AEMC

REVIEW

Australian Energy Market Commission

DRAFT REPORT

Review into the use of total factor productivity for the determination of prices and revenues

Commissioners

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About the AEMC

The Council of Australian Governments, through its Ministerial Council on Energy (MCE), 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 providing advice to the MCE on matters relevant to the national energy markets. We are an independent, national body. 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.

Summary

The Australian Energy Market Commission (AEMC) is conducting a review into the use of a total factor productivity (TFP) methodology in determining regulated prices and revenues for electricity and gas service providers. The objective is to advise the Ministerial Council on Energy (MCE) on whether permitting the use of a TFP methodology would contribute to the national gas objective (NGO) and/or national electricity objective (NEO) and, if so, to provide draft Rules. This Draft Report presents our proposed recommendations.

There are two possible applications of TFP in revenue regulation permitted under the national energy laws. TFP indices can be used to assist the AER in applying efficiency benchmarking to service providers costs under the existing building blocks approach. Alternatively, a TFP methodology could be applied in a more mechanistic manner where TFP indices are used to set the allowed rate of change of allowed revenues over the regulatory period. As the use of TFP indices in benchmarking costs is already allowed for under the Rules, this Review has focused on assessing the use of a TFP methodology in setting the allowed revenue path.

We found that this use of a TFP methodology has the potential to create stronger incentives for service providers to pursue cost efficiencies compared to the building block approach. This is because it could provide higher returns to the service provider when it makes investments and improves operating practices which deliver continuing productivity improvements. Furthermore, a TFP methodology could reduce the scope for the service provider to boost returns by exploiting its information advantage over the regulator and also places a discipline to at least maintain industry productivity growth.

Service providers have raised concerns about the ability of a TFP methodology to set allowed revenue at a level which is sufficient to cover costs and also its ability to cope with changes in circumstances. Our analysis, supported by detailed modelling, indicates that a TFP methodology could provide service providers with a reasonable opportunity to recover their prudently-incurred costs and maintains investment incentives. It can handle significant changes and adverse cost shocks affecting the industry as a whole relatively well provided there are regular price resets or equivalent safeguard mechanisms in place.

Accordingly implementing a TFP methodology as an alternative to the current building block approach could lead to increased productivity and lower prices for consumers in the long term. Therefore such a methodology could in principle contribute to the national energy objectives.

However, a number of conditions need to be satisfied for a TFP methodology to work properly and promote efficient regulatory decisions. We find that such conditions are not likely to be met at the present time. Crucially, the current lack of a sufficiently robust and consistent data-set means that it could be too problematic to reconstruct existing data for the purpose of a TFP methodology. Also the lack of data prevents

proper testing of the other conditions needed for a TFP methodology. We advise that the initial focus should therefore be on establishing a better, more consistent data-set.

In addition, we have found that the conditions needed to support a TFP methodology are more likely to be met in the distribution sectors. The material difficulties in constructing accurate productivity measures for transmission and the lumpy profile of capital expenditure, plus the more limited number of service providers, means that a TFP approach may not be successful in the transmission sectors.

Given these findings, we propose that a TFP methodology be implemented in two stages. Firstly an initial Rule be made which requires service providers to provide specified regulatory data which would then permit the AER to test for the conditions necessary for a TFP methodology and to undertake initial trials. The regulatory data would assist the AER in meeting its obligation to have regard to efficient benchmarks when making regulatory determinations under the current building blocks methodology. In addition, the development of TFP indices for the energy sectors could be used to guide wider policy decisions.

Drafting of the detailed design of the TFP methodology and making of the Rule-the second stage, – should only occur once both a) the necessary conditions can be, or are likely to be, met and b) it is considered that introducing a TFP methodology would contribute either or both the national electricity or gas objective given the status of the market at that time.

One issue with introducing a TFP methodology as an alternative to building blocks regulation is that it could lead to having two alternative forms of regulation working in parallel. While this adds to the flexibility of the regulatory regime, it will add to transaction costs and creates possible gaming incentives. Further consideration of these effects plus the effectiveness of the building block regime at that time should occur before a TFP methodology is implemented.

Conducting the implementation of a TFP methodology in two stages is the most sensible approach. Focusing solely on developing the necessary data-set would also allow proper consideration of the impact of smart grids, measures arising from the Victorian Bushfires Royal Commission and climate change on the practicality of applying a TFP methodology. It will give flexibility to adapt the design of the TFP methodology to the circumstances at that time.

Even if a TFP methodology is not ultimately applied, the collection of relevant, robust data using consistent definitions is an important part of cost effective economic regulation. We note that during the course of this Review, stakeholders have questioned the ability of the current arrangements to deliver good regulatory outcomes for consumers.

Collecting reliable and useful data will improve current regulatory practice in three ways:

1. through addressing the considerable information asymmetry problem that regulators face under the building block approach;

2. facilitating greater use of benchmarking techniques

3. help measure the effectiveness of the current regime in delivering outcomes for consumers

This is consistent with improving regulatory practice, transparency and achieving the efficiency potential of incentive regulation. This will, in turn, provide both end-users of the regulated services and service providers with greater confidence that prices reflect efficient costs over the long term. For these reasons the proposed reporting requirements should cover both distribution and transmission service providers.

Such reporting requirements will lead to costs to both the regulator and service providers from these reporting requirements. The key factor in such costs would be the need to align reporting practices to develop consistent data across the industry service providers. However given the nature of the data being requested such costs should be marginal.

We consider that the benefits would more than offset any such costs. The approximate cost of one complete cycle of revenue determinations using the current building blocks method is estimated to be $327m (which excludes the cost of any merit reviews). An incremental reduction in that cost due to the improved regulatory practice resulting from the reporting requirements would more than cover the additional costs.

Submissions on this Draft Report are to be lodged by 24 December 2010.

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1 Introduction

The Australian Energy Market Commission (AEMC) has initiated a Review into the use of a total factor productivity (TFP) methodology to determine regulated prices and revenues for electricity and gas service providers. The objective is to advise the MCE on whether permitting the use of a TFP methodology would contribute to the national gas objective (NGO) and/or national electricity objective (NEO) and, if so, to provide draft Rules.

Following our assessment, we are proposing to recommend that the use of a TFP methodology as an alternative to the building blocks approach, would have the potential to promote the national energy objectives subject to certain conditions being satisfied. This Draft Report sets out the reasoning for this recommendation and provides an opportunity for stakeholders to comment on the assessment. It presents an analysis of the potential merits and disadvantages of a TFP methodology and also discusses whether the necessary conditions needed to apply this methodology will exist in the energy markets.

This report builds on our analysis contained in the Preliminary Findings Paper (December 2009). In that paper, we indicated that a TFP methodology would increase the incentive for service providers to be innovative and seek cost efficiencies compared to the current building block approach. However, it was not appropriate to implement a TFP methodology in the short term as the available data is not sufficiently robust or consistent.

In submissions to the Preliminary Findings several service providers expressed reservations about the ability of a TFP methodology to cope with potentially large changes about to impact the distribution sectors, particularly those related to climate change and smart grids. We have subsequently undertaken extensive work on the economics behind a TFP methodology and commissioned the construction of a detailed model comparing TFP methodology and building block outcomes by Economic Insights released on 29 June 2010. This Draft Report incorporates the results of that modelling.

1.1 What is TFP?

TFP is a measurement of how businesses, industries or regions use all the inputs in their production processes to produce outputs that are valued by customers and can identify the component of the change in outputs that is not explained by changes in inputs. TFP indices provide a way of comparing how productive businesses or industries use their resources. An industry TFP growth index measures the rate at which the productivity of a group of businesses changes over time and can be used in determining the rate of change of allowed prices for regulated service providers.

The National Electricity Law (NEL) and National Gas Law (NGL) allow for a TFP methodology to be applied in two possible ways.[1] A TFP methodology could be used by the Australian Energy Regulator (AER) to set service providers' prices or revenues. Under this application, an estimate of the historical TFP growth rate is used to determine the X factor, which is the allowed rate of change, in revenues (or prices) for service providers. Alternatively, a TFP methodology could be used to assist the AER in applying the current building block approach in making determinations. In this instance, TFP indices can provide a benchmark against which the AER could assess expenditure proposals or past performance.

Both the National Electricity Rules (NER) and National Gas Law (NGR) allow the AER to have regard to efficiency benchmarks when applying the current building block approach to regulated prices and revenues determinations. This leaves the AER with the option to consider the use of TFP benchmarks under the existing arrangements. Therefore, it is whether amendments to the NER and NGR should be made to facilitate the use of TFP methodology which is the focus of this Review.

1.2 Approach to the Review

The aim of this Review is to determine whether a TFP methodology to set service providers' prices or revenues should be permitted as an alternative to the current building block approach for electricity and gas service providers. The objective is to provide advice to the MCE on:

- whether there would be circumstances in which a permitted application of a TFP methodology would contribute to either the NEO or the NGO;
- the arrangements including information, reporting and data requirements that need to be put in place to facilitate its application; and
- where appropriate, develop and recommend for the MCE's consideration draft rules to allow a TFP methodology for any individual or group of service providers.

To provide this advice, it is necessary to develop and assess the case that a TFP methodology can promote the NEO and NGO. We approached this by first addressing the economic efficiency properties of a TFP methodology. The assessment then moved to considering the practicalities of introducing a TFP methodology into the current arrangements and whether the conditions needed to support a TFP methodology exist, or would be likely to exist, in the energy markets. This was the purpose of the Preliminary Findings Paper, which set out and tested the efficiency properties and the practical application issues associated with a TFP methodology.

1 See NEL, schedule 1, clause 26J and NGL, schedule 1, clause 42(c). The NEL and NGL also allow for rules to be made for the use of a TFP methodology to assist in the resolution of access disputes. This should be permitted if a TFP methodology can be used in the original determination.

We have engaged actively with stakeholders to assess the benefits of a TFP methodology - this report represents the fourth consultation stage for the Review. This included releasing various consultant expert reports for consideration and holding workshops on the TFP design example and conducting discussion with stakeholders on TFP design issues.[2] We have sought to improve stakeholders understanding of TFP and to test the perceptions held by stakeholders as to both the merits and problems with applying a TFP methodology. We have also evaluated the extensive research done on the application of a TFP methodology to energy regulation in Australia.

The need for this Review was identified following consideration of initial submissions on the Rule change proposal on a TFP methodology for electricity distribution network regulation lodged by the Victorian Minister for Energy and Resources in June 2008 (Victorian Proposal).[3]

1.2.1 Why it is important to evaluate a TFP methodology

A TFP methodology is an alternative form of applying incentive regulation to determining regulated prices or revenues for electricity network and gas pipeline service providers compared to the building block approach. The aims of incentive regulation are to provide service providers with incentives to improve their operating and investment efficiency, service performance, and to ensure that consumers benefit from the gains. This Review is looking at how best to achieve these aims in the national energy markets. This is important given the role electricity and gas service providers play in the efficient provision of services and because of the high proportion of customer bills which is accounted for by network and pipeline charges.

Under the existing NER and NGR, regulated prices for electricity networks and gas pipelines are determined using the building block approach. The regulator estimates the efficient level of prices by assessing information and forecasts specific to each individual service provider.

A TFP methodology operates in a different way. TFP indices provide a way of comparing how productive businesses or industries use their resources by measuring how inputs are used to produce outputs that are valued by customers. Instead of an assessment of business-specific costs, the regulator links the annual change in prices to estimates of the industry TFP growth index. Hence while the regulated price at the start of a regulatory period is likely to be the same under either approach, the future path of prices could be quite different under a TFP methodology.

There can be problems with applying the building block approach which a TFP methodology might help to address. Regulators do not have complete information about the costs and operational attributes of individual service providers and will have

2 Appendix B provides a summary of the consultant reports.

3 On 23 June 2008, the Victorian Minister for Energy and Resources submitted a proposal to amend the NER to allow the use of a TFP methodology as an alternative economic regulation methodology to be applied by the Australian Energy Regulator in approving or amending determinations for electricity distribution service providers.

difficulty in estimating the true level of their efficient costs. The service provider may use this information advantage during the regulatory review process to try to increase its profits to the disadvantage of users. The outcome could be less effort by the service provider to keep costs down and prices set above the level of efficient costs.

The building block approach can often become information intensive. This can lead to significant administrative costs and make the process quite contentious as the regulator assesses the information provided by the service provider and attempts to determine forecasts of efficient costs over a number of years.

In the national energy markets, the application of the building block approach has been adapted and refined in response to such problems. However, stakeholders continue to raise concerns with the performance of service providers under this approach and the efficiency of the current level of prices. The Rule change proposal submitted by the Victorian Minister for Energy and Resources was based on such concerns and provided the impetus for this Review.

A TFP methodology could be characterised as attempting to expose regulated service providers to pressures more akin to a competitive market, where a failure to keep up with industry productivity growth would reduce profits. This could deliver stronger performance incentives. A TFP methodology could also lead to lower regulatory administrative costs and redress the information asymmetry issues faced by regulators by relying less on business-specific information when determining regulated prices.

This Review is an opportunity for a comprehensive assessment of the suitability of using a TFP methodology in the national energy markets at this time, both in terms of assessing the potential economic benefits and also addressing whether a TFP methodology could work in practice. This will determine whether permitting the use of a TFP methodology would address the concerns with the current arrangements and contribute to the promotion of economic efficiency in the national energy markets.

1.2.2 Developing the design of a TFP methodology

As a TFP methodology can take many forms, a factual model (TFP design example) was developed and refined in consultation with stakeholders to assist in the assessment. This TFP design example has been refined further to reflect stakeholder comments raised at workshops and in submissions.[4] In particular further work on the appropriate method to determine the initial price necessary for any TFP methodology has been done.[5]

Not all aspects of the design example as it currently stands could be considered complete. However, the design example has been specified to a sufficient degree to assist in the analysis for this Draft Report. Further refinements and details of the TFP methodology are more appropriately left to an implementation stage in the future. This will provide for the detailed TFP methodology required for the relevant rules to reflect

4 See Preliminary Findings, Appendix B.

5 See Appendix C.

the most recent thinking on TFP issues. In addition, at this stage the AER and stakeholders will also be able to consider recent energy market developments that may impact on the design particulars of the TFP methodology.

1.2.3 Options for reforming the Building Block Framework

The Preliminary Findings Paper stated that it may take substantial time to develop the necessary data-set,. It also noted that future circumstances may not support such a TFP methodology plus that the case for applying a TFP methodology in the transmission sectors is less compelling. Given these findings, stakeholders views were sought on whether other reforms to the building blocks approach should be explored. Such reforms could address the deficiencies identified in this Review and improve regulatory outcomes. To assist stakeholders, we published a report by the Brattle Group that outlined possible options for amending the current building block approach.[6]

The options identified by the Brattle Group focused on four key areas:

- setting prices to strengthen incentives;
- improving the quality of information;
- improving the regulatory process (including the appeals process); and
- how to promote innovation in the gas and electricity sectors.

A number of stakeholders responded to the Brattle Group report. In brief, stakeholders thought that while there is merit in looking further at such options and also in assessing the outcome of Ofgem's RPI-X@20 Review, they were concerned about the impact on regulatory certainty. Stakeholders noted:[7]

- any changes to the building block approach should be considered but, for many stakeholders, this should only occur after all service providers have been the subject of an AER regulatory decision;
- changes to the building block approach should be considered in preference to introducing a TFP methodology;
- the TFP Review should not be delayed while possible amendments to the building block approach are considered; and
- one significant issue with the building block approach that should be reviewed is the focus on efficient costs of a service provider.

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6 The Brattle Group, *Options for reforming the building-blocks framework*, 16 December 2009. (*Brattle Group Reform of the Building Blocks Framework*)

7 Submissions from Grid Australia, EnergyAustralia, ActewAGL Distribution, SP AusNet, ENA and APIA.

As noted by the Brattle Group and stakeholders, the UK energy regulator Ofgem has recently undertaken a significant review of the regulatory approach and process that it and its predecessors have used over the last 20 years. It is investigating how best to regulate energy network companies to enable them to meet the challenges and opportunities of delivering the networks required for a sustainable, low carbon, energy sector whilst continuing to facilitate competition in energy supply.

Ofgem published its recommendations in July 2010.[8] It found that the existing frameworks have led to businesses being too focussed on five year price cycles and also on engaging with the regulator rather than their customers. It also observed that there was limited consideration of innovation and 'how best to deliver' with the businesses having a potential bias for capital solutions rather than non-network options.

Ofgem has recommended retaining the existing ex ante form of price control with, however, a number of important modifications. The modifications recommended by Ofgem include:

- providing stakeholders with a greater opportunity to influence Ofgem and network company decision making. It considers that there is a need to involve customers more in the appeal process;
- setting outputs that network companies are expected to deliver to ensure: safe and reliable services, non-discriminatory and timely connection and access terms, customer satisfaction, limited impact on the environment, and delivery of social obligations;
- extending the length of the price control period from five years to eight, with provision for a mid-period review of the outputs that network companies are required to deliver;
- adopting a transparent and proportionate approach to assessing the price control package such that the intensity and timescale of the assessment would reflect the quality of an individual companies' business plan and its record for efficient output delivery;
- requiring a company to provide market testing evidence that its proposals reflect long-term value for money. This would include the option to involve third parties in delivery and ownership of large and separable projects, where this is expected to drive innovation, long-term value for money, and/or more timely delivery; and
- introducing a time-limited innovation stimulus package that would be open to projects at any point in the innovation cycle, and to both network companies and third parties, for innovation related to delivering the networks required for a low carbon energy sector.

8 Ofgem, 'Regulating energy networks for the future: RPI-X@20 Recommendations, Consultation', 26 July 2010.

Ofgem is due to publish its decision document with respect to these recommendations in late 2010.

As noted in the Preliminary Findings Paper, it is important to consider what amendments could be made to the current form of the building block approach applied in Australia to address its deficiencies and improve regulatory outcomes. This is part of the process of continual improvement and development of energy regulation. For example, the AER raised the issue of the imbalance of incentives between operational and capital expenditure as a general matter that requires further consideration during the Review into the Cost Recovery for Mandated Smart Metering Infrastructure.[9] That Review has also identified an issue with the strength of incentives being too high for capital assets which have relatively short asset lives (that is, less than 15 years).[10]

Drawing on the work by the Brattle Group and Ofgem, we will continue to assess and review the operation of the current building block approach as applied by the AER and Economic Regulatory Authority (ERA) over the short term. We will also observe developments and application of the NER and NGR by the Australian Competition Tribunal. This observation stage is a key part of the process of gathering information on the possible improvements and developments that can be made in the regulation of energy infrastructure.

1.3 Outline of the Draft Report

This Draft Report has been structured as follows:

- Chapter 2 summarises the draft recommendations arising from our assessment of a TFP methodology
- Chapter 3 provides our assessment of a TFP methodology against the national electricity and gas objectives
- Chapter 4 discusses what pre conditions are necessary to facilitate the application of a TFP methodology and whether such conditions currently exist in the national energy markets
- Chapter 5 concludes with our proposed way forward for the Review and sets out our draft recommendations for a Rule amendment which would facilitate a TFP methodology being implemented once the conditions are, or are likely, to be satisfied.

The appendices provide further background information and supporting analysis.

9 AER, Response to AEMC Draft Report - Request for Advice on cost recovery for Mandated Smart

10 AEMC, Draftl Report, Request for Advice on Cost Recovery for Mandated Smart Metering Infrastructure, p.20 -21, 18 June 2010.

1.4 Submissions on the Draft Report

The various stages and documents released for the Review, including the next steps, are set out in Appendix A.

This Draft Report represents a key stage in forming the AEMC's recommendations to the MCE. Once stakeholder comments raised in submissions are considered recommendations will be made to the MCE in early 2011.

Submissions on this Draft Report are requested by 5pm, Friday 24 December 2010. Submissions should refer to project number 'EMO0006' and be sent electronically through the AEMC's online lodgement facility at www.aemc.gov.au.

We will hold a workshop which explains the workings of the Economic Insights model and also on how the AEMC has had regard to the model results in reaching its draft recommendations. The workshop will be held at the AEMC Offices, Sydney on Monday, 29 November 2010 from 10.00 am to 1.00 pm. This will also provide an opportunity for stakeholders to ask any questions on the draft recommendations.

Registration for this workshop can be made through the AEMC's online registration facility by 5pm, 25 November 2010.

2 Draft findings

This chapter sets out the various draft findings presented in this Draft Report. The supporting reasoning and discussion behind these findings are provided in the relevant chapters.

Chapter 3 - Assessment of a TFP methodology against the national energy objectives

- Using a TFP methodology has the potential to create stronger incentives for service providers to pursue cost efficiencies compared to the building block approach because of two possible effects:

  (a) a TFP methodology could provide higher returns to the service provider when it makes investments and improves its operating practices which deliver continuing productivity improvements; and

  (b) it reduces the scope for the service provider to boost returns by exploiting its information advantage over the regulator.

- The higher returns are caused by the differences in timing when prices, and hence revenues, are adjusted for ongoing productivity improvements. With the TFP index being calculated using a time series of historical data the effects of ongoing productivity improvements would take time to feed through into a higher X factor. However under the building block approach, the regulator would be able to look forward and factor into the price caps any expected cost savings caused by continuing productivity improvements at the next review

- There would be more pressure on all service providers to out-perform, or at least maintain, the rate of industry group productivity growth. A poor performing service provider would face more risks under a TFP methodology than it would under the building block approach as it would need to at least achieve the industry group average productivity growth to earn its benchmark rate of return. This need to match peer performance should drive productivity and innovation

- This potential for additional efficiency under a TFP methodology could lead to lower prices for consumers in the long term

- The incentives under a TFP-based methodology depend not only on how the X factor is set but also on how prices are reset. The AEMC favours a method for determining the initial price reset for the first year of the new regulatory period which is based on the change in revenue required to realign actual revenue for the last year of the preceding regulatory period with the annual revenue requirement for the last year of the preceding period. The annual revenue requirement for the last year of the preceding regulatory period includes all non-capital costs plus the return on and return of capital where the latter components are calculated the same as they would be for the building block approach (except

that they apply to one year only and are based on actual rather than forecast costs). The annual revenue requirement would be based on efficient input prices and actual input quantities where the test for efficient input prices could be relatively light-handed and included to guard against service providers gaming by inflating the price paid for inputs

- Under a TFP methodology, the information advantage favouring individual service providers would diminish as prices would be determined by industry group factors rather than service provider-specific factors and forecasts. This could lead to improvements in efficiency as it would ensure that prices better reflect underlying efficient costs. Hence, the regulator would be in a better position to set a price path that encourages a service provider to improve its performance and reduces the potential for the service provider to capture informational rents

- A TFP methodology would not improve the balancing of incentives between operating and capital expenditures. Under a TFP methodology, periodic price resets would continue and the rules for which actual capital expenditure is rolled into the regulatory asset base (RAB) would be the same. Hence, the factors which influence the relative incentives between these two types of expenditure would be the same under either a TFP methodology or the building block approach

- An extra benefit from a TFP methodology is likely to be improved incentives for managerial efficiency and the adoption of innovative responses to unforeseen circumstances and new technologies although we cannot be certain of the extent of this impact at this time

- Under normal circumstances TFP–based regulation gives service providers achieving industry group average productivity growth the opportunity to recover their revenue requirement. It thus provides service providers with a reasonable opportunity to recover their prudently-incurred costs and maintains investment incentives

- Relatively small errors in forecasts in building block regulation can lead to significant divergences of realised revenue from actual revenue requirements which means TFP–based regulation has the potential to be a less risky alternative compared to building block regulation under normal circumstances

- A TFP-based methodology can handle significant changes and adverse cost shocks affecting the industry as a whole relatively well provided there are regular price resets or equivalent safeguard mechanisms in place. With resets every five years, the TFP-based approach can handle even large changes such as a 'wall of wire' effect and produce similar profitability outcomes to the business as usual case

- If there were significant cost increases that affect only one service provider under a TFP-based methodology then it may be more difficult for the service provider to fully recover those business-specific cost increases than may be the case under the building block approach

- A TFP methodology may result in additional risks for the service provider but this would be offset by the potential to earn higher returns. Therefore, applying the same weighted average cost of capital (WACC) in both approaches should not diminish the incentive on the service provider to make economic investments

- The development of a TFP-based methodology would assist in developing greater regulatory consistency, particularly in providing support to move toward greater consistency in regulatory reporting

- There is potential for the introduction of a TFP methodology to lead to lower regulatory costs compared to the building block approach. However the extent of any cost savings will depend upon the practical design of the methodology.

- The additional cost for a reporting regime to provide TFP relevant data will be imposed on the industry. We consider that such costs would be offset by the benefits.

- A TFP methodology could have more inbuilt incentives to undertake demand management compared to the building block approach because it includes an incentive to utilise assets well. This has the effect of encouraging the service provider to undertake demand management activity prior to the construction of new assets

- Based on its assessment against the five key criteria the AEMC is of the view that inclusion of a TFP-based methodology for setting price or revenue paths would contribute to achieving the NEO and NGO. It has the potential to improve economic efficiency and would be in the long term interests of consumers

Chapter 4 - Conditions needed to support application of a TFP methodology

- A TFP methodology requires reliable and robust data from service providers. However, the existing data are not consistent, reliable nor robust. Therefore for a TFP methodology to become available, a consistent regulatory data-set must be created

- A TFP index must reflect industry productivity to allow the setting of a price path that reflects industry costs. When certain key conditions are met in designing a TFP index (such as consistency with financial capital maintenance objectives, reflection of service provider activities, use of capital input quantities that reflect industry production characteristics and comparability between the service provider and the industry group), it should be an accurate measure of industry productivity growth and allow the recovery of efficient industry costs

- The outputs associated with electricity system security and reliability may be difficult to measure and value. However if an external service quality incentive mechanism operates with a TFP methodology there should continue to be

sufficient incentives for service providers to maintain and improve system security and reliability

- The structures of some energy sectors indicate that some service providers may have some potential or opportunity to attempt to influence the TFP growth rate. However, the incentive to carry out such action is relatively limited. On balance, it is unlikely that a TFP index will be unduly influenced by a service provider (or a group of service providers acting together)

- An important condition for a TFP methodology is that service providers within an industry group face comparable productivity growth prospects if they are managed efficiently. The preliminary indications based on a limited sample are that operating conditions (such as customer density, geographic location and spread) may not significantly influence TFP growth rates and hence differences in operating conditions would be captured by the setting of each service provider's initial price level. However we recommend that empirical testing on this be undertaken as the TFP data set is being developed

- The ability of the TFP growth index to be a good estimate of future productivity growth for the service providers within the industry group would be met in a steady and mature market. However, there is some doubt that the condition can be met in the foreseeable future as there are a range of external factors that may impact on what service providers are required to deliver. Although we note that there are design features that can be included in the TFP methodology to protect service providers, we recommend that the predictability and stability of the TFP growth rate be tested once the TFP specification is established and data are collected

- It is likely to be appropriate to implement a TFP methodology in the electricity and gas distribution sectors, but sufficiently robust data-sets would be needed to confirm whether necessary conditions exist and to assist in forming industry groups

- Our conclusion is that it appears unlikely that it would be appropriate to implement a TFP methodology for the electricity and gas transmission sectors because of the small number of service providers, the lumpiness of capital expenditure and difficulties in measuring outputs. It is, however, important to improve data collection within the electricity and gas transmission sectors to allow these issues to be tested more fully

- On balance, while it is clear that the conditions necessary to facilitate a TFP methodology do not exist today, we consider that there is sufficient potential for such conditions to arise in the future to proceed with this Review. There is a need to immediately start collecting the necessary data-set and to undertake some empirical testing. Also, for any TFP methodology there is a need to put in place defined threshold criteria which must be met before the methodology can be applied and for the methodology to contain some flexibility and safeguard mechanisms to cope with changing circumstances

Chapter 5 - Way forward

We now propose that a TFP methodology is implemented in two parts:

- Firstly, an initial Rule is made which facilitates data collection and testing. This would enable a TFP methodology to be possibly applied at a later stage; and
- Secondly, drafting of the detailed design of the TFP methodology once the necessary conditions can be, or are likely to be, met and it is considered that there is merit in allowing a TFP methodology to be used as an alternative to building blocks given the market conditions and regulatory framework applying at that time.

We consider that the initial Rule should cover the following areas:

- Collection of necessary data for a TFP methodology;
- Requirement on the regulator to produce an annual TFP data and index calculation report;
- Use of the data to test TFP methodology issues;
- Conditions needed to be met before a TFP methodology could be applied; and
- Principles for the design of a TFP methodology.

Proposed Rule for collection of necessary data for a TFP methodology would:

- Oblige all regulated distribution and transmission (electricity and gas) service providers to submit an annual information disclosure to the AER
- The requirements and definitions will be specified in a schedule to the NER and NGR. This will include financial, asset and network operational data
- Also include an obligation on the AER to develop supporting guidelines to assist in the information disclosure process. The AER will be required to establish a working group with industry representatives on the detailed coverage and specification of the required data
- This information will be publicly available (subject to substantial and approved commercial confidentiality) and audited (financial data only). It will be provided under certification of the CEO, Company Secretary and/or Board of Directors.

Proposed Rule for requirement on the regulator to produce annual TFP index and calculation report:

- The AER would be required to publish an annual TFP calculation and annual TFP report discussing its analysis on aspects of the TFP specification/methodology. The AER can only make adjustments to the data provided by the service providers to: a) adjust for structural differences to

improve the consistency of the data (for example, for different classifications of services); or b) to adjust certain years' data for certain service providers because of exceptional circumstances. Any adjustment to the data must be fully explained in the annual TFP report.

Proposed Rule for use of the data to test TFP specification options:

- The AER would be require to use the data provided under the disclosure Rule to test for the appropriate specification for calculating TFP, and the appropriate definition of the industry groups (to be included in the annual TFP report).

Proposed Rule for conditions needed to be met before a TFP methodology could be applied:

The AER would be required to use the data provided and test for the conditions necessary to support the implementation of a TFP methodology and to inform stakeholders on its assessment in its annual TFP report. The conditions are:

1. The available data is robust and consistent and can produce a TFP growth rate consistent with the criteria specified for the TFP index calculation

2. That the TFP index growth is likely to be a reasonable estimate of future potential productivity growth of the industry group

3. Service providers within an industry group face comparable productivity growth prospects.

Proposed Rule for principles for the design of a TFP methodology:

The specification for calculating the TFP growth rate and forming a TFP methodology for price determinations must comply with the following conditions:

- must use the index number approach;

- output quantities used in the calculation accurately reflect the services supplied;

- capital user costs are set exogenously, are consistent with the service provider's regulatory asset base and are consistent with the property of financial capital maintenance (FCM) - this means that a regulated business is compensated for efficient expenditure and efficient investments such that its real financial capital is at least maintained in present value terms;

- measures of capital input quantities accurately reflect industry production characteristics;

- results in a reasonably stable index over time;

- creates no systematic bias in the TFP growth estimate; and

- is consistent with promoting economic efficiency and does not result in any perverse incentives.

We intend to proceed to making a draft determination on the Victorian Minister's Rule Change Proposal request following publication of the stage 1 final report early next year. In making a determination on this Rule change proposal, the Commission will have regard to the analysis set out in the final report, any statement the MCE makes on the stage 1 final report and the process for stage 2 of this Review.

3 Assessment of a TFP methodology against the national energy objectives

In undertaking this Review, the AEMC must have regard to the NEO and NGO and the revenue and pricing principles.[11] 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 energy network systems. It also covers 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.

The Issues and Preliminary Findings Papers identified five criteria with which to assess whether a TFP methodology would contribute to the national objectives and would be consistent with the revenue and pricing principles.[12] These are:

- cost incentives – the 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;
- investment incentives – 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;
- good regulatory practice – clarity, certainty and transparency of the regulatory framework and processes to reduce avoidable risks for service providers and users;
- cost of regulation – minimisation of the costs and risks of regulation to service providers and electricity and gas users; and
- transition and implementation issues – appropriate resolution of transition and implementation issues and costs.

The following sections of this chapter assess the performance of a TFP methodology for setting price or revenue paths against each of these criteria before making an overall assessment against the objectives. The assessment of how a TFP methodology meets these criteria is against the counterfactual of the present building block approaches for gas and electricity[13]and whether maintaining the current arrangements would best promote the achievement of the national objectives. The relative advantages and

11 NEL, ss. 7-7A and NGL, ss. 23- 24.

12 AEMC 2008, Review into the use of total factor productivity for the determination of prices and revenues: framework and issues paper, 12 December 2008 (Issues Paper) and AEMC 2009, Review into the use of total factor productivity for the determination of prices and revenues: preliminary findings, 17 December 2009 (Preliminary Findings Paper).

13 Taking into consideration how the application of the building block approach differs between the gas and electricity sectors.

disadvantages of the current application of the building block approach are thus discussed in the assessment of a TFP methodology. In each section we review the relevant issues, present the draft finding and discuss the reasoning behind the draft finding.

3.1 Summary of findings

- Using a TFP methodology has the potential to create stronger incentives for service providers to pursue cost efficiencies compared to the building block approach because of two possible effects:

  (a) a TFP methodology could provide higher returns to the service provider when it makes investments and improves its operating practices which deliver continuing productivity improvements; and

  (b) it reduces the scope for the service provider to boost returns by exploiting its information advantage over the regulator.

