



Economic Interpretation of Clauses 6.5.6 and 6.5.7 of the National Electricity Rules

Supplementary Report

Ausgrid

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1. Introduction

This report has been prepared by NERA Economic Consulting (NERA) at the request of Ausgrid. We understand that the report may also be relied upon by Essential Energy and Endeavour Energy.

In 2008 NERA advised Ausgrid (then EnergyAustralia) on the economic interpretation of clauses 6.5.6 and 6.5.7 of the National Electricity Rules. Since that time, the rules have been amended by means of the National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012,¹ as made by the Australian Energy Market Commission (AEMC). This report considers the nature and effect of those amendments particularly as they relate to the principles governing the regulatory assessment of the prudence and efficiency of operating and capital expenditure forecasts.

Our earlier advice to Ausgrid was provided in the form of an expert report entitled '*Economic Interpretation of Clauses 6.5.6 and 6.5.7 of the National Electricity Rules*.' Ausgrid requested that we update that report in light of the amendments to these clauses. To that end we attach to this report the following:

- a marked-up version of our 2008 report, which highlights the amendments to our advice;
- a 'clean' version of the updated 2008 report (the 2014 report) which advises on the economic interpretation of the relevant clauses (hereafter referred to as NERA's 'comprehensive report').

We understand Ausgrid may wish to use our updated advice in the context of its regulatory proposal for 2014-19 in order to provide guidance on the practical application of the objectives, criteria and factors that must be applied by the Australian Energy Regulator (AER) in its assessment of Ausgrid's capital expenditure forecasts.

Our report is structured as follows:

- section 2 summarises the amendments that were made to clauses 6.5.6(c) and 6.5.7(c), and discusses the rationale and implications of these changes;
- section 3 summarises the amendments that were made to clauses 6.5.6(e) and 6.5.7(e), and discusses the rationale and implications of these changes

Clauses 6.5.6 and 6.5.7 of the NER are set out in Appendix A and Appendix B, respectively. For ease of reference, we have identified the changes made to these clauses by the National Electricity Amendment Rule 2012 by way of mark-up.

¹ Hereafter referred to as the 'National Electricity Amendment Rule 2012.'

2. Amendments to Clauses 6.5.6(c) and 6.5.7(c)

Clauses 6.5.6(c) and 6.5.7(c) of the NER, which are termed the *operating expenditure criteria* and the *capital expenditure criteria* respectively, set out the criteria that must be considered by the AER in determining whether to accept the operating and capital expenditure forecasts submitted by a distribution network service provider (DNSP).

Prior to the changes introduced by the National Electricity Amendment Rule 2012, the expenditure criteria required the AER to accept the expenditure forecasts of a DNSP if it was satisfied that the total reasonably reflected:

- (1) the efficient costs of achieving the expenditure objectives; and
- (2) the costs that a prudent operator in the circumstances of the relevant Distribution Network Service Provider would require to achieve the expenditure objectives; and
- (3) a realistic expectation of the demand forecast and cost inputs required to achieve the expenditure objectives.

The National Electricity Amendment Rule 2012 amended clauses 6.5.6(c) and 6.5.7(c) to omit the phrase ‘in the circumstances of the relevant Distribution Network Service Provider’ from the second expenditure criteria. We describe the rationale for, and implications of, this amendment below.

2.1. AER’s rationale for the amendment

The removal of this phrase was proposed by the AER in response to concerns over limitations on its ability to apply benchmarking in the context of identifying efficient costs. In its rule change proposal, the AER recognised that good benchmarking practice required certain characteristics of the individual network, such as network topography, to be taken into account in the process of normalising expenditure data.² However, this is different from taking into account all the circumstances of the relevant DNSP. In particular, there is a range of circumstances that it would be inappropriate to consider in a benchmarking analysis targeted towards assessing efficiency, such as the financial decisions of the network owner.

In light of these observations, the AER argued that the imprecise language employed in the phrase ‘in the circumstances of the relevant Distribution Network Service Provider’ limited its ability to apply benchmarking since it did not restrict the circumstances of the network provider that it was required to consider.³ If the phrase was interpreted excessively broadly, the AER would be required to take into account circumstances that were inappropriate to adjust for in the context of a benchmarking exercise. Such an interpretation would render the analysis less meaningful for assessing the relative efficiency of the DNSPs. By removing this

² AER, *Economic Regulation of Transmission and Distribution Network Service Providers – AER’s Proposed Changes to the National Electricity Rules*, September 2011, Part B, p.33 (hereafter referred to as the ‘AER Rule Change Proposal’).

³ AER Rule Change Proposal, p.36-37.

reference, the AER considered that the question of which circumstances should be taken into account would become a matter for its exercise of regulatory judgement.⁴

2.2. Stakeholder concerns in relation to the amendment

In the AEMC consultation phase, a number of stakeholders raised concerns over then proposed rule change. In particular:

- United Energy and Multinet Gas stated that, from a practical perspective, an assessment of prudence requires that consideration be given to the particular circumstances of the network service provider, and that removal of the reference may send a signal to the AER that these circumstances should be ignored;⁵
- SA Power Networks, CitiPower and Powercor argued that the original wording did not constrain benchmarking, but rather served as a reminder to the AER to have regard to the relevant circumstances of a DNSP in conducting benchmarking since a failure to do so can have significant consequences for revenue allowances. The businesses were concerned that the proposed change removed all guidance for the AER in undertaking benchmarking, noting that the regulator had previously been shown to have erred in its benchmarking analysis by failing to give proper regard to the individual circumstances of the relevant networks.⁶
- the Energy Networks Association (ENA) did not agree that the current reference to ‘in the circumstances of the relevant distribution network service provider’ hindered the application of benchmarking analysis. It argued that the prudence of a business’s actions needed to be assessed in the context of the circumstances facing that business’s network. In particular, the ENA argued that removal of the phrase could potentially permit an outcome where:⁷
 - the AER formed a view about the costs that a prudent operator in the circumstances of the NSP would require to achieve the expenditure objectives (perhaps informed by a properly specified benchmarking analysis that appropriately reflected circumstances exogenous to the service provider); but
 - in determining the forecast expenditure the AER effectively reduced that level of costs because it was not satisfied that the DNSP’s forecast of expenditure reflected the costs of an efficient and prudent operator more generally.

⁴ AER Rule Change Proposal, p.37.

⁵ United Energy and Multinet Gas, *AEMC Draft Rule Determination Submission*, 4 October 2012, pp.13-14.

⁶ The businesses cited the AER's distribution determinations for 2011-15 regarding CitiPower and Powercor Australia, for which the Australian Competition Tribunal found (on review) that the AER's benchmarking of CitiPower's and Powercor Australia's proposed unit rates for vegetation management opex was erroneous because it failed to pay proper regard to differences between the networks and differences between the way in which the businesses were going about achieving compliance with the relevant regulations. This error on the part of the AER resulted in operating expenditure significantly lower than the amount the AER deemed prudent and efficient upon undertaking benchmarking after the Tribunal's decision.

⁷ Energy Networks Association, *Response to Draft Determination: Economic Regulation of Network Service Providers*, 4 October 2012, pp.35.

The ENA submitted that such a possibility should not be permitted by the rules, and considered that it was imperative that the businesses have the reassurance that the rules would continue to require the AER to recognise relevant differences in the circumstances facing their businesses;⁸

- Grid Australia argued that the phrase was not in the rules as a limitation, or any form of guidance, on the application of benchmarking. Rather the term had a different purpose as a central component of the definition of ‘prudence’ when considering a proposed forecast. This is appropriate and removing or relocating this term would reduce or diminish this important criterion when assessing efficiency.⁹

In summary, stakeholders were concerned that, by removing the words ‘in the circumstances of the relevant Distribution Network Service Provider,’ the AER may unduly disregard these circumstances when undertaking its benchmarking analysis and/or subsequently determining whether forecast expenditure is consistent with that of a prudent DNSP.

2.3. AEMC’s consideration of the amendment

The AEMC considered that the amendments to clauses 6.5.6(c) and 6.5.7(c) were required in order to clarify the AER’s ability to undertake benchmarking.

Specifically, the AEMC noted that in order for a benchmarking exercise to be meaningful and useful it must take account of differences in the environments in which various DNSPs operate, such as differences in the age of the network and topography.¹⁰ However, the AEMC also noted that there were likely to be certain circumstances that benchmarking should not take into account, such as the financial decisions of the network owner.¹¹

The AEMC considered that by removing the reference to the individual circumstances of the DNSP, this would not enable the AER to disregard those circumstances that are relevant in undertaking a benchmarking exercise to determine capex and opex allowances. However, it would remove any restriction on the regulator to take account of circumstances that are not relevant for that analysis.¹²

In support of this, the AEMC noted in its Draft Determination:¹³

⁸ Energy Networks Association, *Response to Draft Determination: Economic Regulation of Network Service Providers*, 4 October 2012, pp.33-34.

⁹ Grid Australia, *Consolidated Rule Request – National Electricity Amendment (Regulation of Network Service Providers) Rule 2011 – Response to Draft Rule Determination*, October 2012, p.11.

¹⁰ AEMC, *Draft Rule Determinations - National Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012*, 23 August 2012, p.106 (hereafter referred to as the ‘AEMC Draft Rule Determinations’).

¹¹ AEMC, *Directions Paper – National Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012*, 2 March 2012, p.29.

¹² AEMC Draft Rule Determinations, p.106.

¹³ AEMC Draft Rule Determinations, p.106.

[T]he reference to "circumstances of the relevant NSP" should be removed from the capex and opex criteria. There appears to be little doubt about how the AER should undertake a benchmarking exercise, including the circumstances that should be taken into account, and the reference to individual circumstances is likely to constrain the AER in an inappropriate way. Given the importance of benchmarking in determining the capex or opex allowance, any inappropriate constraints on the AER under the NER in undertaking a benchmarking exercise should be removed.

Similarly, in its Final Determination the AEMC stated:¹⁴

The Commission is of the view that the removal of the "individual circumstances" clause does not enable the AER to disregard the circumstances of a NSP in making a decision on capex and opex allowances. Benchmarking is but one tool the AER can utilise to assess NSPs' proposals. It is not a substitute for the role of the NSP's proposal. Should the phrase remain, it appears that the AER's interpretation of it may restrict it from utilising appropriate benchmarking approaches to inform its decision making.

