gov.au)

**T:** (02) 8296 7800

**F:** (02) 8296 7899

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## **About the AEMC**

The Council of Australian Governments, through its Ministerial Council on Energy, established the Australian Energy Market Commission (AEMC) in July 2005 to be the Rule maker for national energy markets. The AEMC is currently responsible for Rules and policy advice covering the National Electricity Market. It is a statutory authority. Our key responsibilities are to consider Rule change proposals, conduct energy market reviews and provide policy advice to the Ministerial Council as requested, or on AEMC initiative.

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## Foreword

The Australian Energy Market Commission is pleased to publish this consultation document seeking views from stakeholders on a range of issues associated with its Review into the potential use of a total factor productivity based methodology in regulatory revenue and price determinations.

TFP based approaches attempt to expose regulated businesses to competitive market like pressures by linking their prices and revenue to the productivity performance of the industry as a whole instead of basing them on an assessment of business specific costs. These approaches therefore offer a potentially innovative alternative to the existing building blocks arrangements. It is argued that TFP based regulation can deliver stronger performance incentives, lower regulatory administrative costs and redress the information asymmetry issues faced by regulators. However, certain conditions need to be satisfied for a TFP based approach to work and a TFP based approach may also have a negative effect on investment certainty.

The Commission has initiated the Review to advise the Ministerial Council on Energy on whether allowing a TFP based approach in addition to the existing arrangements would contribute to the national gas and/or electricity objectives.

The potential use of TFP based approaches in energy regulation in Australia has been debated for some time. The work by the Expert Panel on energy access pricing and the Essential Service Commission of Victoria have raised a range of policy, regulatory and methodology issues. These issues need to be canvassed and resolved before a TFP approach could be specified in the Rules and applied in practice. The Review will look to comprehensively address these issues and, where appropriate, develop draft Rules.

The Commission invites submissions from stakeholders to be lodged by 27 February 2009. At this stage of the Review, the Commission is assessing the circumstances where a TFP based approach could contribute to the national energy objectives and whether such circumstances exist, or are likely to exist, in the national energy markets.

In conducting the Review, the Commission will be have regard to the future challenges facing network and pipeline service providers, especially with the introduction of an emission trading scheme in Australia, and the indications of interest within the gas and electricity sectors in the introduction of alternatives form of regulation.. While it is important that we are constantly looking for ways to improve regulatory practice, changes to the current regime must be justified on efficiency grounds, have the general support of most energy market stakeholders , and satisfy the relevant criteria of the national energy laws and rules.

John Tamblyn

Chairman

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## Abbreviations

ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
Commission	see AEMC
CPI	Consumer Price Index
DEA	Data Envelope Analysis
DNSP	(electricity) distribution network service provider
ESC	Essential Services Commission (Victoria)
IPART	Independent Pricing and Regulatory Tribunal (NSW)
MAR	Maximum Allowed Revenue
MCE	Ministerial Council on Energy
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
NGL	National Gas Law
NGO	National Gas Objective
NGR	National Gas Rules
NPV	net present value
Ofgem	Office of Gas and Electricity Markets (UK)
PEG	Pacific Economics Group
PFP	partial factor productivity
PTRM	Post Tax Revenue Model
RAB	Regulatory Asset Base
Rules	National Electricity Rules and National Gas Rules
SCO	Standing Committee of Officials
TFP	Total Factor Productivity
TNSP	(electricity) Transmission Network Service Provider
TUoS	Transmission User of Service
WACC	Weighted Average Cost of Capital (the rate of return on capital)

## Glossary of terms

Brattle International Review Report	Brattle Group, <i>Use of total factor productivity analysis in network regulation: case studies of regulatory practice</i> , December 08.
Building block approach	The approach specified by NER and NGR to determine the total revenue of a service provider. Total revenue is the sum of a return on the capital base, depreciation, corporate income tax, increments and decrements resulting from an incentive mechanism and forecast operating expenditure.
Depreciation	the amount representing the return to a service provider to cover its investment costs. This is calculated based upon the profile that reflects the nature of the assets over the economic life of the asset.
External benchmarking	The comparison of a service provider actual or forecast costs to an exogenous reference level (for example, the most efficient business in the sector). A benchmark is deemed to be external if a business cannot influence the benchmark against which it is assessed through its own actions
Expert Panel	Expert Panel on Energy Access Pricing
Fixed X	Where X is determined from an estimate of TFP growth and that estimate is fixed for the entire regulatory period.
Inputs	Those components which the service providers employs to provide its services
Normalisation	Adjusting data to account for differences in operating environment conditions
Outputs	The dimensions of services provided valued by customers
$P_0$	Initial price cap set at the start of the regulatory period.
Regulatory period	The period for which the terms of the regulatory determinations on allowed prices/revenue are set. Under the NEL this is referred to as the regulatory control period. Under the NGL, it is called the access arrangement period.
Rolling X	Where X is determined from an estimate of TFP growth that is annually updated using a rolling average approach.
Rule Change Proposal	Proposed rule change to allow the use of total factor productivity in electricity distribution submitted by the Victorian Minister for Energy and Resources, 18 June 2008.

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# 1 Introduction to the Review

The Australian Energy Market Commission (Commission) has initiated a review (Review) into the possible uses for a total factor productivity methodology for the regulation of prices and revenues in the national energy markets.

To commence the Review, the Commission publishes this Framework and Issues Paper. It sets out those issues requiring consideration as part of the Review and highlights a series of questions on which the Commission is seeking stakeholders views. Terms of Reference for the Review were published on 24 November 2008 and are contained in Appendix A to this Paper.

## 1.1 What is TFP?

Total factor productivity (TFP) measures how businesses, industries or regions use all the inputs in their production processes to produce outputs that are valued by customers. Regulators in overseas jurisdictions have used estimates of the industry growth rate of TFP in setting the revenue paths for network and pipeline businesses. Also, in some cases, TFP measures have been used to cross check the reasonableness of the businesses' expenditure forecasts when applying the building block methodology. Appendix B explains the economic theory supporting the role of TFP growth rates in incentive regulation.

## 1.2 Rationale and purpose for the Review

The Commission decided to conduct the Review following consideration of submissions to a Rule change proposal from the Victorian Minister for Energy and Resources (Rule Change Proposal) which sought to amend the National Electricity Rules (NER) to allow the use of a TFP methodology as an alternative option for electricity distribution determinations.<sup>1</sup>

Stakeholder submissions raised a range of policy, regulatory and methodology issues that would need to be canvassed and resolved before a TFP approach could be specified in the NER and applied in practice. The majority of submissions requested that a comprehensive review be undertaken for this purpose.

Conducting the Review into the possible uses of a TFP based methodology is also consistent with the recommendations made by the Expert Panel on Access Pricing to the Ministerial Council on Energy (MCE).<sup>2</sup>

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1 Victorian Minister for Energy and Resources, Rule change proposal to allow use of total factor productivity methodology in distribution, 18 June 2008. On 24 July 2008, the Commission published a notice under section 95 of the NEL advising of its intention to commence the Rule change process and initial consultation on this Rule proposal. Appendix C provides a summary of the first round submissions on the proposed Rule changes.

2 The Expert Panel on Energy Access Pricing (Expert Panel) was established by the MCE in December 2005 to provide advice to the MCE on a model to achieve a common approach to revenue and

Accordingly, the purpose of the Review is to assess whether at this stage of market development, such TFP based approaches should be included into the national energy regulatory framework.

### **1.3 Scope of the Review**

The Review shall assess the possible applications of a TFP based methodology in the context of the Commission's powers to make Rules and therefore covers all four energy sectors: gas and electricity transmission and distribution.

The National Electricity Law (NEL) and National Gas Law (NGL) allow for a TFP based methodology to be applied in two possible ways. A TFP based methodology could be used by the Australian Energy Regulator (AER) to set a service provider's prices or revenues. Alternatively, a TFP based methodology could be used to assist the AER in applying the current building block methodology in making determinations. In this instance, TFP indices can provide a benchmark against which the AER could assess expenditure proposals or past performance. The NEL and NGL also allow for Rules to be made for the use of TFP to assist in the resolution of access disputes.<sup>3</sup>

The objective of the Review is twofold:

- to advise the MCE on the circumstances in which a permitted application of a TFP based methodology would contribute to either the National Electricity Objective (NEO) or the National Gas Objective (NGO), and
- where appropriate, recommend for consideration by the MCE draft Rules to allow a TFP based methodology for any individual or group of service providers.

The Review is not considering whether a TFP based methodology should replace the existing framework but rather whether allowing the use of TFP in addition to the existing building block approach would provide benefits to customers, service providers and the AER in the relevant decision making processes.

#### **1.3.1 Benchmarking**

Both the NEL and the National Gas Rules (NGR) allow the AER to have regard to efficiency benchmarks when applying the building block approach. However, the Rules do not specify how benchmarking would apply. This leaves the AER with the option of making use of TFP benchmarks under the existing arrangements. Alternatively, service providers could also include the use of TFP benchmarks in

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network pricing across the energy market. It provided its Final Report to the MCE in April 2006. The Expert Panel considered that while there was merit in encouraging the development of a TFP approach, it did not represent the perfect solution to the perceived problems of economic regulation. It noted that there are many issues that would need further consideration before a TFP approach would become a practicable option.

3 NEL, Schedule 1, clause 26j; NGL, Schedule 1, clause 42(c).

their revenue proposals.<sup>4</sup> This level of flexibility is beneficial as it permits a range of benchmarking techniques in addition to TFP growth rates to be used in revenue and pricing decisions for electricity and gas service providers. However, such flexibility needs to be balanced against transparency in, and certainty of, the decision making process.

The Commission considers that with respect to the use of TFP indices as a benchmark to inform the building block methodology, the question for the Review is not whether Rules should be made to permit this application but instead whether more specification on this application is needed in the Rules.

### **1.3.2 Full application**

The Review will focus on the issues relating to using a TFP based methodology to determine allowed revenue or prices. Under this application, a methodology would be developed to calculate the TFP growth estimate which would then be used to determine the X factor – the allowed rate of change – in revenues (or prices) for the service provider.

Under this application, the service provider's revenues (or prices) could also be adjusted to allow for additional factors, including cost through pass events and incentive mechanisms. Also, the initial or starting price may be determined by another method, as TFP based approaches do not by themselves provide information on the profitability level of the businesses.<sup>5</sup>

The design of a full TFP application could take many forms. The Rule Change Proposal provides one example of an application of TFP methodology to determine regulated prices and is used as reference example to discuss the issues in this Paper.

The success of a full TFP application would depend not only on the methodology for estimating the TFP growth rate but also on the design of the framework for its application and the quality of available data. The Review will assess the detailed design parameters relating to how a TFP based methodology could be applied in the energy markets and examine the availability of the required data.

### **1.3.3 Dispute resolution**

The AER has a role in settling disputes about access to the services provided by regulated energy infrastructure. This may require consideration of the same matters that would arise in revenue or price determinations or access arrangement decisions. Accordingly, the same processes, criteria and framework should be relevant to both electricity determinations and access disputes and similarly, to both gas access arrangement decisions and access disputes determinations.

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<sup>4</sup> The Essential Service Commission of Victoria (ESC) has made use of partial factor productivity measures in its gas and electricity distribution determinations.

<sup>5</sup> Multilateral TFP does inform on efficiency levels – but not profitability levels which generally require additional analysis.

Accordingly, the Commission does not intend to consider use of TFP in the context of the various dispute resolution processes undertaken by the AER, but rather its relevance to each sector. The Review will identify any amendments to the Rules to ensure consistency between the decision making processes.

For comment:

1. Is the Commission's proposed scope of the Review appropriate?

## 1.4 Approach to the Review

The possible applications of a TFP methodology to energy regulation has been debated for some time in Australia.<sup>6</sup> In approaching this Review, the Commission will have regard to this extensive research.

In addition, the Commission will consult on a formal and informal basis with interested parties across the gas and electricity distribution and transmission industries. This will take the form of written submissions, meetings and public forums.

To aid its understanding, and to assist interested parties, regarding issues on the technical design and implementation of TFP, the Commission has engaged two consultants:

- Dr Denis Lawrence, of Economic Insights, will advise on data issues and the application of a TFP based methodology; and
- The Brattle Group will advise on international experiences using TFP and its implications for service providers' incentives.