- The higher returns are caused by the differences in timing when prices, and hence revenues, are adjusted for ongoing productivity improvements. With the TFP index being calculated using a time series of historical data the effects of ongoing productivity improvements would take time to feed through into a higher X factor. However under the building block approach, the regulator is able to look forward and factor into the price caps any expected cost savings caused by continuing productivity improvements at the next review

- There would be more pressure on all service providers to out-perform, or at least maintain, the rate of industry group productivity growth. A poor performing service provider would face more risks under a TFP methodology than it would under the building block approach as it would need to at least achieve the industry group average productivity growth to earn its benchmark rate of return. This need to match peer performance should drive productivity and innovation

- This potential for additional efficiency under a TFP methodology could lead to lower prices for consumers in the long term

- The incentives under a TFP-based methodology depend not only on how the X factor is set but also on how prices are reset. The AEMC favours a initial price (Po) reset for the first year of the new regulatory period based on the change in revenue required to realign actual revenue for the last year of the preceding regulatory period with the annual revenue requirement for the last year of the preceding period. The annual revenue requirement for the last year of the preceding regulatory period includes all non-capital costs plus the return on and return of capital where the latter components are calculated the same as they would be for the building block approach (except that they apply to one year only and are based on actual rather than forecast costs). The annual revenue requirement would be based on efficient input prices and actual input quantities where the test for efficient input prices could be relatively light-handed and

included to guard against service providers gaming by inflating the price paid for inputs

- Under a TFP methodology, the information advantage favouring individual service providers would diminish as prices would be determined by industry group factors rather than service provider-specific factors and forecasts. This could lead to improvements in efficiency as it would ensure that prices better reflect underlying efficient costs. Hence, the regulator would be in a better position to set a price path that encourages a service provider to improve its performance and reduces the potential for the service provider to capture informational rents

- A TFP methodology would not improve the balancing of incentives between operating and capital expenditures. Under a TFP methodology, periodic price resets would continue and the rules for which actual capital expenditure is rolled into the RAB would be the same. Hence, the factors which influence the relative incentives between these two types of expenditure would be the same under either a TFP methodology or the building block approach

- An extra benefit from a TFP methodology is likely to be improved incentives for managerial efficiency and the adoption of innovative responses to unforeseen circumstances and new technologies although we cannot be certain of the extent of this impact at this time

- Under normal circumstances TFP–based regulation gives service providers achieving industry group average productivity growth the opportunity to recover their revenue requirement. It thus provides service providers with a reasonable opportunity to recover their prudently-incurred costs and maintains investment incentives

- Relatively small errors in forecasts in building block regulation can lead to significant divergences of realised revenue from actual revenue requirements which means TFP–based regulation has the potential to be a less risky alternative compared to building block regulation under normal circumstances

- A TFP-based methodology can handle significant changes and adverse cost shocks affecting the industry as a whole relatively well provided there are regular price resets or equivalent safeguard mechanisms in place. With resets every five years, the TFP-based approach can handle even large changes such as a 'wall of wire' effect and produce similar profitability outcomes to the business as usual case

- If there were significant cost increases that affect only one service provider under a TFP-based methodology then it may be more difficult for the service provider to fully recover those business-specific cost increases than may be the case under the building block approach

- A TFP methodology may result in additional risks for the service provider but this would be offset by the potential to earn higher returns. Therefore, applying

the same WACC in both approaches should not diminish the incentive on the service provider to make economic investments

- The introduction of a TFP-based methodology would assist in developing greater regulatory consistency, particularly in providing support to move toward greater consistency in regulatory reporting

- There is potential for the introduction of a TFP methodology to lead to lower regulatory costs compared to the building block approach. The cost of a TFP methodology based revenue determination is expected to be less than the costs incurred in the building block approach based determination

- The additional cost for a reporting regime to provide TFP relevant data is likely to be marginal given the type of information requests and compared to the current costs in applying the building blocks

- A TFP methodology is likely to have more inbuilt incentives to undertake demand management compared to the building block approach because it includes an incentive to utilise assets well. This has the effect of encouraging the service provider to undertake demand management activity prior to the construction of new assets

- Based on its assessment against the five key criteria the AEMC is of the view that inclusion of a TFP-based methodology for setting price or revenue paths would contribute to achieving the NEO and NGO. It has the potential to improve economic efficiency and would be in the long term interests of consumers.

3.2 Efficiency incentives under a TFP-based methodology

3.2.1 Issues

This section tests the proposition that the separation between regulated prices and business-specific costs for service providers under a TFP methodology creates better efficiency incentives and consequently is more likely to protect the long term interests of customers in respect of the costs of providing regulated services.

There are three aspects to consider:

- would a TFP methodology increase the incentive for the service provider to make cost efficiencies and become more innovative;

- would a TFP methodology reduce the problems caused by the asymmetry in information between the service provider and the regulator which arises from the service provider having greater knowledge of its own costs and performance; and

- would a TFP methodology improve the balancing of incentives between the service provider undertaking operating and capital expenditures

Both a TFP methodology and the building block approach are ways to apply a CPI-X form of incentive regulation. Under both methods the incentive to reduce costs would be provided by fixing prices at the start of the regulatory period (or on a rolling basis in the case of a rolling X under a TFP methodology). The prices would be fixed regardless of what the actual costs are when they become known during the regulatory period. If the service provider can decrease its costs below the price cap then its immediate profits would increase.

The strength of the incentive on the service provider to seek efficiencies depends on how the effort by the service provider, to either make investments or change operating practices which lead to costs savings, would be rewarded with higher profits. This would depend on:

- the value of extra cost savings which would be retained by the service provider each year;
- the period for which the benefit would be retained; and
- with respect to expenditure which recurs each year, how information on past costs would be taken into account when setting allowed future revenue.

This section focuses initially on the specific question of whether using industry group TFP growth to determine the rate of change of the price caps for individual service providers would improve the incentive for them to become more efficient and innovative compared to the building block approach.

Under the building block approach, the regulator uses forecast costs provided by the service provider as a starting point when setting the price cap. However, the regulator knows less about the service provider's attributes and cost drivers than does the service provider and so there is a situation of asymmetric information. In this context regulators have frequently seen the need for independent assessment and possible modification of service provider's forecasts.

Furthermore, the service provider has the discretion to make choices not only about how it organises its operations, but also about the mixture of inputs and how hard it will work to minimise costs or what level of service quality to provide. This gives the service provider an information advantage over the regulator which it may seek to exploit to maximise its profits and minimise its risks. There is also the risk that, given the uncertainty over future costs and the need to ensure system security, the regulator may overcompensate the service provider by setting prices which are too high relative to the service provider's true costs.

This section next tests the proposition that a TFP methodology would reduce this problem of asymmetric information between the regulator and service provider.

Finally, if the regulatory arrangements encourage service providers to favour either capital expenditure or operating expenditure this may lead to service providers adopting an inefficient mix of operating and capital expenditures to operate their network which could lead to higher prices for customers.

As a TFP methodology would not set individual allowances for operating and capital expenditures there would be a perception that a TFP methodology would not distort the incentive between these two types of expenditure as much as may be the case under building blocks.

3.2.2 Draft findings

For relatively static changes such as one-off and recurrent opex reductions and one-off capex reductions, building block and TFP-based regulatory regimes of similar regulatory period length provide broadly similar efficiency incentives to service providers. However, TFP-based regimes provide substantially stronger incentives than building block regimes to reduce rates of input growth. For example, TFP-based regimes offer far stronger incentives for reduced opex growth and for ongoing capex reductions than does the building block approach.

Under a TFP methodology, the incentives for service providers to innovate and achieve ongoing productivity improvements in excess of those of their peers would be considerably stronger than under the building block approach. A TFP methodology would increase the profits for the service provider from both making investments and changing operating practices which deliver continuing productivity improvements. The risk to the service provider of not innovating and matching the performance of its industry peers would be greater under a TFP methodology. A TFP methodology has the potential to better encourage a service provider to seek out new ideas to improve its processes and lower its prices on an ongoing basis.

This stronger incentive to achieve ongoing reductions in input growth rates under a TFP-based methodology arises because in the building block case the service provider retains all of the benefit of this reduced cost over the first out-period but in the review for the second period the regulator recognises this change in both the cost level and the growth rate of costs and builds this into the building block analyses. Assuming changes are implemented near the start of the first regulatory period, the service provider hence retains none of the benefits in the second and subsequent out-periods whereas part of these benefits are retained under a TFP-based methodology.

Under a TFP methodology, a poorly performing service provider would find it more difficult to remain static and not to seek out ways to improve productivity because it needs to achieve at least industry average productivity growth to earn its benchmark rate of return. This would drive more innovation in the industry as service providers would continually seek to be ahead of the average productivity of the industry. Hence under a TFP methodology there would be more pressure on all service providers to out-perform, or at least maintain, the rate of industry productivity growth. In the long term the likely resulting higher productivity growth under a TFP-based methodology should lead to lower prices for customers.

The incentives under a TFP-based methodology depend not only on how the X factor is set but also on how prices are reset and the possible inclusion of safeguard mechanisms. The AEMC favours a P_0 reset for the first year of the new regulatory period based on the change in revenue required to realign actual revenue for the last

year of the preceding regulatory period with the annual revenue requirement for the last year of the preceding period. The annual revenue requirement for the last year of the preceding regulatory period includes all non-capital costs plus the return on and return of capital where the latter components are calculated the same as they would be for the building block approach (except that they apply to one year only and are based on actual rather than forecast costs). The annual revenue requirement would be based on efficient input prices and actual input quantities where the test for efficient input prices could be relatively light-handed and included to guard against service providers gaming by inflating the price paid for inputs. The reset would hence not include a component designed to eliminate technical inefficiency.

This approach to price resets would maximise the efficiency properties of the TFP methodology because it allows service providers to recover their efficient costs over the regulatory period provided they achieve at least average industry group TFP growth performance. It provides a mechanism that protects both service providers and consumers by ensuring prices do not diverge from efficient costs for too long a period. This gives service providers the confidence to continue investing in the sector while striving to achieve superior productivity performance. It ensures customers will not pay prices in excess of efficient costs for extended periods while also reducing the risk of system failure as may occur if the service provider is not covering its efficient costs for a prolonged period.

If there are regular price resets then there may be limited need for additional safeguard mechanisms such as off-ramps or capital modules. However, these types of safeguards may have a role to play if longer regulatory periods are adopted under a TFP-based methodology. There is a trade-off between certainty of cost recovery and incentives for efficiency in relation to the use of price reset and safeguard mechanisms. Resolution of this trade-off should be left to the time when the service provider moves to a TFP methodology as it will depend upon the commercial nature of each service provider and its attitude to risk. We consider that the TFP methodology should be open to a range of possible combinations of regulatory period lengths and safeguard provisions. We consider that this would be consistent with maintaining the efficiency properties of a TFP methodology.

We remain of the view that an efficiency carryover mechanism (ECM) cannot be readily accommodated within a TFP-based methodology as it would likely require more detailed future forecasts to be built into the approach and thereby undermine many of its efficiency properties. The TFP methodology offers substantially stronger incentives than the building block approach for ongoing dynamic cost savings and these will likely not be adversely affected by the absence of an ECM under a TFP-based methodology.

To maximise the incentive properties of a TFP-based methodology it will be necessary to ensure the industry group(s) contain service providers that have broadly comparable achievable productivity growth performance if a single group X factor is to be used. This issue is discussed in the following chapter.

Under a TFP methodology, the information asymmetry problem would diminish because:

1. the regulator would be less reliant on the service provider's forecasts and more reliant on previous industry group results instead; and

2. the use of a TFP growth index should help to ensure that changes in prices match changes in efficient costs for the service provider.

This decreases the ability of the service provider to earn rents (at the expense of customers) from exploiting its information advantage over the regulator and reduces the need for close examination (and possible modification) of forecasts by the regulator. This places more onus on the service provider to seek additional profits through making real productivity improvements. Efficiency will improve as price changes are more likely to better reflect changes in underlying efficient costs and there is less risk of the service provider earning undue excess profits.

If there were significant changes in market characteristics then a TFP methodology may not be as effective in alleviating information asymmetry to the extent that market changes break the link between historical and future productivity growth. However, the building block approach also has similar difficulties in dealing with uncertainty.

A TFP methodology would neither improve nor make worse the balancing of incentives between operating and capital expenditures. This is because the factors which influence the relative incentives between these two types of expenditure would be the same under either a TFP methodology or the building block approach.

3.2.3 Reasoning

The aims of and different approaches to incentive regulation

The building block approach and a TFP methodology are alternative methods for applying incentive regulation to the determination of revenues and prices. The aims of incentive regulation are to provide service providers with the opportunity to recover efficient costs while also providing them with incentives to improve their operating and investment efficiency, their service performance, and to ensure that consumers share the benefit from the gains.

The incentive to reduce costs is provided by setting the prices or revenue to apply during the regulatory period at the start of the regulatory period, regardless of what actual costs during the regulatory period turn out to be. Hence, the service provider is able to earn extra profits from out-performing the allowed revenues or prices. In doing so, incentive regulation attempts to replicate the discipline that competitive market forces would impose on regulated service providers if they were present. These forces compel service providers that realise productivity gains to pass these gains on to their customers in the form of lower prices (after accounting for changes in input prices) over time.

The building block approach attempts to meet the goals of incentive regulation by relying on service provider-specific forecasts., The building blocks approach to price regulation involves forecasting a stream of annual 'revenue requirements' for each service provider based on the costs it would incur if it was acting prudently.

The forecast costs are made up of opex, the return of and return on capital and a benchmark tax liability (which takes account of the differences between regulatory and taxation parameters and allowances) and are in turn based on forecasts of the quantities of outputs that will be sold over the forthcoming regulatory period. The forecasts also incorporate assumptions about the future productivity of the service provider.

Once the forecasts of output quantities and annual revenue requirements have been made, the P_0 and X factors are set so that the net present value of the forecast operating revenue stream over the upcoming regulatory period is equated with the net present value of the forecast annual revenue requirement stream. Since there is an infinite number of P_0 and X factor combinations which will satisfy this condition, the X factors are usually set at an exogenous value (often zero) and then the P_0 is set to equate the net present value streams.

Financial capital maintenance (FCM) is a key principle in the building blocks approach. FCM means that a regulated service provider is compensated for prudent expenditure and prudent investments such that, on an ex-ante basis, its financial capital is at least maintained in present value terms. If the service provider-specific forecasts turn out to be accurate then FCM will be achieved ex-post. However, since forecasts are rarely entirely realised in practice, FCM will typically not be achieved ex-post. It is more likely that service providers will be over compensated as they can control expenditure to a certain extent.

Under a TFP-based methodology the two key dimensions of incentive regulation are again the initial level of the cap (on allowed revenue or prices) and the rate of change of the cap over time but they are set in a different way compared to the building blocks approach:

- The initial revenue or price cap is set by the regulator to reflect the annual revenue requirement for the service provider (referred to as P_0 determination) at the start of the regulatory period[14]

- The rate of change sets the allowed path for the service provider's inflation adjusted prices or revenues over the course of the regulatory period. This consists of two components: the estimation of the expected productivity growth of the industry group (net of the general economy-wide productivity growth); and an allowance for the difference between the growth of input prices for the industry group and the economy-wide input price growth rate. The rate of

14 In practice there may be a small forecasting element to this assessment because the regulator will be working from the most recent set of regulatory accounts, which will relate to one (or two) years prior to the first year of the forthcoming regulatory period.

change is typically represented by the X factor within the price path formula CPI-X.

Measures of TFP growth can be used to determine the price or revenue path, providing an alternative to the building block approach of carrying out an analysis of service provider-specific cost forecasts. Under a TFP methodology, the X factor is set according to an external benchmark; that is, the observed productivity performance (or rate of change in productivity) of a relevant 'industry group' (which would be a group of comparable service providers) over time.

Under a TFP methodology, if the initial cap is set to recover the opening annual revenue requirement (including capital funding costs), the industry group consists of broadly comparable service providers and the historical TFP growth rate reflects productivity growth that can be expected going forward, then the service provider should be able to recover its costs and earn a reasonable rate of return thus achieving FCM. This is illustrated in the base case (or business as usual) scenario presented in the Economic Insights Model. As under the building block approach, variations of future events from the extrapolation of past industry group productivity growth will mean that FCM may not be achieved ex-post.

A TFP methodology thus links service providers' prices and revenue to the observed productivity performance of the industry group as a whole instead of basing them on forecasts of service provider-specific costs. As a result it is claimed that compared to the building block approach, a TFP methodology could deliver stronger performance incentives. This is examined in the following section.

Incentives to seek cost efficiency

Both a TFP methodology and the building block approach would allow the service provider to keep the difference between its actual costs and allowed costs for some period of time before price levels are adjusted (this is called 'regulatory lag').

The TFP growth index would be calculated using a time series of historical data. Hence the effects of ongoing productivity improvements would take time to feed through into a higher X factor and the extent of the increase in the X factor depends on what proportion of service providers adopt the changes leading to the productivity improvement. In contrast, under the building block approach the regulator is able to look forward and factor into the price cap any forecast costs savings caused by service provider-specific ongoing productivity improvements. As a result, for constant productivity improvements, there would be a difference in the regulatory lag between a TFP methodology and the building block approach. This was a key finding in the Preliminary Findings Paper.

We requested Economic Insights to include quantitative estimates of the relative strength of incentives for productivity improvements in the Economic Insights Model Report. Economic Insights looked at a number of opex and capex reduction scenarios

affecting one service provider in the industry group only.[15] These included a one-off opex reduction, a recurrent opex reduction, a reduced opex growth rate, a one-off capex reduction and a recurrent capex reduction.[16] These changes were taken to be unanticipated at the time of the first regulatory review (year 11 in the model) but, in the case of building blocks, are recognised at subsequent reviews.[17]

The model assesses the strength of the incentive to achieve additional cost savings by calculating a retention ratio which is the present value of savings retained by the service provider relative to the present value of total savings available from the change over the model's 15 out-years. The model includes a 5-year regulatory period building blocks regime and four TFP regimes comprising: three 5-year fixed periods, two 7 or 8-year fixed periods, one 15-year fixed period and a rolling X factor over the 15 out-years. In each case there is a price reset at the start of each regulatory period.

Table 3.1 Retention ratios for unanticipated opex reductions

Retention Ratios	One–off opex reduction	Recurrent opex reduction	Reduced opex growth rate
Building Blocks	100%	41%	17%
TFP – 3 fixed periods	100%	39%	36%
TFP – 2 fixed periods	100%	51%	52%
TFP – 1 fixed period	100%	100%	100%
TFP – Rolling X	84%	88%	91%

Source: Economic Insights Model Report, p.33

The results of the model simulations for opex reductions are presented in Table 3.1. For a one-off opex reduction in one year only all of the benefits are retained by the service provider under the building block and the three fixed period TFP regimes. Most of the savings are retained by the service provider under a rolling X factor TFP regime. For a

[15] It should be noted that Economic Insights' findings regarding the incentive properties of building block versus TFP-based methodologies are invariant to the choice of P0 and X factor combinations. This is because the building block P0 and X parameters are not independent of each other and, once one is set, the other is set to equate the net present value of forecast revenue with the net present value of forecast revenue requirements. For convenience Economic Insights has generally set X=0. Setting X=P0 approximately equates end-year forecast revenues and revenue requirements for each out-period. While the latter approach produces a smoother building blocks price path than setting X=0 if the building blocks forecasts are completely accurate, if the building blocks forecasts are not completely accurate (as will inevitably be the case) then the building blocks price path will tend to diverge from the actual unit cost path (and the TFP-based price path) producing a less smooth price path for consumers.

[16] A one-off reduction affects one year only before the series returns to its former value. A recurrent reduction is a reduction of a given amount which occurs in all subsequent years leading to a 'step change' in the series. A reduced growth rate means that the series grows at a slower rate after the year in question (e.g., by 0.5 per cent per annum instead of by 1 per cent per annum).

[17] The model does not include an efficiency benefit sharing scheme in its building blocks approach but the changes were implemented at the start of the first period to provide results equivalent to those with an efficiency benefit sharing scheme.

recurrent opex reduction around 40 per cent of savings are retained by the service provider under both the building block and the three fixed 5-year period TFP regimes. This is because the price reset at the start of the following regulatory period passes most of subsequent benefits on to customers. Extending the length of the fixed period for TFP-based regulation leads to the service provider retaining more of the saving. With two fixed periods over the 15 out-years the service provider retains around half the savings and with one fixed 15-year period the service provider retains all of the savings.[18],[19]With a rolling X factor TFP-based regime the service provider retains 88 per cent of the benefit.

A significant difference between the five-year building block and fixed period TFP-based regimes emerges where the opex saving is in the form of a reduced opex quantity growth rate. In this case the service provider only retains 17 per cent of the benefit under building blocks because the regulator recognises the service provider's lower opex growth rate at the start of the second regulatory period and builds it into subsequent forecast revenue requirements.

Under the five-year fixed period TFP-based approach the service provider retains 36 per cent of the benefit because the X factor continues to be based on the industry TFP growth rate rather than the individual service provider's now higher TFP growth rate. Again longer regulatory periods under a TFP-based regime lead to more of the benefit being retained by the service provider because there is longer between price resets.

Turning to capex reductions the results of the model simulations are presented in Table 3.2[20]. Unlike the case of a one-off opex reduction where the change in costs is confined to one year only, a one-off reduction in capex produces a lower RAB in subsequent years and thus lower return on and return of capital components of the annual revenue requirements in subsequent years. With a one–off reduction in capex 37 per cent of the benefit is retained by the service provider under the building block approach. It retains all of the benefits during the first out-period but at the review for the second out-period the regulator recognises the lower actual capex during the first period in the RAB roll-forward and so the service provider retains none of the benefits in the second and third out-periods.

18 Although it was not modelled, extending the regulatory period length under the building block approach would also increase the retention ratio.

19 In reality the retention ratio will be less than 100 per cent for the one fixed 15-year period case because prices would be reset in year 16 but the model only goes forward 15 years. However, what happens beyond year 15 will be heavily discounted in present value terms.

20 The model uses a discount rate of 8.8 per cent and assumes an asset life of 50 years (although only 15 out-years are included in the model).

Table 3.2 Retention ratios for unanticipated capex reductions

Retention Ratios	One–off capex reduction	Recurrent capex reduction
Building Blocks	37%	12%
TFP – 3 fixed periods	31%	37%
TFP – 2 fixed periods	43%	50%
TFP – 1 fixed period	100%	100%
TFP – Rolling X	88%	91%

Source: Economic Insights Regulatory Model Report, p.36

In the three fixed 5-year period TFP-based regime the service provider retains 31 per cent of the benefits. Again it retains all of the benefits during the first out-period. But in this case prices are reset at the start of the second out-period to equate revenues and actual revenue requirements (as at the last year of the first out-period) rather than to equate the forecast net present values of revenue and revenue requirements over the whole second out-period as in building blocks.

Retention ratios are higher for the longer fixed period TFP-based regimes with the service provider retaining 43 per cent and 100 per cent under the two period and one period regimes, respectively.[21] Under the rolling X factor approach a small proportion of benefits are passed onto customers as the changing of weights away from capital and towards opex progressively lead to a higher measured TFP growth rate and hence a higher X factor compared to the base case.

A major difference in retention ratios emerges in the recurrent reduction in capex scenario. This scenario is effectively similar to the reduced opex growth rate scenario above because the recurrent percentage drop in capex leads to a reduced rate of growth of the RAB over time - and, hence, of the return of and return on capital annual revenue requirement components. In the building block case the service provider retains all of the benefit of this reduced cost over the first out-period but in the review for the second period the regulator recognises this change in both the cost level and the growth rate of costs and builds this into the building block analyses. The service provider hence retains none of the (increasing) benefits in the second and subsequent out-periods and retains only 12 per cent of the total benefits.

Under the three fixed five–year period TFP-based regime the service provider retains 37 per cent of the benefit. It again retains all of the benefit for the first out-period and also retains the in-period increase in benefits for the later periods. Again, the longer the fixed period, the higher the retention ratio with the service provider retaining 50 per cent and 100 per cent of the benefits for the two fixed period and one fixed period

21 Again in reality the retention ratio will be less than 100 per cent for the one fixed 15-year period case because prices would be reset in year 16 but the model only goes forward 15 years. However, what happens beyond year 15 will be heavily discounted in present value terms.

regimes, respectively. Again under the rolling X factor regime the changing composition of costs and associated weight changes leads to a progressive but small increase in the measured rate of industry TFP growth. This leads to an associated small increase in the X factor leading to customers getting 9 per cent of the benefit under this option.

To summarise the model findings, for relatively static changes such as one-off and recurrent opex reductions and one-off capex reductions, building blocks and TFP-based regulatory regimes of similar regulatory period length provide broadly similar incentives. However, all TFP-based regimes provide substantially stronger incentives than building blocks to reduce rates of input growth. For example, the TFP-based regimes offer far stronger incentives for reduced opex growth and for ongoing capex reductions than does the building block approach. Therefore, in practice, the additional benefit from a TFP methodology compared to building blocks will depend upon the nature and value of the possible expenditure efficiencies open to the service provider.

Stakeholders expressed a range of views on the incentive properties of TFP-based regulation in submissions on the Preliminary Findings Paper. The joint submission from Multinet and United Energy agreed that a TFP methodology would create stronger incentives for service providers to pursue cost efficiencies compared to the building block approach and it offered scope to lengthen regulatory periods.[22] SP AusNet noted that the power of the incentives under a TFP-based regime would be greatly improved if longer (or indefinite) regulatory periods were adopted. It considered that the length of the regulatory period should be at least 10 years, and possibly longer.[23]

Energex considered the strength of incentives due to the length of the regulatory period to be comparable under both approaches, as service providers will be able to nominate the period under TFP as is currently the case under the building block approach.[24] It noted that if the regulatory periods for a TFP methodology and the building block approach were the same and revenue/prices were reset regularly then the incentive properties of the two approaches are likely to be the same. As illustrated by the modelling results presented above, while this is the case for relatively static changes in both opex and capex it is not the case for changes to input growth rates where the TFP-based methodology has considerably stronger incentives.

Jemena's submission included a detailed analysis of incentives under a TFP-based methodology focussing on the example included in the Preliminary Findings Paper (reproduced below in Figure 3.1) of the.[25] In this example a service provider has not undertaken changes that would reduce opex by 1 per cent per annum over 10 years. In this example it was stated that these changes had already been made by the rest of the industry. We argued that in this circumstance a TFP-based methodology would provide stronger incentives for the service provider to catch up as it would be able to

22 Multinet and United Energy Submission, February 2010, p.1.

23 SP AusNet Submission, February 2010, p.5.

24 ENERGEX Submission, February 2010, p.1.

25 Jemena Submission, March 2010, pp.10-15.

outperform the industry TFP growth rate for two 5-year regulatory periods. The service provider would retain the benefits of within period improvements for both five-year regulatory periods compared to only the first regulatory period under a building block approach. An implicit assumption in the Preliminary Findings example was that the service provider was starting from a position of full cost recovery at the start of the period. This would be the case if the changes that had been implemented by other service providers had been done some time previously and any effects of that had already been worked through the system.

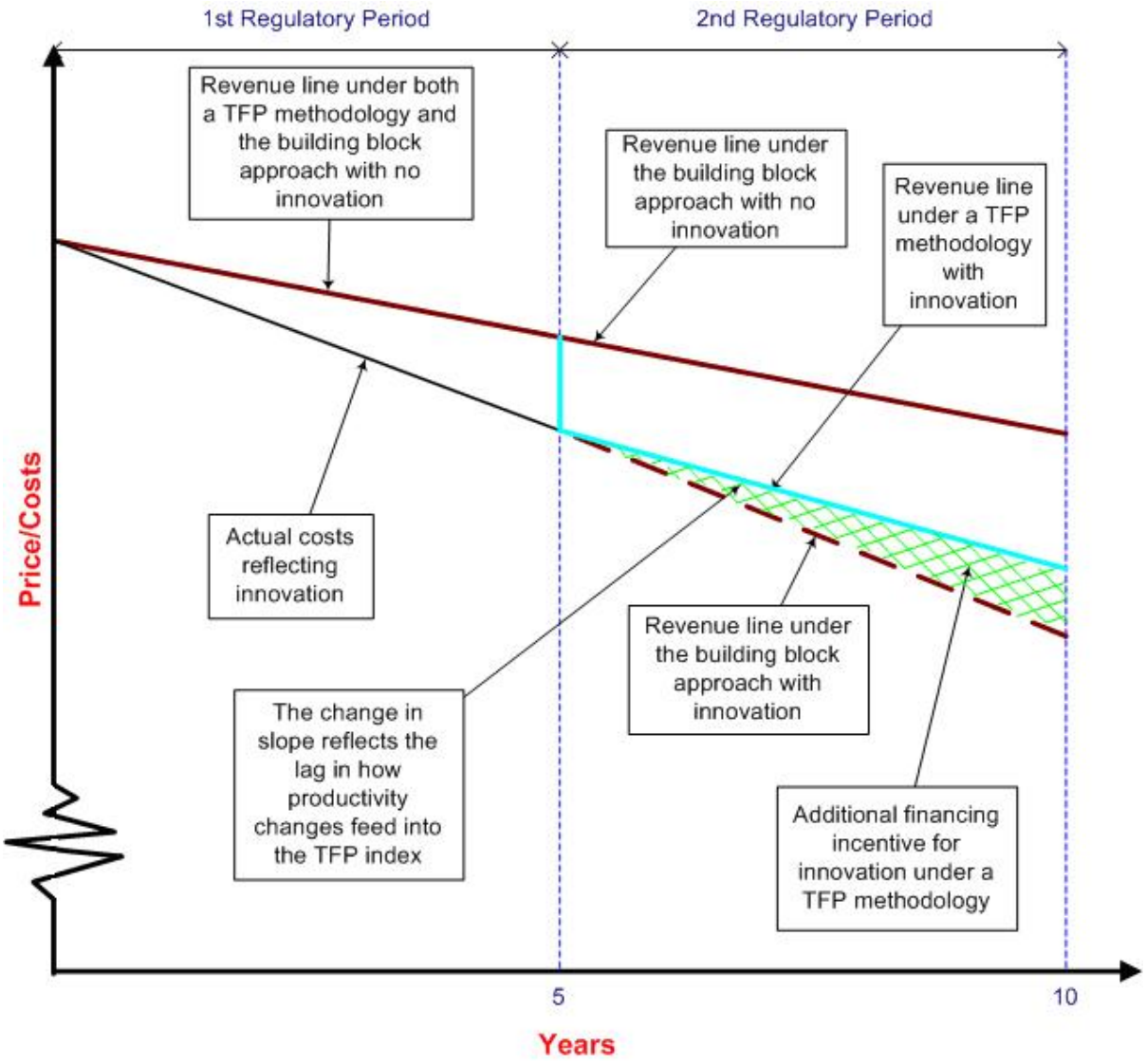
Jemena examined a more specific scenario where there was no productivity growth in the industry then a period of 10 years of productivity growth of 1 per cent per annum before returning to another period of no productivity growth. The lagging service provider starts to implement the changes at the same time that the rest of the industry has completed implementing the changes. This means that the effects of the industry-wide change have not worked their way through the system and need to be explicitly taken account of. In this case the lagging service provider will have faced an X factor that was based on a higher rate of productivity growth than it had been achieving for several years prior to it starting to implement the changes. It will have hence not been recovering its annual revenue requirements for those several years.

Once the lagging service provider starts to implement the changes it will be achieving higher productivity growth than the industry for the 10 years that it takes to implement the changes. If there are price resets then the lagging service provider will be able to earn more than its annual revenue requirement for several years. But, Jemena argue, this period of earning more than the annual revenue requirement has to be considered in conjunction with the earlier period of revenue less than the annual revenue requirements due to the service provider's lagging performance.

In the context of the specific example considered by Jemena the present value of revenues for the lagging service provider fall short of the present value of annual revenue requirements by a small proportion when the earlier period is also taken into account.[26] Jemena noted that the TFP-based approach provided more of a stick than a carrot to the lagging service provider to catch up to industry productivity levels in its example.

26 Jemena made its spreadsheet model available to the AEMC upon request.

Figure 3.1 Additional incentive for efficiency and innovation under TFP



Source: AEMC Preliminary Findings Paper, p.14

Jemena also looked at the converse example where a leading service provider implemented the change but the industry did not start to implement the change until the leading service provider had completed its implementation. Jemena showed that if there were no price resets then the present value of revenues exceeded the present value of annual revenue requirements by up to 4 per cent for the leading service provider and thus there was a significant carrot.

It went on to show that, in the context of its specific example, if there are periodic price resets then revenues initially exceeded the leading service provider's revenue requirements before falling short of them for a short period after the end of the 10-year implementation period as the rest of the industry caught up and the X factor temporarily increased. The introduction of price resets leads to the present value of revenues for the leading service provider exceeding the present value of its annual

revenue requirements by 1 per cent. Price resets also reduced the losses a service provider would incur by lagging the implementation of the change.

It should be noted that the simulation reported in the Jemena submission differs somewhat from the corresponding simulation undertaken in the Economic Insights Model and discussed above. In the Economic Insights simulation the service provider outperforms the industry for the 15 out-years in the model by reducing its rate of opex growth compared to other service providers. In the Jemena simulation the other service providers catch up to the leader in the out-period and the industry then has no productivity growth after this. The benefits to the leader and corresponding incentives are larger in the case where the leader is able to keep ahead of its peers for an extended period.

The analyses in the Economic Insights Model and the Jemena submission indicate that using a TFP-based methodology to determine the X factor could contribute to a material improvement in productivity. A TFP methodology would lead to more competitive disciplines being placed on the service provider where profits would become dependent upon how the service provider performs relative to its industry group. There would be more pressure on all service providers to out-perform, or at least maintain, the rate of industry productivity growth.

A poor performing service provider would find it more difficult to remain 'inert' under a TFP methodology than it would under the building block approach as it would need to achieve at least industry average productivity growth to earn its benchmark rate of return. However the analysis by Jemena highlights the importance of including flexibility on both the length of the regulatory period and the approach to defining industry groups in the TFP methodology.

These additional incentive properties would have a considerable positive benefit through the promotion of innovation.[27]The risk to the service provider of not innovating and matching the performance of its industry peers would be greater under a TFP methodology. A TFP methodology would better encourage a service provider to seek out new ideas to improve its processes and lower its prices on an ongoing basis.

Some analysts have argued that comparisons of a TFP methodology and the building block approach only find stronger incentives in the TFP methodology case because the nexus between revenues and efficient costs is allowed to be broken in the case of the TFP methodology whereas it is required to be maintained under building blocks. An argument could be made that the nexus could also be broken in the building block approach – as is done when an efficiency carryover mechanism is included – in which case the two approaches would have similar incentive properties.