The Commission considers that the removal of the "individual circumstances" phrase will clarify the ability of the AER to undertake benchmarking. It assists the AER to determine if a NSP's proposal reflects the prudent and efficient costs of meeting the objectives. That necessarily requires a consideration of the NSP's circumstances as detailed in its regulatory proposal.

2.4. Implications of the amendment

The capital and operating expenditure criteria (set out in clauses 6.5.6(c) and 6.5.7(c), respectively) are intended to guide the AER in its assessment of how much expenditure is required in order to meet the objectives that are defined and interpreted in clauses 6.5.6(a) and 6.5.7(a).

In our attached comprehensive report, we explain that clauses 6.5.6(c) and 6.5.7(c) require the AER to be satisfied that *all three* of the expenditure criteria are met. In other words, the AER must be satisfied that the expenditure forecasts reasonably reflect:

- the efficient costs of achieving the expenditure objectives;
- the costs that a prudent operator would require to achieve the expenditure objectives; and
- a realistic expectation of the demand forecasts and cost inputs required to achieve the expenditure objectives.

For these criteria to be simultaneously met, there must be no difference between the 'costs that a prudent operator would require' and 'efficient costs.' This raises the question of the relationship between efficiency and prudence.

¹⁴ AEMC, *Final Rule Determination - National Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012*, 29 November 2012, p.107 (hereafter referred to as the 'AEMC Final Rule Determination').

We note in our comprehensive report that whether or not a firm is on the efficiency frontier is not directly observable and, furthermore, that the efficiency frontier itself is always moving.¹⁵ Under these conditions the use of the term ‘prudent’ provides guidance as to how the efficiency of expenditure forecasts can be assessed in practice. In particular, the AER is more likely to be convinced that a DNSP’s expenditure forecasts reflect efficient costs if that DNSP can show that its expenditure forecasts are consistent with prudent decision-making processes.

Given the coexistence of the requirements for prudence and efficiency, the previous reference to the individual circumstances of the DNSP in clauses 6.5.6(c)(2) and 6.5.7(c)(2) may potentially have influenced the way in which the AER assessed both these aspects of DNSPs’ forecasts. Removing this reference therefore potentially amends the AER’s approach to assessing both the efficiency and prudence of DNSPs’ capital and operating expenditure forecasts. We consider each of these aspects in turn below.

2.4.1. Implications for prudence

In our comprehensive report,¹⁶ we note that the concept of ‘prudent’ has relevance in relation to both:

- the *process* followed by the DNSP in developing its expenditure forecasts; and
- the *principles* adopted in deriving the forecasts, and hence the *level* of those forecasts.

We also noted¹⁷ that the definitions of prudent all have in common references to ‘carefully considering consequences,’ ‘carefully managing resources’ and being ‘careful to avoid undesired consequences.’ It follows that the costs that would be incurred by a prudent operator are likely to be those costs that are the outcome of a process that adopts principles reflecting these considerations.

It follows that, notwithstanding the removal of the reference to the individual circumstances of DNSPs, the concept of prudence makes it clear that certain circumstances must be taken into account in order for forecasts to be prudent. In other words, it is not possible to consider the consequences of a decision, and hence the prudence with which that decision was made, without considering the circumstances that affected that decision.

Intrinsic to the concept of ‘prudence’ is that an expenditure decision that may be considered prudent in one environment may not be prudent in another. For instance, if an asset such as a sub-station is reaching the end of its expected life, a DNSP will need to decide whether to replace that asset or to continue to maintain it. In making this judgement, a prudent operator would be expected to consider both the relative risk of asset failure and the consequences if such a failure were to occur.

¹⁵ NERA’s Comprehensive Report, section 3.

¹⁶ NERA’s Comprehensive Report, p.13.

¹⁷ NERA’s Comprehensive Report, p.13.

In this example, the implied costs of the failure of a sub-station or network serving a metropolitan area are likely to be significantly higher than the costs for DNSPs operating in rural areas, because of the greater degree of customer disruption that such a failure will cause. A prudent metropolitan based DNSP may therefore be more inclined to replace the asset in order to avoid these consequences, while a predominantly rural DNSP may consider it prudent to continue maintaining the asset until it is closer to the end of its expected life.

The above example illustrates that the exercise of prudence involves the weighing up of the costs of alternative activities as compared with the costs and likelihood of the potential consequences, and the adoption of a more risk-averse approach to avoiding greater adverse consequences. It follows that two DNSPs that are both acting prudently may arrive at quite different capital expenditure forecasts on account of their varying circumstances.

2.4.2. Implications for efficiency

We note in our comprehensive report¹⁸ that the interpretation of the concept of ‘efficiency’ needs to distinguish between its theoretical construct and the concept as economists would generally apply it in practice. In a perfectly competitive market, whether or not a firm is operating at the efficiency frontier can be deduced from observing whether or not it remains in business. Firms that are not perfectly efficient will be undercut by those that are, so that inefficient firms will no longer be able to sell their output.

However, as soon as the ideal of perfectly competitive markets and perfectly competitive firms is departed from, the assessment of efficiency becomes a *relative* concept.

Notwithstanding that there are no objective factors that can be applied to demonstrate that a DNSP’s expenditure forecast reflects efficient costs, there are indicators that can be used to assess the efficiency of expenditure associated with specific items included in a forecast. A benchmark comparison of a firm’s expenditure forecasts is one means by which the AER attempts to gauge whether the forecast expenditure is efficient.

At this stage, it is unclear exactly how the AER may undertake its benchmarking analysis. The AER has stated:¹⁹

We propose to take a holistic approach to using economic benchmarking techniques, but intend to apply them consistently. We will determine which techniques to apply at the time of determinations, rather than specify economic benchmarking techniques in our Guidelines...

We are likely to use economic benchmarking to (among other things):

- 1. measure the rate of change in, and overall efficiency of, NSPs. This will provide an indication of the efficiency of historical expenditures and the appropriateness of their use in forecasts.*

¹⁸ NERA’s Comprehensive Report, section 3.

¹⁹ AER, *Better Regulation: Explanatory Statement: Expenditure Forecast Assessment Guideline*, November 2013, p.119 (hereafter referred to as the ‘AER Expenditure Forecast Assessment Guidelines’).

2. *develop a top down cost forecast of total expenditure.*
3. *develop a top down forecast of opex taking into account:*
 - *the efficiency of historical opex*
 - *the expected rate of change for opex.*

Economic benchmarking will also indicate the drivers of efficiency change which will assist us in targeting our expenditure reviews.

We described above that certain of the circumstances affecting a business will affect its efficient costs. A direct comparison of firms' costs without accounting for the implications of their relevant individual circumstances would render such comparison meaningless for assessing efficiency. It follows that, notwithstanding the removal of the phrase 'in the circumstances of the relevant Distribution Network Service Provider,' the AER should be expected to continue to take due account of the circumstances that could account for differences in the efficient costs of one DNSP relative to another.

This was recognised by the AER in its Guidelines:²⁰

[I]t is also important to recognise that NSPs do not operate under exactly the same operating environment conditions. That is, operating environment conditions can have a significant impact on measured efficiency through their impact on network costs. It is desirable to adjust for the most important operating environmental differences to ensure that when comparisons are made across NSPs, we are comparing like with like to the greatest extent possible.

The particular aspects of a DNSP's operating environment that can be expected to affect the costs of meeting the expenditure objectives vary in a number of ways. For instance, for DNSPs in rural areas, the distances between customers is likely to increase the travel time that its maintenance workers must incur, affecting overall maintenance costs. On the other hand, DNSPs in predominantly metropolitan areas are likely to face restrictions in relation to undertaking maintenance work during business hours, in order to avoid disruption in the city. As a result, metropolitan network repairs are more likely to need to be scheduled during the late evenings, again affecting the cost.

In order for any cost comparison to be meaningful, it is therefore necessary to control for those differences in the circumstances and output of each DNSP that could be expected to change the costs that an efficient service provider would need to incur. In other words, the AER would be expected to take account of the circumstances that affect the costs that would be incurred by an efficient firm, rather than circumstances that affect the efficiency of a particular DNSP.

The circumstances that affect the efficiency of forecasts will be the same as those that affect prudence. These are discussed in more detail in the following section.

²⁰ AER Expenditure Forecast Assessment Guidelines p.133.

2.4.3. Which circumstances should be taken into account?

We explained in the sections above that assessing whether or not a DNSP's expenditure forecasts reflect the costs that would be incurred by a prudent and efficient operator requires consideration of the relevant characteristics of the environment in which the DNSP operates.

However, not all the circumstances that vary between DNSPs will be relevant for assessing prudence and efficiency. As a matter of principle, the circumstances that should be taken into account are those that are exogenous to the firm – by this we mean circumstances that are outside the firm's control and likely to affect the costs that would be incurred by a perfectly efficient and prudent firm. These have been set out by the AEMC, and include:²¹

- geographic factors:
- topography and climate;
- customer factors: density of the customer base (urban versus rural), load profile, mix of customers between industrial and domestic;
- network factors: age, mix of underground and overhead lines, although this will depend on the extent to which this is at the election of the NSP; and
- jurisdictional factors: reliability and service standards.

Alternatively, circumstances that are endogenous to the firm (in that they are under the firm's control) should not be taken into consideration. The AEMC has noted that these include:²²

- the nature of ownership of the DNSP;
- quality of management; and
- financial decisions.

By way of example, the costs of a perfectly efficient DNSP will be affected by the size and topography of the network, and whether it is operating in a rural or urban environment, and so these circumstances should be considered in the context of the AER's assessment of a DNSP's cost forecasts.

Circumstances that are within the control of the firm should not be taken into account, even if they affect the costs it incurs. One example of such circumstances may be a firm's financial decisions, which include choices around debt structure, hedging policies, accounts receivables management, and the like. Such decisions may affect the costs incurred by the firm but assessing the prudence and efficiency of these types of decisions is, at least in part, the impetus for undertaking benchmarking. These decisions could be said to affect the relative efficiency of a particular firm rather than the costs that would be incurred by an efficient firm, and so would not be expected to be adjusted for in the AER's benchmarking assessment.

²¹ AEMC Final Rule Determination, p.113.

²² AEMC Final Rule Determination, p.113.

Notwithstanding, the AER is yet to determine the precise circumstances that it will take into account in its benchmarking analysis:²³

The materiality of the operating environment factors can be tested as part of the data validation and testing process. That is, the results of sensitivity analyses will inform us in relation to the choice of environmental variables. The selection of environmental variables will also be informed by ongoing research and consultation with stakeholders as increasingly consistent, robust, and detailed data is collected.