The Commission intends to draw on the experiences of TFP based methodologies in other countries and has commissioned The Brattle Group to provide a report providing case studies of the use of TFP in overseas jurisdictions (Brattle Report). The Brattle Report is being released in conjunction with this Paper and is available on the AEMC website.<sup>7</sup>

## 1.5 Review timetable

The Commission will adopt a staged approach in carrying out the Review. First, the Commission will make an assessment of whether it considers that a TFP methodology would promote either the NEO and/or NGO and therefore should

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<sup>6</sup> The ESC has undertaken extensive research into evaluating the use of TFP approaches. Also, the Utility Regulators Forum discussed a number of TFP methodology issues in 2002.

<sup>7</sup> The Brattle International Review report provides a factual description of how TFP based methodologies are applied in New Zealand, Ontario, United Kingdom, Netherlands and in selected jurisdictions in the US.

have a role in the relevant decision making processes. In doing so, the Commission will look at the possible range of models for applying TFP and will assess the issues relevant to the Rule Change Proposal. At the end of this stage, the Commission will provide its findings to the MCE for its consideration (Stage 1 Report).

If the Commission considers that Rules should be made to facilitate the use of a TFP based methodology for either, or both, gas or electricity determinations it will then proceed to develop its recommended draft Rules to be submitted to the MCE. In doing so, the Commission will have regard to considerations from the MCE on the Stage 1 Report. The table below outlines the timelines for delivery:

<b>Milestone</b>	<b>Timing</b>
Framework and Issues Paper	December 2008
Framework and Issues Public Forum	February 2009
Submissions due on Framework and Issue Paper	27 February 2009
Stage 1 Draft Report	June 2009
Public Forum	June 2009
Stage 1 Final Report to MCE	August 2009
Consultation on stage 2 draft Rules	September 2009
Stage 2 report to the MCE	November 2009

As a result of undertaking the Review, the Commission has decided to extend its assessment period for the Rule Change Proposal to after the Review has been completed.

## **1.6 Lodging submissions**

The Commission invites written submissions from interested parties in response to this Framework and Issues Paper by 5 pm on Friday 27 February 2009. Submissions may be sent electronically or by mail in accordance with the following requirements.

### **Lodging a submission electronically**

The submission must be sent by email to [submissions@aemc.gov.au](mailto:submissions@aemc.gov.au). The email must contain the phrase "Total Factor Productivity Review – Framework and Issues Paper, EMO0006" in the subject line or heading. The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated. The submission must be in PDF format, and must also be forwarded to the Commission via ordinary mail.

Upon receipt of the electronic version of the submission, the Commission will issue a confirmation email. If this confirmation email is not received within 3 business days, it is the submitter's responsibility to ensure successful delivery of the submission has occurred.

### **Lodging a submission by mail**

The submission must be on letterhead (if from an organisation), signed and dated by the respondent. The submission should be sent by mail to:

Australian Energy Market Commission  
PO Box A2449  
Sydney South NSW 1235

The envelope must be clearly marked “Total Factor Productivity Review – Framework and Issues Paper, EMO0006”.

Except in circumstances where the submission has been submitted electronically, upon receipt of the hardcopy submission the Commission will issue a confirmation letter. If this confirmation letter is not received within 3 business days, it is the submitter’s responsibility to ensure successful delivery of the submission has occurred.

## **1.7 Structure of the Issues Paper**

The remainder of this Paper is structured as follows:

- **Chapter 2** describes how the Commission will assess the possible applications of a TFP based methodology;
- **Chapter 3** discuss issues relating to the design of a TFP based methodology;
- **Chapter 4** considers how a TFP based methodology could be applied to the different regulated energy sectors in Australia;
- **Chapter 5** deals with issues on evaluating TFP based approaches to regulatory determinations;
- **Chapter 6** reviews implementation and transition issues with introducing a TFP based methodology into the current regulatory framework; and
- **Chapter 7** collates the issues on which the Commission is seeking comments.

In addition, there are a series of appendices to the Paper which provide background and contextual information to assist parties in their consideration of the issues in the Review.

## 2 Assessment framework

This chapter considers the framework, based upon the NEO and the NGO (the national objectives) and the Revenue and Pricing Principles (Principles), which the Commission will apply in assessing the possible applications of TFP. The NEO, NGO and Principles are set out in Appendix D to this Paper.

### 2.1 National objectives

In undertaking the Review, the Commission is required to have regard to the national objectives.

The national objectives are founded on the concept of economic efficiency, with explicit emphasis on the long term interests of consumers. This encompasses not only the price at which services are provided, but also the quality, reliability, safety and security of the network and pipeline systems.

Economic efficiency has three principal dimensions (referred to as productive, allocative and dynamic efficiency), and there is some potential for trade-offs to arise between them. Each dimension is captured by specific references in the national objectives. For example:

- efficiency in the use of electricity or gas requires that the system is operated on a least cost basis (productive efficiency), and that the quality, reliability, security and safety of services are both provided and priced in line with the preferences and valuations of consumers (allocative efficiency);
- efficient investment in infrastructure captures the dynamic component of efficiency, and is met by ensuring there is sufficient incentives and financing capacity to undertake efficient long term investments and take advantage of technological developments in order to meet users' changing needs over time; and
- reference to the long term interests of consumers confirms that the delivery of efficient market outcomes requires a longer term perspective in order to serve the interests of energy users.

The Commission has also taken the view that the scope of the national objectives covers the means by which regulatory arrangements operate as well as their intended results. Hence, the Commission seeks to apply the principles of good regulatory design and practice in order to promote stability and predictability of the regulatory framework, minimise operational interventions in the market, and promote transparency. Therefore, regulatory design and practice will be a significant consideration for the Review as it is important that any reforms are robust over the longer term.

## 2.2 Revenue and Pricing Principles

As the matters raised by the Review relate to the regulatory framework governing transmission and distribution revenue and pricing, the Commission will take into account the Principles as set out in section 7A of the NEL and section 24 of the NGL. The wording is slightly different but essentially the Principles are the same under the NEL and NGL. They relate to:

- the need for the regulatory frameworks to provide reasonable opportunity to recover efficient costs;
- the provision of effective incentives to promote efficiency, including efficiency in investment, the provision of services and the use of the infrastructure;
- the need to have regard to the regulatory asset base adopted in either any previous regulatory decisions or in the Rules;
- ensuring that the prices should allow for a return commensurate with the regulatory and commercial risks involved in providing the regulated services; and
- the need to have regard to the economic costs and risks of the potential for over or under investment or for under or over utilisation of the pipeline or network.

The Principles should not be seen as being independent, but rather as inter-related to the NEO and NGO. That is, in considering if a TFP-based methodology may be used in determining revenues and prices, the Commission will have regard to whether it meets the Principles. This will include a comparison with the current practice of the building block approach.

## 2.3 Assessment criteria

The framework governing the determination of revenue and prices for the provision of network and pipeline services plays a crucial role in promoting efficiency in the national energy markets. The Commission has identified a number of important criteria that are relevant in testing whether a TFP based methodology would contribute to the achievement of the NEO and the NGO and be consistent with the Principles. These are:

1. strength of the incentives on the service provider to pursue cost efficiencies and the extent to which such cost efficiencies are shared with end-users;
2. the ability of the framework to ensure efficient investment to promote long term innovation and technical progress for the benefit of the service provider and end-users;
3. clarity, certainty and transparency of the regulatory framework and processes to reduce avoidable risks for service providers and users;
4. minimisation of the costs and risks of regulation to service providers and electricity and gas users; and

5. appropriate resolution of transition and implementation issues and costs.

### **2.3.1 Cost incentives**

The strength of the incentives under any regulatory framework depends on the extent to which the arrangements allow a business to earn more than the target rate of return determined by the regulator, and the extent to which those returns are able to be retained by the business in subsequent regulatory periods or distributed to customers. TFP based approaches are often referred to as high powered incentives because they de-couple regulated prices from the actual costs of the business, at least for a period of time.

In addition to encouraging cost savings, the regulatory framework must ensure that customers share in the benefits of realised efficiency gains. However, transferring benefits to customers reduces the incentives to undertake actions to cut costs. Therefore, the regulatory framework must trade off the risk of conferring excess returns on the service providers with the risk of higher costs of production passed on to users.

An important aspect for the Review is the assessment of the ability of TFP based approaches to balance this trade off and align the long term incentives of the service providers with those of other market participants. It is important that network and pipeline service providers have appropriate incentives to develop and operate their assets in an efficient manner so that prices reflect efficient production and delivery of energy to end-users at the levels of reliability and security they require.

### **2.3.2 Investment incentives**

The regulatory framework must also provide the right signals for service providers to make the correct investment decisions and not over or under invest in their networks or pipelines. Over investment, such as gold-plating, will result in costly infrastructure for no additional benefit to users. Conversely, continued under investment may lead to the provision of diminished services to users.

Innovation and technological progress are crucial for long-term productivity growth of the individual businesses as well as the sector as a whole. The adoption of technical change in the networks will be influenced by the regulatory framework and the incentives it provides. Accordingly, the framework should take into account the long-term effects of schemes in influencing the behaviour of regulated business.

Future gas and electricity distribution systems can be described as 'active networks' that interact with both demand and supply sides. Industrial combined heat and power, distributed renewable generation, and micro-generation units installed by households equipped with smart meters will all pose new challenges to distribution networks to innovate and adopt new technologies. Therefore, it will be important that the regulatory framework provides sufficient incentives on the businesses to adopt relevant innovations. An important aspect to this is the ability of the business to recover its costs and earn a return commensurate with the risks involved.

### **2.3.3 Good regulatory practice**

Incentive regulation and benchmarking are conceptually based around the power of the profit motive and market-oriented mechanisms. Certainty and transparency of the regulatory framework are features of good regulatory practice and will increase the effectiveness of the incentives.

Transparency has a disciplinary effect on both the regulator and the service providers. It facilitates participation in the process and provides insight for other stakeholders and interest groups. Also, a transparent regulatory framework leads to clarity of rules and procedures as it benefits from third-party participation in the process. Certainty of the decision-making framework is essential to promoting long term investment in the industry.

There are a series of contractual and practical measurement issues that need to be addressed in the development of a TFP based methodology. There is a need for a clearly defined and settled methodology for deriving the TFP growth estimate and a well specified basis for adjusting  $X$  and deciding whether/when/how to update the initial prices and the index itself.

It will be important that key policy issues are clarified and resolved at an early stage so that the regulated businesses will have more certainty about the revenue and price determination process. The Commission recognises, however, that the possible use of new and untried TFP based approaches may reduce the transparency and certainty of the regulatory framework, especially in the short term. Providing the desired certainty to market participants must be balanced against the benefits of giving the regulator flexibility and adaptability in its decision-making.

The Review will consider how to achieve consensus on the practical design of a TFP based approach and the appropriate level of prescription in the Rules governing any application of TFP. It is crucial that market participants have the appropriate level of confidence and understanding in any amendments to the current regulatory framework.

### **2.3.4 Cost of regulation**

In conducting its assessments, the Commission will also have regard to the implementation and administration costs of including a TFP based methodology in the current regulatory framework. There are two types of costs to consider; being those that fall on market participants (compliance costs), and those borne by the regulator. The impact that these costs may have on end-users must be considered in the Commission's assessment.

This assessment will involve estimating the costs involved in collecting and analysing the data and those incurred in the determination of regulated revenue. Also, this assessment will look at the potential for disputes under a TFP based methodology as disputes over regulatory determinations can lead to significant costs.

### **2.3.5 Transition and implementation issues**

If application of a TFP based methodology could contribute to the promotion of the national objectives, and the necessary conditions are able, or likely to be satisfied, then the focus becomes on how to implement and transit to, the TFP based methodology.

The assessment of TFP based methodology against the national objectives will also have regard to the potential issues and costs associated with implementing a TFP methodology (such as establishing the necessary data set) into the existing regulatory framework. It is important that the costs of implementing TFP and changing the existing arrangements do not substantially erode the benefits that may be gained from including a TFP based methodology. Consideration will also be had to the issues associated with transiting to the new arrangements and how this will be managed.

## **2.4 Counterfactual assessment**

The Review will investigate whether it is appropriate to allow the option of applying a TFP based methodology as an alternative to the existing building block methodology in the determination of revenues and prices for electricity and gas service providers. This should only be permitted if applying a TFP based methodology would better contribute to the achievement of the national objectives while meeting the revenue and pricing principles. The option value of having a TFP based methodology available would provide will also need to be considered.

Accordingly, the assessment of TFP based methodologies will include a comparison with the counterfactual of the continuation of the present arrangements. This will involve assessing the advantages and disadvantages of the current application of the building block approach. It will also consider how the current application contributes to the national objectives and is consistent with the revenue and pricing principles.