27 Innovation refers to the process of capturing and exploiting new ideas that could lead to improved products and processes. Innovation and technological progress are crucial for long-term productivity growth of the individual service provider as well as the sector as a whole. The adoption of technical change will be influenced by the regulatory framework and the incentives that it provides.

However, behaviour under a TFP methodology could be expected to be different because the service provider has more certainty regarding the treatment of future costs and the price cap setting process. It would also not be possible for the regulator to provide the same degree of commitment under the building block approach without fundamental changes to the current regulatory framework. For these reasons, a TFP methodology is likely to offer the better approach to providing stronger incentives.

The role of price resets and safeguards

One of the key objectives of TFP–based regulation is to increase the power of the incentive provided to service providers. By allowing service providers to keep more of the benefits from productivity improvements they achieve in excess of the industry group average, TFP–based regulation provides service providers with a stronger incentive to seek out productivity improvements. It does this by (partly) breaking the link between prices and the service provider's own costs.

However, the cost of this increased incentive power is a corresponding increase in risk that prices and service provider costs will progressively diverge leading to substantial over–earning or substantial under–earning by a particular service provider. This involves potentially large costs for consumers if service providers over–earn under a TFP–based regime, large costs for service providers in the event of under–earning (and also for consumers if service providers end up failing as a result) and the risk of potential loss of credibility for the regulator in both cases.

To counter these risks, nearly all TFP–based regulatory regimes include at least one safeguard mechanism (Appendix D provides explanation on the range of possible safeguard mechanisms). In North America safeguards have typically taken the form of earnings sharing mechanisms (which progressively share both the upside risk and downside risk of divergences of the return to capital from a specified target rate) or 'off-ramps' (which trigger a price review if the return to capital moves outside a specified band). In Ontario a capex module is included which provides some price relief for unexpected increases in capex.

Starting period price resets to align revenues and costs are another form of safeguard mechanism which limit the risk of revenues and costs diverging excessively. Indeed, by including P_0s the likelihood of other safeguard mechanisms being needed is greatly reduced.

Apart from safeguard considerations, if a TFP–based regulatory regime is to provide service providers with a reasonable chance of recovering their revenue requirement over the regulatory period then it is desirable that revenues align with the annual revenue requirement at the start of the period. However, there are different interpretations of what is meant by 'efficient costs' on which the annual revenue requirement at the start of the period might be based.

One interpretation is that costs reflect efficient pricing of actual input quantities used at the start of the period. This means that the prices of both opex and capital reflect the relevant opportunity costs of these inputs but that these prices are applied to actual

input quantities, regardless of whether or not there is any technical inefficiency present (ie more inputs are being used per unit of output than is strictly necessary). The requirement for efficient prices to be used may be necessary to guard against service providers gaming by artificially inflating their input prices. In practice, demonstration that efficient prices have been used could be achieved in a relatively light-handed way by requiring provision of evidence that competitive prices were paid for key inputs.

A second interpretation of 'efficient costs' is that they reflect efficient prices applied to technically efficient quantities rather than actual quantities. Since technically efficient input quantities will typically be less than or equal to actual input quantities, the second interpretation of efficient costs will potentially involve a lower cost measure – and, hence, a larger P_0 – than the first measure. However, this option would not be consistent with the rationale for a TFP-based methodology which provides a direct incentive for laggard service providers to catch up to the industry group productivity growth rate.

A number of different options for setting P_0s are discussed in Appendix C. We favour the first option discussed above (Option 1 in Appendix C). This involves calculating the annual revenue requirement for the last year(s) of the preceding regulatory period based on efficient prices and actual input quantities where the test for efficient prices is relatively light-handed.

The P_0 reset is then the change in revenue required to realign actual revenue for the last year of the preceding regulatory period with the annual revenue requirement. Unlike the building block case, the price cap for the first year of the new regulatory period involves adjusting for the CPI, the P_0 and the X factor to allow for productivity growth between the two years. The application of this approach can be seen in the Economic Insights Model.

A number of submissions on the Preliminary Findings Paper highlighted the importance of the P_0 mechanism for a TFP-based methodology. Jemena, for example, noted that an error in the initial price affects every year of the regulatory period uniformly whereas the effect of an error in TFP/X is initially zero but compounds from year to year.[28] The consequences of an error in setting the initial price for a regulatory period can thus be at least as significant in present value terms as an error in setting X.

Multinet and United Energy argued that prudency assessments of actual expenditure levels when determining P_0 would be inappropriate and inconsistent with a TFP methodology because these evaluations would be taking place after more than a decade of regulation of each service provider's price levels.[29]

Some submissions interpreted the term 'efficient costs' in the Preliminary Findings differently. For example, ENERGEX stated that the initial cap to recover efficient level of costs will be set under a building block approach and therefore will be based on business specific forecast costs and will be subject to the same assumed information

28 Jemena submission, March 2010, p.5

29 Multinet and United Energy submission, February 2010, p.9

asymmetry issues. However, as discussed above and in Appendix C, such an option for setting P_0s would be inconsistent with the rationale for a TFP-based methodology.

Submissions also addressed the issue of additional safeguard mechanisms such as off-ramps and capital modules. ENERGEX noted that the inclusion of a range of safeguard mechanisms such as off-ramps and the capital module would weaken efficiency incentives.[30] Multinet and United Energy noted that how any safeguard mechanisms would be applied is particularly important and the key issue is striking the balance between providing certainty on cost recovery and maintaining efficiency incentives.[31] Multinet and United Energy went on to state that they considered profitability off-ramps to be inappropriate as they:

- duplicate the safeguards available via regular P_0 adjustments;
- result in rate of return regulation;
- increase the complexity and weaken the design of a TFP methodology; and
- invariably inject significant regulatory discretion into the process.[32]

We agree that price resets and other safeguard mechanisms such as off-ramps are largely substitutes and there would be limited need for additional safeguards if there are regular price resets. Indeed, including additional safeguards in this case could substantially weaken the incentive properties of a TFP-based methodology. However, there may be a role for safeguards if service providers propose relatively long regulatory periods. In all cases an appropriate balance has to be maintained between providing stronger incentives for productivity improvement by partly breaking the nexus between service providers' revenues and their own costs while also ensuring that revenues and own costs do not move too far out of line.

We consider that the appropriate trade-off between price resets, regulatory period length and safeguards should be left to the time of each individual TFP determination as it will depend upon the commercial nature of each service provider and its attitude to risk. We consider that the TFP methodology should be open to a range of possible combinations of regulatory period lengths and safeguard provisions.

The role of an efficiency carryover mechanism

In its Preliminary Findings Paper we noted it would be difficult to apply an efficiency carryover mechanism (ECM) under a TFP methodology given the absence of annual forecasts of expenditure. We considered possible options to adapt an ECM into a TFP

30 ENERGEX submission, February 2010, p.1

31 Multinet and United Energy submission, February 2010, p.2

32 Multinet and United Energy submission, February 2010, p.15

methodology but found that there would be negative effects and concluded that they should not be applied.[33]

The analysis in Appendix D of the Preliminary Findings Paper showed that a TFP methodology with no ECM offered similar incentives to a building block approach with an ECM if savings were implemented near the start of the regulatory period but lower incentives if the savings were implemented towards the end of the period.

This timing problem could be offset by longer regulatory periods in a TFP methodology offering stronger incentives. We also noted that in the Demand Side Participation Review we concluded that the application of an ECM to operating expenditure only acts as a barrier to the efficient uptake of demand side initiatives. Another possible disadvantage is that it increases the incentive for the service provider to exploit its information advantage in anticipation that the regulator would set the allowed prices above efficient costs. Exclusion of an ECM would help to address these issues.

The analysis of incentives based on the Economic Insights Model is broadly consistent with the findings of Appendix D of the Preliminary Findings Paper. However, the analysis based on the model goes on to show that this is for relatively static savings such as one-off and recurrent opex savings and one-off capex savings. For more dynamic savings such as reduced opex growth rates and recurrent capex savings (which reduce the rate of capital input growth) then a TFP-based methodology offers substantially stronger incentives than a building block approach. These substantially stronger incentives are likely to more than offset the absence of an ECM in a TFP-based methodology.

Views in submissions regarding the need for an ECM differed. Multinet and United Energy were of the view that the absence of an ECM from the TFP framework together with regular P_0 resets would undermine the quest for better business practices and cost savings.[34] But SP AusNet considered it to be a design choice whether TFP-based regulation included an ECM and this design choice should be informed by the incentive properties of the TFP-based regime (which will depend on the length of the regulatory period, the definition of off-ramps, and any re-setting of prices periodically to reflect costs).[35]

We remain of the view that an ECM cannot be readily accommodated within a TFP-based methodology as it would likely require more detailed future forecasts to be built into the approach and undermine many of its efficiency properties. The TFP methodology offers substantially stronger incentives than the building block approach for ongoing dynamic cost savings and these will likely not be adversely affected by the absence of an ECM under a TFP-based methodology.

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33 For example, setting operating expenditure targets by using the opex partial productivity trend growth rate to extrapolate base period opex.

34 Multinet and United Energy submission, February 2010, p.13

35 SP AusNet submission, February 2010, p.6

Dynamic efficiency considerations

A number of submissions on the Preliminary Findings Paper noted that the energy distribution industries are facing a number of uncertainties. For example, the Energy Networks Association stated that key uncertainties include the timing and form of possible smart metering rollout obligations, smart grid developments, likely enhanced renewables uptake affecting infrastructure location and possible changes to the timing and implementation of a Carbon Pollution Reduction Scheme.[36]

The Essential Services Commission of Victoria (ESC) acknowledged the AEMC's finding that using a TFP-based methodology would increase the incentive for service providers to be more innovative and increase cost efficiency compared with building blocks.[37] The ESC went on to note that it is important to recognise that being innovative involves more than just cutting costs. It also involves adapting to unforeseen circumstances, being forward-looking, and helping to unlock the full benefits of technologies being introduced in network industries. The ESC argued that TFP-based regulation also has the potential to encourage innovative behaviour of this type and which it argued was discouraged under the building block approach which was claimed to lead to highly leveraged service providers with risk averse management styles.

The Economic Insights Model Report found that a TFP-based methodology provided considerably stronger incentives than the building block approach for service providers to seek out ongoing efficiency improvements that reduce the rate of input growth. A TFP-based methodology could, therefore, make a significant contribution to improving the dynamic efficiency of the industry.

Although we cannot be certain of the extent of this impact at this time, we stress that a TFP methodology has the strong property of potentially providing a fairly long term reward for companies that consistently perform above the industry productivity growth rate, which the building blocks approach does not necessarily do.

Asymmetric information considerations

The extent to which the service provider would be able to exploit its information advantage depends on the process used to determine the price caps. The more the process is dependent upon its own information, then the greater the opportunity for the individual service provider to exploit its information advantage.

Under the current building block approach, the process is based on a 'propose and respond' model. Under this model, the regulator assesses the service provider's proposal and accepts it (in whole or in part) unless it fails to meet specified criteria. Only in those circumstances does the regulator then determine an outcome that best meets the criteria.

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36 Energy Networks Association submission, February 2010, p.5

37 Essential Services Commission submission, March 2010, p.9

Under a TFP methodology, instead of using the service provider's forecast of future costs, the rate of change of the price cap would be set in accordance with the industry TFP growth index. This use of an external measure, instead of the service provider's forecast, would diminish the ability of the individual service provider to strategically exploit its information advantage. The scope of decisions by the regulator is reduced.

A TFP methodology would not totally alleviate the problem as, under our preferred approach, setting the initial price level would need to be based on the service provider's short term forecast of costs for the last year of the preceding regulatory period. This is because the initial price level needs to reflect the annual revenue requirement in that year and the review would be taking place during that year so some limited forecasting would be required. However, based on the TFP design, the potential for the service provider to make use of its information advantage would be substantially reduced compared to the building block approach where forecasts have to be made for all years of the next regulatory period.

Whether efficiency improvements would be achieved would depend on the ability of the TFP index to better predict future productivity compared to the regulator's assessment under the building block approach. If the use of a TFP methodology ensures that prices reflect underlying annual revenue requirements, then there would be efficiency improvements. In theory, it should enable the regulator to set stronger incentives without the risk of undue excess profit for the service provider.

Some submissions on the Preliminary Findings Paper questioned whether the extent of asymmetric information problems might be overstated. For example, Jemena stated that, given the rules around forecasting, the knowledge that regulators now have of the businesses they are dealing with, and the regulator's power to obtain information, seek advice and substitute its own view (and the track record of regulators in doing just that) it is difficult to argue that outcomes are (or can be) influenced significantly by information asymmetry.[38]

However, the information asymmetry problem can lead to the regulator taking a more intrusive approach leading to more burdensome information requirements on service providers. This in turn, may lead to the regulator becoming too much involved in operational management decisions. In its submission on the Issues Paper, the ESC discussed the problems for the regulator to detect the true level of efficient costs and the difficulties it had encountered in obtaining the correct information from service providers when making its regulatory determinations.[39]

Multinet and United Energy also noted in their submission that the reliance on business-specific forecasts, which is at the core of the building block approach, results directly in heightened levels of regulatory discretion and greater regulatory error, more burdensome information requirements on service providers, and greater intrusion by the regulator into operational management decisions.[40] They went on to

38 Jemena submission, March 2010, p.8

39 ESC submission, March 2009, pp. 40-46

40 Multinet and United Energy submission, February 2010, p.4

state that they remain less optimistic than some that the building block approach can evolve to address these inherent deficiencies and that, while a TFP methodology can be prone to incomplete data, it holds out the promise of more emphasis on known and measurable information and less exposure to regulatory judgment.

The Victorian Department of Primary Industries (DPI) submission also noted its concern with the potential loss of efficacy of the existing 'building blocks' based regulatory approach, as network businesses become more sophisticated in the presentation of their cases for additional expenditure, bearing in mind the asymmetry of information that exists between businesses and economic regulators.[41]

However, the level of uncertainty facing the regulator and the extent of the service provider's information advantage depends on how stable and predictable operating conditions would be. If there were significant changes in market characteristics then a TFP methodology may not be as effective in alleviating information asymmetry to the extent that market changes break the link between historical and future productivity growth. However, the building block approach also has similar difficulties in dealing with uncertainty.

For these reasons, we are of the view that a TFP methodology reduces the scope for service providers to increase their returns by exploiting their information advantage over the regulator and hence creates stronger incentives for service providers to pursue cost efficiencies.

Balancing incentives between operating and capital expenditures

Under a TFP methodology, the issue of balancing between operating and capital expenditures would remain. The relative incentive for the service provider to favour one type of expenditure over the other would depend on the greater value of the extra profit retained by the service provider for efficiency under either its operating or capital expenditure.

Under a TFP methodology, the relative incentives between operating and capital expenditures would remain the same as under the building block approach. This is because there would be a requirement for periodic price reviews under a TFP methodology which would affect the value of savings to service providers from making efficiencies. Also, the rules for which actual capital expenditure is rolled into the RAB would be the same. Therefore, a TFP methodology would not improve, although it would not make worse, the balancing of incentives between operating and capital expenditures.

41 Victorian Department of Primary Industries submission, February 2010, p.1

3.3 Investment incentives under a TFP-based methodology

3.3.1 Issues

For an economic regulatory approach to provide adequate investment incentives it must provide service providers with a reasonable opportunity to recover their prudently-incurred costs. Failure of a regulatory methodology to ensure that service providers are given the opportunity to recover efficient costs would damage investment incentives and put at risk system security, reliability and business continuity. It would also be inconsistent with the NEL and NGL Revenue and Pricing Principles which state that:[42]

> A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in:
>
> (a) providing reference services; and
>
> (b) complying with a regulatory obligation or requirement or making a regulatory payment.

In assessing whether a TFP-based methodology provides service providers with a reasonable opportunity to recover their efficient or prudently-incurred costs in this section we address the following issues:

- under 'business as usual' conditions does a TFP-based methodology allow a reasonable opportunity for cost recovery?
- does a TFP-based methodology provide a reasonable opportunity for cost recovery when there are future changes affecting the industry as a whole?
- does a TFP-based methodology provide a reasonable opportunity for cost recovery when there are future changes affecting one service provider in isolation?
- if a TFP-based methodology were to increase the risks of revenues not being sufficient to cover prudently-incurred costs can appropriate safeguards be put in place to ameliorate those risks?
- would changing from the building blocks to a TFP-based methodology symmetrically increase the risks for the service provider and hence increase its benchmark weighted average cost of capital (WACC)?

The issue of cost recovery only relates to changes in costs which form the regulated services charges (that is, prescribed services for electricity transmission, direct control services for electricity distribution or reference services for gas). Similar to the current arrangements, costs associated with negotiated services would be recovered through separate mechanisms outside a TFP-based methodology. Cost pass-through

42 NGL, s. 24(2).

mechanisms would also continue to apply as they currently do under the building block approach.

In making this assessment, it is also important to note that the X factor would not solely be based upon the industry group TFP index, but would also reflect industry input price inflation. As set out in the Discussion Paper, the X factor under a TFP methodology would contain a term representing the differential between the changes in industry input prices and changes in economy-wide input prices.[43]

Given the importance of investment incentives, the AEMC asked Economic Insights to place particular emphasis on cost recovery levels in its Economic Insights Model and to undertake a number of investment-related scenarios. The results of the Economic Insights Model will be drawn on in this section.

3.3.2 Draft findings

TFP based regulation gives service providers achieving industry average productivity growth the opportunity to recover their revenue requirement. It thus provides service providers with a reasonable opportunity to recover their prudently-incurred costs. Those service providers achieving above industry average productivity growth have the opportunity to exceed their revenue requirement. However, those service providers that do not achieve industry average productivity growth rates do not fully recover their revenue requirements.

An important result from the model is that relatively small errors in forecasts in building block regulation can lead to significant divergences of realised revenue from actual revenue requirements. These small forecast errors in building block regulation can lead to greater variability in profitability outcomes than those typically seen under a TFP-based methodology. Because forecasting errors will inevitably occur in practice, the model indicates that TFP–based regulation has the potential to be a less risky alternative compared to building block regulation under normal circumstances.

The Economic Insights Model also demonstrates that a TFP-based methodology can handle significant changes and adverse shocks affecting the industry as a whole relatively well provided there are regular price resets. For example, the three fixed five–year period TFP–based option performs best of the TFP-based options in the scenario involving an anticipated increase in mandated standards. And, with resets every five years, the TFP-based approach can handle even large changes such as a 'wall of wire' effect and produce similar profitability outcomes to the business as usual base case.

If there were significant cost increases that affect only one service provider under a TFP-based methodology then it may be more difficult for that service provider to fully recover its business-specific cost increases than may be the case under the building block approach. The materiality of this problem would depend on whether or not the

43 This is referred to as the 'differential of a differential' formula for a TFP-based methodology. Discussion Paper, 28 August 2009, Chapter 8.

increase in costs trend corresponds with an upward shift in the trend of an output class which is billed (for example, volumes and connections).

The AEMC is of the view that price resets and other safeguard mechanisms such as off-ramps are largely substitutes and thus there may be limited need for additional safeguards if there are regular price resets. Indeed, including additional safeguards in this case could substantially weaken the incentive properties of a TFP-based methodology. However, there may be a role for safeguards in ameliorating risk and maintaining investment incentives if service providers propose relatively long TFP-based regulatory periods. As noted earlier, we consider that the TFP methodology should be open to a range of possible combinations of regulatory period lengths and safeguard provisions.

Overall, we consider that there would not be extra financing costs to service providers under a TFP methodology compared to the building block approach. In principle, there would be no reason why a TFP methodology could not provide similar levels of certainty for investors as the building block approach.

A TFP methodology may result in additional risks for the service provider but this would be offset by the potential to earn higher returns. Therefore, applying the same WACC in both approaches should not diminish the incentive on the service provider to make economic investments.

3.3.3 Reasoning

The 'business as usual' case

The Economic Insights Model covers five electricity distribution service providers including one that is mainly rural, one that is mainly urban and three that are mixed rural/urban. Historic data levels and growth rates are calibrated against actual Australian service providers for the rural and urban service providers and the three mixed rural/urban service providers are formed from the rural and urban service providers with differing proportions of rural and urban coverage.

Data in the model covers 11 historical years and 15 future out–years. The data for each service provider covers the value, quantity and price of three outputs and four inputs along with initial capital bases and annual capital expenditure. In addition to data for each service provider, a number of economy–wide productivity and price variables are included to permit formation of the relevant X factors.

The TFP–based price cap included in the model is of the CPI–X type where the X factor has the 'differential of a differential' form. That is, the X factor includes the difference between the industry and economy–wide productivity growth rates and the difference between the industry and economy–wide input price growth rates. The economy–wide variables are included because the CPI is an output price index which already incorporates the effects of general productivity and input price growth. The TFP–based

model allows for the important regulatory principle of financial capital maintenance in forming capital user costs.

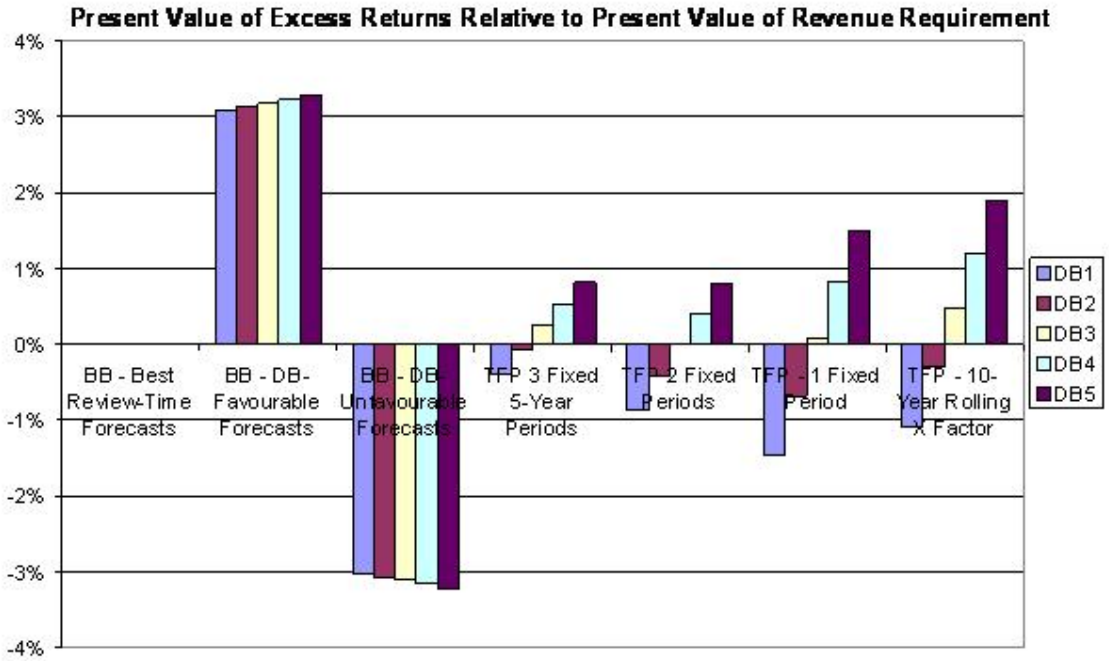
The model includes price resets at the start of each TFP–based regulatory period. The TFP-based P_0s are those required to have aligned revenue with the annual revenue requirement in the last year of the preceding regulatory period. The price cap for the first year of the TFP-based regulatory period includes this P_0 and also the X factor (to allow for productivity growth which has occurred between the last year of the preceding period and the first year of the new period). Price caps for subsequent years of the TFP–based regulatory period include just the X factor.

Four different TFP-based options are examined: three 5-year regulatory periods each with a fixed X factor, two regulatory periods (7 years and then 8 years) each with a fixed X factor, one 15-year regulatory period with a single fixed X factor, and a 15-year regulatory period with a rolling X factor.

The key profitability indicator is the ratio of the present value of the stream of excess returns to the present value of the stream of actual annual revenue requirements. Annual excess returns are defined to be the difference between operating revenue and the corresponding actual annual revenue requirement.

The base case model compares outcomes under building blocks and TFP–based regulation under business as usual conditions. That is, output and input quantities and prices tend to continue growing at their historic growth rates. Profitability indicator results are presented in Figure 3.2.

Figure 3.2 Business as usual profitability indicators



Source: Economic Insights Model Report, p.21

The base case model demonstrates that TFP–based regulation gives service providers achieving industry average productivity growth the opportunity to recover their revenue requirement. Those service providers achieving above industry average productivity growth have the opportunity to exceed their revenue requirement. However, those service providers that do not achieve industry average productivity growth rates do not fully recover their revenue requirements.

The model shows that, compared to building blocks regulation, TFP-based regulation provides a more differentiated outcome by rewarding good performers and penalising poor performers. It does this by setting parameters for the change in the price cap on industry average performance rather than the service provider's own performance. Longer regulatory periods tend to lead to a higher degree of differentiation in profitability outcomes and larger deviations from ex-post FCM.

Another important result from the model is that relatively small errors in adopted regulatory forecasts in building block regulation can lead to significant divergences of realised revenue from actual revenue requirements. For example, small forecasting errors that were favourable to the service provider (an overestimate of future opex and capex by 5 per cent and an underestimate of future output by 1 per cent) would lead to the profitability indicator being over 50 per cent higher than the most favourable TFP-based outcome. Conversely, small forecasting errors that were unfavourable to the service provider (an underestimate of future opex and capex by 5 per cent and an overestimate of future output by 1 per cent) would lead to the profitability indicator being over twice as low as the most unfavourable TFP-based outcome. Because forecasting errors will inevitably occur in practice, the model indicates that TFP–based regulation has the potential to be a less risky alternative compared to building block regulation under normal circumstances.

In its submission on the Preliminary Findings Paper, Jemena noted that it agreed in principle with the two pre-conditions that the AEMC set for a service provider to earn a reasonable rate of return and recover efficient costs under TFP regulation but suggested they should be refined as follows:

- initial cap is set to recover at least the efficient level of costs (including capital funding costs), and
- historical industry average TFP growth rate reflects the industry average productivity growth that can be expected going forward.[44]

Jemena went on to note that because the historical industry average TFP growth rate is an average for all businesses in the data pool, there must be some businesses that have a lower growth rate than the average and others with growth rates above the average. Jemena argued that because the statement in the National Objectives is specific to 'the service provider', for a TFP regime to satisfy the National Objectives there would be a need to consider adding a third pre-condition, or replacing the second pre-condition with the following:

44 Jemena submission, March 2010, p.3

- it is reasonable to assume that the service provider is in a position to achieve productivity growth at least equal to the historical industry average TFP growth rate.

As noted above, the issue of whether productivity levels and more particularly growth rates are broadly comparable is an empirical one that will need to be examined and resolved once adequate robust data becomes available. To maximise the incentive properties of a TFP-based methodology it will be necessary to ensure the industry group(s) contain service providers that have broadly comparable achievable productivity growth performance if a single X factor is to be used. Alternatively, it could be handled by having differential X factors across poor–performing, average–performing and high–performing service providers.

The case of future changes affecting the industry as a whole

We asked Economic Insights to examine the ability of a TFP-based methodology to maintain reasonable service provider profitability levels under two scenarios involving large adverse changes affecting the industry as whole in the out-years. These were:

- an increase in mandated standards – modelled as an anticipated increase of capex to 50 per cent above its base case levels for the first three years of the second out–period only and increases in capital input quantity growth rates of 2 percentage points for the same years for all five service providers. After this capex levels and growth rates and capital input quantity growth rates return to their base case values; and

- an anticipated large increase in replacement capex, or a so–called 'wall of wire' effect – modelled as capex increasing to three times its previous levels for each of the five years of the first out–period only and then returning to base case levels for all five service providers.

The Economic Insights Model demonstrates that a TFP-based methodology can handle these significant changes and adverse shocks relatively well provided there are regular price resets. For example, the three fixed five–year period TFP–based option performs best of the TFP-based options in the scenario involving an anticipated increase in mandated standards. And, with resets every five years, the TFP-based approach can handle even large changes such as a 'wall of wire' effect and produce similar profitability outcomes to the business as usual base case.

In the increase in mandated standards scenario and with three fixed five–year TFP-based periods, the service providers would not cover their revenue requirements during the second out–period with the increase in costs in the first half of that period not being recognised in advance. However, this would be largely offset by the upwards price reset at the start of the third period and a lower X factor due to the reduced rate of industry TFP growth.

The one fixed period TFP option performs worst in this scenario because there are no subsequent price resets (within the modelled out-period) to take account of the higher

cost level or the reduced industry TFP growth rate. The rolling X factor option performs better than the one fixed period option because, while there is also no subsequent price reset, the reduced rate of industry TFP growth is progressively reflected in the X factor. But the rolling X factor option performs less well than the three fixed five–year period option because the latter does have subsequent price resets which capture the step up in cost levels.

A broadly similar pattern of results is obtained in the so-called 'wall of wire' scenario with the three fixed five–year period TFP–based option profitability outcomes being very similar to those in the business as usual case. Although the service providers do not get any compensation for their increased capital costs during the first out-period, the price reset at the start of the second out-period recognises the step up in costs and subsequent X factors also allow annual real price increases, mainly because of the price differential term in the X factor. A detailed explanation of the price transmission mechanisms operating in the TFP-based methodology scenarios can be found in the Economic Insights Model Report.

More generally, the X factor's inclusion of an allowance for changes in industry input prices relative to economy-wide input prices allows for the offset of any general changes in industry costs (for example, changes in the price of materials). This would ensure that the TFP price cap moves with industry-specific changes in input prices.

The case of future changes affecting only one service provider

If there were significant cost increases that affect only one service provider under a TFP-based methodology then it may be more difficult for the service provider to recover those business-specific cost increases than may be the case under the building block approach.

The materiality of this problem would depend on whether the increase in costs trend corresponds with an upward shift in the trend of an output class which is billed (for example, volumes and connections). An assessment of the following two scenarios demonstrates the difference:

1. An increase in the number of required connections above the number of connections allowed for in the initial price cap

2. An increase in capital replacement expenditure in order to maintain compliance with system security standards or to implement measures to address the risks associated with bushfires.

The assessment of the first scenario would also depend on whether the service provider would be subject to a revenue cap or a price cap form of regulation.

Under a price-cap form of regulation, if the increase in the business-specific costs was due to an increase in the service provider's billed outputs (for example, connections and volumes), the service provider would receive extra revenue that would off-set the increase in costs. This would ensure efficient cost recovery as long as the service

provider's average unit costs do not increase above the historical average unit costs. If this condition does not hold, then there would be a potential for the under recovery of costs.

The only difference between a TFP methodology and the building block approach in this first scenario is that under the building block approach the service provider would have the ability to request a higher unit cost allowance at the start of the regulatory period. On the other hand, the regulator would only permit the increase if it considered that the increase in costs would be efficient. If the increase in unit costs was not foreseen by the service provider then a TFP methodology may have some advantages over the building block approach as the use of the rolling X form and/or the inclusion of safeguard mechanisms could provide an opportunity for earlier adjustment of revenue to deal with unforeseen cost shocks.

The situation would be more difficult for a service provider under a revenue cap form of regulation as there would be no corresponding increase in allowed revenue when outputs increase. Some adjustments would have to be made to allow for future growth in volumes and connections. Otherwise, per unit revenue would fall at a rate faster than that intended to reflect efficiency improvements. To ensure that there would be an opportunity for service providers to recover efficient costs, it would be necessary to move to a cap which included an output driver term or move to an average revenue cap.

A similar outcome would occur under the second scenario. In this case, the service provider is required to incur extra expenditure above the levels that were determined to be efficient at the time of the initial price cap. However, under a TFP methodology there would be no corresponding shift upwards in the cap to account for this extra expenditure until the next price reset. Unlike the scenario examined in the preceding section where the entire industry faced an increase in replacement investment requirements, in this case there would be little change to the industry group X factor to supplement the extra revenue from the price reset.

A rolling X under a TFP methodology would provide some compensation to the service provider only if the increase in expenditure feeds through into a higher input quantity and hence a lower TFP growth rate for the industry group. However, the extent of compensation would depend upon the length of the period over which the index would be measured and the relative weight given to the service provider in question in the industry group TFP index calculation. The compensation would not cover all increases in costs.

The role of safeguards in ameliorating risks

Safeguard mechanisms (see Appendix D) can act as a form of insurance against movements in business-specific costs and changes in the industry productivity growth trend by preventing prices from moving too far away from costs. However, the more such insurance mechanisms are employed under a TFP methodology, the greater the risk that costs would be transferred from the service provider to the customer. The key issue is striking the appropriate balance between allowing the service provider the

ability to recover efficient costs and maintaining efficiency incentives on service providers.

If service providers have the ability to pass through increases in costs this could dampen the cost efficiency incentive. However, if an efficiency assessment of past expenditure was applied then such mechanisms may continue to promote efficiency. Furthermore the design of these mechanisms should not create a perverse incentive on service providers to deliberately trigger such mechanisms. Also, off ramps would need to be designed with reference to a minimum acceptable level of returns which would ensure that the service provider remains financially stable.

The risk of costs being transferred from the service provider to the customer would also depend on how frequently the safeguard mechanisms were triggered. Ideally, the mechanisms should be triggered infrequently in order for a TFP methodology to be effective and stable. If the mechanisms were triggered often, then the suitability of applying a TFP methodology for the service provider would need to be questioned.

The analysis presented in the Economic Insights Model Report shows that regular price resets provide an important form of safeguard mechanism that can allow service providers to obtain similar longer term returns to those in the business as usual case even in the face of very large cost shocks affecting the industry. A similar result could most likely be obtained in a TFP-based methodology with long regulatory periods but appropriate safeguard mechanisms.

A TFP-based methodology and the cost of capital

Uncertainty about future regulatory decisions and commitments can lead to higher financing costs for service providers. This issue of regulatory commitment arises under the building block approach because of the timing mismatch between the five yearly price setting cycle and the timeframe for financing regulated service providers. Uncertainty in the financial markets about future price decisions and the allowed WACC tends to increase the regulatory risk premium in the cost of capital.