In summary, removal of the phrase ‘in the circumstances of the relevant Distribution Network Service Provider,’ as it appeared in clauses 6.5.6(c)(2) and 6.5.7(c)(2) does give the AER greater discretion to disregard certain circumstances of particular DNSPs. However, its removal should not be interpreted as allowing AER *carte blanche* in terms of what it should and should not consider. The ultimate objective is to assess the efficiency and prudence of expenditure forecasts. This cannot be done without taking proper account of those factors that will affect the costs that even a perfectly efficient firm would incur.

²³ AER Expenditure Forecast Assessment Guidelines p.133.

3. Amendments to Clauses 6.5.6(e) and 6.5.7(e)

Clauses 6.5.6(e) and 6.5.7(e) of the NER, which are termed the *operating expenditure factors* and the *capital expenditure factors*, respectively, set out a number of factors that the AER must take into account in deciding whether or not a DNSP's expenditure forecasts reasonably reflect the expenditure criteria. The National Electricity Amendment Rule 2012 introduced a number of changes to these clauses, as set out in Appendix A and Appendix B. In summary, the relevant changes to clause 6.5.6 were:

- the deletion of subclauses 6.5.6(e)(1) to 6.5.6(e)(3) – we note that these have simply been moved to clause 6.11.1 of the NER;
- an amendment to subclause 6.5.6(e)(4) to require the AER to consider the most recent annual benchmarking report that is published under rule 6.27;
- the addition of subclause 6.5.6(e)(5A), which requires the AER to consider the extent to which the DNSP's operating expenditure forecast includes expenditure to address the concerns of electricity consumers;
- an amendment to subclause 6.5.6(e)(8) to require the AER to consider any incentive schemes that apply to the DNSP under clauses 6.5.8A and 6.6.2 to 6.6.4;
- the addition of subclause 6.5.6(e)(9A) which requires the AER to consider whether the operating expenditure forecast includes an amount for a 'contingent project' under clause 6.6A.1(b);
- an amendment to subclause 6.5.6(e)(10) to require the AER to consider the extent to which the DNSP has made provision for efficient and 'prudent' non-network alternatives; and
- the addition of subclause 6.5.6(e)(12), which enables the AER to consider any other factors that it considers to be relevant, subject to prior notification to the DNSP.

Equivalent changes were made to clause 6.5.7.

3.1. Rationale and implications of the amendments

The AEMC's stated reasons for making these changes were varied. Many of the changes were facilitated by amendments that were made in other parts of the NER. For instance:

- the National Electricity Amendment Rule 2012 introduced clause 6.27, which imposes an obligation on the AER to publish annual benchmarking reports. The AEMC stated that it believed these reports would improve the information available to consumers, thereby assisting them in their interactions with DNSPs, and encouraging their involvement in the regulatory process. As a result of this addition, subclauses 6.5.6(e)(4) and 6.5.7(e)(4) were amended to require the AER to take its annual benchmarking reports into account in its decision-making;
- the National Electricity Amendment Rule 2012 introduced a number of 'tools' that the AER can apply in order to provide adequate incentives for DNSPs to spend capital expenditure efficiently, having regard to the overall capital expenditure objective. These tools include:

- applying capital expenditure sharing schemes to provide incentives to incur efficient capital expenditure, with such schemes to be designed by the AER;
- undertaking reviews of efficiency of past capital expenditure, including the ability to preclude inefficiently incurred expenditure from being rolled into the regulatory asset base; and
- deciding whether to depreciate the RAB using actual or forecast expenditure.

In light of these additional tools, subclauses 6.5.6(e)(8) and 6.5.7(e)(8) were amended to ensure that the AER had regard to all of the incentive schemes at its disposal; and

- the National Electricity Amendment Rule 2012 introduced a ‘contingent project’ regime for distribution.²⁴ As a result, subclauses 6.5.6(e)(9A) and 6.5.7(e)(9A) were introduced into the NER, which require the AER to make an assessment as to whether expenditure forecasts include an amount relating to a project that should more appropriately be included as a contingent project. If the AER determines that a DNSP’s expenditure forecasts do include amounts for contingent projects, these amounts are to be removed and treated in accordance with the contingent project regime.

In addition, the notion of greater engagement between DNSPs and their consumers, which underpinned the introduction of the annual benchmarking report, also lead to the addition of subclauses 6.5.6(e)(5A) and 6.5.7(e)(5A). These clauses require the AER to consider the extent to which the DNSP’s operating and capital expenditure forecasts include expenditure to address the concerns of electricity consumers. In the AEMC’s view, the more confident the AER can be that consumers’ concerns have been taken into account by DNSPs, the more likely the AER could be satisfied that a proposal reflects efficient costs:

In respect of the factors to be added which will allow for the AER to have regard to the extent to which NSPs have considered what consumers seek, there are various ways this could be relevant. For example, it may be the case that a majority of affected consumers are unhappy with the visual impact of a proposed new line. If the NSP engages with consumers, it may decide that the best way to address the concerns of consumers would be to build the line underground, even if this is a more expensive option. When the AER considers the NSP’s overall capex proposal, it should take into account that the proposed option will provide a higher quality of service in line with consumers’ preferences and willingness to pay above less expensive options which fall below the level of service demanded by consumers.

From the perspective of economic efficiency, efficiency is achieved where the cost incurred by the marginal supplier from producing an additional unit of output (ie, the ‘marginal cost’) is equal to the benefit received by the marginal customer from consuming that output (ie, the ‘marginal benefit’). It follows that consideration of what consumers want and are prepared to pay for, whether in terms of reliability or some other element, will assist in showing where the marginal benefit lies, and thus what is the efficient level of output.

²⁴ A contingent project is a project assessed by the AER as reasonably required to be undertaken, but which is excluded from the ex-ante capital expenditure allowance in a revenue determination because of uncertainty about its requirement, timing or costs. A revenue determination also identifies associated trigger events. Should the trigger event occur, a DNSP may apply to the AER during the regulatory period to amend the revenue determination to include forecast capital expenditure and incremental operating expenditure for the project. The AER is able to vary the contingent project threshold values through the use of guidelines.

Appendix A. Clause 6.5.6 of the NER

This appendix sets out clause 6.5.6 of the NER. Changes to the clause that were introduced by the National Electricity Amendment Rule 2012 are identified in mark-up.

6.5.6 Forecast operating expenditure

- (a) A *building block proposal* must include the total forecast operating expenditure for the relevant *regulatory control period* which the *Distribution Network Service Provider* considers is required in order to achieve each of the following (the *operating expenditure objectives*):
- (1) meet or manage the expected demand for *standard control services* over that period;
 - (2) comply with all applicable *regulatory obligations or requirements* associated with the provision of *standard control services*;
 - (3) to the extent that there is no applicable *regulatory obligation or requirement* in relation to:
 - (i) the quality, reliability or security of supply of *standard control services*; or
 - (ii) the reliability or security of the *distribution system* through the supply of *standard control services*,
 to the relevant extent:
 - (iii) maintain the quality, reliability and security of supply of *standard control services*; and
 - (iv) maintain the reliability and security of the *distribution system* through the supply of *standard control services*; and
 - (4) maintain the reliability safety and security of the *distribution system* through the supply of *standard control services*.
- (b) The forecast of required operating expenditure of a *Distribution Network Service Provider* that is included in a *building block proposal* must:
- (1) comply with the requirements of any relevant *regulatory information instrument*; and
 - (2) be for expenditure that is properly allocated to *standard control services* in accordance with the principles and policies set out in the *Cost Allocation Method* for the *Distribution Network Service Provider*; and
 - (3) include both:
 - (i) the total of the forecast operating expenditure for the relevant *regulatory control period*; and
 - (ii) the forecast ~~of the~~ operating expenditure for each *regulatory year* of the relevant *regulatory control period*.
- (c) The *AER* must accept the forecast of required operating expenditure of a *Distribution Network Service Provider* that is included in a *building block proposal* if the *AER* is satisfied that the total of the forecast operating expenditure for the *regulatory control period* reasonably reflects each of the following (the *operating expenditure criteria*):

- (1) the efficient costs of achieving the *operating expenditure objectives*; and
 - (2) the costs that a prudent operator ~~in the circumstances of the relevant *Distribution Network Service Provider*~~ would require to achieve the *operating expenditure objectives*; and
 - (3) a realistic expectation of the demand forecast and cost inputs required to achieve the *operating expenditure objectives*.
(~~the operating expenditure criteria~~)
- (d) If the *AER* is not satisfied as referred to in paragraph (c), it must not accept the forecast of required operating expenditure of a *Distribution Network Service Provider* that is included in a *building block proposal*.
- (e) In deciding whether or not the *AER* is satisfied as referred to in paragraph (c), the *AER* must have regard to the following (the *operating expenditure factors*):
- (1) ~~the information included in or accompanying the building block proposal; [Deleted]~~
 - (2) ~~submissions received in the course of consulting on the building block proposal; [Deleted]~~
 - (3) ~~analysis undertaken by or for the *AER* and published before the distribution determination is made in its final form; [Deleted]~~
 - (4) ~~the most recent annual benchmarking report that has been published under rule 6.27 and the~~ benchmark operating expenditure that would be incurred by an efficient *Distribution Network Service Provider* over the regulatory control period;
 - (5) the actual and expected operating expenditure of the *Distribution Network Service Provider* during any preceding regulatory control periods;
 - (5A) the extent to which the operating expenditure forecast includes expenditure to address the concerns of electricity consumers as identified by the *Distribution Network Service Provider* in the course of its engagement with electricity consumers;
 - (6) the relative prices of operating and capital inputs;
 - (7) the substitution possibilities between operating and capital expenditure;
 - (8) whether the ~~total labour costs included in the capital and~~ operating expenditure forecasts ~~for the regulatory control period are~~ is consistent with ~~the incentives provided by the applicable service target performance incentive scheme in respect of the regulatory control period any incentive scheme or schemes that apply to the *Distribution Network Service Provider* under clauses 6.5.8 or 6.6.2 to 6.6.4;~~
 - (9) the extent the ~~forecast of required~~ operating expenditure ~~forecast of the *Distribution Network Service Provider*~~ is referable to arrangements with a person other than the ~~provider *Distribution Network Service Provider*~~ that, in the opinion of the *AER*, do not reflect arm's length terms;
 - (9A) whether the operating expenditure forecast includes an amount relating to a project that should more appropriately be included as a contingent project under clause 6.6A.1(b);

(10) the extent the *Distribution Network Service Provider* has considered, and made provision for, efficient and prudent non-network alternatives.