For comment:

2. Are the Commission's proposed assessment criteria appropriate? Are there other desirable criteria?

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### 3 Designing TFP based approaches

There is not one standard approach to using TFP measures in determining the X factor in regulatory determinations.<sup>8</sup> In designing any TFP based methodology, there are a series of issues that need to be addressed which can be divided into three broad categories:

- the method for deriving the TFP growth rate;
- the pre-conditions that need to be met before the methodology can be applied; and
- the design of the TFP based approach for setting revenue and prices.

#### 3.1 Deriving TFP growth estimates

To estimate TFP growth, a method is needed to combine changes in the quantities of a diverse range of outputs and inputs into measures of the change in total output quantity and total input quantity. There is not one commonly accepted method used in estimating TFP and there is often debate about the appropriate method to employ, the time period over which to undertake the calculation, the basis for including or excluding businesses in the base data and how output and input quantities should be measured.

There are two broad approaches to doing this - the index number approach or the econometric approach. There are a number of advantages, as well as limitations, of each (see Appendix B.4). In practice, index number approaches are predominantly used where there are a limited number of observations available.

There are a number of alternative methodologies that could be used under the index number approach. However, they would all form measures of the changes in total output quantity and total input quantity from changes in the quantities of individual outputs and inputs.<sup>9</sup> In practice, regulators tend to use either the Fisher or the Törnqvist indexing method.

Whichever particular index method is used, the following items are needed to calculate the industry TFP growth rate:

- a selection of the group of comparable businesses (defining the industry) over which to calculate the measure;
- specification of the businesses' outputs and how to measure each;

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<sup>8</sup> For example, in New Zealand the TFP growth rate has been supplemented by quantitative information on TFP levels and profitability levels in determining X. In the US, regulators often supplement quantitative information on TFP growth rates with subjective assessments of the need for rebates to consumers. See the Brattle International Review report.

<sup>9</sup> The differences between the methodologies mainly relate to the method of aggregating changes in individual components into the change in the overall output or input measure.

- specification of the businesses' inputs and how to measure each;
- the methodology for determining the weights for each output and each input in total revenue and total cost, respectively; and
- the time period over which TFP growth is to be calculated.

### 3.1.1 Defining the 'industry'

The group of businesses used in estimating the TFP growth rate should be operating under comparable conditions. Setting the X factor equal to the industry wide TFP growth rate would be most appropriate when businesses' efficiency levels have converged to a point close to the industry's efficiency frontier, or have at least been given an opportunity to do so. If a TFP growth rate is applied across a group of businesses which have differing efficiency levels then less efficient businesses would be likely to find it easier than efficient businesses to outperform the X factor and earn greater revenue. In fact, the most efficient businesses' productivity growth would be constrained by the rate of growth of the efficiency frontier and so they may not be able to match the industry TFP growth rate.

In reality, it may be extremely difficult to find a group of comparable businesses operating under identical conditions. The achievable rate of productivity growth may differ from one business to another as a result of specific circumstances under which each business operates (for example, customer density, age of network). In this situation, one of two approaches may be taken. The first would be to define narrowly the industry and only include businesses with similar operating environment conditions. However, this could result in a small sample with the estimate being able to be readily influenced by the behaviour of one business.

The alternative would be to widen the definition of the industry and include a more diverse range of businesses in the calculation but make explicit adjustments for differences in operating environment conditions (this referred to as normalisation). Normalisation can be applied to energy density (energy delivered per customer), customer density (customers per kilometre of main), customer mix, the proportion of cast iron pipes and climatic and geographic conditions.<sup>10</sup> However, issues may arise from normalisation if the basis for normalising the data is not clear or if the adjustment is not performed in a transparent manner.

In Australia there is a wide range of operating environments but relatively few utilities and, therefore, adjustment for operating environment conditions beyond management control may be necessary to produce a workable dataset. The

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<sup>10</sup> Energy density and customer density are generally found to be the two most important operating environment variables in energy distribution normalisation studies. Being able to deliver more energy to each customer means that a pipeline or network service provider will usually require less inputs to deliver a given volume of gas or electricity as it will require less pipelines or lines than a less energy dense service provider. A service provider with lower customer density would require more pipeline or line length to reach its customers than would a service provider with higher customer density. If the two service providers have the same consumption per customer, the lower density distributor would appear less efficient unless differences in customer density are allowed for in the analysis.

alternative would be to divide a sector into sub groups (for example, by rural or urban areas, or by jurisdiction) and determine a growth rate to apply to each sub group.

For comment:

3. If TFP were to be available for revenue and pricing decisions, what would be the correct industry definitions for the respective each sectors? Also, in determining an industry definition for a TFP based approach, would adjustments for operating environment conditions be necessary and, if so, under what conditions?

### 3.1.2 Specifying outputs and inputs

The selection of which outputs and inputs to include in the calculation would often depend on the availability of data. As shown in the Brattle Report, the specification of network outputs and inputs has varied across the jurisdictions which have adopted TFP measures in network regulation.

Output measures used should represent the basket of services provided by the business, with customer numbers, system capacity and volumes tending to be the main output dimensions included.

Another important output would be the quality and reliability of supply.<sup>11</sup> Quality improvements can be brought about by increased use of capital and/or operating costs. However, including measures of quality in TFP calculations can be very difficult as it requires the valuation of quality improvements to customers. Also, there is no satisfactory way of incorporating common quality measures as outputs in TFP calculations increases in quality are reflected in a decrease in the index rather than an increase. Due to these difficulties, most regulators have omitted quality from the TFP calculation, and have sought to regulate quality through side constraints and separate service quality incentive mechanisms.

Similarly, the range of inputs used for the TFP growth rate calculation must reflect as many of the factors of production used by the service providers in providing its outputs as possible. Labour, capital and intermediate (materials and services) inputs are the input components generally used in TFP studies. In some jurisdictions, operating and maintenance expenditure is used instead of labour and intermediate inputs due to lack of available data and/or the high level of contracting out of functions by the network businesses.

Defining an appropriate measure of the capital employed by a network business is another difficult challenge for TFP studies. The quantity of capital inputs can be measured either directly in quantity terms (for example, using measures of line

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11 For electricity network businesses, quality of supply encompasses reliability (the number and duration of interruptions), technical aspects such as voltage dips and surges and customer service (for example, the time to answer calls and to connect or reconnect supply). For gas networks quality relates to safety, interruptions and available pressure.

length adjusted for voltage differences and transformer capacity) or indirectly using a constant dollar measure of the depreciated value of assets. The main difference between these approaches is what they imply for the assumed physical depreciation profile of network assets.<sup>12</sup> Appendix B.4.1 discusses how to measure inputs and outputs for TFP studies.

### 3.1.3 Determining the appropriate weights for outputs and inputs

Since the index number approach essentially forms a weighted average of the change in output and input quantities, weights are required for each output and input component.

For most industries which produce multiple outputs, revenue shares are used as the output weights as prices are set to reflect marginal costs and so revenue shares and output cost shares would coincide. However, for electricity and gas service providers the various dimensions of output are often not charged for separately and pricing structures may not reflect underlying costs. The alternative would be to determine output weights from observed revenue shares (even though they are unlikely to reflect underlying costs) or estimated output cost shares (which are usually derived from an econometric cost function). There is an ongoing debate over which of these approaches should be used.

A related methodological issue is whether to vary the allocated weights over the sample period or to leave them fixed. The rationale for varying the weights is because the relative contributions of the input and output components change over time. Where sufficient information exists to produce year-specific weights these should be used. But in some cases (such as where econometric output cost shares have to be used) an overall average share may have to be used across all observations.

For comment:

4. What is the appropriate method for determining a TFP growth estimate?
  - (a) How should the outputs and inputs for the different energy sectors be classified?
  - (b) What should be the approach for determining the weightings for inputs and outputs?

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<sup>12</sup> Network assets tend to be long lived and produce a relatively constant flow of physical services each year over their lifetime rather than a declining amount of physical service each year. Consequently, their true physical depreciation profile is unlikely to match a declining balance or straight line depreciation method.

## 3.2 Pre-conditions needed for a TFP based methodology

The successful application of a TFP based methodology would require a number of conditions to be met. These relate to the adequacy of the available data to estimate productivity and the characteristics of the industry. The Review will investigate whether such conditions can be met within the national energy market. It may be likely that the ability to satisfy these conditions varies across jurisdictions and the different sectors.

The current absence of these pre-conditions does not necessarily mean that a TFP based methodology should not be applied. If the necessary conditions cannot be presently satisfied, the Review will then look at whether it is possible and desirable to rectify this.<sup>13</sup>

### 3.2.1 Data requirements

The potential advantage of a TFP based methodology is that it obviates the need to assess detailed, firm specific cost and demand forecasts for an entire regulatory period. However, the development of robust TFP estimates depends crucially on the availability of long term reliable information on output and input prices and quantities, as well as the characteristics of operating environments.

There are three aspects to consider with respect to the data requirements for implementing a TFP based methodology:

- the required variables;
- the length and breadth of the available dataset; and
- the integrity of the available dataset.

### 3.2.2 Required data variables

As explained above, to measure productivity, data on both the price and quantity of each output and each input would be required as well as data on output cost shares (or, in some cases, revenue shares) and input shares to determine the respective output and input weights. Information on key operating environment variables would also be required to test that the businesses are comparable.

It is clear from the previous studies and also from Brattle's International Review that TFP calculations can be determined using fairly minimal data but that the calculation can be substantially improved if more detailed data is available. In all cases, however, having data that is accurate and consistent – both over time and across businesses – is an essential prerequisite. Previous work on data collection has been undertaken by Dr Denis Lawrence and the Essential Services Commission, Victoria (ESC). While both identified output and input variables for TFP, there are

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<sup>13</sup> For example, if the existing dataset may not be sufficiently robust to estimate an accurate TFP measure, this could be rectified through implementing better data reporting requirements. This would then allow for a TFP based methodology to be implemented in the future.

differences between the two (Appendix E lists both the ESC and Dr Lawrence proposed variables).

This previous research undertaken informs the Review on the possible list of variables needed to support a TFP based methodology. It is clear that a comprehensive list of outputs and inputs is desirable for an accurate estimation of TFP growth. However, whether such a dataset for the national energy markets is currently available is debatable, and whether data that may exist are sufficiently robust and consistent is far less certain. There are also likely to be differences in the data available across the jurisdictions. This may result in TFP being able to be implemented in some jurisdictions sooner than in others.

As shown in the Brattle Report and the previous work conducted by the Pacific Economics Group (PEG) for the ESC, often the specification of the TFP methodology is designed to fit with the dataset available. While this can result in a workable TFP estimate, the methodology would lose some accuracy and robustness.

The Commission considers that there would be some dangers with this approach as it may undermine the strength of the TFP based methodology and may weaken market confidence in the approach. Also, it could delay implementing a more comprehensive data reporting and collection process and lock in an imperfect TFP specification. It may also increase the risk of a long term TFP estimate being wrong.

For comment:

5. What are the variables that would be needed to compute a TFP growth estimate for the gas and electricity transmission and distribution sectors?
6. What is the current availability of TFP-relevant data and its quality and consistency?
7. What would be the appropriate balance between precision and availability of data for the calculation of TFP?

### **3.2.3 Breadth of the existing dataset**

Breadth of the dataset refers to both the number of businesses included in the dataset and the length of the sample period. The number of businesses used in the TFP calculation should meet the following conditions:

- ensure that the estimate cannot be readily influenced by the behaviour of any single regulated business. (Otherwise, it would leave the TFP based methodology open to gaming by the service providers); and
- represent as complete a set as possible of comparator businesses within the industry. (Without all businesses in the industry providing their data, any derived industry-wide estimate may not be truly representative of the industry.)

The first of these is influenced by the definition of the industry. As noted previously, a lack of suitable comparator businesses can be overcome by adjusting data for

operating differences (that is, normalisation). Alternatively, Australian data could be supplemented with data from overseas.

An important consideration for this Review is whether all the businesses within a sector should be mandated to provide the necessary data irrespective of whether they use the TFP based methodology or even, with respect to gas pipelines, whether subject to regulation. Without all businesses in the industry providing their data, any derived industry-wide estimate may not be representative of the industry.

Another aspect on the breadth of data to consider is the effect of mergers and acquisitions, or changing corporate ownership on the dataset. It should be clear to all parties how to allow for the data set to be amended to reflect changing circumstances such as these.