In principle, there would be no reason why a TFP-based methodology could not provide similar levels of certainty for investors compared to the building block approach. There would be sufficient prescription in the NER and NGR on the application of the methodology. Capital expenditure would be treated the same in the roll-forward methodology that would apply at the price reset determination under both approaches. Also, it could be argued that the issue of regulatory commitment may diminish if a TFP methodology results in less subjective decisions being made by the regulator.

A possible source of increased risk under a TFP methodology could be the level of volatility in annual profit. If a TFP methodology provides enhanced incentives it should lead to more divergence between the service provider's costs and its regulated prices. However, we do not consider this to be a material issue because under the capital asset pricing model (CAPM) greater volatility in profits would be treated as a diversifiable risk. Also, under the building block approach using the X factor as a

smoothing device creates a level of volatility in reported profits. And the Economic Insights Model shows that even relatively minor forecasting errors in a building block approach can lead to far greater impacts on profitability than those likely to be seen under a TFP-based methodology.

Another consideration is whether changes in cash flow profiles and their duration under a TFP methodology compared to the building block approach might have implications for the WACC. However, recent work undertaken for Ofgem found that the WACC is predicated on a longer term basis through returns earned on the RAB rather than through a particular cashflow profile and that the direction and size of any impact from extending the profile was unclear.[45]

In principle, there would be no reason why a TFP methodology could not provide similar levels of certainty for investors compared to the building block approach. There would be sufficient prescription in the NER and NGR on the application of the methodology. Capital expenditure would be treated the same in the roll-forward methodology that would apply at each price reset determination under both approaches. And it could be argued that the issue of regulatory commitment may diminish if a TFP methodology results in less subjective decisions being made by the regulator.

For these reasons, we continue to be of the view that service providers would not require a higher WACC under a TFP-based methodology. SP AusNet was the only service provider to comment on this issue and it stated that it is not possible to be definitive at this time regarding whether service providers would face a higher cost of capital under a TFP regime compared to a building block model. It believed more detailed information on how the TFP index would be calculated was needed before an assessment could be made.

Given this, if a TFP methodology is to be introduced, it will still be important that that adequate communication with investors and the service providers occurs to minimise the possibility of a lack of understanding of the methodology leading to investors becoming concerned about regulatory risk.

3.4 Good regulatory practice

3.4.1 Issues

In assessing the merits of a TFP-based methodology, consideration needs to be given to whether introducing a TFP-based methodology would lead to any diminution of the clarity, certainty and transparency currently incorporated into economic regulation under the NER and NGR. There have been some concerns expressed that a TFP

45 Cambridge Economic Policy Associates, Cashflow profiles and the allowed WACC, Note prepared for Ofgem, July 2010.

methodology will increase uncertainty and, accordingly, regulatory risk.[46]However, proponents of a TFP-based methodology consider that:

- a TFP-based methodology can be provided in the NER and NGR that will meet good regulatory practice; and
- the operation of a TFP-based methodology provides less potential for discretion, and accordingly provides more certainty, than the building block approach.

The analysis must also include consideration of the impact that a TFP-based methodology may have on the consistency of how economic regulation is applied.

3.4.2 Draft findings

The formation of rules for a TFP-based methodology would include the specification of criteria and circumstances relevant to the exercise of regulatory discretion. This task must take into account the requirements of good regulatory principles and practice. In this way, requirements such as clarity and certainty of regulation would be met.

The work to increase regulatory consistency in the energy sector is an ongoing process. The introduction of a TFP-based methodology would not hinder this work. In fact, it may provide a framework to assist in developing greater regulatory consistency. Specifically, the introduction of a TFP-based methodology would provide support to move toward greater consistency in regulatory reporting.

While introducing a TFP-based methodology may diminish the flexibility for jurisdictional differences to continue under the current arrangements because of the need for standardised data and practices, this issue can be managed in the detailed specification of the rules relevant to a TFP-based methodology.

3.4.3 Reasoning

In forming rules for the NER and NGR it is important that the established good regulatory principles be followed. These principles are: communication, consultation, consistency, predictability, flexibility, independence, effectiveness and efficiency, accountability, and transparency.[47] The formation of rules for a TFP methodology can and should take these principles into account.

Some aspects of a TFP-based methodology are likely to require exercise of some degree of regulatory discretion. Where this occurs, any rules that are included in the NER and NGR will require specification of the relevant criteria and circumstances in which this discretion can be used. Similar issues of how the exercise of regulatory discretion should be framed have been addressed in the context of the building block approach, indicating that this matter can be resolved.

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46 ENERGEX submission, 30 October 2009, pp. 3-4; ETSA/Citipower submission, 30 October 2009, p. 2.

47 Utility Regulators Forum, Best practice utility regulation, July 1999, p. 4

In their submission on the Preliminary Findings Paper, Multinet and United Energy noted that a TFP-based methodology offered scope to reduce regulatory risk and uncertainty, by reducing the scope for regulatory discretion when dealing with business-specific forecasts.[48] Instead the regulator would be using known and measurable information rather than relying on business-specific forecasts.

The introduction of a single regulator for electricity and gas transmission and distribution for the majority of jurisdictions significantly improves regulatory consistency for the energy industry. However, at present not all service providers have been the subject of an AER decision meaning differences in process and regulatory approaches still exist. Over time, it is reasonable to expect that these differences will reduce and greater regulatory consistency will occur as a direct consequence of having a single decision maker.

Any introduction of a TFP-based methodology to the NER and NGR would not have any negative impact on the move to greater regulatory consistency. The introduction of a TFP-based methodology increases the need to form a consistent reporting program and consistent regulatory accounts (although these goals are also desirable under the building block approach). However, introducing a TFP-based methodology may diminish the flexibility for some jurisdictional differences to continue under the current arrangements because of the need for standardised data and practices under a TFP methodology (for example, in capitalisation practices and the classification of services).

The AER noted in its submission that it intends to further the progress the development of its reporting requirements and that improving the consistency and robustness of information would help it reduce information asymmetry and improve its scope to use benchmarking in its building block determinations.[49]

3.5 The cost of regulation

3.5.1 Issues

Consideration needs to be given to whether introducing a TFP methodology will lead to lower costs of regulation. Proponents of a TFP methodology claim that it will result in substantial savings in the cost of regulation as it removes the need to prepare and assess detailed individual service provider cost and output forecasts.

To assess this issue, a comprehensive view should be taken of the 'cost' of regulation. It includes the resources and time expended by service providers, regulators and other parties that participate in regulatory processes. This includes both the cost incurred during the regulatory determination process and also the ongoing (or intra-regulatory period) costs on parties to support the regulatory methodology. Consideration of the costs incurred to establish a TFP methodology is also needed. The potential costs of a TFP methodology must be compared to the regulatory costs of proposals, consultation,

48 Multinet and United Energy submission, February 2010, p.1

49 AER submission, March 2010, p.2

consultant assessments, draft determinations, proposal revisions, final determinations and possibly appeals after the determination that are incurred under the current arrangements.

In assessing the merits of a TFP methodology, an assessment of whether introducing a TFP methodology will lead to fewer reviews of regulatory decisions is also required. Proponents of a TFP methodology claim that it will result in fewer reviews and appeals of regulatory decisions. To assess this issue, consideration needs to be given to the potential scope of matters that could be the subject of review.

3.5.2 Draft findings

There is potential for the introduction of a TFP methodology to lead to lower regulatory costs compared to the building block approach., although the extent of any costs savings will depend upon the practical design of the methodology. .

Time and resources will be required to establish a TFP methodology, in particular, to implement an appropriate regulatory reporting regime. However, a reporting regime that provides a robust and relevant data-set for each sector is required irrespective of what revenue determination methodologies are set out in the NER and NGR. Accordingly, the additional cost for such a regime to provide TFP relevant data is likely to be marginal because there is substantial overlap in the data required for either the TFP or building block method.

There is potential for the occurrence of reviews and appeals to be less under an established TFP methodology than under the building block approach. If this eventuates then regulatory costs will fall. However, the likelihood of reviews is difficult to gauge and it should be acknowledged that the introduction of any new revenue determination process may result in a higher likelihood that decisions will be reviewed in the short term.

On balance, there is potential for savings in regulatory costs to occur under a TFP methodology. These savings would be greater if a TFP methodology leads to the use of longer regulatory periods. However it is difficult to form a definitive conclusion on the cost of regulation impact of the introduction of a TFP methodology to the NER and NGR as it will depend upon the detailed design and the number of service providers being regulated under a TFP methodology.

3.5.3 Reasoning

While it is important to keep the cost of regulation down, a low cost regulatory regime will not be desirable if it does not achieve the key aims of regulation. The draft finding that a TFP methodology could lead to lower regulatory costs compared to the building block approach, results from consideration of four aspects:

- the cost to all parties in the decision making processes to determine revenues and prices under either a TFP methodology or the building block approach;

- the ongoing – or intra-regulatory period – costs to all parties of regulation;
- the initial, or set-up, costs to establish the operation of a TFP methodology; and
- review and appeal costs.

Cost of the decision making process

The Perspectives Report provided an overview of the costs of making regulatory decisions under the building block approach.[50]Using the information provided for this report the Preliminary Findings analysis indicated that the cost of a revenue determination process using the building block approach could be $327 million for one complete cycle of AER decisions (excluding any merits review).

Table 3.3 Estimated cost of building block approach decisions

	Service provider total cost	Number of service providers	$ million Total	AER total cost	Total
Electricity distribution	15	13	195	8	203
Electricity transmission	10	5	50	5	55
Gas distribution	3	11	33	8	41
Gas transmission	3	7	21	7	28

Source: Perspectives Report, AEMC analysis.

Clearly, each revenue assessment process does cost many millions of dollars in total although this will be a small proportion to total revenue over a regulatory period.

The cost of making a revenue determination using a TFP methodology would likely be less than would be incurred using the building block approach. There are two reasons for this.

Firstly, the periodic assessment of costs and prices under a TFP methodology would not require as much information (both in terms of data and supporting material) from the service provider. This is especially due to a TFP methodology not requiring projected forecasts. Nor would it require as much analysis by the regulator and its consultants (economic or engineering based) as under the current building block approach because the data would be largely historic rather than being in the form of forecasts over several out-years. These factors would reduce the cost and time of an

50 AEMC 2009, Review into the use of total factor productivity for the determination of prices and revenues: perspectives on the building block approach, 30 July 2009. (Perspectives Report)

assessment. This would still be the case even with the use of additional safeguard mechanisms such as off ramps which require some subjective decision making for the regulator.

The second reason is that the use of a TFP methodology could support longer regulatory periods. The current forms of the NER and NGR do allow regulatory periods to be longer than five years and this has already had some limited use. Accordingly, to the extent that a TFP methodology encourages greater use of extended regulatory periods, the frequency and cost of a periodic assessment of costs and prices will be reduced. It should also be noted that periodic price resets under a TFP methodology would be less costly as they would focus on actual costs for a specific year rather than forecast efficient costs for the entire future regulatory period as under the building block approach.

The Multinet and United Energy submission on the Preliminary Findings Paper noted that a TFP-based methodology offered scope to lower regulatory costs and develop a less adversarial approach.[51] Similarly, SP AusNet noted in its submission that TFP-based regulation, if designed appropriately, can provide a genuine opportunity to deliver a lower cost regulatory regime.[52]

Ongoing regulatory costs

There are some ongoing tasks that are carried out during regulatory periods. The most notable ongoing regulatory activity for service providers and the regulator is an annual regulatory reporting program. Another is the annual resetting of prices according to the specified price path.

To a large degree annual regulatory reporting and annual tariff adjustments are not dependent on the revenue determination methodology adopted. These activities will be undertaken or required regardless. However, to the extent that there may be a difference in the scope or nature of these tasks reflecting the revenue determination methodology, then there may be a small difference in the ongoing costs of regulation.

The introduction of a TFP methodology to the NER and NGR would require the regulator to calculate a TFP index using data sourced from the annual regulatory reports submitted by all regulated service providers (and possible undertake some testing of the necessary conditions as discussed in chapter 5) . This is not a difficult or cumbersome task and should represent only a minor additional cost to the regulator. In addition, the regulator will need to develop and maintain the capacity to assess two revenue determination methodologies.

51 Multinet and United Energy submission, February 2010, p.1

52 SP AusNet submission, February 2010, p.1

Establishment costs

A TFP methodology requires information on actual costs and quantities for regulated service providers to be reported to the regulator. This can be achieved through an annual regulatory reporting regime. However, an augmented annual regulatory reporting program is also expected to operate under the building block approach.[53]If a TFP methodology is available then such a program should also include the provision of TFP-relevant information.

The establishment of a robust regulatory reporting regime may take significant resources for both service providers and the regulator, which could include IT system changes for the service providers. We do not consider this to be significant given that the type of the physical and financial data required for TFP should be already be calculated by the service providers.

It is important (whether for use under the building block approach or a TFP methodology) that service providers report on comparable items. This will reduce the uncertainty about the relevant facts for a particular revenue or access arrangement proposal. That is, time must be taken to establish and define the reportable items. We consider that the additional TFP-relevant information would also be very useful for building block approaches and the fact that this information has not been systematically collected previously may reflect a shortcoming in existing building block methods.[54]

Review and appeal costs

On some occasions the regulator's decision on setting revenues and prices will be the subject of a merits and/or judicial review process. Any review represents an additional burden on the service provider, regulator and any participating intervener. A review process may cost up to $2 million for each party.[55]

Issues that are raised with the review or appeal body relate to the regulator's use of its discretion to make a decision on a proposal before it. Proponents of a TFP methodology have claimed that because the methodology uses industry information that is known and measurable (rather than relying on service provider specific forecasts) then the scope of potential reviews and appeals is reduced. This would reduce the potential cost and time in making regulatory decisions.

In the early period of using a TFP methodology, clarity on the use of discretion may be sought more frequently. In its submission ENERGEX noted that new regulatory approaches are likely to coincide with increased challenges as service providers test their interpretation.[56] The Energy Network Association (ENA) also noted that the

53 AER, Final annual compliance guideline, November 2008; AER, Issues paper: Electricity distribution network service providers annual information reporting requirements, August, 2008

54 Economic Insights Data Availability Report, p. 42.

55 Perspectives Report, p. 14.

56 ENERGEX submission, February 2010, p.3

introduction of new regimes can typically increase the likelihood of challenges as the scope of discretions or the meanings of key terms are tested.[57] However, the ENA noted that this should not simply be characterised as a cost without also recognising that an offsetting benefit of such reviews is increased certainty regarding the operation of a regime going forward.

While an established TFP methodology may reasonably be expected to give rise to fewer reviews and appeals, the extent to which this would be realised is unknown.

3.6 Transition and implementation issues

3.6.1 Issues

A number of transitional and implementation issues need to be assessed when evaluating a TFP-based methodology including:

- availability of the requisite data;
- service quality incentives; and
- demand management incentives.

The availability of requisite data and service quality incentives are analysed in detail in chapter 4. This section concentrates on demand management incentives issues.

Proponents of a TFP methodology claim that current demand management incentives schemes can operate in conjunction with the methodology.

3.6.2 Draft findings

Using a TFP methodology to determine revenues and prices will provide slightly better demand management incentives for electricity distribution service providers than the building block approach. The building block approach needs the addition of an external mechanism such as the demand management incentive scheme to provide service providers with appropriate incentives to improve asset utilisation. In contrast, a TFP methodology incorporates some demand management incentives. However, it is also feasible to operate a demand management incentive scheme in conjunction with a TFP methodology and so there would be minimal transition issues.

3.6.3 Reasoning

The building block approach does not have very good incentive properties to encourage service providers to manage demand, and hence to maximise system utilization as well. There are two key reasons for this. Firstly, the building block approach works with a pricing regime that includes prices largely based on

57 Energy Networks Association submission, February 2010, p.8

throughput or commodity.[58] Throughput-based pricing can have the effect of encouraging a service provider to seek out increases in demand or consumption. At first sight, demand management and energy efficiency considerations might point to the desirability of having prices applied to non–throughput quantities in a price cap (for example, fixed per customer charges and contracted maximum demand charges rather than throughput charges). This is because incentives to increase throughput and hence revenue and profits where there is reliance on throughput–based charges may run counter to social objectives to manage demand unless there is a separate demand management incentive term in the price cap.

However, as noted in the AEMC's Draft Report for the Demand Side Participation Review, distribution service providers have an incentive to enter into contracts with key users to reduce demand at peak times if the cost of paying those users to reduce consumption at peak times plus the associated revenue foregone is less than the annual user cost of installing additional capacity. This should remove the need for additional demand side management incentive terms on efficiency grounds.[59]

The second reason is that the current form of the building block approach encourages service providers to build up the asset base through capital expenditure without regard to first achieving good asset utilisation. This is particularly the case in the electricity distribution sector where actual capital expenditure is included in the asset base without any prudency or efficiency assessment by the regulator.

Proposals for capital expenditure may rely on the need to build additional capacity to meet increasing demand, or particularly increasing peak demand. Accordingly, the demand management incentive scheme has been developed for this sector to encourage service providers to adopt approaches that reduce the growth in demand (particularly peak demand) on the network with the effect of deferring the need to increase the asset base. That is, to encourage service providers to increase their utilisation of the existing assets before building any new assets. Where a TFP methodology is combined with a pricing methodology that includes throughput-based prices, it will suffer the same drawback as noted first above. A TFP methodology will also suffer from encouraging capital expenditure over operating expenditure to the extent that the initial price setting methodology includes a prudency or efficiency assessment of operating expenditure and not capital expenditure.

However, this incentive is countered to some degree because a TFP methodology is based directly on the inputs and outputs of production. This gives a service provider an incentive to improve its output per unit of input under a TFP methodology. That is, a TFP methodology includes an incentive to utilise assets well. This incentive has the effect of encouraging the service provider to undertake demand management activity prior to the construction of new assets. As a result, a TFP methodology has more inbuilt incentives to undertake demand management compared to the building block approach.

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58 The split between commodity and capacity based prices varies between service providers.

59 AEMC, Final report: Review of demand-side participation in the National Electricity Market, 27 November 2009, pp. 18-21.

Demand management schemes can and should work, however, with a TFP methodology. As a result there are unlikely to be significant transitional issues.

3.7 Overall assessment against the objectives

This Review was initiated to advise the MCE on whether allowing a TFP methodology in addition to the existing arrangements would contribute to the NEO and NGO.

A TFP methodology attempts to expose regulated service providers to competitive market like pressures by linking their prices and revenue to the recent productivity performance of the industry group as a whole instead of basing them on an assessment of forecast service provider-specific costs. This approach therefore offers a potentially innovative alternative to the existing building block approach. It is argued that a TFP methodology can deliver stronger performance incentives, lower regulatory administrative costs and redress the information asymmetry issues faced by regulators. As a result of these effects, it is argued that a TFP methodology would increase benefits available to consumers by lowering prices in the long run.

In order to assess whether a TFP methodology would promote the national objectives we developed five key criteria for testing whether a TFP methodology would promote economic efficiency and would be consistent with the Revenue and Pricing Principles. These criteria cover cost incentives, investment incentives, good regulatory practice, the costs of regulation, and transition and implementation issues.

The assessment of how a TFP methodology would meet these criteria is against the counterfactual of the current building block approaches for gas and electricity. This requires identifying problems with the current arrangements and determining whether a TFP methodology would address these issues.

Although the current building block approaches seem to perform well in promoting investment, there are questions on whether the current arrangements adequately promote efficiency, whether they exacerbate information asymmetries facing the regulator, and whether administrative procedures are inappropriate and too costly. These could be leading to higher prices for customers. The Victorian Proposal identified such concerns with the current arrangements which provided the impetus for this Review.[60]

A key disadvantage of the current arrangements is the ability of a service provider to use its information advantage strategically to exploit the regulatory process to increase its profits to the disadvantage of consumers. The inadequacy and inconsistency of the current regulatory reporting requirements seem to add to this problem.

The Perspectives Report set out a number of drawbacks to the building block approach identified by service providers and regulators. Relevantly, these were that the decision making process for setting revenues and prices:

60 Victorian Minister for Energy and Resources, Rule change proposal to allow use of total factor productivity methodology in distribution, 18 June 2008.

- was very information and data intensive;
- had become heavy-handed over time;
- was lengthy; and
- results in significant costs being incurred.

In terms of the five criteria set out at the start of this chapter, our draft findings on the inclusion of a TFP methodology in the NER and NGR are provided in Table 3.4.

Table 3.4 Assessment of a TFP methodology

Criteria	Assessment
Cost incentives	A TFP-based methodology provides substantially stronger incentives than building block approaches to reduce rates of input growth. For example, a TFP-based methodology offers far stronger incentives for reduced opex growth and for ongoing capex reductions than does the building block approach. A TFP methodology would increase the profits for the service provider from both making investments and changing operating practices which deliver continuing productivity improvements. The risk to the service provider of not innovating and matching the performance of its industry peers would also be greater under a TFP methodology. The stronger incentives for innovation under a TFP-based methodology arise from allowing service providers to retain the gains from implementing ongoing productivity improvements longer than compared to the building block approach. In the longer term, this should lead to service providers becoming more efficient and innovative and result in lower prices for customers.
Investment incentives	A TFP methodology, when combined with appropriately designed safeguard mechanisms, can give service providers the opportunity to recover efficient costs. It would provide incentives to invest without any greater risk than under the building block approach.
Good regulatory practice	Sufficient clarity, certainty and transparency of the regulatory framework for a TFP methodology can be achieved through providing sufficient prescription on the methodology in the NER and NGR and include the specification of criteria and circumstances relevant to the exercise of regulatory discretion. The introduction of a TFP-based methodology would provide impetus and support to move toward greater consistency in regulatory reporting across energy networks.
Cost of regulation	There is the potential for the cost of regulation to be less under a TFP methodology compared to using the building block approach. The cost of a TFP methodology based revenue determination is expected to be less than the costs incurred in a building block approach based determination. These savings would be greater if a TFP methodology leads to the use of longer regulatory periods.
Transition and	A TFP methodology can be applied with proper resolution of any

Criteria	Assessment
implementation	transition and implementation issues. Some resources will be required to implement the methodology but the additional data collection costs would be marginal. There would be significant benefits from establishing a consistent database including helping to address information asymmetries and providing stakeholders with a better means of assessing service provider performance. The issue of service quality can be readily managed by relying on an external service incentive scheme, as is currently done with the building block approach.

Based on this assessment we are of the view that inclusion of a TFP-based methodology for setting price or revenue paths would contribute to achieving the NEO and NGO. It has the potential to improve economic efficiency and would be in the long term interests of consumers.

Before a TFP-based methodology can be implemented a number of conditions have to be met. A key condition is the availability of a robust and reliable database for a sufficient period to permit the calculation of a robust and reliable measure of TFP growth. In assessing a TFP-based methodology against the five key criteria outlined at the start of this chapter, we have assumed that these conditions are met. In the following chapter we relax this assumption and examine a range of practical issues.

4 Conditions needed to support application of a TFP methodology

The preceding chapter set out our proposed reasons why applying a TFP methodology would be consistent with promoting the national energy objectives. It established the case that a TFP methodology would promote economic efficiency while allowing for the recovery of efficient costs and is therefore comparable to the application of the current building blocks methodology.

That assessment focused on the efficiency impacts of a TFP methodology and assumed that there would be no issues with data availability or the TFP index specification. However these issues could impede a practical application of a TFP methodology in the national energy markets and it is necessary to now turn to consider them.

This chapter removes the previously held assumptions and discusses what are the pre-conditions necessary to facilitate the practical application of a TFP methodology to the Australian energy markets and assesses whether such conditions currently exist. The various pre-conditions that are discussed in this chapter are:

- whether there is data currently available that is suitable for a TFP methodology;
- whether a TFP index is able to accurately reflect the industry's productivity growth and if so under what criteria;
- whether a TFP index can be influenced by service providers;
- if the service providers within the industry group have comparable expectations of productivity growth;
- whether a TFP index is a good estimate of future productivity growth; and
- the stability of the TFP index over time.

The chapter concludes with an assessment of whether such conditions exist across each of the electricity and gas sectors.

4.1 Summary of findings

We find that:

- A TFP methodology requires reliable and robust data from service providers. However, the existing data are not consistent, reliable nor robust. Therefore for a TFP methodology to become available, a consistent regulatory data-set must be created
- A TFP index must reflect industry productivity to allow the setting of a price path that reflects industry costs. When certain key conditions are met in designing a TFP index (such as consistency with financial capital maintenance

objectives, reflection of service provider activities, use of capital input quantities that reflect industry production characteristics and comparability between the service provider and the industry group), it should be an accurate measure of industry productivity growth and allow the recovery of efficient industry costs

- The outputs associated with electricity system security and reliability may be difficult to measure and value. However if an external service quality incentive mechanism operates with a TFP methodology there should continue to be sufficient incentives for service providers to maintain and improve system security and reliability

- The structures of some energy sectors indicate that some service providers may have some potential or opportunity to attempt to influence the TFP growth rate. However, the incentive to carry out such action is relatively limited. On balance, it is unlikely that a TFP index will be unduly influenced by a service provider (or a group of service providers acting together)

- An important condition for a TFP methodology is that service providers within an industry group face comparable productivity growth prospects if they are managed efficiently. The preliminary indications based on a limited sample are that operating conditions (such as customer density, geographic location and spread) may not significantly influence TFP growth rates and hence differences in operating conditions would be captured by the setting of each service provider's initial price level. However we recommend that empirical testing on this be undertaken as the TFP data set is being developed

- The ability of the TFP growth index to be a good estimate of future productivity growth for the service providers within the industry group would be met in a steady and mature market. However, there is some doubt that the condition can be met in the foreseeable future as there are a range of external factors that may impact on what service providers are required to deliver. Although we note that there are design features that can be included in the TFP methodology to protect service providers, we recommend that the predictability and stability of the TFP growth rate be tested once the TFP specification is established and data are collected

- Our conclusion is that it is likely to be appropriate to implement a TFP methodology in the electricity and gas distribution sectors, but sufficiently robust data-sets would be needed to confirm whether necessary conditions exist and to assist in forming industry groups

- Our conclusion is that it appears unlikely that it would be appropriate to implement a TFP methodology for the electricity and gas transmission sectors because of the small number of service providers, the lumpiness of capital expenditure and difficulties in measuring outputs. It is, however, important to improve data collection within the electricity and gas transmission sectors to improve the application of regulation in these sectors and allow these issues to be tested more fully.

On balance, while it is clear that the conditions necessary to facilitate a TFP methodology do not exist today, we consider that there is sufficient potential for such conditions to arise in the future to proceed with this Review. There is a need to immediately start collecting the necessary data-set and to undertake some empirical testing. Also, for any TFP methodology there is a need to put in place defined threshold criteria which must be met before the methodology can be applied and for the methodology to contain some flexibility and safeguard mechanisms to cope with changing circumstances.

4.2 An available, robust and credible data-set

4.2.1 Issue

For any TFP-based regulatory methodology to be successful, it is important that the data-set used be reliable, consistent and robust. Good quality data that is relevant to measuring and valuing the outputs and inputs of the service providers will produce a TFP index that can be reliably used to measure industry productivity growth and set the price path for service providers.

A key requirement for a robust and consistent data-set is detailed and consistent definitions of the way key output and input quantities and values have to be reported. Without this, data may have been supplied inconsistently across service providers and also through time by each service provider. And since TFP analysis has not been a central part of building blocks regulation, not all output and input quantities may currently be reported.

Without the full range of required variables and without a high degree of consistency and comparability in the underlying output and input data, TFP growth estimates may simply reflect underlying data inconsistencies and gaps rather than provide an accurate measure of actual productivity performance. This would make such TFP growth estimates unfit for the purpose of setting price paths because inaccurate targets would be set for achievable productivity improvements going forward and service providers' ability to recover their efficient costs would be put at risk.

In addition, the data-set used must cover a sufficiently long historical period to cover at least one business cycle in order to remove any business cycle impacts on the measured TFP growth rate. A time period of at least eight years in length is required to achieve this.

The data-set should also be publicly available to enable stakeholders to reach agreement on the veracity of the data used, to do their own TFP calculations and to improve the transparency and credibility of the process and the accountability of all participants in the process.

It is essential to test the currently available data against these criteria.

4.2.2 Draft finding

The AEMC continues to be of the view that existing data on the actual performance of service providers that have been provided to regulators are not sufficiently consistent, reliable nor robust to produce a TFP index that could be relied upon to determine a service provider's price path.

Most submissions on the Preliminary Findings Paper supported the view that currently available data are not sufficiently robust to support TFP-based price path decisions. However, some Victorian submissions argued currently available Victorian data were sufficiently robust and there should be no delay in implementing a TFP-based option in the NER and NGR.

4.2.3 Reasoning

Economic Insights carried out a comprehensive assessment of data currently held by all regulators for this Review. It reviewed the usefulness of the data for a TFP methodology. In particular, it considered whether the data could be relied upon as the primary basis for the setting of service provider revenues and prices. Economic Insights found a number of problems with the existing data. These were:

- the extent, quality, uniformity and continuity of the data is variable across jurisdictions and over time;
- regulatory data has focused on financial information and only very limited physical data is available
- financial data has been subject to progressive refinement and changes in coverage over time and differences across jurisdictions which compromise its usefulness for TFP purposes
- there is a lack of consistency of definitions, collection requirements, adjustments to the data, and cost allocation methods used; and
- very little of the existing data is in the public domain or, if it is, it is only available in aggregate form.[61]

It was also noted that both regulators and service providers were, in general, of the view that the existing data is not sufficiently robust to support any TFP analysis to a standard needed to set prices.[62] The Economic Insights analysis supported this view.[63]

The ESC's work on developing TFP indices also highlights the importance of reliable and consistent data. Since 2004 the ESC has reported results from a TFP methodology.

61 Economic Insights Data Availability Report, pp. v-vi.

62 DPI and ESC do not share this view. DPI submission, February 2010, p.9; ESC submission, March 2010, pp. 11-12.

63 In addition, the NAS Expenditure Profiles Report indicates that publicly available data is not a reliable information source

It has concluded that there is 'sufficient data available in Victoria to estimate a reliable TFP trend at the jurisdictional level, and that the information requirements for estimating a reliable trend are not large'.[64] However, it should also be noted that some service providers have been concerned about the calculation of the ESC's TFP indices and the Victorian DPI noted that extensive questions were raised regarding the accuracy of the ESC's database.

The ESC has also investigated the development of a national TFP trend for the electricity distribution sector. Being reliant on the good will of service providers and other regulators, the ESC had considerable difficulty in obtaining data to calculate TFP indices using even a minimalist specification. This resulted in changes to the methodology, the use of various data sources, and the use of data that was not necessarily suitable for a TFP methodology.

In its submission on the Preliminary Findings Paper Pacific Economics Group (PEG) argued that currently available data was being used for building blocks regulation and so should be good enough for TFP-based regulation.[65] However, because building block regulation uses predominantly forecast information tailored to each firm being reviewed, having a longer time-series of data that is consistent across both time and firms is far less critical than it is for TFP-based regulation where data consistency is paramount.

While the objective of national uniformity has been recognised in the past, it has not received the highest priority and data collections have in general evolved first and foremost to reflect varying jurisdictional characteristics and changing priorities. While this does not impede the use of building blocks regulation[66], this lack of consistency compromises the ability to calculate TFP trends that are sufficiently robust to use as the primary method for setting price caps.

The ESC and PEG submissions go on to argue that errors in currently available data may not be a problem for establishing a TFP trend if they are random in nature and offsetting.[67] This proposition may have some traction in a mature data collection mechanism where the reporting basis is well established and definitions are consistent over time and across firms but incorrect reporting occurs from time to time. However, this is not the case with currently available Australian energy network regulatory data where systematic differences exist in coverage and definitions both over time within each jurisdiction and across jurisdictions.

The Economic Insights Data Availability Report presents examples of where definitions have changed over time as regulators have amended their approach to building blocks in response to perceived gaming by regulated firms. In other cases the

64 ESC & PEG, *Total factor productivity and the Australian electricity distribution industry: estimating a national trend*, December 2006, pp. 2-3.

65 PEG submission, April 2010, p.6.

66 Although it could create problems for making comparisons or applying benchmarks, across different service providers when making a building block determination.

67 ESC submission, March 2010, pp. 11-12 and PEG submission, April 2010, p.7.

definition of key variables was left to the individual regulated entities themselves. While the forward-looking building blocks approach can accommodate this lack of temporal and cross-sectional consistency, it leads to data that is not fit for the purpose of calculating TFP trends to base price path decisions on.

The Economic Insights Data Availability Report also noted that in earlier discussions the ESC had drawn attention to significant problems with current data availability and integrity including:

- outsourcing practices have made it difficult to obtain data;
- the submission of 'last minute amendments' by service providers have made it difficult for the regulator to assess data accuracy;
- the focus of current regulatory accounts on financial variables and the lack of input quantity data made it difficult for the regulator to assess the accuracy of financial data submitted and there was a need to fill this gap by linking of financial and system physical data; and
- auditing deficiencies in earlier years.

The ESC submission also questioned whether data for TFP-based regulation needed to be in the public domain. If TFP-based regulation is to be accepted as a light-handed alternative and if it is to be subject to less disputation than has been the case with building blocks, then data that will be used to calculate TFP trends should be generally agreed and available to all interested parties. This provides a useful discipline to all stakeholders and reduces the scope for regulator discretion thereby increasing certainty and accountability.

SP AusNet argued in its submission that while current data may not be ideal, it could be 'cleaned' to ensure acceptable consistency in definitions. However, the difficulties the AER has had in populating its historic Regulatory Information Notices (RIN) in recent regulatory reviews is indicative of the difficulties that would be encountered in such an exercise. Staff turnover in jurisdictional regulators and service providers and associated loss of corporate memory would be a further impediment as evidenced by the slow response – and, in some cases, non-response – to Economic Insights' regulator data availability questionnaire. A process of 'cleaning' historic data would also introduce further scope for disputation and gaming, as well as reducing ownership of the process by key stakeholders.

The work from both Economic Insights and the ESC indicate that, regardless of the detailed design of a methodology, the matter of a reliable and robust data-set is a key issue that needs to be addressed before a TFP-based approach can be implemented as the primary means of setting price paths.