(11) **[Note: Clause left intentionally blank]**

(12) any other factor the AER considers relevant and which the AER has notified the *Distribution Network Service Provider* in writing, prior to the submission of its revised regulatory proposal under clause 6.10.3, is an operating expenditure factor.

Appendix B. Clause 6.5.7 of the NER

This appendix sets out clause 6.5.7 of the NER. Changes to the clause that were introduced by the National Electricity Amendment Rule 2012 are identified in mark-up.

6.5.6 Forecast capital expenditure

- (a) A *building block proposal* must include the total forecast capital expenditure for the relevant *regulatory control period* which the *Distribution Network Service Provider* considers is required in order to achieve each of the following (the *capital expenditure objectives*):
- (1) meet or manage the expected demand for *standard control services* over that period;
 - (2) comply with all applicable *regulatory obligations or requirements* associated with the provision of *standard control services*;
 - (3) to the extent that there is no applicable *regulatory obligation or requirement* in relation to:
 - (i) the quality, reliability or security of supply of *standard control services*; or
 - (ii) the reliability or security of the *distribution system* through the supply of *standard control services*,
 to the relevant extent:
 - (iii) maintain the quality, reliability and security of supply of *standard control services*; and
 - (iv) maintain the reliability and security of the *distribution system* through the supply of *standard control services*; and
 - (4) maintain the reliability safety and security of the *distribution system* through the supply of *standard control services*.
- (b) The forecast of required capital expenditure of a *Distribution Network Service Provider* that is included in a *building block proposal* must:
- (1) comply with the requirements of any relevant *regulatory information instrument*; and
 - (2) be for expenditure that is properly allocated to *standard control services* in accordance with the principles and policies set out in the *Cost Allocation Method* for the *Distribution Network Service Provider*; and
 - (3) include both:
 - (i) the total of the forecast capital expenditure for the relevant *regulatory control period*; and
 - (ii) the forecast ~~of the~~ capital expenditure for each *regulatory year* of the relevant *regulatory control period*.
- (c) The *AER* must accept the forecast of required capital expenditure of a *Distribution Network Service Provider* that is included in a *building block proposal* if the *AER* is satisfied that the total of the forecast capital expenditure for the *regulatory control period* reasonably reflects each of the following (the *capital expenditure criteria*):

- (1) the efficient costs of achieving the *capital expenditure objectives*; and
 - (2) the costs that a prudent operator ~~in the circumstances of the relevant *Distribution Network Service Provider*~~ would require to achieve the *capital expenditure objectives*; and
 - (3) a realistic expectation of the demand forecast and cost inputs required to achieve the *capital expenditure objectives*.
(~~the capital expenditure criteria~~)
- (d) If the *AER* is not satisfied as referred to in paragraph (c), it must not accept the forecast of required capital expenditure of a *Distribution Network Service Provider* that is included in a *building block proposal*.
- (e) In deciding whether or not the *AER* is satisfied as referred to in paragraph (c), the *AER* must have regard to the following (the *capital expenditure factors*):
- (1) ~~the information included in or accompanying the building block proposal; [Deleted]~~
 - (2) ~~submissions received in the course of consulting on the building block proposal; [Deleted]~~
 - (3) ~~analysis undertaken by or for the *AER* and published before the distribution determination is made in its final form; [Deleted]~~
 - (4) ~~the most recent annual benchmarking report that has been published under rule 6.27 and the~~ benchmark capital expenditure that would be incurred by an efficient *Distribution Network Service Provider* over the regulatory control period;
 - (5) the actual and expected capital expenditure of the *Distribution Network Service Provider* during any preceding regulatory control periods;
 - (5A) the extent to which the capital expenditure forecast includes expenditure to address the concerns of electricity consumers as identified by the *Distribution Network Service Provider* in the course of its engagement with electricity consumers;
 - (6) the relative prices of operating and capital inputs;
 - (7) the substitution possibilities between operating and capital expenditure;
 - (8) whether the ~~total labour costs included in the~~ capital ~~and operating~~ expenditure forecasts ~~for the regulatory control period are~~ is consistent with ~~the incentives provided by the applicable service target performance incentive scheme in respect of the regulatory control period any incentive scheme or schemes that apply to the *Distribution Network Service Provider* under clauses 6.5.8 or 6.6.2 to 6.6.4;~~
 - (9) the extent the ~~forecast of required~~ capital expenditure ~~forecast of the *Distribution Network Service Provider*~~ is referable to arrangements with a person other than the ~~provider~~ *Distribution Network Service Provider* that, in the opinion of the *AER*, do not reflect arm's length terms;
 - (9A) whether the capital expenditure forecast includes an amount relating to a project that should more appropriately be included as a contingent project under clause 6.6A.1(b);

- (10) the extent the *Distribution Network Service Provider* has considered, and made provision for, efficient and prudent non-network alternatives.
- (11) any relevant final project assessment report (as defined in clause 5.10.2) *published* under clause 5.17.4(o), (p) or (s);
- (12) any other factor the AER considers relevant and which the AER has notified the *Distribution Network Service Provider* in writing, prior to the submission of its revised regulatory proposal under clause 6.10.3, is an capital expenditure factor.

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Economic Interpretation of clauses 6.5.6 and 6.5.7 of the National Electricity Rules

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1. Introduction

This report has been prepared by NERA Economic Consulting (NERA) following a request by EnergyAustralia-Ausgrid to provide an economic analysis of provisions in the ~~transitional~~ National Electricity Rules (NER) concerning the capital and operating expenditure forecasts submitted by a Distribution Network Service Provider (DNSP). In particular, EnergyAustralia-Ausgrid has asked NERA to analyse both the overall structure and terms within the relevant provisions, including the concepts of ‘the efficient costs of achieving the [capital and operating] expenditure objectives’ and ‘the costs that a prudent operator in the circumstances of a DNSP would require to achieve the [capital and operating] expenditure objectives.’ The terms of reference for this report are attached as Appendix A. We understand that this report may also be relied upon by Essential Energy and Endeavour Energy.

The remainder of this report is structured as follows:

- Section 2 sets out the relevant provisions in the National Electricity Law (NEL) and the NER in relation to the criteria that must be applied by the AER when it determines whether or not a DNSP’s operating and capital expenditure forecasts reasonably reflect those criteria;
- Section 3 explains the term ‘efficiency’ as used by economists in general and how it should be interpreted in the context of its fundamental importance as a reference point for the assessment of operating and capital expenditure forecasts;
- Section 4 analyses the structure of clauses 6.5.6 and 6.5.7 of the NER from an economic perspective as well as relevant terms or phrases appearing in the clauses and in the NEL, including ‘efficient costs’ and ‘the costs that a prudent operator ~~in the circumstances of the relevant DNSP~~ would require to achieve the [capital and operating] expenditure objectives’;
- Section 5 sets out the practical implications of our analysis for the processes and principles that a DNSP could be expected to apply in developing operating and capital expenditure forecasts and in presenting them in its regulatory proposal to the AER; and
- Section 6 provides concluding comments~~concludes~~.

2. Relevant Provisions in the NEL and NER

This section sets out the relevant provisions of the NEL and the NER that govern the criteria that must be applied by the AER in assessing the operating and capital expenditure forecasts submitted by a DNSP, including the factors to which the AER is to have regard ~~in~~when determining whether to accept those forecasts.

In performing or exercising an AER economic regulatory function or power – including the assessment of expenditure forecasts put forward by a DNSP – section 16 of the NEL imposes overarching requirements on the AER. These require it to:

- perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the national electricity objective (16)(1)(a); and
- to take into account the revenue and pricing principles when exercising a discretion in making those parts of a distribution determination relating to direct control services (16)(2)(a)(i).

The national electricity objective is set out at section 7 of the NEL:

Section 7: The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –

- (a) price, quality, safety, reliability and security of supply of electricity; and
- (b) the reliability, safety and security of the national electricity system.’

The revenue and pricing principles set out in the NEL (Section 7A) include:

Section 7A

(2) A regulated network service provider should be provided with a reasonable opportunity to recover at least the efficient costs the operator incurs in –

- (a) providing direct control network services; and
- (b) complying with a regulatory obligation or requirement or making a regulatory payment.

(3) A regulated network service provider should be provided with effective incentives in order to promote economic efficiency with respect to direct control services the operator provides. [..]

| The ~~transitional~~ NER also contain provisions governing the specific operating and capital expenditure criteria that must be applied by the AER in determining whether or not it is

satisfied that the expenditure forecasts submitted by a DNSP reasonably reflect these criteria.¹ These are that:

6.5.6(c)/6.5.7(c):

The AER must accept the forecast of required operating (capital) expenditure of a Distribution Network Service Provider that is included in a *building block proposal* if the AER is satisfied that the total of the forecast operating (capital) expenditure for the *regulatory control period* reasonably reflects:

(1) the efficient costs of achieving the *operating expenditure objectives (capital expenditure objectives)*; and

(2) the costs that a prudent operator ~~in the circumstances of the relevant Distribution Network Service Provider~~ would require to achieve the *operating expenditure objectives (capital expenditure objectives)*; and

(3) a realistic expectation of the demand forecast and cost inputs required to achieve the *operating expenditure objectives (capital expenditure objectives)*.

The provisions in 6.5.6(c) and 6.5.7(c) are termed the *operating expenditure criteria* and the *capital expenditure criteria*, respectively.

In deciding whether or not it is satisfied that the expenditure proposals put forward by a DNSP reasonably reflect these expenditure criteria,² the AER is exercising its discretion, and must therefore take into account the revenue and pricing principles.³ ~~—~~ Clauses 6.5.6(e) and 6.5.7(e) set out a number of factors to which the AER must also have regard in making its decision. ~~There~~ **These** factors are termed the *operating expenditure factors* and *capital expenditure factors*, respectively. These factors are discussed further in section 4.4.

The *operating expenditure objectives* and *capital expenditure objectives* referred to in clauses 6.5.6(c) and 6.5.7(c) are set out in clauses 6.5.6(a) and 6.5.7(a):

6.5.6(a)/6.5.7(a)

A *building block proposal* must include the total forecast operating (capital) expenditure for the relevant *regulatory control period* which the *Distribution Network Service Provider* considers is required in order to achieve each of the following (the *operating expenditure objectives*) (the *capital expenditure objectives*):

(1) meet or manage the expected demand for *standard control services* over that period;

¹ ~~— The transitional NER apply to the DNSPs in New South Wales and the Australian Capital Territory for the regulatory control period 2009-14.~~

² NER, 6.12.1(3) and (4).