Regarding the length of the sample period for the data-set, the use of the longest period possible tends to be desirable. This is because TFP growth rates tend to vary year by year and, there is a risk that TFP estimates will be biased by the current position on the business cycle. Therefore, it may be preferable to use the longest historical sample period to conduct the TFP estimate, and for the sample period to cover a full business cycle. However, this does not obviate the need to assess whether extrapolation of past performance is likely to be an appropriate indicator or estimate for future conditions and circumstances.

In cases where significant events have occurred in the past (such as privatisation), it may be prudent to exclude certain years from the dataset even if that results in a dataset that is much shorter. One-off cost events may need to be removed from the historical data to ensure that the TFP growth estimate properly reflects the long term efficiency trend. However, it is often difficult to isolate the impact of these events and they are, in any case, part of the cost of doing business and need to be recognised. Furthermore some adjustment processes may occur in a non-linear rather than linear fashion over a prolonged period (for example, convergence to industry best practice following major reforms). This may make simple linear extrapolation of past growth rates inappropriate.

In response to the Rule Change Proposal, a number of interested parties expressed concern about the option of using overseas data and considered that it would be highly problematic to include data from overseas jurisdictions.<sup>14</sup>

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14 See Appendix C. Citipower/Powercor/ETSA Utilities considered that it would be highly problematic to include data from overseas jurisdictions. They noted that with differences in accounting policies, tax laws and corporate structures, there would need to be considerable normalisation of the data. EnergyAustralia also raised a concern about the possible use of US data. It considered that given the current investment phase facing distribution businesses, there is likely to be too few Australian comparators available to successfully measure industry productivity. However, because of the different regulatory frameworks, and even different capitalisation policies, data from the US is likely to be incomparable to Australian data.

For comment:

8. If a TFP based approach is to be adopted, what sample period would be appropriate for the data and what adjustments, if any, would be needed for it to be extrapolated for future circumstances?
9. If a TFP based approach is used, should any Australian data be supplemented with overseas data? Under what conditions would this be appropriate?

### 3.2.4 Integrity of the data set

In addition to having a long term, comparable data set covering all the necessary data variables, the data set must satisfy some key conditions for the TFP estimation to be robust and accurate.

It is crucial that the data set has been compiled using the same definitions and measurement methodologies across all the participating service providers. Important variables such as customer numbers, system capacity and operating expenses can be measured using different methods both over time and across businesses. However, to allow measurement differences would undermine the accuracy of the resulting TFP estimation. This is likely to be a significant issue for the Review as past Australian utility reporting requirements have been implemented at the jurisdictional level. This issue was recognised by the Expert Panel who considered that the quality and robustness of regulatory accounting information in the Australian energy sector has been poor, and has varied from one jurisdiction to another.

Other important considerations about data integrity are:

- to ensure that the data used in the calculation are complete and internally consistent;
- that data variables are accurate and have not been manipulated or gamed by the business in order to mislead the regulator or influence TFP estimates;
- that the database be available to all stakeholders to allow them to undertake their own analyses and sensitivity testing; and
- whether the AER should be permitted to 'clean up' the data.<sup>15</sup>

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<sup>15</sup> This issue was raised by submissions to the Rule Change Proposal which noted this has been an issue in Victoria where the ESC and its consultants have made periodic adjustments to audited outturn information at their discretion which has made it impossible for DNSPs to replicate and understand the TFP estimates.

For comment:

10. What characteristics of the dataset would need to be met for a TFP calculation to be robust and credible? Should the regulator be permitted to 'clean up' data?

### 3.3 Industry characteristics

TFP growth estimates are backward looking measures of productivity and are only a suitable benchmark for the future performance of the regulated businesses if the future conditions facing the businesses are likely to be similar to historic conditions (This is referred to the industry being in a 'steady state'). Therefore, an assessment of the maturity and investment profile of the industry is needed to ensure that a TFP based methodology is an appropriate approach to determining revenue and prices.

#### 3.3.1 Investment profile

If there are substantial fluctuations in capital expenditure from year to year, then volatility in the input index may arise if asset value based capital quantities are used. This could lead to misleading results in the TFP analysis. In addition, significant fluctuations in future expenditure may undermine the ability of a TFP based methodology to ensure that the business recovers its costs. This could deter investment.

The profile of capital expenditure tends to be relatively lumpy for transmission service providers. This was recognised by the Expert Panel as a difficulty that appeared to make the case for TFP for the transmission sector less compelling.<sup>16</sup>

Investment in distribution systems includes improvements to the existing assets and incrementally extending into new centres. Typically, expenditure of this nature is relatively consistent over time because of its incremental nature. As a result, output and investment growth is more stable over time and, accordingly, more conducive to the application of a TFP based methodology for the regulation of these businesses. However, the Commission notes that a number of submissions to the Rule Change Proposal questioned whether the electricity distribution industry is currently in a relatively steady state and whether the long term estimate of TFP would be a good estimator of future cost changes.

The timing of past investment roll-outs and the impact this may have on the future capital expenditure profile also needs to be considered. In Australia much of the current electricity network was rolled out in the 1950s to 1970s. This means that replacement investment requirements are likely to be similarly 'bunched'. Such long term cycles in investment programs may make simple extrapolation of past TFP trends inappropriate as a selected period in the past may not be a good representation of future asset lifecycle conditions. As a result, consideration will be needed to be given on how to manage bunched capital expenditures. One approach

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<sup>16</sup> Expert Panel, p. 105.

may be to allow cyclical movements in the price caps may need to be allowed to reflect the asset renewal life cycles.

### **3.3.2 Economies of scale**

Economies of scale effects could potentially be important in a TFP analysis because strong scale economies would mean that when output is increasing over time, unit costs would tend to decrease even in the absence of any change in underlying productivity. Therefore, if there are economies of scale, unadjusted estimates of TFP growth could overstate the underlying trend during a period of increasing volumes.

For the purpose of setting X factors in a mature and stable industry, scale economies may matter less. If volume growth in the future is expected to be at similar levels to the past, and scale economies are not expected to change much, then it would be necessary only to assess unadjusted TFP growth. However, if volume growth is expected to be different during the regulatory period compared to the TFP calculation period, then an adjustment for scale effects may be required.

### **3.3.3 Maturity of the industry**

Another issue to consider is the 'maturity' of the industry with respect to ownership and regulatory arrangements. Following privatisation and major regulatory reforms it is likely to take several years before businesses converge to a productivity growth rate similar to the rate of technical change in the industry. Failure to allow for this when extrapolating past productivity growth may lead to unrealistically high targets being set.

### **3.3.4 Future developments**

It is important that the Review assesses the likely conditions for the sectors in the future. The Commission recognises that the arrangements governing and affecting investment in, and operation of, the electricity networks and gas pipelines have recently undergone significant reform. Government policy initiatives in response to climate change - including emissions trading, the expanded mandatory renewable energy targets and the roll-out of smart meters - will create new challenges for service providers. Even if the industries are currently considered to be at or near maturity, these fundamental changes may initiate significant market developments. Accordingly, the industries could not be regarded as mature for the short or medium term. This may impact on the introduction of a TFP based methodology.

The Review will investigate whether the electricity network and the gas pipeline sectors are in such a steady state and are likely to remain so in the near to medium future. Chapter 4 presents some considerations on applying a TFP based methodology to the respective sectors.

To the extent the industry is not in a steady state, flexibility could be built into the methodology to allow for uncertainty to a certain degree. This could take the form of off-ramps short regulatory periods (that is, short periods between the review of costs

and prices) or cost pass through mechanisms. The benefits and disadvantages of these design parameters are discussed next in section 3.4.

For comment:

11. What should be the pre-conditions relating to industry characteristics required for the implementation of a TFP based approach?

### **3.4 Design parameters**

There is no single approach to designing a TFP based methodology to the determination of revenues or prices for regulated electricity and gas service providers. This section sets out to identify a number of parameters that may be incorporated into a full application of a TFP based methodology. The choice on design parameters would depend on the circumstances of the regulated business, whether there would be a need to address the issues relating to the industry conditions and the balance between efficiency incentives and cost recovery.

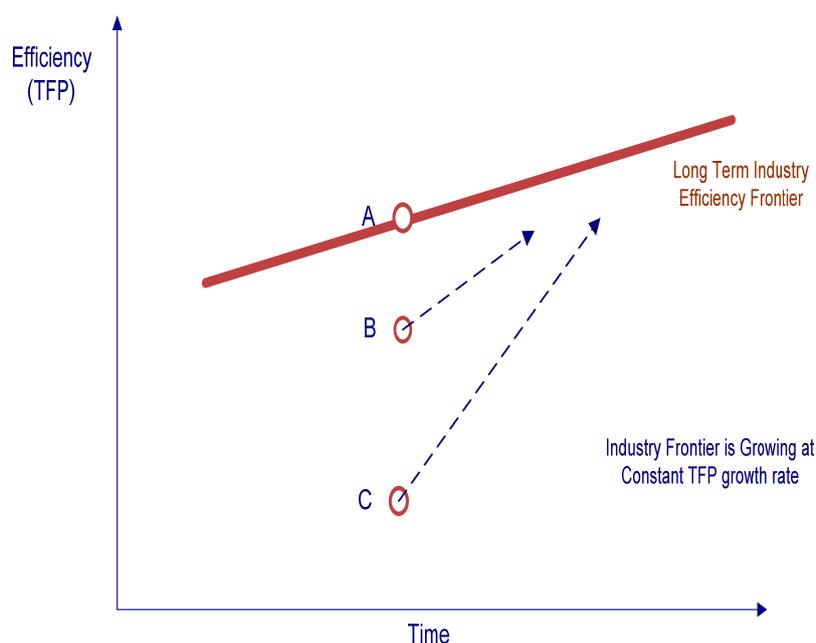
#### **3.4.1 Firm specific X factors**

One key matter is to determine whether the X factor calculated from the industry TFP growth rates should be applied to all relevant service providers in the industry. The benefits of calculating a single growth rate are:

- It should be easier to implement and administer compared to calculating firm specific X factors with no need to allocate businesses to specific groups as well as less emphasis on detailed cost assessments for each service provider.
- It establishes a clearer break between a service provider's costs and its regulated revenues and prices. The 'de-linking' of costs and revenues is one aspect of the incentives that can be established from the use of a TFP based approach.

If TFP growth rate is applied across an industry with a spread of efficiency levels less efficient businesses would be likely to find it easier than efficient businesses to outperform the X factor and earn greater revenue. Therefore, if businesses vary greatly in their levels of efficiency, it may be appropriate to use different X factors to account for differences in the businesses' relative productivity levels (these adjustments are referred to as 'stretch factors'). This is shown by example the figure below.

**Figure 3.1** Setting X factors by using the long term TFP growth rate



However, it has also been suggested that operational circumstances would impact on the level of costs rather than the rate of change. That is, service provider specific circumstances would influence the initial level of revenue or prices ( $P_0$ ) rather than the value of X.<sup>17</sup>

Therefore, the choice of whether to make business specific adjustments to the industry TFP growth rate and have separate X factors for businesses would depend upon how the industry is defined for the TFP growth calculation and the variation in past performance and operational environment facing the businesses within that industry.

For comment:

12. If implementing a TFP based approach, should adjustments to an industry wide X be allowed to account for specific business characteristics?

### 3.5 Fixed or rolling X factors

The basis for setting the X factor can be either:

- an estimate that is fixed until the next regulatory review (fixed X factor); or
- an estimate that is updated annually (rolling X factor).

<sup>17</sup> Rule Change Proposal, p. 27

The first is often used. It is the conventional approach and was considered by the Expert Panel in its consideration of TFP issues. The underlying assumption is that productivity in an industry does not vary significantly over time. The value would be recalculated for the next regulatory period. In this way, some change in the growth rate would be accommodated in the framework without the uncertainty that year to year fluctuations may bring. The fixed X approach provides certainty about prices during a regulatory period to both service providers and users.

The alternative provides for the possibility that TFP growth does change over time and that it is appropriate that the growth rate should be updated frequently. Under this approach, a value of X for the first year of the regulatory period would be estimated from a time series of data. For the second year, a new value of X would be determined using data that also encompasses the latest year of data and (may exclude the oldest year's data). This would be repeated each year of the regulatory period. This approach would allow industry wide cost changes to flow through to the revenues or prices of the service providers over several years. This suggests that it would be most relevant for the data set to use only Australian service providers in the relevant sector, or, possibly, the service providers within a jurisdiction.<sup>18</sup> However, this may result in a smaller sample size of service providers from which to obtain data that in turn could lead to greater volatility in the value of X.