4.3 An accurate measure of industry productivity growth

4.3.1 Issue

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 has been some debate about the appropriate method to employ in measuring TFP growth including 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 specified and measured. It is crucial that the index specification used accurately measure productivity growth of the industry to ensure that service providers are provided with a reasonable opportunity to recover the efficient costs incurred in providing regulated services.

At this stage of the Review, it is not necessary for the Commission to decide upon the appropriate specification for calculating the TFP growth rate. This is better left to closer to when the TFP methodology will take effect and after testing based on actual data once it is available. What is necessary at this stage is for the Commission to identify the key criteria that must be met by a TFP index specification and to assess whether such criteria are likely to be met.

In addition to the key criteria that a TFP measure should satisfy, there are two specific issues that a TFP measure and a TFP-based regulatory method must be able to address:

- whether excluding a material output such as reliability would undermine the value and usefulness of the method; and
- the ability of the method to accommodate changes in system security and reliability successfully.

4.3.2 Draft finding

When certain key conditions are met in designing a TFP index, it should provide an accurate measure of industry productivity growth and, along with other aspects of the method such as the use of appropriate starting prices, allow service providers the opportunity to recover their efficient costs. The key conditions that the industry TFP measure needs to satisfy are:

- the measure creates no systematic bias in the TFP growth estimate;
- the measure is consistent with promoting economic efficiency and does not result in any perverse incentives;
- the measure is consistent with the service provider's regulatory asset base;
- there is reasonable comparability of the productivity growth prospects for the service providers within the industry group and the service provider subject to the regulatory decision;

- output quantities used in the calculation accurately reflect the services supplied and charged for;

- capital user costs are set exogenously and are consistent with the property of financial capital maintenance;

- the measurement of capital input quantity accurately reflects the production characteristics of the industry (that is, the depreciation profile used in forming the capital input quantity is consistent with physical asset depreciation characteristics).

The model prepared by Economic Insights demonstrates that distribution businesses achieving at least industry average productivity growth rates can be expected to at least recover their revenue requirement when such conditions are met.

We recognise that one risk with a TFP methodology is that the specification may not be able to capture all the outputs successfully or to adequately handle the lumpy nature of investment in the electricity and gas transmission sectors. As a consequence, the TFP index may not be a good measure of industry productivity for the transmission sectors.

Electricity distribution system security outputs may also be difficult to capture within a TFP calculation. This may impact on the ability of the TFP index to accurately reflect industry productivity for the sector. However, the relevant inputs can be measured even without the corresponding outputs. This does not discourage service providers from undertaking system security and reliability expenditure. We consider that distribution service quality will be best addressed by the continuation of existing external service quality incentive mechanisms.[68].

4.3.3 Reasoning

To help the Commission address these issues, we commissioned two reports from Economic Insights - the Sensitivity and Specification Reports.[69]

The Sensitivity Report documented the results of a sensitivity analysis of TFP estimates to variations in the methodology. The purpose was to determine whether variations in output and input specifications, the time period used, weighting methods and the calculation of the average growth rate would impact on the TFP index. To make this assessment, Economic Insights used actual data from the Victorian electricity and gas distribution service providers. Economic Insights concluded that the specification of outputs, inputs, time periods, weighting methods and the growth rate calculation method do have an impact on the resulting TFP growth rate. Accordingly, it is important to develop a robust specification and methodology to ensure that the TFP index does accurately reflect the industry group's productivity.

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68 The spreadsheet model prepared for the AEMC by Economic Insights demonstrates that an appropriately specified TFP methodology is able to accommodate increases in required standards provided adequate price reset and/or safeguard mechanisms are included.

The Specification report reviewed a range of issues concerning output specification including whether both billed and unbilled outputs should be included in the TFP measure, input specification including the appropriate way to measure capital input quantities and annual costs, indexing methods and ways to calculate growth rates. The report assessed specification options against the five criteria set out in the AEMC Design Discussion Paper. It also highlighted areas where more work needs to be done, particularly in terms of output measures and data collection.

Conditions that need to be met

While this Review does not need to make a decision at this point on the appropriate specification for the industry TFP growth rate measure, there are a number of key conditions that the measure needs to satisfy to allow service providers the opportunity to recover their efficient costs. There are a number of linkages and interrelationships between these conditions.

The first condition is that the TFP growth measure does not create any systematic bias. If the TFP growth estimate is biased upwards relative to actual industry productivity growth then there is a risk that service providers will not be able to recover their efficient costs because the X factor will be set too high. Conversely, if the TFP growth estimate is biased downwards then there is a risk that service providers will earn excessive returns.

An upward bias in the measured TFP growth rate could result, for example, from overestimating the rate of decay in capital input service potential. This would produce an artificially high TFP growth measure and an X factor that was correspondingly too high. A downward bias in the measured TFP growth rate could result, for example, from underestimating the annual cost of capital inputs where capital input quantities are increasing at a slower rate than operating input quantities. This would lead to too little weight being placed on the slower growing input and result in an underestimate of TFP growth and hence in too low an X factor being set.

The second condition that needs to be met is that the TFP growth measure be consistent with promoting economic efficiency. This requires a broader examination of the impact on consumers as well as producers. A key requirement is that resulting prices be reflective of efficient costs. For producers this means that they are provided the opportunity to recover their efficient costs, including on investment. This requirement is met when overall prices are sufficient to cover the full opportunity cost of the resources employed, including the return of and return on capital inputs. For consumers it requires that prices be reflective of efficient costs overall and that the price of each product purchased reflects the costs of producing that product. This means that the structure of prices has to be taken into account as well as the overall average price.

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69 Economic Insights, *Energy network total factor productivity sensitivity analysis*, 9 June 2009, and Economic Insights, *Total factor productivity index specification issues*, 7 December 2009.

The main practical implication of this condition is that the cost of capital measure used in the TFP growth measure be consistent with financial capital maintenance (FCM) and that capital input quantities accurately measure asset service potential. FCM refers to the requirement that investors be given the opportunity ex ante to recover the full opportunity cost of their investments in present value terms. This requires that they be able to recover their investment in real terms – referred to as the return of capital – while receiving compensation for the opportunity cost of that capital including an allowance for risk – referred to as the return on capital. If investors can be assured of ex ante FCM then they will be indifferent between investing in the industry and other alternative forms of investment. FCM is a key regulatory principle and plays a key role in building block regulation. It is essential that a TFP method is also consistent with ex ante FCM if economic efficiency is to be achieved.

The third condition that needs to be met is that the TFP growth measure be consistent with the service provider's regulatory asset base (RAB). This means that the annual capital cost included in the TFP measure needs to be based directly on the return of and return on the RAB and be consistent with ex ante FCM.

The fourth condition is that there be reasonable comparability of the productivity growth prospects for the service providers within the industry group and the service provider subject to the regulatory decision. For service providers to be given an opportunity to recover their efficient costs and an incentive to outperform their peers then the productivity growth rate calculated from the industry group must reflect the reasonable productivity growth opportunities for the service provider in question. If the other members of the industry group all have higher TFP growth prospects because of more favourable conditions then the service provider in question will not have a reasonable opportunity to recover its efficient costs because it will be set too high an X factor.

The fifth condition is that output quantities used in calculating the TFP growth rate accurately reflect the services supplied and charged for. For example, using relatively erratic measures such as peak demand as proxies for contracted reserved capacity would be likely to cause significant inaccuracies and potential biases in the measured TFP growth rate.

The sixth condition that needs to be met is that annual capital costs used in calculating the TFP growth rate be set exogenously and be consistent with the property of FCM. As noted under the second condition above, achieving ex ante FCM is an important prerequisite for regulatory outcomes to be consistent with promoting economic efficiency. Annual capital costs that are consistent with ex ante FCM can normally only be implemented using an exogenously specified capital cost. Calculating the annual capital cost endogenously as the difference between revenue and operating costs will not result in ex ante FCM-consistent capital costs except by accident. This has the potential to not only be inconsistent with promoting economic efficiency but may also lead to biased TFP growth estimates.

The last condition that needs to be met is that the measurement of the capital input quantity used in calculating the TFP growth rate accurately reflects the production

characteristics of the industry (that is, the depreciation profile used in forming the capital input quantity is consistent with physical asset depreciation characteristics). The actual physical capital input quantity available to service providers each year – or the total service potential of available assets - is the relevant quantity measure for calculating TFP growth. This is akin to the 'carrying capacity' of the asset each year. This quantity is not directly observable and so assumptions need to be made about how asset service potential decays over time. As noted above, overestimating the rate of decay in annual capital input service potential would bias the TFP growth rate upwards and could result in too high an X factor being set. This would mean that service providers would not then have a reasonable opportunity to recover their efficient costs.

The ESC and PEG submissions have advocated the use of 'monetary' measures to proxy the capital input quantity.[70] This would involve using constant price depreciated asset values as a proxy. However, if based on regulatory depreciation, such a series would assume that the service potential or carrying capacity of an energy network capital asset declines in a straight-line fashion. That is, the ability of the line or pipeline to carry energy declines by a given amount each year. With many service providers having opted to front end load depreciation charges such an approach would effectively assume that carrying capacities fall sharply in the early years of an asset's life.

The Economic Insights Specification report noted that, instead of falling off by a given amount each year, the carrying capacity of an energy network asset stays relatively constant over its life. The report also noted that leading statistical agencies have recognised that most capital assets – and structures in particular - maintain their service potential at relatively high levels for most of their lives. As a result Economic Insights argues that proxy measures which reflect a relatively constant service flow over the asset's life will produce more accurate measures of TFP growth and not put the service provider's ability to recover its efficient costs at risk as could occur using a 'monetary' proxy. The 'monetary' proxy overestimates the decay in service potential and hence TFP growth and could lead to too high an X factor being set.

The Economic Insights spreadsheet model demonstrates that, for a TFP specification satisfying the seven conditions above, service providers achieving industry average productivity growth have the opportunity to recover their efficient costs and those achieving above average productivity growth have the opportunity to exceed their revenue requirement. The model also shows that small errors in forecasts in building blocks regulation can lead to significant divergences of realised revenue from revenue requirements making TFP-based regulation a somewhat safer alternative under normal circumstances.

The detailed formation of a TFP index will, therefore, need to take the seven conditions above into account to allow service providers the opportunity to recover their efficient costs. The modelling shows that achieving the seven conditions is possible. The main gap between the model and current circumstances relates to the availability of data,

70 ESC submission, March 2010, p.14, and PEG submission, April 2010, pp.21-30.

particularly that for contracted reserved capacity, line capacity and transformer capacity. However, these information gaps can be readily addressed in data collection going forward. Similarly, many other variables are not currently of sufficient consistency and this will also need to be addressed in future data collection. Once a consistent and robust data-set becomes available it will be possible to test whether proposed TFP growth measures satisfy the seven conditions outlined above.

Exclusion of outputs

It is desirable that a TFP methodology include all outputs of the service provider. However, Grid Australia made particular comments on output data for the electricity transmission sector:

- a key output for electricity transmission is providing a reliable service which is focused on minimising the likelihood of failure and is difficult to measure;
- output measures that take into account the variety of transmission networks and their service would be 'impossible' to design.[71]

Both comments suggest there is some risk that in the course of specifying outputs for the electricity transmission sector the selected outputs would not accurately reflect all the activities of all service providers. That is, the outputs would be difficult to define and be relevant to all service providers. This means that not all of the outputs would be likely to be measured and valued in a reliable and consistent manner. As a result, the TFP index may not be a reliable measure of the sector's productivity and may not set a price path that recovers industry costs. This issue is also likely to be relevant to gas transmission service providers.

In the case of the distribution sectors, it is also desirable all service provider outputs be included in a TFP methodology. Some submissions commented on the issue of whether just billed outputs should be included or whether both billed and unbilled outputs should be included. Because network industries are natural monopolies the price of billed outputs will typically not equal their marginal cost (as would be the case in a competitive industry).

Furthermore, some key output dimensions that would be charged for in competitive industries may not be charged for at all in networks. Jemena provided examples of the disparity that can exist between network output and the basis of charging that has evolved as accepted practice or for convenience.[72] Economic Insights has recently shown that all network outputs – both billed and unbilled – should ideally be included in the productivity measure and that each output should be weighted by the difference between its price and marginal cost in deriving the X factor.[73]

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71 Grid Australia submission, 28 October 2009, p. 3

72 Jemena submission, October 2009, pp.4-5.

73 Economic Insights, The theory of network regulation in the presence of sunk costs, Report for the Commerce Commission, 11 June 2009.

The ESC and PEG submissions argued that only billed outputs should be included in the productivity measure as this is the only way service providers can recover their costs.[74] While costs are ultimately recovered from billed outputs, the Economic Insights report noted that prices for these outputs are higher than they otherwise would be if there are important network outputs that are not billed for and this deviation of prices from marginal costs has a detrimental impact on economic efficiency.

Because marginal costs are not readily observable and their estimation would currently require the use of econometric methods, it is likely to be necessary to rely on including only billed outputs with revenue share weightings in TFP measures in the short to medium term. We advise that the AER should undertake further research on the feasibility of obtaining accurate marginal cost measures and including unbilled as well as billed outputs in TFP measures.

Service quality is an important dimension of output for service providers but one that is typically not charged for explicitly. The Economic Insights Specification Report noted that service quality has also proven to be problematic to include in TFP measures because of the way it is measured. TFP measures cannot readily incorporate an output where the production of more of the output (eg reliability) is measured by a decrease in the relevant measure (SAIDI and SAIFI in this case).

As a TFP methodology provides better efficiency incentives than the building block approach and because service quality cannot readily be incorporated within the TFP measure, it is important that an external service quality incentive mechanism operates with a TFP methodology. In this way, there would be clear and direct incentives to maintain and improve system security and reliability.

Most jurisdictions that have used a TFP method address service quality considerations by way of a separate 'S' factor scheme so that the overall price cap becomes of the form CPI–X+S. The best approach to handling service quality issues and providing the appropriate incentives to maintain or improve service quality is to continue the use of a separate mechanism similar to that currently operated by the AER.

Measuring system security

During this review there has been some discussion on whether a TFP methodology is able to accommodate expenditure to meet system security and reliability requirements.

This is particularly an issue for electricity distribution service providers that supply metropolitan areas, especially those covering the larger central business districts. These service providers have been subject to increasing pressure to further increase their redundancy levels.[75]This has resulted in significant expenditure to increase the security and reliability of the services provided by their assets.

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74 ESC submission, March 2010, pp. 14-15 and PEG submission, April 2010, pp.10-13.

75 Economic Insights, Total factor productivity index specification issues, December 2009,p. 10.

In TFP measurement terms, this expenditure could be a substantial input. However, current TFP methodologies do not capture the corresponding output which is akin to a higher level of insurance being provided against exceptional events. Even if reliability measures were included as outputs in a TFP methodology, these may not measure the change in output corresponding to the increased input as the event being insured against may not occur. As a result, the affected service providers will have a lower measured rate of TFP growth than their actual rate due to the exclusion of the system security or insurance output. That is, the TFP index will not be an accurate measure of industry productivity.

If the relevant output cannot be successfully captured then an alternative solution may be to exclude the relevant inputs. However, there may be considerable difficultly in separating out expenditure for system security and reliability from other capital and operating expenditures. In addition, excluding such expenditure would raise the question of whether the service provider would have the opportunity to recover legitimate, efficient expenditure. Accordingly, this is not a satisfactory solution.

Another solution is to include system security and reliability expenditure in the inputs as it is a legitimate expenditure even though there is no corresponding output to represent increased system security. Although there will be some difference between the measured and actual TFP growth for these particular service providers, the capital expenditure undertaken will still be included in the asset base at the start of the next regulatory period. If the system security output is not allowed for in the TFP index then service providers will have a lower rate of measured TFP growth than would otherwise be the case. To the extent that this results in lower X factors then there would be some compensation for the service providers and no disincentive to improve system security and reliability.

One of the scenarios we asked Economic Insights to model was an increase in mandated standards (i.e. an increase in required redundancy levels) during a regulatory period. This is modelled as an increase in capex to 50 per cent above its previous levels for the first three years of the second future 5-year regulatory period and a corresponding increase in the capital input quantity growth rate of two per cent in each of those years.

The model shows that this large increase in required inputs can be accommodated by TFP-based regulation provided there are five-yearly price resets in the fixed X factor case or there is a rolling X factor in place. In these cases TFP-based regulation will continue to provide good outcomes for service providers with above average productivity growth rates.

4.4 The TFP index cannot be manipulated by service providers

4.4.1 Issue

One concern raised with a TFP methodology is the possibility that the estimation of the TFP growth rate may be manipulated or influenced by the actions of an individual

service provider or a group of service providers acting in concert. If this occurs then the condition that the TFP index is to reflect the true productivity of the industry group would be jeopardised. This section assesses whether the potential for manipulation exists in the national energy sectors.

4.4.2 Draft Finding

The structure of some energy sectors indicates that some service providers may have a potential or some opportunity to attempt to influence the TFP growth rate. However, the incentive to carry out such action is not clearly apparent. And, depending on how the growth rate is calculated, it would require concerted behaviour over the full TFP cycle rather than just individual years. On balance, the draft finding is that it is unlikely that a TFP index will be unduly influenced by a service provider (or a group of service providers acting together). Nevertheless, if this matter remains a concern, then the rules included in the NER and NGR can be drafted to include criteria on the formation of industry groups to address this conduct.

4.4.3 Reasoning

There are two aspects to the issue of whether the TFP index can be manipulated by service providers:

- whether service providers have the ability or opportunity; and
- whether service providers have the incentive to attempt to influence the index.

On the first aspect of this issue, an individual service provider may have the ability to influence the TFP index of an industry group if the industry group consists of a small number of service providers. An alternative to this is that there may be a large number of service providers in the group but one individual service provider is much larger than the others and may be considered to be the 'industry leader' of the group. The third possibility is that a number of service providers within the industry group have common ownership, and accordingly, may act together.

The other alternative is that a number of independent service providers act together. This can be discounted from this discussion as such behaviour may breach competition laws. The risk also exists under the building block approach.

The potential for service providers to influence the TFP index can be reduced by forming industry groups that contain several service providers. It should also be remembered that service providers are regulated as separate entities even if they have a common owner. The regulator would be able to take into account common costs and any related party transactions in determining the initial price level.

Nevertheless, the sector with the greatest potential for this issue to arise is gas transmission. Of the eight transmission pipelines currently subject to full regulation,

six are owned and/or operated by the APA Group[76]. The gas distribution sector comprises 11 regulated distribution systems. Envestra and Jemena are both owners and/or operators of three systems.[77] There is some common ownership of two of the five electricity transmission sector service providers. The electricity distribution sector has the greatest number of service providers and limited common ownership.[78]

The second aspect of this issue that must be considered is whether service providers have an incentive to attempt to influence the TFP growth rate.

There will be a trade-off for a service provider in deciding whether to alter its behaviour. It could forego current profits by reducing productivity growth now in an attempt to secure a lower X factor for future regulatory periods. Alternatively, the service provider could implement available productivity improvements now and obtain higher current profits but incur a higher future X factor. Given time preferences and regulatory risk considerations, it is likely that service providers will discount possible but uncertain future gains heavily in comparison to actions that can increase profits now. As a result, the incentive to reduce current productivity growth to influence future X factors should not be a critical issue.

Furthermore, the incentives to reduce current efficiency to influence the X factor for future regulatory periods are less under a TFP methodology than under the building block approach. This is because productivity improvements have to be foregone for an extended period under a TFP methodology to influence the overall TFP growth rate (particularly if the regression-based trend method is used to calculate the overall growth rate rather than the end-point to end-point method).

In comparison, the building block approach typically places significant weight on recent actual cost data to assess efficiency levels. Accordingly, the service provider may only have to forego productivity improvements for a short period to influence the future period X factor. This makes the potential net benefits from this course of action higher. The potentially adverse incentives associated with a TFP methodology are therefore no worse than similar incentives under the building block approach.

It is also possible that service providers might seek to manipulate outcomes under building block regulation before entering a TFP methodology. The service provider might seek to increase its expenditure under the building block approach by bringing forward expenditure it expects to incur in the future and then seek to benefit from reduced expenditure under a TFP methodology. However, similar incentives would exist to a large extent under a continuation of the building block approach for the service provider, particularly given that the RAB would be calculated using the same method under both approaches.

76 APIA submission, 26 October 2009, p. 3.

77 Issues Paper, p. 106.

78 Issues Paper, pp. 99 & 104.

4.5 Members of an industry group face similar productivity conditions

4.5.1 Issue

In considering the merits of a TFP methodology, an assessment of whether service providers face similar productivity growth conditions must be made. This is an important issue because if service providers within an industry group are not sufficiently comparable then there is some risk that the resulting TFP growth index may not be a good measure of a service provider's future potential productivity growth. Consequently, the service provider may not have the opportunity to recover efficient costs or alternatively be over-compensated by a too generous X factor.

No two service providers are identical and there will clearly be differences in operating environment and practices across service providers. This will lead to differences in service providers' unit cost levels and these will be reflected in the starting prices (or P_0s) that are set for each service provider under a TFP method (see chapter 3 and appendix C). However, differences in operating environment conditions may or may not also affect service providers' productivity growth potential as well as their unit costs.

If operating environment conditions do also impact on productivity growth potential then it may be necessary to have more than one industry group in calculating the relevant TFP growth rate - and hence X factor - for different service providers. If operating environment conditions only impact on unit cost levels and not productivity growth potential then there would need be only one industry group for the purpose of deriving the X factor and operating environment differences would be adequately accounted for in setting each service provider's initial price alone.

4.5.2 Draft Finding

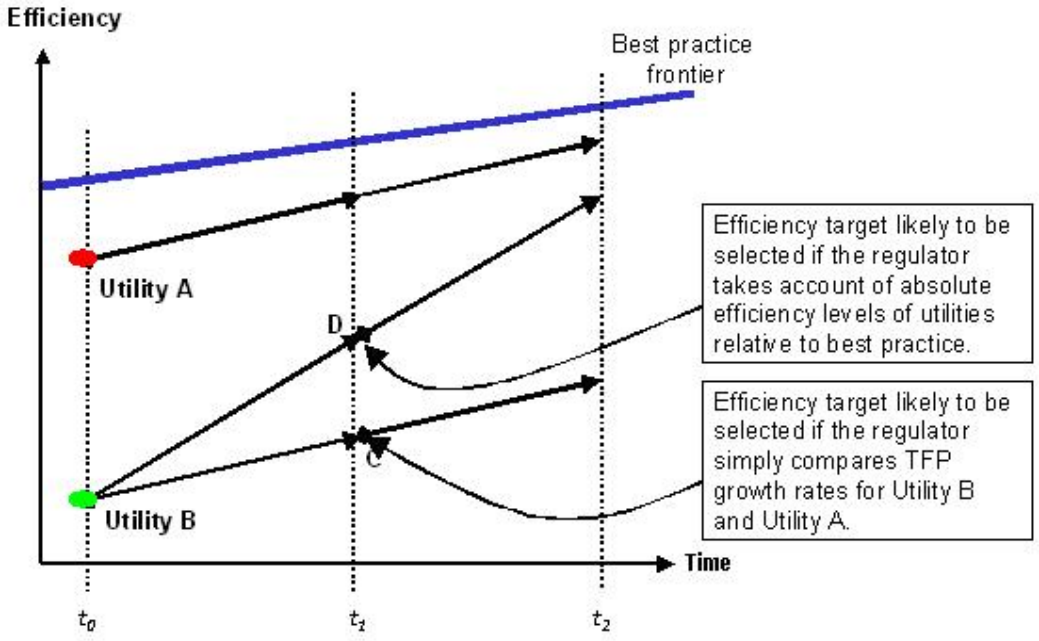
An important condition for a TFP methodology is that service providers within an industry group face comparable productivity growth prospects if managed efficiently. There are some preliminary indications that operating conditions (such as customer density, geographic location and spread) may not significantly influence TFP growth. Differences in operating conditions between service providers within an industry group will be reflected in the setting of each service provider's initial price level. But whether differences in operating conditions also influence TFP growth rates remains an empirical question.

To confirm that service providers within an industry group do face comparable expected productivity growth rates empirical testing should be undertaken. This can be carried out once the TFP specification is finalised and robust and consistent data has been collected.

4.5.3 Reasoning

During the course of this Review service providers have raised concerns about ensuring that industry groups contain comparable service providers. In considering this issue it is important to make the distinction between aspects of business operations that impact on the determination of the initial price level and factors that influence the prospects for productivity growth of a service provider. For example, differences in the extent of undergrounding of electricity lines and customer density may impact on unit cost levels and hence the determination of the initial price level but not on potential TFP growth rates and hence the appropriate X factor. However, if there were changes in undergrounding trends between service providers then this may impact on the achievable TFP growth rate as well as on unit cost levels.

Figure 4.1 Efficiency levels and growth rates



Another situation where there may be differences in achievable TFP growth is if there is a spread of TFP levels among the otherwise similar included service providers at the outset and a process of convergence is taking place. In this case, given the right incentives, service providers with initially low productivity levels could be expected to achieve high productivity growth rates as they make easy catch up gains and move closer to best practice. However, service providers who already have high productivity levels will have far fewer opportunities to further improve their productivity levels (as they have already implemented available options) and so their actual and achievable productivity growth will be relatively low. This could be expected to be the case where a diverse range of service providers at different stages of the reform process are included (see Figure 4.1).

Where there is convergence taking place and a common X factor is applied to all service providers based on extrapolating the industry average TFP growth rate, those service providers starting from low TFP levels should be able to outperform average industry TFP growth while those starting from high TFP levels would not be able to match the average TFP growth rate. Thus, a TFP–based methodology with a common X factor would be good for initially poor performing service providers (in terms of TFP levels) but bad for initially good performers.

This can be overcome by having more than one industry group with service providers with similar future productivity growth opportunities being grouped together. Or it could alternatively be handled by having differential X factors across service providers with low, average and high productivity levels.

The question of how operating conditions affects productivity growth and hence how the industry groups should be formed for a TFP methodology is an empirical matter. The ESC's work to date indicates that business conditions may not materially influence the TFP growth rate.[79] Accordingly, the ESC considers that a single X factor for an industry sector would be appropriate. The ESC considers there is no indication that the sectors should be split into sub-groups according to criteria that indicate different achievable TFP growth rates.[80]

This finding indicates that the most appropriate starting point in setting industry groups is to set an industry group equal to the industry sector. We note that there are additional benefits to such an approach. It results in a grouping that reduces the opportunity for any undue influence over the TFP growth rate. It also provides no opportunity for service providers to attempt to influence what group they are allocated to.

However, the ESC's research has been based on a limited sample of service providers all at the same stage of the reform process and has used a method that has not been supported by all parties. Empirical work to confirm whether all service providers have comparable productivity growth performance should be undertaken. This can be carried out once the TFP specification is finalised and robust and consistent data has been collected. The PEG submission agreed that whether there should be one industry group or a number of industry groups is a matter for subsequent empirical investigation.[81]

If the empirical testing indicates that there are material differences in achievable TFP growth between service providers within an industry then this could be addressed by:

- forming sub-groups that contain more comparable service providers. However, this may raise issues with service providers' ability to influence the growth rate; or

79 ESC submission, May 2009, p. 7.

80 ESC submission, March 2009, p. 16.

81 PEG submission, April 2010, p.16.

- including business-specific (or group-specific) adjustments to the X factor. However, this may raise issues of what methodology should be used for this adjustment and whether there is an increased risk of the regulator making subjective decisions.[82].

In their submission Multinet and United Energy noted that while business-specific price path adjustments under a TFP methodology would add significant complexity to the administration of a TFP methodology, measuring a TFP index for each group of comparable service providers would improve the reliability of the TFP index and provide a more appropriate basis for calculating benchmark productivity growth.[83]

To maximise the incentive properties of a TFP-based methodology it will be necessary to ensure the industry group(s) contain service providers that have broadly comparable achievable productivity growth performance if a single X factor is to be used. At this stage it appears unlikely that service providers' TFP growth performances would be so disparate and divergent as to make a TFP method unworkable.

4.6 The TFP index is a good estimate of future productivity growth

4.6.1 Issue

A key assumption behind the use of a TFP methodology in regulation is that historical productivity growth measures will accurately predict future productivity growth potential. If this condition does not hold then the price path will not be set in accord with potential productivity growth. This creates a risk that service providers will either significantly over-recover efficient costs or that they will under-recover efficient costs. To ensure that service providers do have an opportunity to recover efficient costs, an analysis of a TFP methodology must include consideration of whether past productivity performance is a good estimate of future productivity growth potential.

4.6.2 Draft Finding

The ability of the TFP growth index to be a good estimate of future productivity growth potential for the service providers within the industry group must be satisfied to establish a successful TFP methodology. The condition would be met in a steady and mature market subject to little external changes. However, there is some doubt that the condition can be met in the foreseeable future as there may be external factors that impact on what service providers may be required to deliver, particularly in regard to climate change and related initiatives.

If there is uncertainty on whether this condition is met then a TFP methodology could incorporate a capex module, off ramps or re-openers that allow for price resets and an updated X factor to be applied to a service provider. Alternatively, a rolling X factor could be adopted as this will adjust each year, taking into account changes in the

82 Discussion Paper, pp. 53-55

83 Multinet and United Energy submission, February 2010, p.8

industry productivity growth rate. However such safeguards can provide some protection against changing conditions. If it is clear that in the future the drivers of productivity growth will be affected then it may not be appropriate to allow a TFP methodology to be applied. In any event, the predictability and stability of the TFP growth rate can be tested once the TFP specification is established and data are collected.

4.6.3 Reasoning

The use of a TFP methodology in economic regulation is feasible if the past productivity performance of the industry group is a reasonable, unbiased predictor of future productivity growth. If this is true, and a service provider's productivity prospects are consistent with that of the industry group, then the service provider will have a reasonable opportunity to recover efficient costs.

Once an energy market is established and mature, demand will tend to grow relatively steadily. The service provider will have steady costs reflecting the stability of the market it services. In this scenario, it would be reasonable to expect that past productivity growth would be a good estimate of likely future productivity growth.

However, it has been suggested that this scenario may not have occurred yet in the Australian energy markets. The Network Advisory Services (NAS) Expenditure Profiles Report indicates that operating and capital expenditures for electricity and gas distribution service providers have experienced shifts in the past. It also notes that there are a number of cost drivers that may have this effect.[84]

In addition, and perhaps more relevantly, service providers expect that significant changes will occur in the energy markets in the near future. As a result, many service providers doubt that past productivity growth will be a sound estimate of future productivity growth. The changes mentioned include the introduction of smart meters and the need to accommodate dispersed sources of renewable energy generation. In addition, electricity service providers, in particular, have referred to their forecast of significant increases in capital expenditure requirements.[85]

Against this, however, the AER's recent draft decision covering the Victorian electricity distribution service providers found that the operating environment was relatively stable.[86] The AER did not consider that the impact of climate change requires significantly enhanced measures that would justify substantial increases to network build or asset replacement. Furthermore, the AER found that service providers would

84 NAS Expenditure Profiles Report, pp. 84-96.

85 This is the 'wall of wire' effect where the need to replace a significant amount of assets is concentrated over a relatively short time, reflecting the pattern of the initial commissioning of assets.

86 AER Victorian electricity distribution network service providers Distribution determination 2011–2015, June 2010, pp. viii-x.

not be subject to changes to their operating environments that would have a material impact on operating expenditure over the next regulatory period.[87]

If these factors do prove to influence the productivity growth of service providers (rather than the price level) then there may be difficulty in relying on past TFP growth to determine revenue and price paths of service providers unless relatively frequent price resets are included. As noted in the previous section there is a need to build on the previous work conducted by ESC on the drivers of productivity growth in the Australia energy sectors.

We note that the modelling by Economic Insights shows that an appropriately specified TFP methodology can handle relatively extreme shocks such as an increase in mandatory standards and a concentrated increase in replacement capital expenditure provided there is not too long a gap between price resets. A similar outcome could be achieved by appropriate design of off-ramp provisions. The model also shows that rolling X factors can build in some ongoing adjustment to changing circumstances but having regular price resets is more important to ensuring service providers have an opportunity to at least recover their revenue requirement.

Given this, we do not see a reason to reject a TFP methodology on this basis. Instead we recommend that the following appropriate safeguards are built into the design. Without a robust and consistent time-series of actual service provider data it is difficult to assess the predictability, or steadiness, of the TFP growth rate over time. Therefore once the data is collected, work on assessing the trend in productivity should be undertaken. This work will help to determine whether the conditions for a TFP methodology can be, or are likely to be satisfied. It should be noted that it may be ten years before a sufficient time series of data is available to support robust TFP measurement to the standard required for it to be used as the primary basis for setting price caps.

Secondly, as it is difficult to forecast future costs conditions with certainty, the design of a TFP methodology should always include the flexibility to apply certain safeguard mechanisms where appropriate (i.e., off-ramps, capex module, re-openers). Appendix B provides a description of the possible safeguard mechanisms.

87 AER noted new obligations and expenditure requirements may eventuate for bushfire mitigation, stemming from measures raised by the Victorian Bushfires Royal Commission (VBRC). It noted that these obligations will ultimately be determined by the Victorian Government and will be dealt with under the regulatory framework as they arise, including through potential pass through events. AER's review also found, for SP AusNet and Powercor, that some increase in their conductor replacement activity would be prudent both for reasons of asset age and condition, and potential reduction in future potential fire risk.

4.7 The TFP index is relatively stable

4.7.1 Issue

An assessment of the merits of a TFP methodology needs to include an analysis of the stability of the included TFP growth rate as this will have an impact on the volatility of the resulting price path. Since the productivity growth rate is a key determinant of the X factor in the CPI-X price cap then volatility in the TFP growth rate will feed through to volatility in network prices. Increased variability in prices would not be a desirable outcome for either service providers or users as it increases uncertainty and makes longer term decision making more difficult.

To assess this issue, we need to consider whether the use of a fixed X or a rolling X in a TFP methodology has a different impact on price stability. And comparisons have to be made between the price outcomes under a TFP methodology and those using a building block approach in the same situation to assess whether price volatility is likely to be a problem under a TFP methodology.