³ NEL section 16(2)(a)(i).

(2) comply with all applicable *regulatory obligations or requirements* associated with the provision of *standard control services*;

~~(3) maintain the quality, reliability and security of supply of *standard control services*;~~

~~(4) Maintain the reliability, safety and security of the *distribution system* through the supply of *standard control services*.~~

~~(3) to the extent that there is no applicable *regulatory obligation or requirement in relation to*:~~

~~(i) the quality, reliability or security of supply of *standard control services*; or~~

~~(ii) the reliability or security of the *distribution system* through the supply of *standard control services*.~~

~~to the relevant extent:~~

~~(iii) maintain the quality, reliability and security of supply of *standard control services*; and~~

~~(iv) maintain the reliability and security of the *distribution system* through the supply of *standard control services*; and~~

~~(4) maintain the reliability safety and security of the *distribution system* through the supply of *standard control services*.~~

In light of its fundamental importance as a reference point for the NER provisions, the following section explains how the term ‘efficiency’ is interpreted and applied by economists, with particular attention to the context of assessing expenditure forecasts.

3. 'Efficiency' in the Context of Expenditure Forecasts

This section explains the term 'efficiency', as it is understood by economists, with particular attention to its interpretation in the context of the assessment of operating and capital expenditure forecasts.

3.1. Definition of 'efficiency'

'Efficiency' is a term of art in economics. Economists typically distinguish three types of efficiency:

- *productive* efficiency concerns itself with how goods and services are produced, and is attained when this takes place at least cost;
- *allocative* efficiency concerns itself with what is produced and for whom, and is attained where the optimal set of goods and services is allocated so as to provide the maximum benefit to society; and
- *dynamic* efficiency is concerned with the achievement of productive and allocative efficiency over time in the face of changing technology and consumer tastes, and is attained when the optimal set of goods and services is produced at the least cost, as the world changes.

In considering the interpretation of the concept of 'efficiency' in the context of the assessment of a regulated business's expenditure forecasts, it is important to distinguish between efficiency as a theoretical construct, against an assumed background of perfect competition, and efficiency as economists would generally apply the concept in practical terms to businesses in the real world, operating in less than perfectly competitive markets.

A firm that was efficient in all of the above three dimensions would, to put it simply, be doing the right thing, doing it at least cost and doing it all the time. However, in practice, just as there are no perfectly competitive markets, no firm can realistically be expected to achieve this level of efficiency in every facet of its operations, in perpetuity.

3.2. The 'efficient' outcome is constantly changing

A key consequence of the above definition of efficiency is that what constitutes an efficient outcome will be ***constantly changing***. Consumer preferences change over time, altering the most efficient mix of goods and services. Technology also changes over time, changing production costs and potential alternatives for producing a given mix of goods and services.

The economics textbook definition of efficiency is underpinned by the concept of perfect competition. A perfectly competitive market ensures that firms are always producing at least cost, and are constantly evolving to ensure that they continue to produce the optimal mix of goods and services at least cost over time.

In the real world there are constraints on firms constantly altering their mix of goods and services and production processes, to take account of new technology and changes in consumer tastes. Companies' abilities to transform inputs into outputs efficiently will vary over time and will be constrained by their specific operating environments. This is

particularly true for firms operating in industries ~~which that~~ are capital intensive and where there are long-lived assets, such as infrastructure businesses.

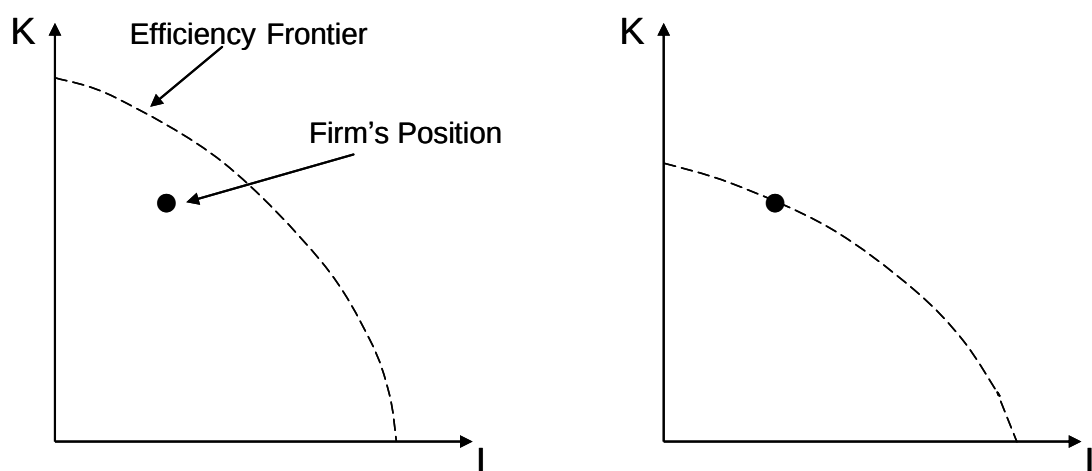
It is therefore unrealistic to expect a firm to *always* be operating on the efficiency frontier.⁴ Even if a firm is on the efficiency frontier at one point in time, it is unlikely ~~also to also~~ be on it a moment later, as the frontier itself will have moved. In practical terms, efficiency is something that firms may be constantly working towards, without ever actually ~~fully~~ achieving ~~it~~.

3.3. 'Efficiency' cannot be directly observed

Importantly, the attainment of perfect ~~of~~ frontier efficiency is not directly observable. Under the construct of a perfectly competitive market, whether or not a firm is operating on the efficiency frontier can be deduced from observing whether or not it remains in business. Firms that are ~~less than~~ not perfectly efficient will be undercut by firms that are, ~~so that inefficient firms perfectly efficient and~~ will no longer be able to sell their output. However, in the real world firms operate in markets that are less than perfectly competitive and ~~so~~ this external gauge of whether or not a firm is achieving frontier efficiency is no longer available.

Figure 3.1 below illustrates the difficulty of determining whether or not a firm is efficient, if the efficiency frontier cannot be directly observed. If the efficiency frontier is assumed to be as depicted in the diagram on the left hand side, then a firm operating at the point indicated would be considered not to be perfectly efficient. However, if the frontier it is assumed to be as depicted in the right hand side diagram, then the same firm would be considered to be perfectly efficient. If there is no external measure of where the efficiency frontier lies, then there is no way of knowing which of these cases applies.

Figure 3.1: The Difficulty of Measuring Efficiency



⁴ The 'efficiency frontier' is defined as the combinations of labour and capital inputs that, taken together, result in the lowest cost of production of a given bundle of goods and services. A firm that is operating on the efficiency frontier is perfectly efficient.

3.4. Measurement of 'efficiency' is relative to others

Given that a firm's efficiency in relation to the efficiency frontier cannot be directly observed in real-world circumstances of less than perfect competition, the assessment of efficiency typically becomes a *relative* concept. A given firm's efficiency is measured by considering the firm's costs relative to the costs of other firms. However, it is again difficult to measure when a firm is behaving efficiently, once you move away from the perfectly competitive market paradigm.

In a perfectly competitive market, firms produce homogenous outputs. The efficiency of one firm can therefore be directly compared to the efficiency of another, since the outputs produced are the same. However, as soon as the assumption of homogeneity is relaxed, it becomes difficult to measure the efficiency of one firm against another, ~~as~~ since the outputs they are producing are different. One firm may be producing its output at a lower cost than another; however the output may also be of a lower quality and be valued less by consumers.

Equally, differences in the circumstances facing a firm will affect the costs incurred by that firm and so whether, without taking into account those circumstances, a firm is thought to be operating efficiently. For instance, a firm serving a major city will likely serve a much larger or more densely located customer base than a similar firm serving a rural area, leading to lower capital and operating costs per customer. Alternatively, the customers of the rural firm may be fewer in number and located across a much wider geographic area than its urban counterpart, resulting in higher capital and operating costs per customer.

In making a comparison it is therefore necessary to control for all of the relevant differences in the circumstances between the businesses and the differences in the outputs produced. Often, this may leave little that can be said about the relative efficiency of the two businesses.

Once viewed as a *relative* concept, it is also clear that not all firms can be operating at the efficiency frontier. By definition, some firms will be more efficient than others, so that there will always be a distribution of firms around an average level of efficiency. The average firm will only be averagely efficient, and so will be inside the efficiency frontier rather than on the frontier.

3.5. Average efficiency is a realistic benchmark for regulation

The subtle but important distinctions between perfect and real world efficiency, and the perfect and effectively competitive market thresholds that are consistent with these concepts, ~~gives~~ rise to the question as to whether the benchmark concept for an 'efficient' firm applied by regulators should be one of 'average' efficiency or 'perfect' efficiency.

Each business is an amalgamation of different operations. Some firms will simply be better at some of these operations than others. It would be unrealistic to expect any one firm to be able to attain frontier efficiency across *all* of its operations. It follows that setting expenditure benchmarks by reference to 'perfect' efficiency runs the risk of establishing tariffs that are *below* the lowest sustainable cost of delivering the service that is practically achievable for *all* firms. Tariffs set by reference to 'perfectly efficient' costs risk undermining service providers' incentives to undertake efficient investment and may therefore be detrimental to dynamic efficiency and so to the long-term interests of consumers.

Related aspects of the regulatory regime applying to DNSPs also throw light on the appropriate interpretation of 'efficient costs'. The NEL requires the service provider to be provided with the opportunity to earn 'more than' its efficient costs (Section 7A(2)). This implies that efficient costs are not to be interpreted as 'perfectly efficient' costs which, by definition, cannot be bettered (this is discussed further in section 4.4). The NEL also requires the service provider to be given effective incentives,⁵ which forms the basis for the efficiency benefit sharing scheme set out in the NER.⁶ If every firm could attain 'perfect' efficiency on an ongoing basis, then there would be no need for either of these provisions, which have the primary purpose of incentivising improved efficiency performance.

Notwithstanding that, in practice, perfectly competitive markets and perfectly efficient firms amount to an unattainable threshold, and so represent an unrealistic benchmark against which to assess regulated firms' expenditure, the regulatory regime seeks to ensure that profit maximising firms are always striving to improve their efficiency. Adopting a benchmark of 'average' efficiency in assessing expenditure does not therefore mean that a regulated firm's incentives to improve its efficiency are in any way diminished.