Some submissions to the Rule Change Proposal argued against the proposal to allow the use of a rolling X on the grounds that it would introduce a degree of randomness and uncertainty into the price determination.<sup>19</sup>

For comment:

13. If a TFP based methodology was to be introduced, should fixed or rolling X factors be used? Alternatively, should the regulator have the option to choose between these in applying the TFP based methodology?

### 3.6 Determining the initial price or revenue cap

TFP indices do not, by themselves, provide information on the profitability of the businesses and therefore another method is needed to determine the initial cap at the start of each regulatory period, under a TFP based methodology.

The initial cap should be set at a level where the service provider has the opportunity to recover the efficient costs of providing the regulated service(s). The Rule Change Proposal included a requirement for the AER to set the initial level of prices ( $P_0$ ) through the application of a form of the building block approach.<sup>20</sup> The alternative to applying a full building block methodology would be to base the initial cap on recent

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<sup>18</sup> Rule Change Proposal, p. 31.

<sup>19</sup> Ergon Energy submission, 22 August 2008, p. 7; Citipower/Powercor/ETSA Utilities submission, 22 August 2008, pp. 3-4.

<sup>20</sup> Rule Change Proposal, Attachment A, p. 9.

actual costs (as determined by the regulator and using an appropriate rate of return).<sup>21</sup>

A common feature of TFP based regulatory frameworks is to provide for a periodic assessment of a service provider's costs to ensure that the TFP based methodology is adequately reflecting the costs of the business. An appropriate framework and method is needed to carry out this re-assessment. The Rule Change Proposal recommended carrying out a one-year building block methodology to establish the initial cap for each regulatory period. However, the use of a single year of data to establish the initial revenue or price would rely on the assumption that a single year of actual costs is a sound indicator of longer term costs. This could be alleviated, in part, by identifying and estimating a base level of recurrent expenditure and a base level of expenditure for new functions and operations. Nevertheless, the use of a snap-shot building block determination raises some issues:

- It is questionable whether the term used for the calculation of the rate of return would need to be a single year – consistent with the other costs - or whether it should still be required to be consistent with the term of the forthcoming regulatory period; and
- In order to assess the efficiency of proposed costs in that single year, the regulator would need to also assess the proposed profile of expenditure over the period. This may result in the regulator conducting a de-facto building block methodology as part of the TFP based methodology.

Consideration on how to treat depreciation and the determination of the opening RAB would be needed under a TFP based methodology. If periodic revenue or price reviews or 'resets' were to be undertaken, then the interaction between the asset base (including depreciation, new capital expenditure and incentive mechanisms) and TFP should be clear for the benefit of the regulator and service providers.<sup>22</sup>

For comment:

14. If a full application of a TFP based approach were to be introduced:
- (a) Should periodic assessments of efficient costs and the resetting of the X factor be undertaken?
  - (b) Would it be appropriate for the building block approach be applied to an assessment of single year of costs?
  - (c) Does the building block approach need amending to allow it to work within a TFP framework (particularly in relation to the asset base, depreciation, new capital expenditure and the rate of return)?

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<sup>21</sup> In New Zealand, this approach is known as 'partial building blocks'.

<sup>22</sup> This is also important where, as proposed by the Victorian Government, service providers will be able to move from a TFP-based approach to a building block based approach to the determination of their revenues.

### 3.7 Length of the regulatory period

Along with periodically resetting the X factor in a pure TFP application, is the question of the length of the regulatory period. The strength of the incentives under any price control setting method depend on the extent to which the arrangement allows a firm to earn more than the target rate of return applied at the time the price control was determined, and the extent to which those returns are able to be retained by the firm in subsequent regulatory periods.

While a longer regulatory period would strengthen the incentives to improve performance, the potential for exogenous costs or events (that were not contemplated at the time the revenue or price path was set) to impact on the service provider's achieved returns increases.<sup>23</sup>

In addition, a longer period would increase the exposure of the service provider and regulator to risk that the X factor is set at an incorrect level. However, once a pure TFP process is well established, it may be feasible to extend the regulatory period.<sup>24</sup> At present the NER requires regulatory control periods to be a minimum of five years (chapter 10). The NGR does not specify a minimum or maximum access arrangement period although rule 50 suggests that a five year period would be usual.

For comment:

15. Under a full application TFP approach, what should be the length of the regulatory period?

### 3.8 Off ramps

The objective of an off ramp is to provide a mechanism where service providers and the regulator can manage exogenous situations that arise during a regulatory period. These events should be defined at the commencement of a regulatory period and may include:

- where the actual rate of return falls outside a predetermined range;
- major restructuring of the service provider or changes to the market; and
- uncontrollable events.

The ability to trigger a review of the regulatory arrangement, and potentially reset X earlier than initially anticipated, or pass through certain costs to users, has an impact on the strength of the regulatory framework's incentives to improve performance for the service provider. It may also encourage the regulator to set longer regulatory periods,

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<sup>23</sup> To address this risk, the alternative to shortening the regulatory period is to incorporate 'off ramps'.

<sup>24</sup> Denis Lawrence report to ACCC, 19 November 2003, p. 7.

### 3.8.1 Earnings based re-opener

In some US applications of a TFP based methodology, an off ramp is based on the actual rate of return of the business. This mechanism, referred to as an earnings based re-opener, would specify a band for the rate of return. If the service provider's rate of return falls outside of the specified band then this would trigger a review of its revenues and prices. Where the band is narrow, the opportunity for the service provider to increase its return without triggering a regulatory review would be limited. Accordingly, the incentive to improve its performance and returns would be limited. A service provider would have greater incentives to improve its performance if it could increase its rate of return without triggering a review. That is, if the band is wide. This would be enhanced further if it is combined with an extended regulatory period. However, it does require the regulator, users and end-users to accept higher returns than may have otherwise been set by the regulator.<sup>25</sup>

The Rule Change Proposal argued against the use of earning based off-ramps and instead advocated the use of re-setting of prices at a pre-determined date. It considered that off-ramps reduce the incentives on service providers to make efficiency savings.<sup>26</sup>

### 3.8.2 Cost pass throughs

Other off-ramps may be in the form of passing through the costs or savings arising from certain events such as changes in taxes or changes in regulatory or legal requirements. These events may be managed by a cost pass through process that would allow the costs or savings associated with these events to be passed through to prices without re-opening the whole regulatory framework and resetting the value of X.

Clearly, it is important to specify the details of how the mechanism would operate. It is equally important to define the events that would be included in a cost pass through mechanism. The general principle is that cost pass through events should be outside the service provider's control or influence. Accordingly, events such as a change in the corporate tax rate would meet this criteria while a change in insurance premiums would not. The other key principle in establishing cost pass through mechanisms is that they operate symmetrically. Allowing for cost increases would insure that a service provider maintains its opportunity to recover the efficient costs of providing the regulated service. It is equally important that where cost reductions arise, these flow through to users of the service.

The Rule Change Proposal recommended maintaining the existing cost pass through provisions in the NER.

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<sup>25</sup> Expert Panel, pp. 101-102.

<sup>26</sup> Rule Change Proposal, p. 25. In response, SPAusNet argued that first, the power of the incentives would be greatly improved if longer (or indefinite) regulatory periods were adopted. Second, it considered that for longer regulatory periods, off-ramps provide a low-cost mechanism for ensuring that the net effect of any unexpected input cost and productivity changes are shared appropriately between the company and its customers. SP AusNet's view was that the Rules should be sufficiently flexible to allow DNSPs to choose between off-ramps and pass-through arrangements.

For comment:

16. If a TFP based methodology was introduced, could earnings based re-openers or cost pass through mechanisms be used? What features of these mechanisms would be desirable (or not desirable)?

### 3.9 Input price index

As shown in Appendix B, the CPI-X formula under a TFP based methodology is:<sup>27</sup>

$$\Delta \text{ allowed prices for regulated business} = \Delta \text{ consumer prices} - \{[\Delta \text{ industry TFP} - \Delta \text{ economy TFP}] - [\Delta \text{ industry input prices} - \Delta \text{ economy input prices}]\}$$

In designing a TFP based methodology, consideration is needed on whether growth in industry input prices is equal growth in consumers prices, and if not, what should be the appropriate index for measuring input prices for each of the sectors.

If it is assumed that input prices grow at the same rate as consumer prices, then there is no need to determine the appropriate measure of input prices growth. The Rule Change Proposal noted that the question of whether CPI is an appropriate proxy for input prices is an empirical matter. According to PEG, its work indicated that input prices for Victorian electricity distribution businesses changed at a rate approximately equal to the CPI.<sup>28</sup>

The goods and services included in the basket used to measure the CPI would be very different to the inputs used by electricity and gas service providers in the provision of their services. For this reason, it may not be appropriate to assume that industry input price growth would be cancelled out by consumer prices growth. Furthermore, recent evidence indicates that input prices for the electricity and gas businesses have far outstripped general inflation as the service providers have had to compete with the mining sector, among others, for skilled labour and materials.<sup>29</sup>

For comment:

17. If a TFP based methodology was introduced, what would be the appropriate index for measuring input prices?

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<sup>27</sup> Or, as proposed by the Victorian Government rule change proposal:

$$\Delta \text{ allowed prices for regulated business} = \Delta \text{ consumer prices} - (\Delta \text{ industry TFP} - (\Delta \text{ industry input prices} - \Delta \text{ consumer prices}))$$

<sup>28</sup> Rule Change Proposal, p. 16.

<sup>29</sup> See, for example, Econtech, *Labour Costs Growth Forecasts: Report prepared for Australian Energy Regulator*, 13 August 2007, Canberra

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## 4 Applications of TFP to national energy markets

This chapter discusses the issues that may arise where a TFP based methodology is used to determine the revenue or prices of regulated electricity and gas services. The chapter also comments on the suitability of applying a TFP based methodology to each of the energy sectors. TFP growth estimates have been calculated for gas and electricity distributors in Victoria and Appendix F provides a summary of the methods employed. Also, Appendix G provides background information on each sector.

### 4.1 TFP to determine the allowed cap

A full application of a TFP based methodology would be an alternative approach to the existing building block approach. It could be applied to a sub-group of service providers within a sector with the other service providers remaining subject to the building block methodology.

The setting of an X factor based on forecast efficiency improvements using TFP growth estimates would represent a significant change to the current arrangements. In both the NGR and NER, the X factor is used to smooth revenues over the regulatory period and is not based upon expected efficiency improvements.<sup>30</sup> Instead, assumptions about future efficiency are included in the establishment of the individual building block components.

#### 4.1.1 Application to revenue and price cap form of regulation

The Rule Change Proposal suggested that a TFP approach can only be applied where the form of control is a price cap (whether as individual price caps or as a weighted average tariff basket). It argues that the relationship between allowed prices, TFP and inflation which justifies the use of TFP in a CPI-X framework is based upon the assumption that the control applies to prices rather than to revenue or average revenue.<sup>31</sup>

However, it may also be feasible to apply a TFP based methodology to a revenue cap form of regulation. Comments are sought on whether market participants agree with this. The Review will investigate the conditions that apply to the use of TFP methods in price and revenue caps and the implications for efficiency.

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<sup>30</sup> For electricity distribution service providers, the X factor is to be set with regard to total revenue and must equalise (in net present value (NPV) terms) the revenue to be earned from standard control services over the regulatory control period with the total revenue requirement for the regulatory control period (clause 6.5.9). For electricity transmission service providers, the NPV of the maximum allowable revenue over the regulatory control period must be equal to the NPV of the building block revenue requirement for the period (clause 6A.5.3). Rule 93 of the NER requires the NPV of forecast revenue from reference services to equal the total revenue allocated to reference services.

<sup>31</sup> Rule Change Proposal, p. 17.

### 4.1.2 Process for opting in to a TFP based methodology

A key aspect to the design a full application of a TFP based methodology is the framework which determines when such a methodology could be used in place of the existing approach.

The Commission notes that all the submissions to the Rule Change Proposal agreed with the condition that a TFP methodology can only be applied with the consent of the service provider. They considered that it must be for the service provider alone to initiate the transition from the building block approach to a TFP based methodology, and that it would be unacceptable for TFP to be imposed on a business without its consent.

Given that a TFP based methodology would represent a new innovation in network regulation, a case could be made to make the application of TFP subject to the consent to the service provider. However as noted in section 5.4, the availability and choice between two forms of regulation may provide businesses with perverse incentives.