4.7.2 Draft Finding

The indications at this stage are that a well specified and designed TFP index will meet the condition of being relatively stable and will be able to provide a price path at least as stable as that which would result from building blocks being applied in the same situation. The spreadsheet model comparing TFP-based and building blocks outcomes shows that TFP-based price paths generally exhibit less volatility than those resulting from the application of the building blocks method. This is particularly so compared to the building blocks case where adjustment is front-end loaded into the initial price change or P-zero.

Where a TFP methodology makes use of a rolling X, there is some potential for more growth rate and price volatility. However, this is not expected to be significant as the TFP growth index should not vary significantly and the rolling X is calculated as a rolling average over at least eight years. This would moderate the impact of any individual annual change.

Nevertheless, before a TFP methodology is to be included in the NER and NGR then it would be appropriate to test the stability of the annual growth rate once the TFP specification is finalised and data is collected.

4.7.3 Reasoning

Under the building block approach the price path follows CPI-X where 'X' is a smoothing factor. Under building blocks the Po and X are set jointly for each distribution business to equate the present value of the forecast revenue and cost streams for the whole regulatory period. For some service providers the actual price path will also reflect, for example, approved cost pass through amounts and the operation of an ECM. Since the regulator can choose an infinite number of

combinations of the Po and X to achieve a net present value of zero, the impact on stability of the price path depends on the combination chosen. Many regulators have chosen to front end load changes into the Po and leave real prices constant for the remainder of the regulatory period. This can result in a series of relatively erratic step changes in the price path at the start of each regulatory period.

Under a TFP methodology, the price path is also generally of the CPI-X type. But the X factor is now the industry (or group) productivity growth rate (for all service providers) and the Po aligns opening revenues with costs for each service provider. This removes the regulator's ability to choose different combinations of the price path parameters and so will tend to result in a more stable price path, all else equal.

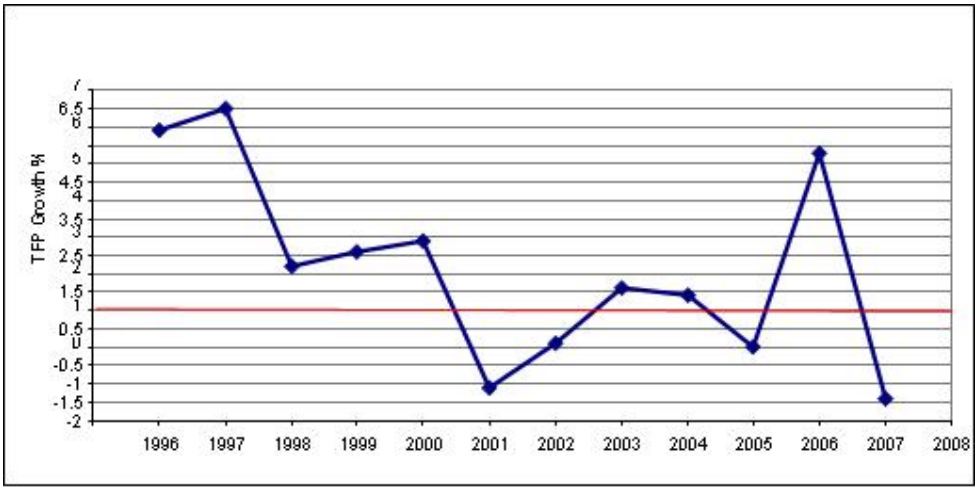
As under the building block approach, additional elements may also operate. Where a rolling X is used, there is the potential for somewhat more variability in prices during the regulatory period compared to the fixed X factor case. However, if the TFP growth rate does not alter dramatically from year to year then the rolling X (which is calculated as a rolling eight year average) will not produce significant variations in prices from one year to the next.

Accordingly, the use of a TFP index to determine the X factor is not expected to result in price path volatility that is significantly more than what may already occur under the building block approach. Neither service providers nor users will have greater uncertainty over prices within a regulatory period under a TFP methodology because the TFP growth rate, if appropriately specified, will tend to be relatively stable.

The spreadsheet model constructed for the AEMC by Economic Insights shows that an appropriately specified TFP-based price path is generally more stable than those resulting from the application of the building blocks method under a range of commonly used Po and X factor combinations used in building blocks applications.

The energy network industries tend to be characterise by relatively stable production conditions, although innovation or productivity improvements can be unpredictable and erratic at times. It is important to assess whether erratic year-to-year changes in measured TFP are due to problems with the TFP specification used or with the quality of the data used.The ESC's TFP results for Victoria show considerable year-to-year variability as illustrated below.

Figure 4.2 Annual TFP growth for the Victorian electricity distribution industry, 1996 to 2008



ESC & PEG, TFP research for Victoria's power distribution industry: 2007 update, December 2008.

Figure 4.2 shows an initial period of very high TFP growth in 1996 and 1997, followed by strong TFP growth in 1998 to 2000. There is then negative TFP growth in 2001 followed by modest TFP growth in 2003 and 2004. TFP growth spikes in 2006 before again going negative in 2007.

The initial very high TFP growth rates are driven by strong throughput and peak demand growth combined with large reductions in operating expenditure in the years immediately following privatisation. Normally such abnormal periods would be excluded from TFP growth rate calculations for setting the X factor. Subsequent movements in the growth rate reflect changes in throughput and changes in peak demand. For instance, peak demand fell in 2001 leading to a large fall in the output growth rate and a fall in TFP growth. Peak demand is used as a proxy for contracted demand but is likely to be much more erratic than contracted demand and may not be well correlated with contract demand due to the diversification of demand within the network.

The spike in TFP growth in 2006 is caused by a sudden jump in both throughput and peak demand combined with a sudden and unexplained fall in the quantity of operating expenditure of over nine per cent. A change in operating expenditure of this magnitude in a relatively mature regime is more likely to reflect data issues (for example, cost allocation changes) than actual changes.

In its submission PEG noted that the impact of erratic year-to-year movements in measured TFP will be reduced once an average growth rate spanning several years is formed and the impact on a resulting price path will be considerably less volatility than indicated by year-to-year movement in the TFP index.[88] While this is true, it

88 PEG submission, April 2010, pp. 13-16.

remains the case that erratic year-to-year movements may point to specification and/or data problems.[89]

These issues notwithstanding, the Economic Insights spreadsheet model shows that an appropriately specified TFP-based price path is generally more stable than those resulting from the application of the building block approach. While stability of the TFP growth rate and the resulting price path is not likely to be a problem under a TFP methodology, this can be further tested once a consistent and robust data-set becomes available.

4.8 Assessment of a TFP methodology in the electricity and gas sectors

This section provides an assessment of the suitability of using a TFP methodology to determine regulated prices and revenue across each of the electricity and gas sectors, drawing on the analysis in this chapter. To assess the potential performance of a TFP methodology, four key questions were considered for each of the energy sectors:

- Can industry groups be classified in a way which meets the conditions needed to support a TFP methodology?
- Will the TFP index be an accurate measure of productivity?
- Is the existing data appropriate for a TFP methodology?
- Will the TFP index be stable?

4.8.1 Electricity Distribution

It is likely that electricity distribution service providers can be classified into an industry group (or groups) that have comparable productivity growth potential and where individual service providers cannot manipulate the resulting TFP growth rate. Preliminary evidence indicates that TFP growth rates have been similar across a range of service providers with different operating environments.[90] However, more empirical work is required to check whether the comparability of service providers – particularly across different states - would allow for one industry group. Since there are 13 service providers in this sector it would be possible to have a number of industry sub groups if necessary.[91]

89 It should also be noted that the impact of erratic year-to-year movements in the TFP index on TFP growth can be greater when the endpoint-to-endpoint growth rate calculation method is used compared to the use of the regression-based trend method. This is because an erratic movement in the index at either the start or the end of the time period will have a larger impact on the growth rate calculated using the endpoint-to-endpoint method and so feed through to larger price path movements.

90 ESC submission, May 2009, p. 7.

91 Issues Paper, Appendix G.

With regard to whether the TFP index would be an accurate measure of productivity for the electricity distribution sector, there are some difficulties associated with measuring outputs in this sector related to contracted reserved capacity, system security and reliability. Peak demand has been used as a proxy for contracted reserved capacity to date but it is likely to be a poor proxy. Direct data on contracted reserved capacity can be collected as part of an improved data collection process. While system security outputs cannot readily be included in a TFP measure, the Economic Insights model shows that significant increases in standards can be accommodated within a TFP methodology provided there are adequate price resets and/or safeguard mechanisms. And the continuation- or even strengthening - of a separate service quality incentive scheme is likely to be the best way of addressing reliability.

There are some external factors that could influence whether the historic TFP index is a good representation of future productivity growth potential in this sector. A number of submissions drew attention to the impact the roll out of smart meters, climate change initiatives and the response to the Victorian bushfires may have on this sector. However, the AER has recently stated that it believes the operating environment in the sector is stable.[92] And other submissions have claimed that a TFP methodology is necessary to provide incentives for service providers to adopt innovative solutions to these challenges.[93] Empirical testing will be required to check whether these factors have a material impact on TFP growth.

There is limited information available on the stability of TFP growth in this sector. Limited evidence has been provided on the impact of a potential 'wall of wire' effect. If it does exist, then it may impact on the TFP index. However, the Economic Insights model demonstrates that an appropriately designed TFP methodology can cope with relatively large changes such as increased capital replacement requirement provided there are adequate price resets and/or safeguard mechanisms.

The main impediment to the introduction of a TFP methodology for this sector is the absence of a reliable, consistent and robust data-set. Currently available data are 'patchy' across jurisdictions and over time. Where existing data has been used in TFP studies, substantial 'cleaning up' of the data has occurred and this has typically not been transparent. To ensure that data is of the standard required to base price cap decisions on and to ensure ownership of data by all stakeholders and appropriate levels of accountability, the development of a satisfactory data collection process is a high priority. This will have wider benefits for other regulatory processes including the application of the building block approach.

Our conclusion is that it is likely to be appropriate to implement a TFP methodology in the electricity distribution sector, but a sufficiently robust data-set would be needed to confirm whether necessary conditions exist and to assist in forming industry groups.

92 AER Victorian electricity distribution network service providers Distribution determination 2011–2015, June 2010, p. x.

93 Energy Safe Victoria submission, February 2010.

4.8.2 Electricity Transmission

Given the limited number of service providers (five service providers across five jurisdictions and two interconnectors) within the electricity transmission sector, it would only be viable for there to be one industry group for this sector.[94] This places greater emphasis on the comparability of service providers and whether there would be a dominant service provider and hence scope for manipulation of the TFP growth rate. We note that Powerlink and TransGrid each hold approximately 30% of the total RAB in this sector.[95] Empirical testing would be required to assess whether the limited number of service providers all had comparable productivity growth conditions.

With regard to whether the TFP index would be an accurate measure of productivity for the electricity transmission sector, some submissions noted that the outputs of transmission are more complex and more difficult to measure than for electricity distribution. In particular, there would be difficulty in measuring outputs related to maintenance of system security and the facilitation of competition between supply sources.[96] Similarly, although measuring and valuing reliability would be an issue for all sectors, it would be particularly problematic in the electricity transmission sector.

There may also be some external factors that could influence the reliability of a TFP index in this sector. The roll out of smart meters and, in particular, capital expenditure lumpiness may have an impact on the stability of the productivity trend in this sector.[97] Limited evidence has been provided on the impact of any 'wall of wire' effect in this sector but, if it does exist, then it may impact on the TFP index.

Again the availability of reliable, consistent and robust data is an impediment to implementing a TFP method in the electricity transmission sector at this point in time.

Our conclusion is that it appears unlikely that it would be appropriate to implement a TFP methodology for the electricity transmission sector because of difficulty in measuring outputs related to system security and reliability, the lumpiness of capital expenditure and given the small number of service providers. All service providers would need to be comparable to form one industry group and data is needed to test whether this is the case. We also note that there is little, if any, international experience with applying a TFP methodology to electricity transmission. It is, however, important to improve data collection within the electricity transmission sector to allow these issues to be tested more fully. This will also have wider benefits for other regulatory processes including the application of the building block approach.

94 Issues Paper, Appendix G.

95 AER, Transmission network service providers: Electricity performance report for 2007/08, October 2009.

96 Grid Australia submission, February 2010, p. 3.

97 AER, Transmission network service providers: Electricity performance report for 2007/08, October 2009.

4.8.3 Gas Distribution

There are seven owners and eleven distribution systems that operate in the gas distribution sector.[98] Consequently, it is likely that gas distribution service providers can be classified into an industry group (or groups) that have comparable productivity growth potential and where individual service providers cannot manipulate the resulting TFP growth rate. Empirical testing would be required to check whether all service providers are comparable. Common ownership would be an issue that needs to be considered in this sector as it may affect the size of the industry group and whether there would be a dominant service provider within the group.

With regard to whether the TFP index would be an accurate measure of productivity for the gas distribution sector, outputs are more easily measurable for gas distribution than electricity distribution. Operating conditions should also be more stable in this sector than in electricity distribution, as there is likely to be less impact from external influences such as smart meter roll out, climate change initiatives and bushfire response. Empirical testing would be required to further assess this.

The productivity trend in this sector should be more stable than in electricity distribution due to less of an impact from climate change initiatives.[99] It is also likely that lumpiness of capital expenditure would not be an issue in this sector and hence TFP growth could be expected to be relatively stable.

Again the main impediment to the introduction of a TFP methodology for this sector is the absence of a reliable, consistent and robust data-set. Currently available data are sparser and less uniform than for electricity distribution. To ensure that data is of the standard required to base price cap decisions on and to ensure ownership of data by all stakeholders and appropriate levels of accountability, the development of a satisfactory data collection process is a high priority. This will have wider benefits for other regulatory processes including the application of the building block approach.

Our conclusion is that it is likely to be appropriate to implement a TFP methodology in the gas distribution sector, but a sufficiently robust data-set would be needed to confirm whether necessary conditions exist and to assist in forming industry groups.

4.8.4 Gas Transmission

As three owners and ten transmission pipelines operate in this sector, it would only be viable for one industry group to be formed.[100] Empirical testing would be required to test the comparability of transmission pipelines. Common ownership and whether there would be a dominant service provider would also need to be considered in setting the industry group. We note that the Dampier to Bunbury Natural Gas Pipeline

98 Issues Paper, Appendix G.

99 AER, Draft decision – public version, ActewAGL, Access arrangement proposal for the ACT, Queanbeyan and Palerang gas distribution network, 1 July 2010 -30 June 2015, November 2009.

100 Issues Paper, Appendix G.

accounts for over 40% of the total RAB for this sector and that the APA Group owns or operates the majority of pipelines.[101]

With regard to whether the TFP index would be an accurate measure of productivity for the gas transmission sector, outputs are likely to be somewhat more easily measurable for gas transmission than for electricity distribution. It is also expected that there would be fewer significant external factors (such as climate change initiatives) impacting on the gas transmission TFP index. But lumpiness of capital expenditure may also be an issue as it is likely to be in electricity transmission. The impact of these factors would need to be empirically tested.

Where capital expenditure is lumpy, this may have an impact on the stability of the TFP index.[102] However, if there is only low levels of capital expenditure in a mature transmission pipeline sector, the TFP index may be relatively stable. The stability of the TFP index would need to be empirically tested.

The gas transmission sector has the least available data of the four sectors. The existing data is very 'patchy' and is neither uniform across the service providers nor continuous over time. The development of a satisfactory data collection process is a high priority for this sector. This will have wider benefits for other regulatory processes including the application of the building block approach.

Our conclusion is that it appears unlikely that it would be appropriate to implement a TFP methodology for the gas transmission sector given the degree of common ownership and operation and because lumpy capital expenditure may cause problems for the TFP index.[103] Furthermore, one industry group would be required but it would be necessary to empirically test whether service providers are sufficiently comparable. We also note that there is little, if any, international experience with applying a TFP methodology to gas transmission. It is, however, important to improve data collection within the gas transmission sector to allow these issues to be tested more fully - particularly given that this sector has the least available data of the four sectors. This will also have wider benefits for other regulatory processes including the application of the building block approach. It is also possible that in the future, further work is done which addresses the challenge of quantifying the outputs of a transmission business.[104]

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101 ibid and various AER and ERA decisions on gas transmission pipelines.

102 AER, Transmission network service providers: Electricity performance report for 2007/08, October 2009.

103 We note that while the concentration of ownership in gas transmission is a problem for introducing TFP, it may be a positive for getting comparative data reporting.

104 We understand that Ofgem have done considerable work on defining transmission businesses outputs. See http://www.ofgem.gov.uk/Networks/rpix20/ConsultReports/Documents1/rpt-outputs.pdf.

5 Way forward

We have approached this Review into the use of TFP in two stages. Stage 1 aims to establish whether there is a national objective enhancing case for introducing a TFP methodology into the Rules and, if so, to identify which conditions are needed to support the economic application of TFP to determine allowed revenue. If stage 1 concludes that the circumstances needed for a TFP methodology to contribute to the national energy objectives exist or are likely to exist, then the intention is to proceed to stage 2 and develop draft Rules to support the application.

The preceding chapters establish the economic case for introducing a TFP methodology and identify the conditions needed for the application of such a methodology to be consistent with the national objectives. The next stage of this Review would be the introduction of the Rules for the implementation of the methodology. This chapter now turns to stage 2 of the Review and discusses how the methodology should be implemented and sets out our draft recommendations on the procedures and actions for the next stage of this Review.

5.1 Submissions to the Preliminary Findings Paper

In our Preliminary Findings paper we stated our intention to proceed to stage 2 after publication of the stage 1 final report and to start preparing Rules given the finding that a TFP methodology will contribute to the promotion of the national objectives. However we also considered that it was not appropriate to implement a TFP methodology in the short term as the available data is not sufficiently robust or consistent. In the Preliminary Findings paper we suggested that 8 years of data would be needed before a TFP methodology could be applied.

Service providers argued strongly that detailed drafting of Rules under stage 2 should be deferred. They considered that this would allow further testing of a TFP methodology once data starts to be collected and enable:

- appropriate consideration of the impacts of climate change policy and smart grids;
- further experience to be gained of the current building blocks arrangements;
- assessment of the recommendations of the Ofgem RPI-X@20 Review and their applicability to Australia; and
- further work on the theory and application of TFP regulation to be undertaken.

Jemena considered that if 8 years of data is needed then there is no need to start developing Rules now and that stage 2 should be delayed for at least 5 years.[105] Likewise, Energex thought that the development of Rules prior to establishing whether the pre-conditions for a TFP methodology exist would be inefficient since such Rules

105 Jemena submission, March 2010, p.6

are likely to need to be significantly revised before coming into effect.[106] Energy Australia stated that the focus of the Review should be on the information needed to support TFP and addressing index specification issues.[107] SPAusNet argued that a detailed TFP design proposal should be decided and articulated before the Commission proceeds to stage 2.[108] They considered that this would be necessary to ensure stakeholder support before any drafting occurs.

However ESC argued that delaying the implementation of a TFP methodology by 8 years would reduce the benefits from estimating TFP and developing concrete TFP based mechanisms as they noted that TFP could possibly assist building blocks determinations immediately.[109] ESC instead advised that we should make rules to permit TFP methodologies but control the use of TFP by specifying criteria on when and how TFP estimates should be used. The Victorian DPI also strongly disagreed with any delay to TFP implementation.[110]

5.2 Proposed Approach for implementing a TFP methodology

In chapters 3 and 4 of this Draft Report, we establish that a TFP methodology can contribute to the promotion of the national objectives but also find that data collection and further testing of the conditions is needed to determine how the methodology should be applied. Therefore we agree with Energy Australia that the current focus should be on facilitating the collection of the data needed for a TFP methodology to enable testing of the conditions needed for the methodology. Given this and the need to develop a suitable robust dataset before a TFP methodology could be applied, we propose to separate drafting of the Rules into two stages.

Instead of stage 2 covering the drafting of all the Rules needed to implement a TFP methodology to apply in revenue and pricing decisions and access determinations, we now propose that a TFP methodology is implemented in two parts:

- Firstly, an initial Rule is made which facilitates data collection and testing. This would enable a TFP methodology to be possibly applied at a later stage; and

- Secondly, drafting of the detailed design of the TFP methodology once the necessary conditions can be, or are likely to be, met and it is considered that there is merit in allowing a TFP methodology to be used as an alternative to building blocks given the market conditions and regulatory framework applying at that time.

106 Energex submission, February 2010, p.2

107 Energy Australia submission, February 2010, p.1

108 SP AusNet submission, February 2010, p.2

109 ESC submission, March 2010, pp.6-7

110 Victorian DPI submission, February 2010, p.1

It is appropriate to split the making of the TFP methodology into two stages. It permits the drafting of the Rules on how the TFP methodology will be applied to be deferred until the conditions are met. This allows flexibility to adapt the design of the TFP methodology in accordance with the operating conditions at that time and avoids the need for drafting of detailed Rules at an early stage. It allows proper consideration of the impact of smart grids and climate change plus any new measures relating to address bushfires on the practicality of applying a TFP methodology as it would give flexibility to adapt the design of the TFP methodology to the circumstances at that time. This approach is consistent with the majority of stakeholders' views.

The delay in introducing the full set of Rules is not intended to permit a re-examination of the economic case for a TFP methodology at a later date. However it would be prudent to assess the effects of introducing a TFP methodology on the regulatory framework. In the interim, there may have been refinements to the building blocks regime that achieve some of the benefits from a TFP methodology.

One issue with introducing a TFP methodology as an alternative to building blocks regulation is that it could lead to having two alternative forms of regulation working in parallel. While this adds to the flexibility of the regulatory regime, it will add to transaction costs and creates possible gaming incentives. Further consideration of these effects plus the effectiveness of the building block regime at that time should happen before a TFP methodology is implemented.

We note that even if the detailed drafting is not triggered, the data collection and testing would deliver other significant benefits which would offset the costs involved. This includes the possible use of TFP as a benchmarking technique in building blocks or other similar benchmarking techniques. We consider there to be a net economic benefit from proceeding on this basis. The collection of relevant, robust data using consistent definitions is also an important part of cost effective economic regulation.

Reliable and consistent data will go some way to addressing the information asymmetry problem that regulators face under the building block approach. This is consistent with improving regulatory practice, transparency and achieving the efficiency potential of incentive regulation. This will, in turn, provide both end-users of the regulated services and service providers with greater confidence that prices reflect efficient costs over the long term.

It is important that the data collected would support greater use of benchmarking techniques by the AER in its building blocks determinations. This includes not only the use of TFP indices as efficient benchmarks but other methods such as data envelopment analysis and stochastic frontier analysis. We consider that a core set of physical and financial data will support the range of possible benchmarking techniques.

We do recognise that there will be a costs to both the regulator and service providers from these reporting requirements. Such costs should be marginal given that the data required should be readily available for the service providers and the list of data is comparable to the information requests that the AER issues for building block

determinations. Given that, we have regard to the potential cost in developing the proposed Rule through ensuring that only necessary data will be required to be provided.

There maybe a need for service providers to change their reporting practices and IT systems in order to provide the data in a consistent manner as required for a TFP methodology. However we consider that the benefits would more than offset this costs. In section 3.5, we reported that based upon information provided we have estimated that the cost of one complete cycle of revenue determinations using the current building blocks method to be $327m (which excludes the cost of any merit reviews). An incremental reduction in that cost due to the improved regulatory practice resulting from the reporting requirements would more than cover the additional costs.

5.3 Developing the initial Rule

We consider that the initial Rule to facilitate the possible implementation of the TFP methodology should cover the following areas:

- Collection of necessary data for a TFP methodology;
- Requirement on the regulator to produce an annual TFP data and index calculation report;
- Use of the data to test TFP methodology issues;
- Conditions needed to be met before a TFP methodology could be applied; and
- Principles for the design of a TFP methodology.

We set out the proposed aspects of the Rule and discuss the reasoning for each area in the next sections. Subject to stakeholder comments, we intend to include in the stage 1 final report a draft Rule change request which would seek to initiate this Rule for the MCE to consider. If the MCE accepts our recommendations then changes to the Rules would then be considered through a standard Rule change process in 2011.

5.3.1 Collection of necessary data for a TFP methodology

Proposed Rule:

This Rule would:

- *Oblige all regulated distribution and transmission (electricity and gas) service providers to submit an annual disclosure of regulatory information to the AER*
- *The requirements and definitions will be specified in a schedule to the NER and NGR. This will include financial, asset and network operational data.*

- *Also include an obligation on the AER to develop supporting guidelines to assist in the information disclosure process. The AER will be required to establish a working group with industry representatives on the detailed coverage and specification of the required data*

- *This information will be publicly available (subject to substantial and approved commercial confidentiality) and audited (financial data only). It will be provided under certification of the CEO, Company Secretary and/or Board of Directors.*

As a reliable and robust data-set is a key component in having a workable TFP methodology, it is important to identify and specify the core set of data requirements for regulation and to ensure that data is consistent across service providers and over time. The collection of robust and relevant data has benefits other than allowing the commencement of a TFP methodology in the future. These are:

- a better understanding for the regulator and users of the differences and similarities of the service providers' operating environments, conduct and performance;

- providing relevant information to assist in the management of the service providers' businesses; and

- data that can be used to undertake benchmarking and comparative analysis between service providers (and over time) within the building block approach.

That is, even if a TFP methodology is not ultimately included in the NER or NGR or, if the methodology is not selected by service providers, the collection of relevant, robust data using consistent definitions is an important part of cost effective economic regulation. Reliable and useful data will go some way to addressing the information asymmetry problem that regulators face under the building block approach. This is consistent with improving regulatory practice and achieving the efficiency potential of incentive regulation. This will, in turn, provide both end-users of the regulated services and service providers with greater confidence that prices reflect efficient costs over the long term. Therefore, transmission service providers must also be included in this reporting requirement.

For these reasons, we advise that the reporting requirements also apply to transmission service providers as well as distribution service providers. Although we found that it is unlikely to be appropriate to implement a TFP methodology in the transmission sectors, the issues with the building block approach identified during this Review apply equally to both transmission and distribution. Therefore the developing of robust and transparent regulatory data sets for transmission will potentially improve the application of economic regulation in these sectors as well.

However, regulatory reporting is also a cost to service providers, the regulator and users. It will take some resources to establish a reporting regime as well as ongoing costs for all regulated service providers in compliance and costs for ongoing improvements. Ultimately, these costs will be recovered through regulated prices.

Nevertheless, the costs are not so significant as to render accurate, consistent and relevant regulatory reporting infeasible.

There are also significant costs under the building block approach. The regulator has to expend considerable time and effort to understand what data submitted by a service provider actually are (that is, to establish the facts), before it is in a position to analyse and interpret the data presented. The full cost of this task in terms of more time consuming, intrusive and less well informed regulatory decision making also needs to be recognised.

There were differing views expressed by stakeholders in submissions on whether the AER has sufficient powers to collect TFP data, with most arguing that the current powers are adequate. However, we consider that, as it is recommending a new function for the AER with respect to the TFP methodology, placing an obligation in the Rules on the service providers to provide the necessary data (in a clearly defined and consistent format) would:

- add clarity and regulatory certainty;
- provide support to the tasks given to the AER; and
- ensure that the AER can start its work without unnecessary delay or argument.

The submission from the AER supports this position.[111]

The proposed requirement will be separate to the existing provisions in the National Electricity and Gas Law. Therefore this proposed Rule will not prevent the AER's use of its existing information gathering powers under the NEL and NGL to obtain any other information that it requires. The benefits of having this separate rule is that it will remove uncertainty on what information is to be provided for revenue decision making processes, and prevent service providers from delaying revenue determinations and information gathering processes by questioning of or seeking justification for data requests from the AER.

Also the current arrangements may not be fully supporting the collection of the regulatory data necessary for good regulation. Data collection is carried out on a case by case basis, on a five year cycle as part of revenue determination decisions. As a result, some uncertainty exists for both service providers and the AER on what data is to be provided and the data is not collected on a consistent basis.

Therefore improving the collection of regulatory data would not only permit the future implementation of a TFP methodology but would also improve the application and transparency of the current building block approach.

The proposed Rules will detail the required data variables. The Rule change process will ensure that the variables are relevant to regulatory requirements and the calculation of a TFP index. We note that the data necessary to support TFP

111 AER submission, March 2010, p.2

methodology will support other forms of benchmarking and overlaps with the data necessary for building blocks determinations. It will be necessary for the Rules to define the scope of the information that the regulated network service providers are required to provide.

Further consideration is needed of how prescriptive the Rule should be on the detail of the requested data. There is a risk that if the Rule is very detailed then there is little flexibility to adapt the data requirements to changing circumstances. An alternative would be for the Rule only to set out high level categories of the data needed (e.g., asset values) and for the AER to provide the specific type of data needed (e.g., the breakdown of what type of assets are required to be reported on).

The process for determining the data variables must also involve the regulator and service providers in developing the data specification and methodology details together, taking into account the different histories and needs of service providers as relevant. The collaborative approach to forming the data specifications will have the benefit of addressing some of the key regulatory principles such as communication, consultation, and transparency. The variables listed in appendix E of the Commission's Preliminary Findings Paper provide a starting point for this process.

The AER would then be tasked to develop supporting guidance. For example, the flexibility service providers currently have in choosing cost allocation methods may lead to cost data being supplied that is not sufficiently consistent for TFP purposes. One way of addressing this might be to require service providers to supply cost data both with and without overheads included. This would provide scope to adopt a common cost allocation method across all service providers for TFP purposes.

The working group will help the AER ensure that the same services can be reported on over time and that definitions and collection mechanisms remain unchanged for a sufficiently long period to create a robust database.

To ensure that all parties can have confidence in the accuracy of data supplied it will be important to have as much of the data audited as possible. In principle, all data would need to be audited to ensure consistent treatment across service providers and to ensure that starting prices are set using the best quality information available. External auditors with the requisite experience and track record in auditing financial data are readily available. Requiring financial data to be supplied on an audited basis would not increase the costs of supplying data unduly. Consequently, we recommend that all data be required to be supplied under certification of the CEO, Company Secretary and/or Board of Directors.

One of the potential benefits of a TFP methodology is that it is more transparent than current building block arrangements. This should reduce the extent of disputation as well as providing a higher level of confidence and certainty to all stakeholders. However, to ensure this potential is realised it is important that all relevant data – both that supplied by the service providers and that used by the regulator - are available in the public domain. This not only allows all stakeholders to conduct their own analysis

if they so choose but leads to service providers having ownership of the data used and to appropriate levels of accountability for the regulator.

As the data used in a TFP methodology relate to the service providers' key outputs and inputs and are historic rather than forecast, it is unlikely that the relevant data would be of a genuinely commercial-in-confidence nature. Consequently, to ensure the benefits of a TFP methodology are realised and all stakeholders are as fully informed as possible, the bar for any data remaining commercial-in-confidence needs to be set at a particularly high level.

Service providers' TFP information disclosures would be published annually on the AER's website.

It should be emphasised that we are not proposing a wider and deeper collection of information than which may be relevant. All data reporting requirements must be justified and cost efficient, especially as the costs will be passed through to customers. The intended outcome will be the collection of a standardised, relevant and robust regulatory data-set which is consistent with best practice regulation. The data for effective regulation – covering both the building block and TFP approaches - should be specified, with consistent definitions established, and reported on. This process would also provide an opportunity to centralise the reporting requirements for service providers and remove any ineffective duplication.

The proposed set of regulatory data specified will be a core set of financial and physical data useful to both building blocks and TFP regulation. It is not meant to be exhaustive and would not impede the AER's ability to seek additional specific information through its existing powers.

5.3.2 Requirement on the regulator to produce annual TFP index and calculation report

Proposed Rule:

The AER would be required to publish an annual TFP calculation and annual TFP report discussing its analysis on aspects of the TFP specification/methodology. The AER can only make adjustments to the data provided by the service providers to: a) adjust for structural differences to improve the consistency of the data (for example, for different classifications of services); or b) to adjust certain years' data for certain service providers because of exceptional circumstances. Any adjustment to the data must be fully explained in the annual TFP report.

In addition to making the TFP data-set publicly available to the maximum extent possible, an important part of the process will be annual reports by the AER on its progress in developing TFP indexes and a TFP methodology for price determinations. The annual reports will provide a means for the AER to discuss its work on measuring TFP growth and development of a TFP methodology.

The annual reports will have a number of benefits. Firstly, they will facilitate analysis of the data-set and help identify any problems with the data at an early stage. This will allow refinement of data collection and reporting as necessary so that a robust data-set

can be established quickly. Once a few years of data are available the focus of the annual reports should move to undertaking 'paper trials' of a TFP methodology for price and revenue determinations. This will assist with refining the methodology and help build stakeholder confidence in the approach.

Secondly, the annual reports will help improve stakeholders' understanding of TFP before a TFP methodology is applied. Similarly, they will promote understanding of possible TFP growth figures and their key drivers. The annual reports reporting TFP calculations should be at least as detailed as the reports released by the ESC and those prepared by Economic Insights staff for the Commerce Commission in New Zealand and for Jemena.[112] They should clearly explain all aspects of the construction of output and input prices and quantities variables, the derivation of total output and total input quantity indexes and the resulting TFP and partial productivity indexes. Movements in the relevant indexes from year to year should be clearly explained to promote understanding of the drivers of TFP and all the data used to construct the indexes should be included in appendices. The Economic Insights Model report provides a guide for detail required on a TFP methodology for price determinations.

Thirdly, the AER's research on TFP indexes based on a robust and reliable data-set and associated coverage in the annual reports should facilitate the use of TFP indexes as a benchmarking tool for use in building block determinations. This will require work not only on TFP growth but also on TFP levels and the influence of operating environment conditions on both TFP levels and TFP growth. This work will, in turn, inform the formation of industry groups for use in a TFP methodology.