In summary, in practical terms it is difficult to assess a firm's efficiency at a given point in time. This is because the absolute efficiency frontier is not directly observable and comparisons with other firms may have limited relevance. Even if the efficiency frontier was directly observable, it is constantly shifting and therefore constitutes a moving target. Given these ~~considerations~~considerations, the focus of regulation is typically on providing incentives for efficiency that encourage firms to 'head in the right direction'.

The following section considers the wording of the provisions of the relevant NER clauses in more detail, by reference to the above principles.

⁵ NEL, section 7A(3)

⁶ NER, clause 6.5.8

4. Analysis of Relevant Terms and Phrases

This section analyses the implications for the assessment of the expenditure forecasts put forward by the DNSPs of a number of critical terms and phrases used in clauses 6.5.6 and 6.5.7, together with related provisions in the NEL, in light of the conclusions on the practical application of the concept of efficiency.

4.1. Overall structure and focus of clauses 6.5.6 and 6.5.7

The construction of the expenditure assessment clauses 6.5.6 and 6.5.7 of the NER reflects the dimensions of efficiency discussed in the previous section. Clauses 6.5.6(a) and 6.5.7(a) provide a set of expenditure objectives, which effectively define the outputs (or the process and principles for determining the outputs) that a DNSP is required to produce. The effect of these objectives is to establish the services to be produced by DNSPs, with the implication that the Ministerial Council on Energy (MCE)⁷ intended these to reflect the desired outcomes or benefits to society. In other words, clauses 6.5.6(a) and 6.5.7(a) effectively determine the parameters of **allocative efficiency** for the DNSPs.

Clauses 6.5.6(c) and 6.5.7(c) then set out the criteria to be adopted by the AER in determining whether the DNSP is proposing to produce the required goods and services in a **productively efficient** way, ie, whether the *costs* are efficient and are the *costs* that a prudent operator would require to achieve the expenditure objectives. The evaluation of costs in these clauses is not limited to current costs, and so is also able to encompass a longer-term view of efficiency over time, ie, **dynamic efficiency**.⁸

The focus of the two clauses is on DNSPs' *forecasts* of expenditure. Forecasts are inherently uncertain, since they depend on expectations of demand and future cost inputs required to produce the expenditure objectives, as recognised in 6.5.6(c)(3) and 6.5.7(c)(3).

Section 3 discussed the difficulty of identifying whether or not a firm is behaving efficiently. This difficulty is magnified in the context of forecasts, which is the focus of clauses 6.5.6 and 6.5.7. If it is difficult to recognise efficiency today, it likely to be *even more difficult* to recognise now what constitutes efficiency looking into the future.

This difficulty in recognising what constitutes efficiency in the context of a forecast is compounded by the fact that the regulator is also not in a position to know *ex post* whether a firm has in fact behaved efficiently. In looking ahead and forecasting an exchange rate for 31 December ~~2010~~2014, it will always be possible after that date to observe the outturn exchange rate, and so to assess how good or bad the forecast was. By contrast, in forecasting efficient expenditure for the year ~~2010~~2014, no such objective measure is available, even *ex post*. Although actual expenditure for the year ~~2010~~2014 will be known, there is no objective means of gauging whether the *forecast* made of the required level of expenditure for that year was efficient and, in particular, whether it was efficient *given the circumstances in which the forecast was made and the uncertainties in relation to actual outturns*.

⁷ The MCE was the decision maker in establishing the transitional NER.

⁸ In section 4 we consider further the implications of the wording in these clauses in relation to consideration of costs over the longer term. In particular, the term 'prudent' encompasses consideration of the future (see section 4.3.3).

Outturn expenditure below the forecast level does not indicate that the original forecast encompassed a degree of inefficiency, since the forecast needs to be able to accommodate a range of potential outturn outcomes (that will in turn drive actual expenditure), which are uncertain at the time at which the forecast is made, whilst still meeting the expenditure objectives.

To summarise, the construction of the expenditure assessment clauses 6.5.6 and 6.5.7 reflects the dimensions of efficiency whilst the focus of the clauses is on the *forecasts* of efficient expenditure, which cannot be objectively verified, either at the time that the forecasts are made or after the event.

4.2. The expenditure objectives (clauses 6.5.6(a) and 6.5.7(a))

Clauses 6.5.6(a) and 6.5.7(a) specify a set of objectives or outputs that a DNSP is required to produce, thereby effectively performing the function of establishing the services to be produced by a DNSP that reflect the desired outcomes or benefits to society. In other words, clauses 6.5.6(a) and 6.5.7(a) effectively determine the parameters of allocative efficiency for the DNSPs.

The DNSP must determine the total expenditure that it considers ‘is required’ to achieve the expenditure objectives. This is consistent with our earlier conclusion that there is no objective measure of required expenditure; rather, the DNSP’s opinion as to the adequacy of the forecast is of principal relevance. Similarly the clauses make reference to ‘*expected demand*’⁹, which also reflects the fact that the expenditure forecasts are being made against an uncertain background.

4.3. The expenditure criteria (clauses 6.5.6(c), 6.5.7(c))

Clauses 6.5.6(c) and 6.5.7(c) address the question of how much expenditure is needed to meet the objectives defined and interpreted (by DNSPs) in clauses 6.5.6(a) and 6.5.7(a).

4.3.1. ‘Reasonably reflects’

Clauses 6.5.6(c) and 6.5.7 (c) establish a threshold in the form of whether the AER is satisfied that the forecasts ‘reasonably reflect’ the relevant expenditure objectives. The use of the term ‘reasonably’ recognises that an assessment is required (ie, it is subjective), rather than the expenditure criteria reflecting objective standards. This is consistent with the view set out in section 3 that whether or not a firm is operating efficiently cannot be directly observed.

The clause also refers to ‘the *total*’ of the expenditure for the regulatory control period reasonably reflecting the expenditure criteria. This is consistent with the reference to ‘total forecast expenditure’ in clauses 6.5.6(a) and 6.5.7(a) and implies that the AER must consider the reasonableness of the forecasts overall, and take account of the role of each element as part of an overall assessment.

⁹ 6.5.6(a)(1); 6.5.7(a)(1).

4.3.2. 'Efficient costs'

Clauses 6.5.6(c)(1) and 6.5.7(c)(1) refer to 'the efficient costs of achieving the operating (capital) expenditure objectives.'

As discussed in section 3, in circumstances of less than perfect competition, it would be unreasonable to expect all firms to be operating on the efficiency frontier all of the time (although it would be reasonable to expect all firms to be striving for improvement). The reference to 'the efficient costs' in 6.5.6(c)(1) and 6.5.7(c)(1) should not therefore be interpreted as being a reference to 'perfectly efficient' costs.

This interpretation is consistent with the revenue and pricing principles in the NEL. In particular, clause 7A(2) requires that the regulated service provider be provided with a 'reasonable opportunity' to recover 'at least the efficient costs' that it incurs (emphasis added). Interpreting an 'efficient cost' standard as being something closer to 'perfectly efficient costs' would be inconsistent with this principle, since it would provide no scope for a firm to recover *more* than its efficient costs.

4.3.3. 'A prudent operator'

The second expenditure criterion set out in the NER is:

'the costs that a *prudent operator* ~~in the circumstances of the relevant DNSP~~ would require to achieve the operating (capital) expenditure objectives.'

4.3.3.1. Definitions of 'prudent'

'Prudent' is defined in the dictionary in the following ways:

1. wise, judicious, or wisely cautious in practical affairs, as a person; sagacious or judicious; discreet or circumspect.
2. careful of one's own interests; provident, or careful in providing for the future
3. characterised by or proceeding from prudence, as conduct, action, etc

(The Pocket Macquarie Dictionary, Macquarie Library 1981)

1. (or a person or conduct) careful to avoid undesired consequences; circumspect
2. discreet

(The Australian Concise Oxford Dictionary, Fourth Edition, 1987)

1. discrete or cautious in managing ones activities, circumspect
2. practical or careful in providing for the future
3. exercising good judgment or common sense

(Collins Dictionary 5th Australian Edition 2003)

1. having good sense: having good sense in dealing with practical matters
2. carefully considering consequences: using good judgment to consider likely consequences and act accordingly

3. careful in managing resources: careful in managing resources so as to provide for the future

(Encarta: http://encarta.msn.com/dictionary/_prudent.html)

In addition, in the utility regulation context a ‘reasonable and prudent person’ is defined in three distinct Western Australian regulations.¹⁰ All three are broadly consistent, and define a ‘reasonable and prudent person’ as:¹¹

‘Reasonable and prudent person means a person acting in good faith with the intention of performing his or her contractual obligations and who in doing so and in the general conduct of his or her undertaking exercises that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be exercised by a skilled and experienced person complying with recognised standards and applicable laws engaged in the same type of undertaking under the same or similar circumstances and conditions.’¹²

As defined above, the concept of prudence has relevance both in relation to:

- the *process* followed by the DNSP in developing its expenditure forecasts; and
- the *principles* adopted in deriving the forecasts, and hence the *level* of those forecasts.

Section 3 explained that whether or not a firm is on the efficiency frontier is not directly observable, and that the efficiency frontier itself is always moving. Given this context, the inclusion of the term ‘prudent’ within the expenditure criteria provides guidance on how the assessment of the ‘efficiency’ of the expenditure forecasts should be approached in practice.

4.3.3.2. Implications for the process of developing expenditure forecasts

The definitions of prudence all have in common references to ‘carefully considering consequences’, ‘carefully managing resources’ and being ‘careful to avoid undesired consequences.’ These are all concepts that can be applied in assessing the *process* that the DNSP has followed in developing the expenditure forecasts. The costs that would be incurred by a prudent operator are likely to be those costs that are the outcome of a process that reflected these considerations. An assessment of the *process* followed by the DNSP is important because the efficiency of the level of a DNSP’s forecasts cannot be measured directly against an objective, external standard. This makes it necessary to consider other indicators of the likely efficiency of a DNSP’s forecasts ~~which that~~ can be directly observed.

The concept of ‘prudence’ also encompasses a time element, since it includes both the consideration of consequences (which by definition is forward looking) and also ‘making provision for the future’.

¹⁰ Dampier to Bunbury Pipeline Regulations 1998; Electricity Referee and Dispute Resolution Regulations 1997; Gas Referee Regulations 1995.