For comment:

18. Is a TFP based methodology consistent with a revenue cap form of control?
19. If a TFP based methodology was introduced, should it be a requirement for service providers to consent to an application of TFP to determine allowed revenue/prices?

## 4.2 Electricity transmission

The Expert Panel suggested that the electricity transmission sector may not be suitable for a full application of a TFP based methodology to determining forecast revenue paths.<sup>32</sup> There are a number of reasons why this may be the case.

- The electricity transmission systems differ in structure and operating characteristics.<sup>33</sup> In addition, the institutional arrangements governing electricity transmission differ across the jurisdictions. These differences may make it difficult to make like-with-like comparisons and to form a robust and representative industry wide TFP growth rate.

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<sup>32</sup> Expert Panel, p. 105.

<sup>33</sup> For example, the ElectraNet system is characterised by long distances, low energy density, a small customer base and a peaky demand profile in summer. Powerlink, on the other hand, operates a network that covers long distances, its peak demand is for the entire summer season (November to March) and it faces high demand growth. In contrast, Transend's network is much smaller geographically, and in terms of line length, and connects numerous small generators.

- The profile of capital expenditure tends to be relatively lumpy for electricity transmission service providers.<sup>34</sup> In addition, indications are that capital expenditure is increasing significantly. The rising capital expenditures of the transmission service providers reflects both the need to invest in new assets and the increasing costs to build those assets.<sup>35</sup>
- Unlike distribution businesses, it is difficult to form an appropriate measure of a TNSP's end customer base and a holistic measure of its output.<sup>36</sup> As a result, most TNSP TFP studies have only been able to include energy throughput and system capacity as outputs.<sup>37</sup>

In its determination on the economic regulation of electricity transmission services, the Commission concluded that the building block approach remains preferable to alternative regulatory approaches which utilise industry-wide benchmarks (such as TFP based approaches) in view of the lumpiness and uniqueness of shared transmission network costs.<sup>38</sup>

For these reasons, the Commission notes that there are serious questions about the suitability of applying a TFP based methodology to determine the revenue path of electricity transmission service providers. For these reasons, the existing building block approach may better accommodate situations where the investment profile is lumpy and uncertain because prices and revenues are more closely tied to a business's own cost base.

The Commission would like interested parties to comment on whether the Review should continue to consider an application of TFP in electricity transmission revenue determinations.

For comment:

20 Would a TFP based approach be suitable to determine the revenue path for electricity transmission service providers?

<sup>34</sup> Information on the actual and forecast capital expenditures for the various electricity transmission service providers for 2002-03 to 2006-07 is set out in the AER's regulatory report. It highlights that capital expenditure can fluctuate from year to year and also suggests that capital expenditure levels from only a few years ago may not be a very good indicator of the capital expenditure undertaken more recently. AER, *Transmission network service providers electricity regulatory report for 2006-07*, August 2008, pp. 44-46.

<sup>35</sup> See Appendix G for further discussion and AER, *State of the market 2008*, November 2008, p. 123.

<sup>36</sup> Determining the exact nature of the outputs of transmission service providers was a problem identified by MMA in its analysis of productivity factors in transmission and generation for the Energy Reform Implementation Group. MMA, *Analysis of Productivity Factors in Transmission and Generation for the NEM*, 28 December 2006, report to ERIG.

<sup>37</sup> See Denis Lawrence, *Regulation of electricity lines businesses, analysis of lines business performance – 1996–2003: report by Meyrick and Associates to the Commerce Commission*, 19 December 2003, section 5.

<sup>38</sup> AEMC, *Final Determination, Economic Regulation of Transmission Services*, 16 November 2006, p. 40.

### 4.3 Electricity distribution

The characteristics of distribution networks appear to be more suitable for a TFP based methodology than transmission networks. Investment in distribution networks tends to be incremental and hence relatively consistent over time. As a result, output and investment growth is more stable over time and, accordingly, more conducive to the application of a TFP based methodology. Also, in contrast to transmission, classifying the outputs of a distribution network is more straightforward and the institutional arrangements governing distribution networks are more uniform between jurisdictions

There is significant variation in customer and energy densities among these businesses and the operating environments facing these distribution networks differ across states which may make it inappropriate to compare all distribution networks' TFP growth to an overall industry average growth rate. This may mean that a TFP based methodology would be more suitable for some jurisdictions than for others and there may be a need to segregate distribution networks according to states (or some other defining characteristic).<sup>39</sup>

A number of submissions to the Rule Change Proposal questioned whether the electricity distribution industry is currently in a relatively steady state and whether the long term estimate of TFP would be a good estimator of future cost changes. Submissions also queried whether past TFP performance is a reasonable indicator of future performance as TFP performance from period to period tends to be highly variable and in most industries productivity is highly heterogeneous across businesses.<sup>40</sup>

In its submission, Ergon Energy argued that TFP is likely to be impractical as a revenue control setting method because distribution networks have different services included within their standard control services category and consequently, different cost components. As a consequence, the information used in the calculation of both their 'inputs' and 'outputs' (that is, productivity) for these services would not be comparable between distribution networks, and therefore not suitable to apply to a TFP approach.

The Commission notes these points and will consider whether they can be adequately addressed in the specification of the methodology to apply TFP. In addition, the Commission understands that the AER is working towards achieving

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<sup>39</sup> A danger with segmentation is that it may result in the TFP growth rate being unduly influenced by the behaviour of one business. One option would then be to supplement dataset with suitable overseas data but this introduces a multitude of comparability issues.

<sup>40</sup> Energex submission, 21 August 2008, p. 2; Country Energy submission, 22 August 2008, p. 1; Intergral Energy submission, 22 August 2008, p. 2; EnergyAustralia submission, 27 August 2008, p. 4.

consistency in the definition of services across the service providers as part of its regulatory reporting program.<sup>41</sup>

For comment:

21. If a TFP based methodology was to be introduced, should it be applied in electricity distribution determinations? Are there such significant differences in the DNSPs across the jurisdictions that classifying the sector as a single industry would be difficult or inappropriate?

#### 4.4 Gas transmission

For similar reasons to electricity transmission, there are reasons to question whether a full application of a TFP based methodology would be feasible or appropriate for gas transmission pipelines.<sup>42</sup> Other factors specific to the gas transmission industry to consider are:

- The various pipelines differ considerably in terms of operating characteristics. In particular, most transmission pipelines operate under a contract carriage management system with the exception of the GasNet System. In Victoria GasNet owns the transmission assets that are operated by VENCORP under a market carriage system. This difference in service provision may make it difficult to include GasNet in any comparative TFP dataset. There are also differences between transmission pipelines in terms of geography, usage, size and capacity and type of end-users (see Appendix G).
- While there are numerous transmission pipelines, the gas transmission pipeline sector is dominated by only a few owners. If there is a small number of comparative businesses used for the TFP growth calculation, this issue of common ownership could mean that the estimation may be unduly influenced by the behaviour of one owner.
- Only some gas transmission pipelines are subject to regulation under the NGL. Of the 11 transmission pipelines currently servicing the capital cities, five are presently covered pipelines. Of these, the Moomba to Sydney Pipeline is now subject to light regulation.<sup>43</sup> Only covered pipelines that are not the subject of a

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<sup>41</sup> Inclusion of EnergyAustralia within any TFP dataset will create specific issues since EnergyAustralia also operates some transmission lines. Consideration of how to appropriately apportion the data between the distribution and transmission aspects of the business will be required.

<sup>42</sup> Gas transmission pipelines are quite different to electricity transmission networks in some respects. When the key transmission pipelines were built they tended to be point to point pipelines with limited laterals serving specific load centres. More recently, some interconnection has occurred, particularly in the eastern states. Nevertheless, the network and the extent of multiple flow paths is limited.

<sup>43</sup> The Moomba to Sydney Pipeline is partly covered. The covered portion of the pipeline is now subject to light regulation. NCC, *Light regulation of the Moomba to Sydney System: final decision and statement of reasons*, 19 November 2008.

light regulation determination are subject to revenue and pricing decisions (through a full access arrangement) under the NGR and therefore could use a TFP based methodology to determine a price path. As a result, the number of pipelines available to form a dataset from is very limited. This raises questions of whether the data would be robust.<sup>44</sup>

For comment:

22. Would a TFP based approach be suitable for determining the price path for gas transmission pipeline service providers?

#### 4.5 Gas distribution

For similar reasons as in electricity, gas distribution appears to be more suitable for application of a TFP based methodology than gas transmission. However there are a range of issues relating to how a TFP based methodology could be applied to the gas distribution sector.

Gas distribution service providers are more likely to undertake capital expenditure for a new distribution system (that is, greenfields development) than electricity distribution networks. As this expenditure tends to be lumpy in nature, a TFP based methodology may become unsuitable when such expenditure is undertaken although this does, of course, depend on the size of the new development relative to the existing system. The Review will look at the extent of variation in future expenditure needs by gas distribution.

As with gas transmission pipelines, only certain gas distribution systems are subject to economic regulation under the NGL and there is common ownership across some of the distribution systems.<sup>45</sup>

For comment:

23. Can a TFP based methodology be applied to the gas distribution sector? Are there such significant differences in the gas distribution systems across the jurisdictions to make classifying the sector as a single industry inappropriate?

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<sup>44</sup> In addition, while there are numerous transmission pipelines, the gas transmission pipeline sector is dominated by only a few owners. The key pipeline owners are APA Group, Epic Energy and Jemena Limited. If there is a small number of comparative businesses used for the TFP growth calculation, this issue of common ownership could mean that the estimation may be unduly influenced by the behaviour of one owner.

<sup>45</sup> The majority of the major distribution systems in large population centres are defined as covered pipelines under the NGL. Certain regional distribution systems are also defined as covered pipelines (the list of covered distribution systems is contained in Appendix G).

## 5 Whether to introduce TFP based approaches

A key aspect to the Review is a comparison between TFP based methodology and the existing building block methodology. This will include consideration of how the two methodologies promote efficiency incentives, ensure recovery of efficient costs and minimise regulatory burden and costs. This chapter discusses the issues on whether to include a TFP based methodology into the national energy regulation framework.

### 5.1 Comparison with the building block methodology

The building block methodology relies on forecasts of firm specific costs and demand over the regulatory period. TFP based approaches use information on recent industry-wide productivity performance to set the businesses' future allowed revenues or prices. However, in practice, this depends upon the specific design of the TFP based methodology as there may still be a need to undertake certain business specific analysis.

The current framework for revenue regulation is well understood and provides a degree of certainty for investors. However, the building block methodology has been criticised for being too resource intensive, requiring subjective judgements by the regulator and being open to gaming by service providers. The potential benefits from TFP based approaches compared with the building block methodology are:

- lower regulatory costs since the need to form detailed firm specific forecasts of costs and revenue would be greatly reduced;
- less likelihood of disputes (provided there is a generally accepted TFP methodology) since the allowed price path would be based upon historical industry wide data which would be known and measurable instead of relying on firm specific forecasts;
- helps the regulator to overcome the current information asymmetry problem which arises from the service providers having greater knowledge of future cost and volume trends;<sup>46</sup> and
- overcomes the substitution problem between operating expenditure and capital expenditure which exists under the building block approach.

TFP based approaches could also enable lighter handed regulation of non-monopoly services and reduce the need to address controversial issues such as affiliate transfer prices. The use of TFP approach may also avoid difficulties in cost allocation between monopoly and competitive services.

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<sup>46</sup> The TFP approach is not the only possible mechanism to overcome the information asymmetry problem. In the UK, Ofgem has applied a menu based approach for capital expenditure determinations.

The Review will assess whether such benefits from a TFP based methodology exist and, if they did, to what extent would they be diminished if the particular TFP based approach included earnings based re-openers, cost pass through mechanisms or short regulatory periods.

While there are a number of advantages advanced in favour of TFP methodologies, there are also some disadvantages. TFP is fundamentally dependent on the availability of high quality time series data that can be used to accurately calculate industry wide trends. As such, the data must be collected through a transparent process that ensures the data is clearly defined, consistent, comparable, reliable and covers sufficient items to allow alternative specifications to be tested and operating environment differences to be allowed for. This could increase the administration cost on businesses. The data should also be publicly available.

Also, there may be disagreements upon the specification of the methodology used to calculate TFP growth (for example, defining the appropriate range of inputs and outputs). From the evidence provided in the Brattle International Review report, it seems that TFP based methodologies can result in disputes. A key reason for this seems to be the lack of prescription on the TFP based methodology in the legislative framework.