The AER's ability to amend data must be limited to adjusting for structural differences to improve the consistency of the data and to adjusting certain years' data for certain service providers because of exceptional circumstances. Ideally the reporting requirements for the data-set should eliminate as many inconsistencies as possible but some (such as the treatment of overheads) may remain and require some standardisation of treatment. It is also possible that the impact of particularly large and unusual one-off events may need to be removed from the data. An example of such an occurrence was the impact of the cable failure leading to the Auckland CBD outage in February 1998 and its aftermath. The effects of this highly unusual event were removed from the TFP series used by the Commerce Commission.

Any adjustments made to the data supplied by the service providers must be fully and clearly explained and quantified by the AER. This is essential for transparency of the calculations and to ensure service providers retain ownership of the data used and resulting estimates. It should be noted that several service providers have been concerned about the calculation of the ESC's TFP indexes because they have not been able to replicate the data used or reconcile it with data they have previously supplied to the regulator. The Victorian DPI also noted that extensive questions were raised

112 PEG, TFP Research for Victoria's Power Distribution Industry, Report for the ESC, December 2004; Denis Lawrence, Regulation of Electricity Lines Businesses, Analysis of Lines Business Performance – 1996–2003, Report for the Commerce Commission, December 2003; Economic Insights, The Productivity Performance of Jemena Gas Networks' NSW Gas Distribution System, Report for Jemena Gas Networks, August 2009.

regarding the accuracy of the ESC's database.[113] To the extent that such problems can be avoided then all stakeholders will have more confidence in the process.

As noted in the preceding section, an important part of ensuring there is transparency and ownership of the process by all stakeholders is to ensure that all data supplied by service providers and used by the AER in the calculation of TFP indexes is in the public domain to the maximum extent possible. Successful arguments for granting commercial-in-confidence status to any of the relatively high level data used in TFP analysis would have to be exceptionally compelling.

5.3.3 Use of the data to test TFP specification options

Proposed Rule:

The AER would be required to use the data provided under the disclosure Rule to test for the appropriate specification for calculating TFP, and the appropriate definition of the industry groups (to be included in the annual TFP report).

The Economic Insights Specification report lists and discusses a number of alternative ways of specifying both output and input prices and quantities in TFP analysis. The earlier Sensitivity report showed that making different specification choices can have a material impact on resulting TFP estimates using historic time-series data for Victoria.

The Economic Insights Model shows how one specification satisfies the key requirement for allowing service providers who achieve at least industry average TFP growth to recover or exceed their revenue requirement and how it can handle relatively large external cost shocks. It also showed that the resulting price path was likely to be smoother than that which would result from applying the building block approach. However, the model used a synthesised database which was benchmarked against selected service providers' data for one year and their actual TFP growth rates. Similar tests need to be carried out using actual data for a number of years and across the full population of service providers.

In its submission PEG agreed that testing of alternative specifications was important.

While the TFP index specification and the TFP methodology would both need to satisfy the key requirements set out in section 5.3.6 below, testing of alternative specifications meeting these requirements using robust and consistent historic data will provide a basis for deciding which specification performs best and is hence preferred. To enable testing of alternative specifications it will be necessary to ensure that sufficient data is collected to cover the major alternative output and input specifications. The variables listed in Appendix E of the Preliminary Findings Paper cover the range of alternatives discussed in the Specification report.

The formation of one or more industry groups that have similar productivity growth performance and potential across the members of the group is another task that can

113 Victorian DPI submission, February 2010, p.9

only be done once robust and consistent data are available. While preliminary evidence from Victoria finds similar productivity growth across both rural and urban service providers, a more comprehensive analysis is required using agreed data covering the whole population of service providers.

5.3.4 Conditions needed to be met before a TFP methodology could be applied

Proposed Rule:

The AER would be required to use the data provided and test for the conditions necessary to support the implementation of a TFP methodology and to inform stakeholders on its assessment in its annual TFP report. The conditions are:

1. *The available data is robust and consistent and can produce a TFP growth rate consistent with the criteria specified for the TFP index calculation*

2. *That the TFP index growth is likely to be a reasonable estimate of future potential productivity growth of the industry group*

3. *Service providers within an industry group face comparable productivity growth prospects*

A discussed in section 5.3.1 above, a TFP methodology requires robust and consistent data from service providers. The data needs to be consistent both over time (so that variations in TFP reflect actual performance changes rather than changes in data coverage or definitions) and across service providers (so that comparable activities are being covered). In the preceding chapter the Commission found that existing data are not currently consistent, reliable nor robust. Therefore the first requirement for implementing a TFP methodology is the creation of a regulatory data-set that is consistent and robust and which can support an appropriately specified TFP calculation.

The AEMC is recommending that the first priority is to start collecting relevant data from all service providers once definitions for the requisite variables have been agreed. This does not preclude the AER, in consultation with service providers, from also backcasting data to earlier years (i.e., to the period before the start of formal TFP data collection) if it thinks this can be done with the required degree of robustness and consistency. We are of the view that at least 8 years of robust and consistent data will be required to establish a TFP growth rate that could be used in a TFP methodology for price and revenue determinations.

The AER will, therefore, be required to assess and report on whether available data (from both formal data collection and backcasting) are sufficiently robust and consistent to support rigorous TFP analysis to the standard that would be required to support a price determination using a TFP methodology.

The second requirement is that historic TFP growth rates are a good predictor of likely future TFP growth potential. This requires conditions facing service providers to be relatively stable over time. A number of service providers submitted that they are

likely to face a number of potentially large changes that will make future conditions less stable than historically. Examples quoted included climate change initiatives, the development of smart grids and likely increases in required replacement investment or the so-called 'wall of wire' effect. However, the AER has recently concluded that the impact of climate change does not require significantly enhanced measures that would justify substantial increases to network build or asset replacement. It also found that service providers would not be subject to changes to their operating environments that would have a material impact on operating expenditure over the next regulatory period.

Once a robust and consistent data-set is available the AER will be able to test whether its view of relative stability going forward or the view of some service providers that major changes will be required appears to be the most valid. An important part of assessing whether this condition is met will be forming a view on whether safeguard mechanisms built into the TFP methodology provide adequate insurance for the emergence of unexpected cost shocks.

The third requirement that needs to be met is that groups of service providers facing reasonably comparable productivity growth potential can be formed. As discussed in chapter 4 each group needs to have a sufficient number of service providers so that no single service provider can influence the group outcome unduly. It is only once robust and consistent data becomes available and TFP indexes have been calculated for each service provider that service providers will be able to be placed into groups with similar productivity growth potential. The AER will need to report on progress with measuring individual service provider productivity, with assessing the impact of operating environment conditions on productivity growth and on the grouping of service providers.

5.3.5 Principles for the design of a TFP methodology

Proposed Rule:

The specification for calculating the TFP growth rate and forming a TFP methodology for price determinations must comply with the following conditions:

- *must use the index number approach - econometric approaches are not permitted;*
- *output quantities used in the calculation accurately reflect the services supplied;*
- *capital user costs are set exogenously, are consistent with the service provider's regulatory asset base and are consistent with the property of financial capital maintenance (FCM) - this means that a regulated business is compensated for efficient expenditure and efficient investments such that its real financial capital is at least maintained in present value terms;*
- *measures of capital input quantities accurately reflect industry production characteristics;*
- *results in a reasonably stable index over time;*

- *creates no systematic bias in the TFP growth estimate; and*
- *is consistent with promoting economic efficiency and does not result in any perverse incentives.*

A detailed discussion of the above conditions the TFP index and methodology are required to meet was presented in chapter 4. If these conditions are met then the industry productivity growth should be accurately measured and, along with other aspects of the methodology such as the use of appropriate starting prices, service providers should be allowed the opportunity to recover their efficient costs.

Given the relatively small number of observations available in Australia, productivity will have to be calculated using the index number method. This method is also the most transparent and reproducible of the alternative ways of estimating productivity growth.

Output quantities used in calculating the TFP growth rate will need to accurately reflect the services supplied and charged for. For example, using relatively erratic measures such as peak demand as proxies for contracted reserved capacity would be likely to cause significant inaccuracies and potential biases in the measured TFP growth rate.

The cost of capital measure used in the TFP growth measure needs to be based directly on the return of and return on the RAB and be consistent with ex ante financial capital maintenance. FCM refers to the requirement that investors be given the opportunity ex ante to recover the full opportunity cost of their investments in present value terms. FCM is a key regulatory principle and plays a key role in building block regulation. It is essential that a TFP method is also consistent with ex ante FCM if economic efficiency is to be achieved. To satisfy ex ante FCM annual capital costs will need to be calculated exogenously.

The capital input quantity used in calculating the TFP growth rate will need to accurately reflect the production characteristics of the industry (that is, the depreciation profile used in forming the capital input quantity needs to be consistent with physical asset depreciation characteristics). Overestimating the rate of decay in annual capital input service potential would bias the TFP growth rate upwards and could result in too high an X factor being set.

The TFP index will need to be relatively stable over time reflecting the capital intensive nature of the industry with long-lived, sunk assets. Erratic movements in the TFP index are more likely to reflect specification or data errors than actual performance.

The TFP index should not exhibit any systematic biases. If there are systematic biases present in the TFP growth rate then the resulting X factor may be too high or too low leading to service providers earning inadequate or excessive returns, respectively.

Finally, the TFP growth measure and the TFP methodology will need to be consistent with promoting economic efficiency. This requires a broader examination of the impact on consumers as well as producers. A key requirement is that resulting prices be

reflective of efficient costs. This means that the structure of prices has to be taken into account as well as the overall average price.

Given the importance of the specification of the TFP index in the application of a TFP methodology for determining allowed revenue and prices, we consider that it is necessary to specify this range of criteria in the initial Rule. These will also guide the AER in its calculations of the TFP indices.

During this Review, we have also discussed other key aspects of the design of the TFP methodology. For example, the initial price method, the process for moving to and from a TFP based determination and use of safeguards mechanisms. While these aspects are important to the application, we consider that it would be better to leave consideration on these to the later stage of the development of the detailed implementation Rule. Therefore we have not proposed to include any other criteria for the TFP design in the initial Rule.

5.4 Victorian Minister Rule Change Proposal

On 18 June 2008, the Victorian Minister for Energy and Resources submitted a Rule change proposal to amend the National Electricity Rules to allow the use of a TFP methodology as an alternative option for pricing determinations. That proposal sought to permit the option of TFP for electricity distribution determinations and requested that the option be made available in time for the next Victorian revenue reset process.

The Commission issued a 95 Notice on 24 July 2008 advising of its intention to commence the rule making process and initial consultation on the proposal. Following a review of the submissions to the Rule change proposal, especially the AER's comment that it would not be able to complete all the tasks required for a TFP methodology to be operational in time for the 2011-2015 Victorian determination, the Commission decided to hold consideration of the Rule and initiate this wide ranging Review.

We intend to proceed to making a draft determination on this Rule change request following publication of the final report early next year. In making a determination on this Rule change proposal, the Commission will have regard to the analysis set out in the final report, any statement the MCE makes on the stage 1 final report and the process going forward supporting any implementation of a TFP methodology.

Abbreviations

AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
CAPM	capital asset pricing model
DEA	Data Envelopment Analysis
DPI	Victorian Department of Primary Industries
DTe	Office of Energy Regulation (Energiekamer Directie Toezicht Energie)
ECM	efficiency carryover mechanism
ENA	Energy Network Association
ERA	Economic Regulatory Authority
ESC	Essential Services Commission of Victoria
FCM	financial capital maintenance
GPAL	Gas Pipelines Access Law
MCE	Ministerial Council on Energy
NAS	Network Advisory Services
NEL	National Electricity Law
NEO	National electricity objective
NER	National Electricity Rules
NGL	National Gas Law
NGO	National gas objective
NGR	National Gas Law
PEG	Pacific Economics Group
RAB	Regulatory asset base
RIN	Regulatory Information Notices

RIO	Regulatory Information Order
TFP	total factor productivity
WACC	weighted average cost of capital

A Consultation process

On 21 November 2008, the AEMC initiated a review into whether the National Electricity Rules (NER) or National Gas Rules (NGR) should be amended to permit these applications of a TFP methodology. The need for this Review was identified following consideration of initial submissions on the Rule change proposal on a TFP methodology for electricity distribution network regulation lodged by the Victorian Minister for Energy and Resources in June 2008 (Victorian Proposal).[114] Conducting this Review is also consistent with the recommendations made by the Expert Panel on Access Pricing (Expert Panel) to the Ministerial Council on Energy (MCE).[115]

This Review covers the gas and electricity transmission and distribution sectors, and its objective is to provide advice to the MCE on:

- whether there would be circumstances in which a permitted application of a TFP methodology would contribute to either the national electricity objective (NEO) or the national gas objective (NGO); and
- where appropriate, recommend for the MCE's consideration draft Rules to allow a TFP methodology for any individual or group of service providers.

A.1 Outline of process

The various stages and documents released for the Review including the next steps are set out in the table below. All the documents are available from the AEMC website.

Table A.1

Date	Stage
12 December 2008	Release of Issues Paper and consultant report *Brattle Group International Review Report* and *London Economics International Review Presentation*
11 February 2009	Public forum on Issues Paper
28 April 2009	Release of Revised Statement of Approach Paper
12 June 2009	Release of consultant reports: *Economic Insight Sensitivity Report*, *Economic Insight Data Availability Report* and *Brattle Group*

114 On 23 June 2008, the Victorian Minister for Energy and Resources submitted a proposal to amend the NER to allow the use of a TFP methodology as an alternative economic regulation methodology to be applied by the AER in approving or amending determinations for electricity distribution service providers.

115 The Expert Panel considered in its Final Report to the MCE (April 2006) that, while there was merit in encouraging the development of a TFP methodology, 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 methodology would become a practicable option.

Date	Stage
	Incentives Report
23 July 2009	Release of *Perspectives on the Building Block Approach*
21 August 2009	Release of consultant report: *NAS Expenditure Profiles Report*
28 August 2009	Release of Discussion Paper
28 September 2009	Workshop on Discussion Paper: electricity sector
2 October 2009	Workshop on Discussion Paper: gas sector
17 December 2009	Release of Preliminary Findings and consultant reports: *Brattle Group Review of Options in Victoria*, *Brattle Group Reform of the Building Blocks Framework* and *Economic Insights Index Specification Issues*.
1 February 2010	Public forum on Preliminary Findings
29 June 2010	Release of consultant report: *A model of building blocks and total factor productivity-based regulatory approaches and outcomes by Economic Insights*
12 November 2010	**Release of Draft Report**
29 November 2010	Workshop on Economic Insights modelling and Draft Report
Early 2011	Provide Stage 1 Final Report and Rule Change Request to MCE
2011	Assessment of Rule change into facilitating data collection and future application of a TFP methodology

A.2 Issues Paper

On 12 December 2008, the AEMC released a Framework and Issues Paper (Issues Paper) to commence the Review. The rationale, scope and approach to the Review were set out for stakeholder comment. The Brattle International Review Report was also released which provided information on the use of TFP by energy regulators in a selection of overseas jurisdictions. Presentation slides from London Economics were also released at this time.

A public forum on the Issues Paper was held on 11 February 2009. Following the public forum and receipt of submissions, AEMC staff also met with a variety of stakeholders.

After considering the issues raised by interested parties in their submissions to the Issues Paper, the AEMC decided to amend its approach to the Review. A revised statement of approach was released on 28 April 2009. This informed parties on the amended approach that would be taken for the remainder of the Review.

On 12 June 2009, the AEMC released three reports that it had commissioned. The first, a report on the current availability of data suitable to support the calculation of a TFP

index, was prepared by Economic Insights.[116] The second report, also from Economic Insights, reported on a sensitivity analysis of TFP estimates to variations in the methodology used in their construction.[117]A report was also prepared by The Brattle Group. This report discussed the extent and role of incentives under a TFP methodology.[118]

On 23 July 2009, the AEMC revised its timeline for the TFP Review to allow sufficient time to take into consideration a number of consultant reports and other new material. The AEMC released its report *Perspectives on the building block approach* on 30 July 2009. A report by NAS was released on 21 August 2009.[119]

A.3 Discussion Paper

The AEMC's Discussion Paper was released on 28 August 2009. This paper was designed to respond to stakeholders' comments that further information on the design of a TFP based revenue and pricing methodology (TFP methodology) was required to enable them to reach a view on the relative merits of applying a TFP methodology. The Discussion Paper presented a design example of a possible TFP methodology for consultation and discussion. The release of the Discussion Paper was consistent with the Revised statement of approach which outlined our intention to conduct a co-operative approach with stakeholders to analyse issues relevant to the development of a TFP methodology suitable for the Australian energy context.

In addition to inviting stakeholders to make written submissions in response to the Discussion Paper, workshops on the design example from the Discussion Paper were held in September and October 2009.

A.4 Preliminary Findings

Following the consideration of submissions to the Discussion Paper as well as matters raised at the workshops, the AEMC released its Preliminary Findings for the Review on 17 December 2009. The purpose of this report was to step through an analysis of the potential advantages and disadvantages of including a TFP methodology in the NER and NGR. The report also discussed whether the conditions necessary for a TFP methodology exist within the sectors of the energy market.

In addition, a number of consultant reports were released in conjunction with the Preliminary Findings. These prepared by The Brattle Group (*Review of incentive power*

116 Economic Insights, *Assessment of data currently available to support TFP-based network regulation*, 9 June 2009.

117 Economic Insights, *Energy network total factor productivity sensitivity analysis*, 9 June 2009.

118 The Brattle Group, *Incentives under total factor productivity based and building-blocks type price controls*, June 2009.

119 Network Advisory Services, Issues in relation to the availability and use of asset, expenditure and related information for Australian electricity and gas distribution businesses, August 2009.

and regulatory options in Victoria and *Options for reforming the building-blocks framework*) and Economic Insights (*Total factor productivity index specification issues*).

A public forum to discuss the Preliminary Findings was held on 1 February 2010. Submissions to the Preliminary Findings were also invited from stakeholders.

The AEMC subsequently released an excel model prepared by Economic Insights that compared a TFP methodology with the current building block approach that is applied by the AER to electricity distribution service providers. This modelling also included a number of scenarios to assist stakeholders in their assessment of the relative effect of the building block approach and a TFP methodology. It also provided the opportunity for stakeholders to test their own scenarios. The models were accompanied by the Economic Insights report *A model of building blocks and total factor productivity-based regulatory approaches and outcomes* (29 June 2010).

We will hold a workshop which explains the workings of the Economic Insights model and also on how the AEMC has had regard to the modelling results in reaching its draft recommendations. The workshop will be held at the AEMC Offices on Monday, 29 November 2010 from 10.00 am to 1.00 pm. This will also provide an opportunity for stakeholders to ask any questions on the draft recommendations.

A.5 Way forward

Written submissions responding to this Draft Report are requested by 5pm, Friday 24 December 2010. Submissions are to be lodged electronically through the AEMC's online lodgement facility at www.aemc.gov.au and should refer to project number 'EMO0006'.

Following receipt and consideration of written submissions to this Draft Report, the AEMC will prepare a Final Report. This Final Report will include advice to the MCE on the appropriate course of action to be taken on the question of whether to provide a TFP methodology in the NER and NGR as an alternative to the current building block approach to revenue and price determinations. It is expected that this will be provided to the MCE in early 2011.

The AEMC will then consider the rule change on the use of TFP for electricity distribution service providers lodged by the Victorian Minister for Energy and Resources in June 2008.

B Reference material

As part of this Review, the AEMC requested several consultants to undertake specific studies to inform it and stakeholders on matters relating to the design and use of a TFP methodology. Below are summaries of these different reference materials. Any opinions expressed in this appendix are the views of the authors of the reference material and do not necessarily represent the views of the AEMC.

B.1 Brattle International Review Report

The Brattle Group, *Use of total factor productivity analyses in network regulation: case studies of regulatory practice*, October 2008. (Brattle International Review Report)

B.1.1 Scope

The AEMC requested The Brattle Group review case studies on regulators' use of TFP methodologies in setting price and revenue controls primarily for energy network companies in NZ, the UK, the Netherlands, Ontario in Canada, and selected jurisdictions in North America.

For each case study, the Brattle International Review Report covers:

- the contextual framework, the industry structure and institutional framework in the relevant market;
- how a TFP methodology is applied in network regulation and specification of the key design features to a TFP methodology;
- how the TFP framework has evolved (a historical and structural perspective) and the rationale for applying a TFP methodology in the market, and if there is any indication of future changes to the regime;
- observations on the performance of a TFP methodology; and
- identification of the conditions necessary for the successful application of a TFP methodology.

B.1.2 Observations from The Brattle Group

General observations from the Brattle International Review Report include:

- the reasons for using a TFP methodology and its specific design are difficult to identify due to the different jurisdictional institutional settings;
- TFP analysis can be used to set the rate for changing the price cap, but not for setting initial prices to achieve a reasonable profit;

- a TFP methodology is simple in concept for the regulator, but may be difficult to adopt if it does not meet all the objectives set for the regulator;
- the TFP analysis requires an appropriate benchmark set of firms to be relevant for the regulator to set prices;
- in some cases, regulators may be concerned that better performing firms may not maintain the average rate of productivity growth in the future while other firms require higher targets to encourage improvement. Here, regulators may set different efficiency targets for different firms using methodologies other than a TFP analysis with a relative productivity analysis;
- TFP analysis measures the rate of productivity change of a group of firms over time, but does not measure 'inefficiency'. Other methods such as Data Envelopment Analysis (DEA) or stochastic frontier methods can determine inefficiencies;
- some regulators use TFP methodologies (such as partial productivity method) as part of the building block approach, rather than for explicitly setting the X factor; and
- TFP methodologies can be technically difficult and controversial, with different TFP methodologies providing different results and disagreement between regulated firms and other stakeholders on the preferred method to apply.

Specific observations from the Brattle International Review Report are also made on each of the case studies. These are summarised below.

Electricity distribution in NZ

The Brattle Group observed that a TFP methodology is used for electricity distribution in NZ (where there are 28 electricity distributors) to reduce the regulatory effort for setting price controls. Here, if the threshold price, which is set by a TFP methodology, is breached, the building block approach is applied.[120]

Company-specific X factors are applied under the NZ approach. The X factor is higher for companies with below average relative TFP levels, and for companies with above average profitability.

A TFP methodology was used in NZ because regulatory accounts spanning over a number of years were already available from electricity distributors as a result of previously instigated legal requirements.

Quality of service has not yet been addressed under a TFP methodology in NZ. This needs to be resolved in order to avoid penalising firms that invest to improve service

120 Since the publication of the Brattle International Review Report, the NZ regulatory framework for electricity distribution has changed and taken effect from 1 April 2009 (subpart 9 of Part 4 of the Commerce Act 1986 (NZ)).

quality. NZ legislation does not specify a TFP methodology for the regulation of electricity distribution companies.

Energy networks in the UK

The Office of the Gas and Electricity Markets (Ofgem) has a wide discretion over how price controls are set. Under its building block approach, Ofgem uses TFP analyses as part of its review of companies' cost forecasts.[121] This allows for the determination of the rate that operating costs might be expected to fall during the regulatory period. Here, a TFP methodology is not used to set the X factor. The Brattle Group characterises Ofgem's approach as a 'partial factor productivity' approach by the fact that it has considered evidence from TFP studies within its building block approach. For instance, Ofgem uses the building block approach and comparisons between companies to determine a reasonable level of operating expenditure for the start of the regulatory period. A productivity growth assumption is also applied to the starting level of operating expenditure to determine the allowed level of operating expenditure for the regulatory period.

Ofgem assumes that the rate that unit operating costs might fall during price control. It also assumes the rate that less productive firms will be able to reach to the level of the more productive firms.

Ofgem uses evidence from different TFP methodologies, including from the UK electricity distribution sector, and sectors in other countries. The TFP analysis is only one part of the information that Ofgem uses to set prices. The formulaic method used with the TFP data is unclear.

Electricity distribution in the Netherlands

In the Netherlands, firm-specific X factors were set by the Office of Energy Regulation (Energiekamer Directie Toezicht Energie (DTe)) based on DEA at the first regulatory period 2001-03. An outcome of this was the requirement for less productive firms to reduce their prices more quickly than more productive ones. As a consequence, all firms had the same X factor in subsequent regulatory periods using pure TFP analysis.

Pursuant to the Electricity Act 1998 (Netherlands), the DTe developed a TFP methodology for determining the price cap to promote efficient operations. It used a pure TFP analysis to establish and apply the same X factor to all firms in subsequent regulatory periods.[122]

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121 The Brattle Group notes that the gas sector consists of one transmission network and eight distribution networks. Under electricity, the transmission network is owned by the same corporate group as gas, and some of the electricity distribution networks are under common group ownership.

122 There are ten electricity distribution firms in the Netherlands.

Here, a TFP methodology is based on data which only spans from the beginning of the first regulatory period 2001-03. The TFP growth rate measurements are based on three years of data.

There have been several legal challenges from the regulated electricity distribution companies on the DTe's decisions relating to X factors. Accordingly, these decisions have been revised following these appeals. The Brattle Group suggests that these disputes may have been partially due to the DTe's consultation process on setting the X factor, and the formulaic method in using the TFP analysis to set the X factor.

Gas distribution in Ontario, Canada

Here, there were two proposed TFP methodologies by the advisors (Pacific Economics Group) to the Ontario Energy Board (the regulator) and the advisors (Dr Paul Carpenter of The Brattle Group and Professor Jeffrey Bernstein of the Florida International University) to Enbridge (one of two major gas utilities in Ontario). The two approaches were based on similar input data-sets taken from a group of US gas distribution companies, but resulted in different X factor proposals.

The Brattle Group observed that this was an example of the problem with econometric-based TFP methodologies where the results are:

- sensitive to the precise specification of the model;
- not robust, difficult or impossible to reproduce; and
- less likely to be agreed upon.

Uses of a TFP methodology in selected jurisdictions in North America

A number of jurisdictions in North America, including Ontario, Massachusetts, California and Maine, have used a TFP methodology to set price caps for energy distribution. The approach has not been specified as a requirement in relevant legislation, but has developed over time in each jurisdiction.

For energy distribution in the US, companies are regulated by state public utility commissions and the legislative framework only provides for cost of service (rate of return) regulation. As exceptions to the rule, Ontario, Massachusetts, California and Maine are the only jurisdictions in the US which use price caps regulation. In these particular jurisdictions, as each company has its own rate case, the issue of whether an industry-wide X factor or a company-specific one should be used does not arise.

The building block approach is uncommon in North America. Instead, prices are reset with reference to costs for the most recent year with available actual data or a forecast for the year following the rate case. Prices then remain at this level until a new rate case is requested by the company or customers.

In the regulated part of the US telecommunications sector, a TFP methodology has predominantly been adopted for setting prices. A major issue was applying this to only the regulated part of the companies' business. Technological changes and new competition have now reduced the regulated parts of these businesses and so a TFP methodology has been applied less for that sector.

B.1.3 Comments from the ESC

The ESC submitted that Brattle International Review Report did not refer to PEG's incentive power model, which it considered to be 'the most comprehensive, rigorous assessment of the incentive effects of alternative regulatory regimes that has been presented in Australia'. The ESC considered that the incentive effects of a TFP methodology and the building block approach should take this into account and build on this work. It also stated that the ESC's research does not support The Brattle Group's main conclusions.[123] For instance, the ESC considered that The Brattle Group did not consider:[124]

- ex ante incentives related to cost projections;
- long-term cost reduction initiatives when comparing a TFP methodology and the building block approach;
- 'light-handed' review of company costs under a TFP methodology;
- implementation and administrative costs of rival regimes; and
- the ESC's detailed argument on why a TFP methodology provides for stronger incentives than the building block approach.

The ESC also disagreed on a number of points in the Brattle International Review Report. In particular, the ESC commented on:[125]

- information asymmetries being ameliorated by a 'menu' approach of using a TFP methodology as a benchmarking tool;
- regulators benefiting from more information than less;
- the TFP outputs including service quality; and
- a TFP methodology measuring physical quantities.

123 ESC submission, June 2009, p. 5.

124 ibid., pp. 6-7.

125 ibid., pp. 8-9.

B.2 Economic Insights Sensitivity Report

Economic Insights, Energy network total factor productivity sensitivity analysis, 9 June 2009. (Economic Insights Sensitivity Report)

B.2.1 Scope

The AEMC requested Economic Insights conduct a sensitivity analysis of TFP estimates to variations in the methodology used in their construction to determine whether this was a material issue. The Economic Insights Sensitivity Report focuses on examining sensitivity to different output and input specifications, lengths of the time period used, index and weighting methods used, and the method used to calculate average growth rates.

For the sensitivity analysis of TFP results, aggregate Victorian data for electricity and gas distribution was used. The electricity data covered 1995 to 2007 while the gas data covered 1998 to 2007.

B.2.2 Findings from Economic Insights

Electricity distribution

For electricity distribution, Economic Insights found that the average annual growth rate of the output index is relatively sensitive to its specification with previously used specifications providing estimates ranging from 2.0 to 2.9 per cent. The average annual growth rate of the input index is also relatively sensitive to its specification with previously used specifications providing estimates ranging from 0.6 to over 1 per cent over the period since 1995 and a larger difference for the period since 2002.

Depending on which TFP specification is chosen, Economic Insights observed TFP growth rates ranging between 1 and 2.2 per cent over the whole period.

Gas distribution

For gas distribution, Economic Insights found that the average annual growth rate of the output index is also relatively sensitive to its specification with previously used specifications providing estimates ranging from 0.7 to over 1.7 per cent. Depending on which method is used to measure capital input quantities, the average annual input quantity index growth rate ranges from –0.4 to –1.8 per cent. This difference is more pronounced for the period since 2002 with average annual growth input rates ranging from –0.7 to –2.5 per cent.

Depending on which TFP specification is chosen, Economic Insights observed TFP growth rates ranging between 1.5 and 3.5 per cent over the period since 1998. For the more recent period since 2002, the difference is even greater with a growth rate difference of 2.5 percentage points.

B.2.3 Conclusion from Economic Insights

Economic Insights concluded that TFP analyses of Australian electricity and gas distribution systems will be quite sensitive to the specifications chosen. For electricity distribution, specifications which place more weight on throughput and peak demand output measures will exhibit higher TFP growth and more volatility than specifications that place more weight on customer number and system capacity output measures. For gas distribution, specifications which place more weight on customer number and system capacity output measures will exhibit higher TFP growth but less volatility. In both cases TFP measures which use the constant price depreciated asset value as a proxy for capital input quantities will exhibit higher growth than those using physical proxies for capital input.

Economic Insights also concluded that TFP analyses of Australian energy distribution systems will be relatively sensitive to the output and input specifications chosen, the time period examined and the method used to calculate growth rates. It stated that it is therefore important to specify the correct methodology in any future implementation of a TFP methodology.

B.3 Economic Insights Data Availability Report

Economic Insights, *Assessment of data currently available to support TFP–based network regulation*, 9 June 2009. (Economic Insights Data Availability Report)

B.3.1 Scope

The AEMC requested Economic Insights provide an assessment of whether currently available data and current regulatory reporting requirements are sufficiently robust and relevant to adequately support the implementation of a TFP methodology. Economic Insights was also requested to advise on possible courses of action to address any identified gaps in the quality and availability of such data.

B.3.2 Findings and conclusion

Coverage and definitions

In the Economic Insights Data Availability Report, Economic Insights found that the coverage of currently available historical regulatory data varied both between jurisdictions and over time. Economic Insights suggested that the available regulatory data has only concentrated on financial data. It considered that it is both financial data and its associated physical quantity data that is relevant for TFP analysis.

Nevertheless, Economic Insights considered that gaps and differences in coverage over time and across jurisdictions exist in financial data that has been collected to date. It also observed that there are many variables which remained inadequately defined,

which makes it difficult to compare across service providers, jurisdictions and time periods.

Consistency

According to Economic Insights, the consistency of regulatory data is variable across time and jurisdiction including operating expenditure.

Economic Insights regarded the transfer of network regulation to the AER as an opportunity to achieve greater uniformity of data for the future, but it will be difficult to compile a robust historical database. It also considered that there is a loss of corporate knowledge from stakeholders that would assist in determining whether past data is consistent and comparable across jurisdictions.

Accessibility

Economic Insights found that the current regulatory data is either not publicly available or, if available, is represented in aggregated format. It considered that the transparency of the TFP process is compromised by the lack of availability of all relevant data in the public domain.

B.3.3 Way forward proposed by Economic Insights

As the currently available data was found by Economic Insights to be not sufficiently robust for the purposes of a TFP methodology, it recommended ways forward to address this issue.

Economic Insights suggested that:

- a well-specified and robust national TFP database can be developed for the electricity and gas distribution industries. This database would allow for the potential to apply an alternative method of regulation in the future and address the information asymmetry issues under the building block approach;
- the AER's draft Regulatory Information Order (RIO) could include more information on outputs and inputs and consistent cost data. The extra information required would be readily available and not be onerous for service providers to supply;
- service providers and other stakeholders should be consulted on the data variables required for TFP analysis and their detailed definition;
- inconsistencies and problems in the available data for TFP analysis would be identified and rectified only by actually carrying out TFP studies and using that data;
- it will take a number of years before there is sufficient data available for a TFP methodology to commence; and

- however, a TFP methodology may commence as early as the next round of reviews if necessary, including conducting 'paper trials' of a TFP methodology compared with the building block approach.

B.4 Brattle Incentives Report

The Brattle Group, *Incentives under total factor productivity based and building-blocks type price controls*, June 2009. (Brattle Incentives Report)

B.4.1 Scope

The AEMC requested The Brattle Group compare the strength of incentives facing regulated firms under the AER's currently applied the building block approach in accordance to the NER, and an alternative TFP methodology proposed by the Victorian Proposal.

The building block approach and a TFP methodology were compared according to the strength of the incentives.