¹² ~~Dampier to Bunbury Pipeline Regulations 1998.~~

¹² ~~Dampier to Bunbury Pipeline Regulations 1998.~~

In addition, definitions of ‘prudent’ make reference to ‘wise’, ‘judicious’, ‘exercising good judgement or common sense’ and ‘having good sense’. The reference to a ‘prudent operator’ therefore implies the application of judgement. This is consistent with the focus of the clause on the development of forecasts and the uncertainty associated with these. It is also consistent with the reference to ‘*reasonably reflects*’ in the introduction to the clause and with the reference to ‘*the DNSP considers*’ in clause 6.5.6(a) and 6.5.7(a).

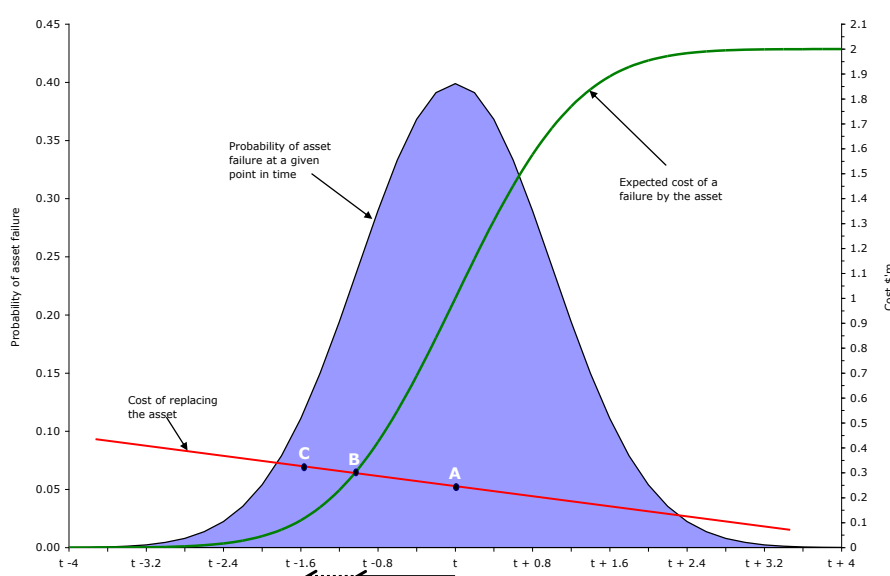
4.3.3.3. Implications for the principles adopted in developing forecasts

The references to ‘carefully considering consequences’, ‘carefully managing resources’ and being ‘careful to avoid undesired consequences’ also have implications for the principles applied in developing expenditure forecasts, which ultimately affect the *level* of expenditure forecasts made by a prudent operator. From an economist’s perspective, an operator that is careful to avoid undesired consequences can be characterised as being ‘risk-averse.’

A ‘prudent’ or ‘risk-averse’ operator would be expected to avoid risks that give rise to high cost consequences by incorporating in its expenditure forecasts the costs of measures to guard against such outcomes, even where these are not the most likely outcomes. For example, a failure of a sub-station in a CBD area would have high cost consequences in terms of customer disruption and would be likely to result in the DNSP failing to meet the expenditure objectives. A prudent operator may decide to include in its forecasts the cost of replacing an aging sub-station, even where the *most likely* outcome in the absence of such expenditure would not be the failure of the sub-station. The total expenditure forecast by a prudent or risk-averse operator could therefore be expected to be higher than an expenditure forecast prepared by a party with a greater appetite for risk.

Figure 4.1 Figure 4.1 illustrates this point.

Figure 4.1
Expected Costs and Benefits of Asset Replacement



The bell shaped curve represents the probability (depicted on the left axis) that a given asset will fail. In the scenario shown, point t represents the time that the asset is most likely to fail (for example, due to its age). There is also a fifty per cent chance that the asset will fail at or before point t .

The cost of replacing the asset (in net present value terms) is represented by the red line in the diagram. The net present value (NPV) of the replacement cost is falling over time since the later replacement date reduces the long term costs associated with the asset, by delaying the timing of future replacements.

The expected costs that would result from a failure of the asset are illustrated by the green line. For illustrative purposes we have assumed that a cost of \$2m would be incurred if the asset failed. The expected cost of failure is therefore this cost multiplied by the probability of failure occurring. This expected cost increases over time, as the probability of failure increases (with the age of the asset).

When assessing the optimal time to replace the asset, a prudent and efficient DNSP could be expected to compare the cost of replacing the asset with the consequences that would flow from not replacing it by a given point in time. The efficient replacement time will be given by the point where the cost of replacing the asset is equal to the expected costs that would be incurred if the asset failed, ie, point B in the diagram. Point B occurs at an earlier point in time than the most likely date of asset failure. Given the downward sloping nature of the cost of replacement over time, this also implies that the costs of replacement at point B are above the costs of replacement at point A.

Point B represents the efficient timing for replacement of the asset, assuming the probability of failure is indeed as depicted in the diagram. However, the probability of failure is necessarily uncertain. A risk-averse DNSP may take a more cautious view of the distribution of risks than implied by the curve depicted above. The consequence of a more cautious view of the probability distribution is that the efficient replacement date would occur earlier, eg, at point C. The replacement costs at point C are greater than the replacement costs at point B, in net present value terms.

An important factor in the DNSP's choice between points A, B and C will be its assessment of the likelihood of asset failure, the consequences of such failure, and the implied costs of failure as compared with the costs of replacement. An assessment of these consequences is consistent with behaving in a prudent and risk-averse manner, and is likely to result in a higher expenditure in net present value terms than would be implied by focusing only on the most likely outcomes.

This example also demonstrates the importance of considering the circumstances of the particular DNSP. The likelihood of asset failure, the consequences of such failure, and the implied costs of failure will depend on the nature of the firm. The failure of an asset located in a CBD area would give rise to significantly higher costs than the failure of a similar asset located in a rural area. It follows that the firm providing services to a CBD location may decide that it would be prudent to replace the asset in order to avoid these consequences, whereas the firm providing services in a regional location may decide to continue maintaining the same or similar asset until it is closer to the end of its expected life. In both cases, 'prudence' is reflected in the weighing up of the costs of alternative activities

compared with the costs and likelihood of the potential consequences, and in the adoption of more or less a risk-averse approach to avoiding adverse consequences.

~~4.3.4.~~ ‘In the circumstances of the DNSP’

~~Clauses 6.5.6(c)(2) and 6.5.7(c)(2) refer to the costs that would be incurred by a prudent operator ‘in the circumstances of the DNSP’.~~

~~The AER is required to consider the particular circumstances of the DNSP in assessing whether the expenditure forecasts reasonably reflect the expenditure criteria. As discussed in section 3, as soon as one moves away from the theoretical ideal of perfect competition, the particular circumstances of a firm are highly relevant in considering how efficiently that firm is operating.~~

~~This requirement effectively moderates one of the expenditure factors ((c)(4)), which requires the AER to have regard to the benchmark operating or capital expenditure that would be incurred by an efficient DNSP over the regulatory control period. In considering such benchmark information the AER must have regard to ‘the circumstances of the DNSP’.~~

~~4.3.5.~~4.3.4. ‘Realistic expectation’

Clauses 6.5.6(c)(3) and 6.65.67(c)(3) refer to ‘a realistic expectation of the demand forecast and cost inputs required to achieve the operating expenditure criteria.’

This sub-clause again reflects the focus of clauses 6.5.6 and 6.5.7 on the *forecasting* of expenditure and the uncertain background against which this takes place, including uncertainty in relation to future demand and input costs. The use of the term ‘realistic’ expectation again recognises that these aspects of forecasting are subjective.

~~4.3.6.~~4.3.5. Overall structure of sub-clause 6.5.6(c) and 6.5.7(c)

The expenditure criteria require the AER to accept the expenditure forecasts if it is satisfied that the total reasonably reflects:

- (1) the efficient costs of achieving the expenditure objectives; *and*
- (2) the costs that a prudent operator ~~in the circumstances of the relevant DNSP~~ would require to achieve the expenditure objectives; *and*
- (3) a realistic expectation of the demand forecast and cost inputs required to achieve the operating expenditure objectives.

The AER must be satisfied that the expenditure forecasts reasonably reflect *all three* of the expenditure criteria.

If the AER is not satisfied that the expenditure forecasts reasonably reflect all three of the expenditure criteria, then it must set out an estimate of the expenditure that the AER is

satisfied reasonably reflects the expenditure criteria.¹³ Again, the AER must be satisfied that its alternative estimate satisfies *all* of the expenditure criteria.

In principle, a distinction could be drawn between the ‘efficient costs’ required by the first criteria and ‘the costs that a prudent operator ~~[..]~~ would require’, as set out in the second criteria, as illustrated in ~~Figure 4.1~~~~Figure 4.1~~. However, the structure of clauses 6.5.6(c) and 6.5.7(c) effectively rules this out for the purposes of the AER’s assessment of the expenditure forecasts. If such a distinction were to be drawn (ie, if the AER considered that the forecasts reflected the costs a prudent operator would require, but not the *efficient* costs) then the forecasts could not simultaneously satisfy the first two expenditure criteria.

This conclusion begs the question of the relationship between efficiency and prudence. ~~Figure 4.1~~~~Figure 4.1~~ illustrated that the efficient timing of investment is conditional on the view taken as to the probability distribution of asset failure, which is inherently uncertain. A prudent DNSP may take a more pessimistic view of the probability of asset failure, and decide to replace assets earlier. Such replacement is both prudent (since it reflects a degree of risk-aversion) and efficient (based on the DNSP’s view of the probability distribution).

The discussion in section 3 highlighted that efficiency is a dynamic process. Whether or not a firm is operating on the efficiency frontier is also something that cannot be objectively verified. The reference to a ‘prudent operator’ in the expenditure criteria provides some guidance as to how efficiency may be identified in practice. We have already identified that a key aspect of prudence is the *process* followed by the DNSP. An important dimension of the prudence of a process is the degree to which it is motivated by (or reflects) improvements in efficiency. A process that is motivated by efficiency will in turn ensure that the DNSP moves closer to the efficiency frontier, even though that frontier will itself be moving.

For example, a prudent process is likely to be one that considers alternative options for undertaking an augmentation. The motivation behind ~~such a that~~ process ~~would be is~~ to select the least cost option for that augmentation (all other factors being equal), ie, to ensure it is an efficient option.

A prudent process can therefore be expected to result in the DNSP moving towards maximum cost efficiency, even as that efficiency benchmark is itself moving. In other words, an assessment of prudence, ie, satisfaction of criterion (2), can be expected ~~to~~ also to lead to satisfaction of criterion (1), over time.