Another potential disadvantage of the TFP approach is that by setting the businesses' allowed revenues based upon an external benchmark instead of using business specific data, the risk is increased of businesses either not being able to recover their efficient costs or making excess returns. However, the design of the TFP methodology can include safeguards against these outcomes.

## 5.2 Impact on incentives

The Expert Panel stated that there is no basis for concluding that one approach (either building block or TFP) has intrinsically stronger or weaker efficiency incentives than the other as this depends on the detailed parameters adopted under any application of either methodology.<sup>47</sup>

TFP based approaches are often held to provide stronger productive efficiency incentives than those present under the building block methodology. It is argued that because businesses' allowed revenue is set by external factors, and because the regulatory periods could be longer, businesses would have a greater incentive to pursue profit maximising activities.

However, by allowing more divergence between service providers' own costs and regulated revenue or prices, a TFP approach could lead to greater uncertainty in recovery of costs. Also, divergence between the service providers' own costs and allowed prices may lead to increased volatility in profit. Therefore, TFP based methodologies are sometimes criticised for providing disincentives to invest.

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<sup>47</sup> Expert Panel, p. 103.

The strength of the incentives under any regulatory approach depends upon the extent to which the framework allows a business to earn more than the target rate of return applied at the time the cap was determined, and the extent to which those earnings are able to be retained by the business in subsequent regulatory periods. A TFP based methodology could provide more security with regard to cost recovery by having frequent reviews of the revenue or price cap. It could also include off-ramp provisions. Hence, there is a trade-off between productive efficiency incentives and investment certainty to manage in designing a TFP based methodology.

Consideration should also be had to the behaviour of the service provider during the course of the regulatory period. If the TFP based methodology is combined with a significantly longer regulatory period, then the service provider might behave more like it would in a more competitive environment until the next cost review approaches. Hence, the framework for revenue and price reviews under the TFP based methodology would influence the behaviour of the business during the period.

It has also been argued that a TFP based methodology may encourage more innovation and risk taking by the service provider, and more investment in non-network solutions.<sup>48</sup> TFP based methodologies can make the service provider revenue less dependent upon the RAB and therefore can overcome the possible disincentive on businesses not to pursue non-network options as an alternative to capital expenditure. In addition, under a building block methodology, the regulator needs to apply a high level of scrutiny to cost allocation between monopoly and competitive services. This can act as a disincentive on the business to pursue competitive market opportunities.

For comment:

24. What would be the ability of a TFP based methodology to address any perceived problems with the current applications of the building block approach?
25. Under a TFP based approach, what would be the impact on the incentives to make efficiency improvements and make efficient investments?

### 5.3 Incorporating existing incentive schemes

The regulatory frameworks established by the NEL and NGL provide for specific incentive mechanisms which seek to encourage efficient behaviour in a range of areas. The Review will consider how these incentives schemes could be maintained under a TFP based methodology, if necessary.

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<sup>48</sup> L.Kaufmann (PEG), *Energy market policy and regulatory barriers: how energy networks can contribute to energy market objectives*. Available on the ESC website.

### 5.3.1 Service target performance incentive schemes

Service performance incentive schemes seek to reward the service provider for improvements in service performance above a defined target and provide a financial penalty for reductions in performance. The schemes aim to signal to service providers that customers place a value on the quality of service provided and to minimise the scope for businesses to gain financially from reducing costs at the expense of reduced service performance. These schemes can also compensate individual customers for below target performance (guaranteed service levels).

Such mechanisms reward (or penalise) service providers based on performance against an explicit service target and can easily be inserted into a TFP based methodology through an additional explicit term in the CPI-X formula. This is because these schemes are established and operate separately to the setting of either the initial revenue or price cap or the rate of change set by the TFP growth estimate.

There is an argument that service performance measures should be included within the list of outputs used in estimating TFP growth since service quality is an important dimension of output. However, there are a number of difficulties with including service performance measures as outputs in the calculation of a TFP growth rate. As a result, regulators have usually opted to include service quality incentives separately.

### 5.3.2 Efficiency benefit sharing schemes

Efficiency benefit sharing schemes (also called efficiency carryover mechanisms) aim to maintain the strength of efficiency incentives over an entire regulatory period by allowing profits, or losses, earned during a regulatory period to be carried over a set number of years (regardless of whether this moves into the next period). This ensures that gains and losses are retained for the same period of time irrespective of when they occur during the regulatory period.

The amount of any carry-over from year to year is calculated based on the difference between actual and forecast expenditure on an annual basis. However, the absence of annual forecasts of expenditure under a TFP based methodology could make it difficult to apply such a scheme in the context of TFP.

It is unclear whether the absence of such schemes would materially diminish the service provider's incentives under a TFP approach. The ESC has argued that TFP based methodologies are an optimal form of efficiency carryover mechanism. Service providers retain a greater share of any benefits from efficiency gains that are greater than the industry trend in efficiency and retain those benefits for a longer period.<sup>49</sup>

In addition, the Rule Change Proposal argued that if such an efficiency carryover mechanism does not prove to be feasible under TFP, its absence would be unlikely to imply a significant diminution of the incentives for efficiency compared to the

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<sup>49</sup> ESC submission to the Expert Panel, March 2006.

building block approach in practice.<sup>50</sup> These arguments were based on combining a TFP approach with a regulatory period longer than five years.

### 5.3.3 Demand management incentive scheme

Demand management incentive schemes seek to encourage businesses to adopt policies which reduce growth in demand or peak demand in order to defer or remove the need for network augmentation. Such schemes operate through providing an additional annual expenditure allowance to the service providers in addition to its regulated revenue or price cap. Any under-spend accumulated by the end of the regulatory period is not retained in the next period and is deducted from revenue in the subsequent period.

Such schemes are currently only applied to certain electricity distribution service providers. As demand management schemes take the form of an external expenditure allowance, it would be possible to transfer such schemes into a TFP based methodology via an additional term in the CPI-X formula.

For comment:

26. If a TFP based methodology was to be introduced, would the existing incentives schemes be needed? And if so, do they require any amendment?
27. If a TFP based methodology was to be introduced, how should service quality be regulated?

## 5.4 Having two forms of control

Amending the Rules to include a TFP based methodology would result in having two forms of economic regulation available to service providers. This would create a set of economic and regulatory issues for service providers, the AER and other interested parties which would need to be addressed prior to any implementation of TFP.

The benefit of allowing both the building block and TFP methodologies is that it would enable each service provider and the AER to agree upon the methodology which best suits the service provider's situation and characteristics. Furthermore, the mere existence of an alternative method provides an option value by allowing ready transition should circumstances change significantly.

However, there are likely to be additional costs with the development and implementation of an alternative form of regulation. Consistent and tightly specified national databases on electricity and/or gas service providers would have to be established, requiring service providers to collect and provide additional information

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<sup>50</sup> Rule Change Proposal, p. 35.

(although there are likely to be other public policy benefits from having such a database available). In addition, the AER would have to develop the necessary skills and expertise in order to apply a TFP based methodology. There could be a loss of administrative cost synergies by the AER and service providers that arise from concurrent revenue and price reviews. These factors suggest that the AER may require more resources as a result of the introduction of a TFP based methodology.

There is also a concern that the service providers that expect to improve productivity faster than the industry average would opt to be regulated under a TFP based methodology. Service providers which expect their productivity to improve slower than the average would seek to remain under the building block methodology.

Some submissions to the Rule Change Proposal argued that having two forms of control would undermine the goal of national consistency both within and between the gas and electricity sectors.

Another issue to consider is the framework moving between the two forms of regulation. The ability to revert back to a building block approach might create perverse incentives for service providers. They could seek a short term financial benefit by under-investing under a TFP based methodology and then revert back to a building block methodology and seek to recover increased forecast expenditure. To address this, some constraints on the ability to revert back to building block could be incorporated into the regulatory framework. Nevertheless, on balance, it may be appropriate to provide service providers with discretion on the form of regulation to apply to their regulated business.

For comment:

28. What would be the benefits and costs from having two forms of control in the regulatory framework?
29. Would giving service providers the option between either a TFP based methodology and a building block methodology be appropriate? Would the option create any perverse incentives?

## **5.5 Participation in a TFP based methodology**

An important aspect to the Review is understanding the likelihood that the TFP applications would be used in the national energy markets and the level of support within the energy industry for TFP. The implementation and administration of an alternative form of revenue and price regulation would involve considerable cost and effort. Therefore, there must be a reasonable expectation that the benefits are real and attainable and that the methodology would be applied. If service providers are not interested in applying a TFP methodology, then there would be a significant risk of imposing unnecessary regulatory costs on the industry. However, even if the method is not initially used, there may still be a significant option value in having an alternative readily available for the future.

For comment:

30. What would be the likely participation by service providers under a TFP based methodology?

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## **6 Implementation and transition issues**

Assuming a full application of a TFP based methodology would be desirable and possible, the focus then turns to the implementation and transition to the TFP based methodology.

The Commission will address and consult on the detailed issues relating to the mechanics of implementation and designing the determination framework for a TFP based methodology under stage 2 of the Review. The purpose of this chapter is to identify and seek views on some high level issues relating to implementation and transition.

### **6.1 Establishing the framework needed for TFP**

There are three key parts to the framework needed to support the implementation of a TFP based methodology:

- gathering the necessary historical dataset;
- collecting and maintaining the required dataset going forward; and
- establishing a settled and transparent methodology.

#### **6.1.1 Historical dataset**

The successful use of a TFP based methodology in the economic regulation of network services is highly dependent on the collection of the appropriate dataset. This involves establishing the historical dataset for the first TFP calculation and then maintaining the dataset for the future. As discussed earlier in this paper, there may be significant gaps in the historical dataset that would need to be addressed before a TFP based methodology could be applied.

The historical dataset may be collected from various sources. Some data could already be in the public domain; while other data could be accessed from regulatory submissions or the service provider directly. One issue is whether confidential data, previously provided to the regulator for regulatory determinations, should be used for calculating TFP.

There are potential pitfalls in reconstructing historic data for the purposes of a TFP based methodology. It is unlikely that the available data would be uniform in classification and breadth across the market, or in some cases, even over time. However, it is more likely to be consistent within a state which could have implications for how the industry should be defined for the purpose of calculating TFP.

Data variables such as system annual energy, peak demand and revenue should be readily available, but segregation according to customer class, size or location may not have been separately stated. Reliability should be available as overall figures, with various segregations according to regulatory requirements, but possibly not

uniformly according to system location and environment or over time. Uniformity of definition may also present problems in comparing like with like.<sup>51</sup>

The classification of a network as CBD, urban, rural or remote may also be subjective. Changes in recording and reporting as well as the area served and customers connected would have occurred and would occur as organisations separate or combine so that consistency and continuity of data over time may present some difficulties.

Establishing a suitable dataset for TFP would likely require significant time and resources. There are potential pitfalls in reconstructing historic data for the purposes of a TFP based methodology. It is unlikely that the available data would be uniform in classification and breadth across the market. However, it is more likely to be consistent within a state which could have implications for how the industry is defined for the purpose of calculating TFP. The Economic Insight report will inform on the extent of the gaps and consistency of the existing historical data.

### **6.1.2 Data collection**

Into the future, a common set of data to support a TFP based methodology would need to be collected. The dataset should:

- use a common set of detailed definitions;
- be audited or otherwise confirmed so that regulators can have confidence in the analysis produced from it;
- be provided in as timely a fashion as possible; and
- be in the public domain as much as possible so that all interested parties can undertake analysis using a common starting point.

The most appropriate means to collect this dataset would be through the AER's powers to gather information under the NEL and NGL. This would take the form of information reporting requirements, under which businesses would be required to disclose relevant data. This may have to be mandatory for all regulated businesses within each sector (even if the business remains subject to the building block methodology) to ensure that the TFP estimate would be representative of the industry.

Such information should be collected on an annual basis as this would enable the regulator to maintain the TFP dataset and produce estimates on an on-going basis.

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<sup>51</sup> For example, transformer capacity can be quoted by the summation of each unit's nominal rating, or the station's cyclic emergency rating on an n-1 basis in each location. Capacity of lines and transformers will differ depending on whether the system peak load occurs during a series of hot summer afternoons, or during a cooler winter evening. Reporting and treatment of 'unusual events', such as bushfires, vehicle impact interruptions and dust induced insulator flash-over may vary according to the jurisdiction. Accounting treatment of capital contributions (in cash or kind) and the allocation of various overhead charges may distort revenues or valuations.

This would improve the process for applying a TFP based methodology at the start of each regulatory period.