B.4.2 Conclusion from The Brattle Group

Based on the comparison between the building block approach and the Victorian Proposal, The Brattle Group concluded:

- in terms of improved cost control incentives, the difference between the Victorian Proposal and the building block approach is small, giving a marginal benefit under a TFP methodology;
- as a TFP methodology is an option under the Victorian Proposal, only service providers expecting higher prices under this approach than the building block approach would request a TFP methodology. Service providers may also be protected if a TFP methodology is an option as they would expect to earn some return if firms were efficient compared to a pure TFP methodology. On the other hand, if firm-specific factors were taken into account under a mandatory TFP methodology, service providers would also be protected;
- the Victorian Proposal does not address the issue of a service provider gaming the cost forecasts in order to accelerate the increase in prices by the regulator. Under the building block approach, incentive mechanisms such as the 'menu' approach mitigate this problem;
- the regulator would benefit in using a TFP methodology as one source of information for setting prices under the building block approach as it would add more information to improve the current framework; and
- further study should be taken to assess the availability of data required for TFP studies, the comparability between the different jurisdictions on energy within and outside of Australia, and the possibility to design a robust TFP methodology.

B.5 NAS Expenditure Profiles Report

Network Advisory Services, *Issues in relation to the availability and use of asset, expenditure and related information for Australian electricity and gas distribution businesses*, August 2009. (NAS Expenditure Profiles Report)

B.5.1 Scope

The AEMC requested Network Advisory Services (NAS) to investigate what publicly available expenditure and asset information exists for Australian electricity and gas distribution service providers. In particular, NAS was requested to look into the degree of stability of capital and operating expenditures over time and whether there is a 'wall of wire' looming for the Australian electricity and gas distribution sectors.[126]

For the gas distribution sector, NAS found that capital and operating expenditure information are publicly available for: AGL in NSW from 1996-97 and for other NSW distribution service providers from 1999-2000; Victorian distribution service providers from 1998; Envestra in South Australia from 1998-99; ActewAGL in the ACT from 1999-2000; AlintaGas in Western Australian in 2000; and Queensland distribution service providers from 2000-01 (except for Allgas which only has operating expenditure information available from 1999-2000).

B.5.2 Findings from NAS

Actual capital expenditure: 1950 to the mid 1990s

NAS indicated that it was unable to find any existing publicly available data-set of capital expenditure information for the electricity and gas distribution sectors across Australia that could be used for TFP analysis and understanding the profile of investment in Australian electricity and gas distribution infrastructure.

Information is available for distribution-specific capital expenditure data in annual reports for some service providers. For these cases, NAS did not consider this information to be feasible for preparing a comprehensive data-set of capital expenditure information..

Actual operating expenditure between 1950 to the mid 1990s was not reported on by NAS.

Actual capital and operating expenditures: mid 1990s to the present day

Generally, there was no consistency of data across jurisdictions. Some data were available but spanned for short timeframes.

126 Wall of wire' refers to the need to replace large quantities of ageing assets in a relatively short timeframe. This replacement pattern may arise if the initial commissioning of assets also occurred in bursts.

For the electricity distribution sector, NAS found that capital and operating expenditure information are publicly available for: NSW and Victoria from 1995-96; South Australia and Tasmania from 1999-2000; Queensland and the Northern Territory from 2001-02; and Western Australia and the ACT from 2002-03.

For the gas distribution sector, NAS found that capital and operating expenditure information are publicly available for: AGL in NSW from 1996-97 and for other NSW distribution service providers from 1999-2000; Victorian distribution service providers from 1998; Envestra in South Australia from 1998-99; ActewAGL in the ACT from 1999-2000; AlintaGas in Western Australian in 2000; and Queensland distribution service providers from 2000-01 (except for Allgas which only has operating expenditure information available from 1999-2000).

Forecast capital expenditure: the present day to 2029

NAS indicated that it was unable to obtain current capital expenditure forecast information for electricity and gas distribution service providers between the present day and 2029.

Age profile of distribution assets

For electricity distribution, NAS found that:

- Many electricity distribution service providers' recent regulatory submissions and proposals to their regulators include information about the age profile of their network assets;
- most of the publicly available asset age information provided by the service providers is qualitative in nature and describes the historical development, and current state, of the networks; and
- some service providers have provided quantitative and graphical details of their assets' age profiles, which highlights particular types of ageing assets.

For gas distribution, NAS found that:

- There is relatively little publicly available information in gas distribution service providers' access arrangement information documents, or elsewhere, about the age profile of their assets;
- available asset age information is generally limited to what is necessary to justify regulatory depreciation forecasts, as part of the building block approach requirements; and
- some gas distribution service providers' access arrangement information documents have provided qualitative information.

NAS indicated that it has not sought, nor had access to, information on asset registers for both electricity and gas distribution service providers. It recommended that these should be reviewed.

B.5.3 Conclusion from NAS

NAS found that there are various factors that affect the availability, quality and comparability of historic expenditure information for Australian distribution service providers in both the electricity and gas sectors. These factors limit the conclusions that can be drawn in relation to:

- the stability of capital and operating expenditures over time;
- the feasibility of past expenditure providing a reasonable indication of forecast expenditures; and
- the possibility of an impending 'wall of wire'.

NAS noted that there were a variety of factors that limit it from drawing conclusions about historic and forecast expenditure and asset age profiles for the distribution sectors. These would not necessarily affect the AER from applying a TFP methodology in the future. It suggested that the AER can request service providers to provide or prepare the relevant information via a Regulatory Information Notice (RIN) or RIO. However, NAS noted that this will depend on how effectively the service providers are able to backcast existing information into a format suitable for the AER.

B.6 London Economics TFP Experience Presentation

London Economics, *Experience with TFP methods in regulation of North American electric utilities*, 18 November 2008. (London Economics TFP Experience Presentation)

London Economics provided a presentation on TFP methodologies in North America to the AEMC. Specific jurisdictions it considered included California, Canada and New England.

The key points from the London Economics TFP Experience Presentation were:

- a TFP methodology is an exception rather than the norm in North America;
- there is no agreed model for a TFP methodology in North America;
- hybrid models with earnings sharing mechanisms are preferred;
- choosing relevant geographical regions and historical time periods for comparative analysis have been difficult for regulators; and
- regulators in North America have limited awareness of overseas trends and tend to be followers.

The London Economics TFP Experience Presentation concluded that:

- although there is a renewed interested in Canada, a TFP methodology is not extensively used for rate setting in North America;
- comparative TFP studies are challenged by differences between the North American utilities; and
- there appears to be small interest in adopting formulations based on TFP analysis, although it improves incentives.

B.7 AEMC Perspectives Report

AEMC, *Perspectives on the building block approach*, 30 July 2009. (AEMC Perspectives Report)

B.7.1 Scope

In submissions made to the Issues Paper regarding this Review, stakeholders suggested that the AEMC should understand and identify the deficiencies with the current building block approach before considering changes to the current framework. Stakeholders requested that the AEMC investigate the benefits and costs associated with the building block approach.

In response to these submissions, the AEMC conducted a survey of stakeholders in the form of a questionnaire. The questionnaire was sent to 40 stakeholders, with 18 responses received.

In these questionnaires, the AEMC enquired as to:

- the benefits and drawbacks of the building block approach;
- the adequacy of incentives or presence of disincentives;
- whether recent national reforms improved or detracted from the application of the building block approach;
- whether the building block approach was adversarial in nature; and
- evidence on the nature and quantum of costs incurred in participating in assessments of revenue proposals or access arrangements and conducting merits reviews and appeals of regulatory decisions.

The AEMC Perspectives Report compiles and describes the results of the survey process undertaken by the AEMC through the responses to the questionnaires received from stakeholders.

B.7.2 Results from the survey

Participating stakeholders considered that the main benefit of the building block approach is that it is a relatively straight-forward, stable, certain and understandable process which yields sufficient incentives for service providers to seek cost efficiencies. The major drawbacks of the building block approach appear to be that it fails to cater adequately for innovation, there is a risk that the regulator may set the level of efficient prices too low leading to insufficient returns and that the regulator is exposed to information asymmetry.

Stakeholders noted that the building block approach may be adversarial at times, but it was acknowledged that this depends upon the relationship between the regulator and service provider.

Recent energy market reforms, for the most part, are regarded to have improved the application of the building block approach although respondents indicated that some areas of reform remain. For instance, some concerns included:

- the lack of merits review available for the AER's cost of capital parameters;
- the limited review rights under the NGL and NGR as the avenues to apply for merits review are now more limited, compared to those previously available under the Gas Pipelines Access Law (GPAL);
- the AER has been provided with wider investigative and information gathering powers under the NGL and NGR compared to under the previous regimes;
- the introduction of merits review to the NEL and NER has made the regulatory review process more costly, adversarial and compounded the problem of information asymmetry;
- the introduction of legislatively prescribed timelines into the regulatory review process, combined with the practice of receiving late information from service providers, has increased the administrative costs for the regulator and made it more difficult for it to fully consider information in the decision making process;
- the risk of a perceived 'mechanical' application of the AER service incentive scheme arrangements which would render it susceptible to gaming; and
- a greater prescription of economic concepts in legal instruments has been created under the new regime which may not necessarily be in the long term interests of consumers.

C P_0 options for a TFP-based methodology

This appendix considers four different options for setting the initial price resets (P_0) a TFP-based methodology and recommends a preferred approach.

Under a CPI-X price cap using a TFP-based methodology, the initial price needs to cover the service provider's annual revenue requirement for the first year of the regulatory period. This should include all non-capital costs plus the return on and return of capital where the latter components are calculated the same as they would be for the building block approach (except that they apply to one year only and are based on actual rather than forecast costs).[127]

If this condition is met and prices in subsequent years change according to the differences between industry and economy-wide productivity growth and industry and economy-wide input price growth, then the service provider would earn a reasonable rate of return and recover its costs if it is able to match industry productivity growth. Also including price resets at the start of each regulatory period limits the risk that revenue and costs diverge excessively under a TFP methodology and thus provides an important safeguard mechanism.

Industry TFP growth estimates do not by themselves provide information on the annual revenue requirement for a particular service provider and hence on its appropriate initial price level. [128] Therefore a separate method is needed to calculate the initial price in regulatory determinations based upon the TFP methodology.

Given that the regulator's price determination will occur before the start of the regulatory period, actual data for the first year of the next regulatory period will not be available. In fact actual data for the last year of the previous regulatory period will typically not be finalised either at the time of the review although final actual data for the second last year of the previous period will typically be available. Consequently, the best information on which to base decisions regarding the initial price will come from the year (or years) at the end of the previous regulatory period. This will then have to be rolled forward to approximate the situation at the start of the next regulatory period taking account of intervening productivity and price changes.

The possible approaches to setting the P_0 vary by the nature of the information used in making the determination (whether actual expenditure amounts or estimates of costs after eliminating technical inefficiency are used), the extent to which it is necessary to rely on forecast data and the extent of discretion given to the regulator.

In the Preliminary Findings paper we stated that the methodology should be based upon determining the 'efficient' opening price. A number of submissions questioned what was meant by efficiency in this regard For example, Jemena questioned whether

127 The Economic Insights spreadsheet model provides a detailed illustration of how to calculate a service provider's annual revenue requirement for a given year.

128 However, most of the necessary information should be available in the database used to calculate an appropriately specified industry productivity growth rate.

price resets would be based on the service provider's own costs or whether the regulator would be empowered to take the fact that a service provider was demonstrably less efficient than its peers into account.[129] Jemena also noted the importance of errors in setting the initial price as this would impact the price level for the entire regulatory period whereas the impact of errors in setting the X factor was initially zero but then compounded progressively over the remainder of the regulatory period.

We now turn to discuss the main possible methods available to calculate the P_0.

C.1 Option 1: Change required to align revenues with the annual revenue requirement in the last year (or years) of the preceding regulatory period based on efficient input prices and actual input quantities

This option would ensure that the service provider starts each regulatory period with approximately zero excess profits, where excess profits refers to the deviation of revenue from the service provider's annual revenue requirement for that year. The adjustment is approximate because the calculation is done on actual data for the last year (or years) of the preceding period but applied to the first year of the new period after allowing for the CPI increase and differences between industry and economy-wide productivity and input price growth rates between the years. This then provides the service provider with an incentive to earn positive pure profits over the forthcoming regulatory period by maximising its productivity growth.

This option has been described as the 'partial building blocks' approach in New Zealand – it is partial in the sense that it does not attempt to remove technical inefficiency and is applied to only one year (or a small number of years) where there is actual data (rather than to forecast data for all of the next regulatory period as would be the case in a full building block application). Technical inefficiency exists where a service provider is using a greater quantity of inputs to produce a given quantity of outputs than is necessary given current production technology. By accepting the service provider's actual input quantity levels in calculating the P_0, then its current level of technical efficiency is also accepted.

This option is the most consistent with the underlying logic behind TFP–based regulation. It is relatively light–handed, does not require firm specific cost forecasts or efficiency assessments to be made and will not compromise the ability of the service provider to recover costs provided it can at least match the industry TFP growth rate.

A downside of this method is that it may leave some technical inefficiency present if service providers are not all technically efficient at the outset. But TFP–based regulation is intended to provide incentives for service providers to become more efficient over time. It is based on the relatively smooth adjustment patterns found in competitive markets rather than more pronounced step changes as often seen in building block outcomes.

129 Jemena submission, March 2010, p.5

There is some risk of gaming with this method because it relies on data for the last year of the preceding regulatory period. This presents a number of issues. Firstly, this data will not be known with certainty at the time of the determination and so a limited amount of forecasting will be required to predict data for the last year of the previous period. Reliance on this limited forecasting could be reduced further by combining it with data for the second last year of the previous period (which should be finalised by determination time).

Secondly, service providers could have an incentive to increase their input use at the end of the previous regulatory period or to delay efficiency improvements so as to gain a more favourable P_0 for the next period. One way of reducing this incentive would be to base the P_0 on the results for, say, the last two years rather than just the last year of the preceding period.

Another potential avenue for gaming is that service providers may P_0 seek to inflate their costs (even if they are using technically efficient input quantities) by paying inefficiently high prices for their inputs. Establishing efficient prices may be contentious, particularly if service providers have been using mechanisms such as related party transactions to inflate their cost base, but could be done by setting relatively light-handed criteria to be met and also looking at historical trends in expenditure and industry comparisons.

C.2 Option 2: Change required to align revenues with the annual revenue requirement in the last year of the preceding regulatory period based on efficient input prices and efficient input quantities

This option is similar to Option 1 but also seeks to eliminate any technical inefficiency. This would, of course, require a detailed efficiency assessment of each service provider making the option no longer light–handed. Rather, it would be intrusive and prone to information asymmetry and disputation problems similar to the current building blocks regime (although to a lesser degree as it would only involve one year of actual data).

It appears to be this option which the Victorian Rule Change Proposal (pages 23-24) had in mind:

> "The resetting of prices with reference to cost at a price review is, effectively, an application of the building block approach to a single year, with the year being one where the costs incurred either can be observed or can reasonably be estimated. ... Importantly, while the AER will be required to determine the required initial price adjustment by looking at revenue and costs for a known, historical year, it will not be required simply to accept the reported expenditures as efficient. The criteria that guide the AER's assessment of forecast expenditure under the building block approach require an administrative assessment of the prudence and efficiency of the proposed expenditure requirement, and the scope for the same administrative assessment will exist when measuring expenditure to set the initial set of prices."

There are a number of potential concerns with this option.

Firstly, it would not be consistent with the gradual adjustment process we would normally expect to see in industries that are capital intensive and have long–lived, sunk cost assets. It would risk service providers responding to larger revenue cuts by overshooting their input use reductions to meet unrealistic short term targets.

Secondly, this approach would intentionally break the relationship between productivity levels and growth rates. If there was a range of efficiency levels among included service providers then this option may run the risk that no service providers would now be able to match extrapolated historic TFP growth rates. Alternatively, if the included service providers had all been subject to previous regulatory determinations and most of the inefficiencies had been removed then there would be minimal technical inefficiency to start off with and this option would be redundant.

C.3 Option 3: Change required to ensure all service providers can recover costs based on efficient prices and actual quantities over the period when they are all subject to a common X factor

In some ways this option is a hybrid between a TFP–based methodology and traditional building blocks, as it seeks to make an individual efficiency assessment of the service providers costs for the initial year. If a common X factor was imposed across a group of service providers with disparate productivity growth rate potentials then under this option compensating adjustments would have to be made via the P_0 level to provide all service providers with the opportunity to recover their efficient costs.

This option would be potentially most relevant where there is a spread of TFP levels at the outset and a process of convergence taking place whereby service providers with low productivity levels are able to achieve higher productivity growth rates than service providers who are already operating at high productivity levels. Where there is convergence taking place and a common X factor is applied to all service providers based on extrapolating the industry average TFP growth rate, those service providers starting from low TFP levels should be able to outperform average industry TFP growth while those starting from high TFP levels would not be able to match the average TFP growth rate. Thus, a TFP–based regime (with a common X factor) would be good for initially poor performing (in terms of productivity levels) service providers but bad for initially good performers.

This can be overcome by either having differential X factors across poor–performing, average–performing and high–performing (in terms of productivity levels) service providers or by having a common X factor but making offsetting adjustments to the P_0 so that service providers can reasonably expect to cover their efficient costs over the regulatory period.

This option would, however, be relatively information-intensive and could be correspondingly intrusive. If convergence was thought to be an issue then the differential X factor option based on average TFP growth of relevant poor-performing,

average-performing and high-performing peer groups is likely to be a better way of allowing for this.

C.4 Option 4: Change based on full building block analysis

Another option could be to base the P_0 on a full building block analysis for the first year of the next regulatory period. However, this would appear to defeat the purpose of moving to a TFP-based methodology since it would still require the service provider to submit and the regulator to assess a full set of forecast outputs and expenditures for the next regulatory period. Furthermore, the P_0 and X factor are obviously not independent as the X factor in building blocks is simply a smoothing factor chosen in conjunction with the P_0 to equate the present values of forecast revenues and costs. The X factor has often been set at zero in this calculation (so that the service provider takes the adjustment in the first year and is then allowed to P_0 increase its prices at the CPI rate in subsequent years).

One way in which the building block process could be made at least superficially more consistent with the TFP approach would be to set the X factor in the above building block calculation equal to the observed industry average TFP growth rate. This would allow a more compatible P_0 to be calculated but it would then still be a building block regime rather than a TFP-based methodology.

C.5 Preferred Approach

Each of the four options examined above have some advantages and disadvantages. We have assessed these options against the following principles. If these principles can be satisfied then the positive economic properties of a TFP methodology would not be diminished (as shown in the Economic Insights modelling exercise).

- it should accurately reflect the costs of the business where capital costs take account of the principle of financial capital maintenance
- the regulator cannot assess likely future efficiency when making its decision
- the Po methodology should be the same irrespective of the length of the regulatory period or the use of other safeguard mechanisms
- to the extent practicable, it should be consistent with the existing Rules for building block determinations
- it should reflect good regulatory practice with proportional administrative costs
- any regulatory decision on allowed costs and starting prices should be subject to merits review.

Overall, option 1 is the most consistent with the underlying logic of the TFP–based approach and the above principles. It simply attempts to reset prices so that revenues approximate the annual revenue requirement (including the return of and return on

capital) at the start of each period. The annual revenue requirement would be broadly similar to that used in the building block approach (except that it applies to actual rather than forecast data). By not attempting to eliminate technical inefficiency in the starting year it does not interfere with the relationship between TFP levels and growth rates nor impose unrealistic adjustment periods on service providers.

Option 1 would also have lower administrative costs and minimises the potential areas of dispute between the service provider and the regulator. However, it will still require some assessment by the regulator to avoid gaming. In particular, care would need to be taken in the choice of the test year or years and an assessment still has to be made that efficient input prices have been used.

There may be a risk that a service provider seeks to run up its expenditure under the building block approach and then seeks to benefit by subsequent "under expenditure" under a TFP methodology. That is, the service provider may seek to inflate its costs towards the end of the previous regulatory period to secure a more favourable starting price as it moves into a TFP methodology. However we consider that Option 1 would have the following safeguards against this risk that the service provider over spends or that its costs were highly unusual in the relevant year(s):

- the regulator can do a reasonableness check at the commencement of a service provider being subject to a TFP methodology and adjust its forecasts or reported costs for the relevant year(s) accordingly;

- the service provider would have to offset any future gains it may make against losses it would incur if it over-spends its current building block allowance; and

- over time the incentives provided by the X factor under a TFP methodology would reduce any resulting inefficiencies.

Provided gaming risks can be adequately addressed, Option 1 would maximise the efficiency properties of a TFP methodology and provide ongoing benefits to consumers. By ensuring that the service provider covers its reasonable costs at the start of the regulatory period, it ensures service providers can recover their reasonable costs over the whole regulatory period provided they at least match the productivity growth of the industry group. It will provide appropriate investment incentives and, as demonstrated in the Economic Insights model, is an important form of safeguard mechanism should unexpected cost shocks occur. It would provide clarity, certainty and transparency of the regulatory framework while also being the cheapest to implement of the options discussed above.

The information requirements to implement Option 1 would largely be available from the data-set used to calculate an appropriately specified TFP index. Although the TFP growth rate would be calculated for the industry as whole, it would use data for each service provider that included its actual revenue, non-capital costs and its return of and return on capital. Calculated costs would be based on the rolled forward RAB using actual capital expenditure and using the same WACC and tax allowance currently specified in the Rules. An example of the calculation of the annual revenue requirement can be found in the Economic Insights model.

While Option 1 does not seek to eliminate any existing technical inefficiency, the AER would need to satisfy itself that service providers were not inflating the prices they pay for inputs in a way that would benefit them. The test for whether efficient input prices were being paid could be relatively light-handed and be based on a sample of prices paid and comparisons of these prices across service providers, particularly in different jurisdictions. As such issues would have been addressed under previous building block decisions, comparisons of prices paid for inputs over time would also be relevant. Similarly, as noted above, the AER would need to do a reasonableness check of reported costs when the service provided first moved from the building block approach to a TFP methodology to assure itself that the service provider had not purposely increased its input use at the end of the building block period to gain a more favourable starting price under the TFP methodology.

The regulator would also need to ensure that any rewards or penalties under existing incentive schemes are maintained so an appropriate adjustment would have to be made to the annual revenue requirement.

It is likely that limited forecasting would need to be undertaken to obtain the annual revenue requirement components for the last year of the previous regulatory period. This is because the price determination would be being made during that year and before final data was known or available. While any forecasting errors are likely to be small because the year will be part-way through at the time of the forecast, a reconciliation adjustment could be made at a later date once final actual data becomes available.

The current roll-forward provisions for the RAB in electricity distribution contain a mechanism for carrying forward forecast errors and incorporating them at the start of the subsequent regulatory period. This mechanism could be extended to allow for forecast errors in both capex and opex to be adjusted for at the start of the subsequent regulatory period. While it may be up to 10 years before the next price determination is made, carrying forecast errors forward appears preferable to making a mid-period revision in terms of certainty and stability and provides an incentive to maximise the accuracy of relevant forecasts.

C.6 Worked Example

Option 1 is the method used for price resets in the Economic Insights model. To illustrate its operation we will examine the price reset which occurs in year 16 of scenario 4b which models the effects of a 10 per cent recurrent opex reduction for DB3 starting in year 11. We look at the case of the three fixed 5-year regulatory period TFP option.

In year 15 (the last year of the previous regulatory period) DB3's annual revenue requirement is $259.05m (comprising opex of $92.445m, return of capital of $35.269m,

return on capital of $126.746m and benchmark tax liability of $4.59m).[130] In the same year DB3's revenue was $269.274m. Revenue exceeded the annual revenue requirement in this case because of the recurrent opex reduction implemented in year 11. The X factor applying in the first regulatory period was 1.07% based on the differences between industry and economy-wide productivity and input price growth rates.

At the start of the second period the regulator seeks to reset prices to approximately equate revenues with the annual revenue requirement for the first year of the second period (year 16). But the most recent actual data it has will be for year 15. To equate revenues with the annual revenue requirement in year 15, revenue would have to fall by 3.8% (= 1 - 259.05/269.274). This is the P_0 term for the price reset at the start of the second period. But to approximately equate unit revenues and unit annual revenue requirements in year 16 the regulator would need to allow for productivity growth and input price changes between years 15 and 16. It does this by including both the P_0 and X factor in the price cap for year 16. In subsequent years of the second period the price cap includes only the X factor. The new X factor for the second period is 0.97% based on the differences between industry and economy-wide productivity and input price growth rates. The price change in year 16 is now given by $(1+CPI)(1 - P_0)(1 - X)$. Using the P_0 or 3.8% and the X factor of 0.97% this produces revenue in year 16 of $269.941m compared to the revenue requirement in that year of $269.618m. Without the P_0 adjustment revenue in year 16 would have been $280.595m. If only the P_0 adjustment had been included and not the X factor in year 16 then revenue would have been $272.588m. Including both the P_0 and the X factor thus approximately equates revenue with the revenue requirement in year 16.

130 The complete derivation of the components can be seen in the file 'Economic Insights AEMC TFP v BB Model Scenario 4b.xls' at http://www.aemc.gov.au/Market-Reviews/Open/Review-Into-the-Use-of-Total-Factor-Productivity-for-the-Determination-of-Prices-and-Revenues.html

D Safeguard mechanisms

As noted in chapter 3 of this report, one of the key objectives of TFP–based regulation is to increase the power of the incentive provided to service providers. It does this by (partly) breaking the link between prices and the service provider's own costs. However, the cost of this increased incentive power is a corresponding increase in risk that prices and service provider costs will progressively diverge leading to substantial over–earning or substantial under–earning by a particular service provider.

To counter these risks, nearly all TFP–based regulatory regimes include at least one safeguard mechanism. Starting period price resets to align revenues and costs are an important form of safeguard mechanism which limit the risk of revenues and costs diverging excessively over time. A number of options for resetting prices at the start of each regulatory period are discussed in appendix C. If price resets occur relatively regularly (say, every 5 years) then there may be little need for other safeguard mechanisms as even quite large cost shocks can be accommodated as demonstrated by the Economic Insights Model. However, if regulatory periods are longer than 5 years then inclusion of other safeguard mechanisms may be beneficial to mitigate risks facing both service providers and consumers.

In this appendix we briefly review three such safeguard mechanisms:

- off-ramps
- earnings sharing mechanisms, and
- capital modules.

D.1 Off-ramps

Off-ramps are designed to provide protection in the event of exceptional circumstances arising. Off-ramps lead to a review of the service provider's price cap being instigated if the specified exceptional circumstances should occur.

Off-ramps are most commonly specified in terms of movements of the realised rate of return away from the WACC by a given amount. A typical specification would be the off-ramp being triggered if the rate of return moves outside a given 'band' around the WACC. The band could be either symmetric or non-symmetric above and below the WACC. Bands in the order of 5 to 6 per cent above and below the WACC are a typical magnitude for a rate of return-based off-ramp[131].

Off-ramps need not be specified solely in terms of a rate of return criterion. They could also include provisions for major industry restructuring occurring or a range of force majeure events talking place.

[131] Farrier Swier Consulting, *Comparisons of Building blocks and Index-based Approaches*, Report for Utility Regulators Forum, June 2002.

Where the off-ramp is specified in terms of a given departure from the WACC, this would need to be calculated based on the service provider's audited TFP data returns. There would thus be a lag between the events occurring and the confirmation of their impacts from the audited data.

If the off-ramp rate of return band is set sufficiently widely there should be little impact on the incentive properties of a TFP-based methodology. However, the existence of the off-ramp provides both the service provider and consumers with insurance that limits the extent of possible unfavourable outcomes for either and should engender a corresponding degree of confidence from stakeholders.

Off-ramps are likely to be particularly appropriate where the regulatory period is extended well beyond 5 years.

D.2 Earnings sharing mechanisms

Earnings sharing mechanisms (ESMs) are a means of sharing risk between the utility's owners and consumers. They have some similarities to earnings-based off-ramps in that they usually provide a narrower band around the WACC within which the service provider's owners bear the full effects of variations in the realised rate of return from the WACC. However, outside this narrower band there may be a number of subsequent bands where benefits (if the realised rate of return is higher than the WACC) or costs (if the realised rate of return is lower than the WACC) are progressively shared between owners and consumers.

For example, an ESM might specify that variations in the realised rate of return within plus or minus 1.5 per cent of the WACC are fully borne by the owners, between 1.5 and 3 per cent are borne half by owners and half by consumers and above 3 per cent are borne solely by consumers. ESMs can include several bands with either progressive or regressive sharing (ie consumers bear less or more of the benefit as the realised rate of return increases) which can be one-sided or double-sided. Double-sided ESMs can be symmetric or non-symmetric.

Like off-ramps, an ESM would have to be based on audited data and so there would be a lag between the deviation from WACC and subsequent adjustment of prices.

ESMs have the advantage of providing relatively automatic adjustment to unforeseen circumstances. However, they have some major disadvantages in that they significantly reduce the incentive properties of a TFP-based methodology. Indeed, they would move the methodology very much in the direction of being akin to a cost of service regime. They may also be subject to gaming by service providers who could attempt to manipulate their reporting and timing of expenses to ensure consumers shared the cost of downside rate of return movements rather than sharing the benefits of upside movements.

Most analysts have suggested that an ESM should be designed in a similar fashion to an off-ramp to avoid its inherently negative impact on incentives:

'Sharing mechanisms tend to blunt the incentive to cut costs, which is a prime motivation for considering PBR [performance based regulation]. If a sharing mechanism is to be used, it should be designed to apply only if earnings fall outside a very wide band, e.g., no sharing if earnings stay within plus 200 and minus 300 basis points of a target. In this way, the sharing mechanism becomes a kind of insurance policy to guard against large and unforeseen circumstances.'[132]

D.3 Capital modules

Increasing capital expenditure requirements due to either new functional requirements (eg related to climate change or smart grid initiatives) or aging of the network – what has become known as the 'wall of wire' effect – have been raised in a number of jurisdictions as a potential concern with TFP-based methodologies. One response to this has been the inclusion of 'capital modules' in the overall price or revenue cap. One such module has recently been implemented by the Ontario Energy Board (OEB).

The OEB's review concluded in late 2008 and the new regime runs for a period of 3 years from May 2009. The current regime involves a price cap of the form $P_{GDP} - X + K + Z$ where P_{GDP} is the GDP implicit price deflator for final demand, X is based on the US electricity distribution industry productivity growth rate and positive 'stretch' factors for all Ontario service providers, K is an incremental capital module factor and Z is a pass–through factor.

The OEB noted that productivity–based price caps automatically allow for increases in capex in line with output growth but this was on the basis of recent historical capex patterns.[133] The OEB also noted that if future capex requirements were substantially in excess of historical patterns then there could be a case for an additional capex allowance to be triggered within the regulatory period. This would be pending a thorough reassessment of capex requirements at the next 'test' year which leads to a 'rebasing' of rates in line with costs at the start of the next regulatory period.

The OEB determined that qualifying capex over and above a threshold level would be allowed depreciation and a return by way of a 'rider' on rates (ie a surcharge on prices). Most of the debate in the OEB proceedings related to how this threshold level of capex should be determined.

The OEB's initial proposal was that capex increases would have to be the subject of specific applications by service providers and be shown to be non–discretionary to qualify for the capex module. A threshold of 25 per cent above the capital budget proposed in the base rates was proposed. Three eligibility criteria were proposed as follows:

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132 The Regulatory Assistance Project, *Performance-based regulation for distribution utilities*, December 2000, p.4.

133 OEB, *Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors*, EB–2007–0673, Toronto, 14 July 2008.

Criteria	*Description*
Causation	Amounts should be directly related to the claimed driver, which must be clearly non–discretionary. The amounts must be clearly outside of the base upon which rates were derived.
Materiality	The amounts must have a significant influence on the operation of the distributor; otherwise they should be dealt with at rebasing.
Prudence	The amounts to be incurred must be prudent. This means that the distributor's decision to incur the amounts must represent the most cost–effective option (not necessarily least initial cost) for ratepayers.

Consultation on the initial OEB proposal revealed a number of incentive problems including service providers having an incentive to increase capex if they are close to the threshold. It was also noted that historical capex may vary substantially between service providers for a number of management–related reasons. To reduce the scope to game the module, the OEB revised its threshold proposal to be a ratio of forecast capex to depreciation as depreciation was thought to be less subject to influence and more representative of long term capital requirements. The value of this ratio was initially proposed to be 150 per cent for all service providers but submissions complained that this did not take account of differences in organic growth between service providers. The OEB ended up adopting the following threshold which gives a different value for each service provider:

$$Capex/d = 1 + (RB/d)*(g + PCI*(1 + g)) + 20\%$$

where Capex is forecast capital expenditure, d is depreciation expense, RB is the rate base included in the base rates, g is growth in revenue based on load growth and PCI is the price cap index (inflation less productivity growth less stretch factor).[134] The 20 per cent add on at the end of the formula is the result of a decision to include a relatively arbitrary 'deadband' (ie additional adjustment).

The OEB provided an example of a service provider whose rate base was $100 million, regulatory depreciation was $5 million, load growth was 1.5 per cent and whose price cap was 0.75 per cent. Application of the formula to this service provider would lead to a materiality threshold of 1.65 or 165 per cent of its depreciation allowance. The OEB noted it would expect the service provider to manage a capex level of up to $8.26 million (ie 165 per cent of $5 million) before being eligible to apply to recover incremental amounts.

The OEB described the intention of the capital module as follows:

> 'The intent is not to have an IR [incentive regulation] regime under which distributors would habitually have their CAPEX reviewed to determine whether their rates are adequate to support the required funding. Rather,

134 OEB, *Supplemental Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors*, EB–2007–0673, Toronto, 17 September 2008, p.33.

> the capital module is intended to be reserved for unusual circumstances that are not captured as a Z-factor and where the distributor has no other options for meeting its capital requirements within the context of its financial capacities underpinned by existing rates.'[135]

Reporting requirements and ex–post assessments are as follows:

> 'Distributors that receive rate relief through this module will be required to report to the Board annually on the actual amounts spent. At the time of rebasing, the Board will carry out a prudence review to determine the amounts to be incorporated in rate base. The Board will also make a determination at that time regarding the treatment of differences between forecast and actual capital spending during the IR plan term. Overspending or underspending will be reviewed at the time of rebasing.'[136]

The prudency test requirement at the end of the regulatory period introduces a degree of uncertainty for service providers and makes the regime more intrusive and heavy–handed than would normally be expected of a productivity–based regime.

135 Ibid, p.31.

136 Ibid, pp.31-2.