There may be an issue concerning the collection of data from the non-regulated pipelines for use in the dataset since these businesses are not subject to the economic regulation provisions of the NGL.

### **6.1.3 Dataset costs**

The collection of the dataset would involve some costs and impose an administrative burden on the regulator and the service providers. Consideration must be given to such costs to ensure that the arrangements are appropriate and reflect good regulatory practice.

It is also important to note that the provision of such data for productivity measures may have other benefits. It would improve transparency, and market participants' understanding, of the performance of the business. Such data could also assist with the regulator application of the building block methodology and could help improve benchmarking analysis.

### **6.1.4 Settled and transparent methodology**

Any application of TFP for use in revenue and pricing determinations needs to be clearly specified in order to promote proper regulatory certainty and good practice. The current building block approach is clearly specified in the Rules and is well understood. For TFP there would need to be:

- confidence that a sustainable starting point has been achieved in relation to costs and prices;
- a settled methodology and for deriving X (all outputs and inputs included and certainty on how they are to be measured and weighted);
- a well-specified basis for adjusting X in light of new information; and
- a well-specified basis for deciding whether/when/how to update initial prices, and the index itself.

To the extent these elements are not present, service providers would face unnecessary risks and customers would incur unnecessary costs.

Key matters for decision would be how to specify the methodology in the Rules and how to determine the balance between what specification would be needed in the Rules and what issues may be explained in supporting guidelines and other documents made by the regulator. The trade off between prescription and certainty for market participants versus operational flexibility and adaptability to individual circumstances would need to be managed.

The majority of submissions to the Rule Change Proposal stated that too much of the methodology and decisions were proposed to be in supporting guidelines.

The Expert Panel concluded that the Rules should address matters that have industry wide application or effects that are likely to change relatively infrequently over time and that do not rely on an assessment of individual market conditions or circumstances.<sup>52</sup>

The Expert Panel recognised that prescription in the Rules promotes certainty and stability of regulatory outcomes, but noted that it reduces the regulator's ability to accommodate the particular circumstances of individual market participants in regulatory decisions. It considered that the appropriate balance between these conflicting objectives will vary depending on the matter at issue, as well as the interest of different stakeholders.

This Paper presents a list of issues that need to be decided upon for implementing a TFP based methodology. These can fall into two categories:

- the methodology for deriving the TFP growth rate; and
- the design of the TFP based methodology for setting revenue and prices.

Although this is a matter of detailed regulatory design, there seems to be significant reasons for specifying clearly in the Rules the essential features of any TFP based regulatory methodology. The reasons include the fact that a TFP based methodology would affect the commercial returns of the businesses and also because TFP has yet to be applied in Australia. Also, one of the findings of the Brattle Report, is that the lack of prescription in the legislative framework can lead to disagreements on how TFP is applied and variations in the TFP approach between regulatory periods.

Accordingly, there seems to be a need to have sufficient detail in the Rules on both these categories for regulatory certainty. The Rules, guidelines and methodology should be fixed over a defined period to enable service providers to properly assess the option of using TFP.

For comment:

31. If a TFP based methodology was to be introduced, what should be the procedures for collecting the TFP dataset? Should confidential data which have previously been provided to the regulator for regulatory determinations now be allowed to be used for calculating TFP growth estimates?
32. What are the costs of implementation a TFP based methodology?
33. What is the required level of specification on a TFP based methodology that needs to be included in the Rules?

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<sup>52</sup> Expert Panel, p. 25.

## 6.2 Defining the necessary pre-conditions

The pre-conditions that need to be fulfilled for a TFP based methodology to be successfully applied are:

- the TFP growth measure is based on data not readily influenced by the behaviour of any single regulated business;
- the historical TFP growth measure is a good proxy for future productivity growth;
- the data are robust, consistent, credible and represent comparable businesses; and
- the measure is based upon data reflecting stable business performance.

An important aspect to the implementation of a TFP based methodology is how to specify these necessary pre-conditions in the Rules, and the process and responsibility for determining whether such conditions are likely to be satisfied.

For comment:

34. What are the criteria for assessing whether a TFP based methodology should be applied?

## 6.3 When to introduce a TFP based methodology

In submissions to the Rule Change Proposal, stakeholders and the AER expressed concern regarding the introduction of an alternative approach at a time while other significant reforms are still in their early stages. For example, the NEL framework for the economic regulation of electricity distribution services has only recently commenced operation. Some participants also stated that these arrangements should be given the opportunity to be tested first before introducing more changes.

As a result, it may be appropriate to have an initial shadow period where data would be collected and TFP estimates are calculated in accordance with an agreed method before the TFP methodology could be applied to service providers.

For comment:

35. If a TFP based methodology was to be introduced, what would be the appropriate timing for its introduction? Should the implementation process include a trial period?

## 6.4 Transitional issues

The transition from the use of a building block methodology to a TFP based methodology would need to give effect to past commitments under the incentives schemes that were intended to have a continuing effect from one regulatory period to the next. For example, the opening cap under a TFP based methodology would have to be adjusted for any under-spend in the demand management incentive scheme.

For jurisdictions where efficiency carryover mechanisms (ECM) are currently operative, consideration would need to be given to how to treat any carryover balance at the start of the first TFP regulatory period. The two main options are:

- an amortisation of the carry over amounts over the term of the TFP period, as if the ECM continued to operate over the succeeding regulatory period as in a building block approach with an ECM; or
- an upfront adjustment to the opening cap at the start of the first TFP regulatory period equal to the net present value of any carry-over balance at the end of the building block period.

The Rule Change Proposal suggested applying a one-off up-front adjustment to the opening prices. However, it recognised that this would require demand forecasts (in order to correctly calculate the adjustment amount) but considered that the economic significance of such forecasts would not be expected to be a first order issue and hence not add materially to the administrative costs of regulation.<sup>53</sup>

For comment:

36. How could the balances under the existing incentive schemes be carried over from a building block methodology to a TFP based methodology?

## 6.5 Establishing a TFP based methodology in the Rules

In addition to designing the TFP based methodology, the framework and processes for making a TFP based determination would also need to be developed. This would involve considering:

- the process for the business to submit its revenue proposal;
- the required contents of the business proposal;
- the decision making process for adopting the TFP based methodology;
- criterion that must be met before for the TFP based methodology can be used;
- terms of the determination under the TFP based methodology;

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<sup>53</sup> Rule Change Proposal, p. 36.

- timetables and procedures for making a determination;
- the appeal process available to the business;
- the monitoring arrangements to assess the performance of the TFP based methodology; and
- a framework for reverting back to a building block methodology.

At this stage of the Review, the Commission is assessing whether a TFP based methodology to set regulated revenue (or prices) would contribute to the national objectives. As many of these issues relate directly to how to implement a TFP based methodology, the Commission will discuss these issues further later in the Review.

Some initial considerations are:

- As the focus is the introduction of a TFP based methodology into the existing regulatory frameworks for national energy markets, it would be preferable to retain as much of the existing frameworks as possible;
- The existing regulatory frameworks are based upon the concept that a service provider develops and submits a proposal for its future revenue requirements. The regulator then assesses the proposal against defined criteria set out in the Rules. Whether this concept could be maintained under a TFP based approach needs to be considered; and
- It would appear to be good practice for the regulator to indicate at the start of a process whether a business is considered suitable to opt in to a TFP based methodology. This would prevent the need for the service provider to develop two proposals, one for each methodology, in case its request for a TFP based determination was rejected during the determination process.

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## 7 List of issues

Chapter	For comment
<b>1</b> <b>Scope of the Review</b>	1. Is the Commission's proposed scope of the Review appropriate?
<b>2</b> <b>Assessment framework</b>	2. Are the Commission's proposed assessment criteria appropriate? Are there other desirable criteria?
<b>3</b> <b>Designing TFP based approaches</b>	3. If TFP were to be available for revenue and pricing decisions, what would be the correct industry definitions for the respective each sectors? Also, in determining an industry definition for a TFP based approach, would adjustments for operating environment conditions be necessary and, if so, under what conditions?  4. What is the appropriate method for determining TFP growth estimates? (a) How should the outputs and inputs for the different energy sectors be classified? (b) What should be the approach for determining the weightings for inputs and outputs?  5. What are the variables that would be needed to compute a TFP growth estimate for the gas and electricity transmission and distribution sectors?  6. What is the current availability of TFP-relevant data and its quality and consistency?  7. What would be the appropriate balance between precision and availability of data for the calculation of TFP?  8. If a TFP based approach is adopted, what sample period would be appropriate for the data and what adjustments, if any, would be needed for it to be extrapolated for future circumstances?  9. If a TFP based approach is used, should any Australian data be supplemented with overseas data? Under what conditions would this be appropriate?

Chapter	For comment
<p><b>3</b> <b>Designing TFP based approaches</b></p>	<p>10. What characteristics of the dataset would need to be met for a TFP calculation to be robust and credible? Should the regulator be permitted to 'clean up' data?</p> <p>11. What should be the pre-conditions relating to industry characteristics required for the implementation of a TFP based approach?</p> <p>12. If implementing a TFP based approach, should adjustments to an industry wide X be allowed to account for specific business characteristics?</p> <p>13. If a TFP based methodology was to be introduced, should fixed or rolling X factors be used? Alternatively, should the regulator have the option to choose between these in applying the TFP based methodology?</p> <p>14. If a full application of a TFP based approach were to be introduced:  (a) Should periodic assessments of efficient costs and the resetting of the X factor be undertaken?  (b) Would it be appropriate for the building block approach be applied to an assessment of single year of costs?  (c) Does the building block approach need amending to allow it to work within a TFP framework (particularly in relation to the asset base, depreciation, new capital expenditure and the rate of return)?</p> <p>15. Under a full application TFP approach, what should be the length of the regulatory period?</p> <p>16. If a TFP based methodology was introduced, could earnings based re-openers or cost pass through mechanisms be used? What features of these mechanisms would be desirable (or not desirable)?</p> <p>17. If a TFP based methodology was introduced, what would be the appropriate index for measuring input prices?</p>

Chapter	For comment
<p><b>4</b>  <b>Application of TFP to national energy markets</b></p>	<p>18. Is a TFP based methodology consistent with a revenue cap form of control?</p> <p>19. If a TFP based methodology was introduced, should it be a requirement for service providers to consent to an application of TFP to determine allowed revenue/prices?</p> <p>20. Would a TFP based approach be suitable to determine the revenue path for electricity transmission service providers?</p> <p>21. If a TFP based methodology was to be introduced, should it be applied in electricity distribution determinations? Are there such significant differences in the DNSPs across the jurisdictions that classifying the sector as a single industry would be difficult or inappropriate?</p> <p>22. Would a TFP based approach be suitable for determining the price path for gas transmission pipeline service providers?</p> <p>23. Can a TFP based methodology be applied to the gas distribution sector? Are there such significant differences in the gas distribution systems across the jurisdictions to make classifying the sector as a single industry inappropriate?</p>
<p><b>5</b>  <b>Whether to introduce a TFP based approach</b></p>	<p>24. What would be the ability of a TFP based methodology to address any perceived problems with the current applications of the building block approach?</p> <p>25. Under a TFP based approach, what would be the impact on the incentives to make efficiency improvements and make efficient investments?</p> <p>26. If a TFP based methodology was to be introduced, would the existing incentives schemes be needed? And if so, do they require any amendment?</p> <p>27. If a TFP based methodology was to be introduced, how should service quality be regulated?</p>

Chapter	For comment
<p><b>5</b>  <b>Whether to introduce a TFP based approach</b></p>	<p>28. What would be the benefits and costs from having two forms of control in the regulatory framework?</p> <p>29. Would giving service providers the option between either a TFP based methodology and a building block methodology be appropriate? Would the option create any perverse incentives?</p> <p>30. What would be the likely participation by service providers under a TFP based methodology?</p>
<p><b>6</b>  <b>Implementation and transition</b></p>	<p>31. If a TFP based methodology was to be introduced, what should be the procedures for collecting the TFP dataset? Should confidential data which have previously been provided to the regulator for regulatory determinations now be allowed to be used for calculating TFP growth estimates?</p> <p>32. What are the costs of implementation a TFP based methodology?</p> <p>33. What is the required level of specification on a TFP based methodology that needs to be included in the Rules?</p> <p>34. What are the criteria for assessing whether a TFP based methodology should be applied?</p> <p>35. If a TFP based methodology was to be introduced, what would be the appropriate timing for its introduction? Should implementation process include a trial period?</p> <p>36. How could the balances under the existing incentive schemes be carried over from a building block methodology to a TFP based methodology?</p>