4.4. The expenditure factors

Clauses 6.5.6(e) and 6.5.7(e) set out a number of expenditure factors to which the AER is to have regard in deciding whether or not it is satisfied that the DNSP’s expenditure forecasts reasonably reflect the expenditure criteria.

The fourth factor is the ‘benchmark’ expenditure that would be incurred by ‘an efficient’ DNSP over the regulatory control period. Consistent with the use of the term ‘efficiency’ in the expenditure criteria, an ‘efficient’ DNSP in this context should be assessed by reference

¹³ NER 6.12.1 (3)(ii) and (4)(ii).

to that which would arise under workable competition rather than ‘perfect efficiency’. We discussed in section 3 that, as soon as the theoretical ideal of perfect competition is departed from, the circumstances of a firm are highly relevant for assessing how efficiently that firm is operating. In practice, this

~~In addition, as noted above, the application of clauses 6.5.6(c)(2) and 6.5.7(c)(2)~~ means that, in considering benchmarking evidence, the AER needs ~~also~~ to consider how relative ~~that~~ efficiency may be affected by the circumstances of the DNSP.

The sixth and seventh expenditure factors are:

- (6) the relative prices of operating and capital inputs; and
- (7) the substitution possibilities between operating and capital expenditure.

These factors make clear that the AER is to consider the potential trade-off between operating and capital expenditure in assessing the expenditure forecasts. The reference to ‘the efficient costs of achieving the operating expenditure forecasts’ (6.5.6(c)(1)) and ‘the efficient costs of achieving the capital expenditure forecasts’ (6.5.7(c)(1)) therefore need to be interpreted in relation to the total expenditure forecasts of the DNSP, rather than separately in relation to operating and capital expenditure.

A paper prepared by NERA economist Graham Shuttleworth (2005) highlights that the risks intrinsic in regulating to perfect efficiency are exacerbated when regulators apply benchmarking to different sub-sets of total costs, such as capital and operating expenditure forecasts under the NER:¹⁴

‘For each subset, companies may achieve the lowest costs only by spending money on other subsets, eg, they may lower opex by investing in new capital equipment and vice versa. The danger with such partial measures of “efficiency” is that the regulator combines the lowest (or “most efficient”) costs for each subset from different companies, thereby producing an overall estimate of costs which is simply infeasible and an unreasonable basis for setting targets.’

4.5. The revenue and pricing principles in the NEL (section 7A)

In exercising its discretion in determining whether it is satisfied that the DNSP’s proposed expenditure forecasts reasonably reflect the expenditure criteria set out in clauses 6.5.6(c) and 6.5.7(c), the AER is required to take into account the relevant revenue and pricing principles set out in the NEL.¹⁵

In particular, clause 7A(2) requires the regulated service provider to be provided with a ‘reasonable opportunity’ to recover ‘*at least* the efficient costs’ that it incurs.

¹⁴ Shuttleworth (2005), ‘Benchmarking of electricity networks: Practical problems with its use for regulation, *Utilities Policy*, Vol.13, p314.

¹⁵ NEL (16)(2)(a)(i). See section 2.

The ‘at least’ threshold in the NEL reflects the recommendation of the Expert Panel.¹⁶ This recommendation was in turn based on a desire to achieve consistency between the cost recovery principles in the NEL and the new NGL, and the regulatory principles established in the COAG Competition and Infrastructure Reform Agreement for third party access regimes. The COAG principles include a revenue sufficiency condition that access prices should generate revenue at least sufficient to meet efficient costs.¹⁷

Providing a firm with the opportunity to earn a stream of revenue that recovers *at least* its efficient costs is quite a different matter to allowing it only to recover its perfectly efficient costs. For a regulated business facing regulatory incentive mechanisms, there is an opportunity for that business to earn *more* than its efficient costs, at a given point in time, where it has made efficiency gains that it is allowed to retain for a period. Importantly, such efficiency gains may result from the firm ‘doing things better’ than it did previously and therefore moving closer to the frontier, rather than from innovation and technological change moving the efficiency frontier itself (although the latter would also be captured).

It follows that the term ‘efficient costs’ in clauses 6.5.6(c)(1) and 6.5.7(c)(1) of the NER needs to be interpreted as distinct from ‘perfectly efficient’ costs, in order to be consistent with clause 7A(2) in the NEL.

¹⁶ Expert Panel on Energy Access Pricing, Report to the Ministerial Council on Energy, April 2006, p.113.

¹⁷ COAG Background Paper: COAG National Competition Policy Review, February 2006, Recommendation 4.2 page 31

5. Addressing the Expenditure Criteria in Practice

This section sets out the practical implications of the preceding analysis for the principles and processes that a DNSP could be expected to apply in developing expenditure forecasts. It also addresses how a DNSP's regulatory proposal should be structured so as to address the capital and operating expenditure criteria.¹⁸

5.1. Demonstration of Allocative Efficiency

We discussed the construction of clauses 6.5.6 and 6.5.7 in the NER in section 4.1 and concluded that this reflects the different dimensions of efficiency. In particular, clauses 6.5.6(a) and 6.5.7(a) provide a set of expenditure objectives, which constitute the output that the DNSP is required to produce. These clauses effectively determine the parameters of **allocative efficiency** for the DNSPs. Clauses 6.5.6(c) and 6.5.7(c) then set out the criteria to be adopted by the AER in determining whether the DNSP is proposing to produce the required goods and services in a **productively efficient** way.

In the first instance, a DNSP's proposal could therefore be expected to set out clearly the link between the expenditure objectives in clauses 6.5.6(a) and 6.5.7(a) and the programs that are captured within its expenditure forecasts. A DNSP's demonstration that the coverage of its expenditure forecasts reflects the outputs identified in clauses 6.5.6(a) and 6.5.7(a) amounts to establishing that the forecasts are consistent with allocative efficiency.

In particular, the DNSP's proposal could be expected to set out what the expenditure objectives in clauses 6.5.6(a) and 6.5.7(a) mean in its specific circumstances, and to link the activities included within its forecasts to one or more of these objectives. For example, the DNSP's proposal could be expected to set out all of the regulatory obligations or requirements it faces, at an appropriate level of detail (consistent with clause 6.5.6(a)(2) and 6.5.7(a)(2)), and to explain how compliance with these requirements affects its forecast expenditure over the period.

Consideration of what the forecast expenditure is intended to achieve (ie, what outputs are being produced) is the first step in assessing whether the proposed expenditure reasonably reflects the cost of achieving those things. This was recognised by the Expert Panel on Energy Access Pricing:

‘The concept of efficient costs is also to be assessed by reference to all relevant regulatory obligations that exist for a particular service provider.’¹⁹

In some instances it is relatively straightforward to link the proposed expenditure with the expenditure objectives. For example, replacement of an aging sub-station may be required in order to maintain the reliability of the distribution system (ie, objective (4)). In other instances the link may not be so direct. For example, DNSPs incur expenditure to maintain

¹⁸ The first of the expenditure factors to which the AER must have regard in determining whether or not it is satisfied that the expenditure forecasts reasonably reflect the expenditure criteria is ‘the information included in or accompanying the expenditure proposal.’ See: NER 6.5.6(e)(1) and 6.5.7(e)(1).

¹⁹ Expert Panel on Energy Access Pricing, Report to the Ministerial Council on Energy, April 2006, p. 113.

corporate functions, such as accounting and contracting departments. These functions contribute to the achievement of all or several of the specific expenditure objectives, by facilitating the activities that are themselves more directly linked to the objectives. For example, in order to replace an aging sub-station, contracts need to be issued and reviewed, requiring the expertise of a corporate contracting function.

In addition, the discussion in section 4.3.3 highlighted that a ‘prudent operator’ may be expected to take steps to avoid negative consequences. Such prudence can be reflected in the activities a DNSP considers are necessary to ensure that a particular expenditure objective is met. For example, a prudent DNSP may consider that in order to continue to meet a given reliability standard for the distribution system (ie, objective 4) it needs to undertake activities that aim to avoid or reduce the probability of certain worst case outcomes.

5.2. Demonstration of Productive Efficiency

Having demonstrated that the expenditure forecasts are derived from the expenditure objectives, and can therefore be taken to be allocatively efficient, the DNSP’s proposal then needs to demonstrate that the expenditure forecasts comply with the expenditure criteria set out in clauses ~~5.6~~5.6.5.6(c) and 6.5.7(c), ie, that they are also productively and dynamically efficient.

Section 3 highlighted that in the real world it is difficult if not impossible to identify when a firm is behaving-operating ‘efficiently’ and that, in addition, ‘efficiency’ itself is a constantly evolving threshold or target. It follows that there are no objective, external factors that can be relied upon to demonstrate that a DNSP’s expenditure forecast is productively efficient.

Consistent with this interpretation, one of the expenditure criterion set out in the NER is the costs that would be incurred by a ‘prudent’ operator. A critical aspect of ‘prudence’ is the *process* that is followed and the reasoning that is applied by the DNSP in developing its expenditure forecasts. Both these aspects of the approach to developing forecasts can be demonstrated, in a way that the ‘efficiency’ of costs cannot. A DNSP’s regulatory proposal could therefore be expected to be structured so as to emphasise the process followed and the reasoning applied by the DNSP in developing its expenditure forecasts. This is discussed in the first part of this sub-section.

Notwithstanding the fact that there are no external, objective factors that can be relied upon to demonstrate that a DNSP’s expenditure forecast reflects efficient costs, there are some partial indicators that can be used to assess the efficiency of expenditure associated with specific items included within the forecasts. These indicators are discussed in the second half of this sub-section. Demonstration by the DNSP that these aspects of its projected level of expenditure reasonably reflect efficiency, as well as having been derived as the result of a prudent process, provide comfort that the processes used to develop the forecasts overall are indeed prudent (and that the overall forecasts reasonably reflect efficient costs).

5.2.1. Demonstration that the process is prudent and efficient

In interpreting prudence, the emphasis on ‘carefully considering consequences’, ‘carefully managing resources’ and being ‘careful to avoid undesired consequences’ has implications for the *process* followed by the DNSP in developing the expenditure forecasts. In light of the

discussion in section 4, matters that could be expected to be demonstrated by a prudent DNSP include:

- i. a clear link between the activities required to meet the expenditure objectives and the forecast level of expenditure for those activities;
- ii. clear consideration of key uncertainties, including potential adverse consequences;
- iii. the appropriateness of the approach to forecasting the different expenditure categories, given the nature of the expenditure;
- iv. recognition of the specific circumstances of the DNSP that could be expected to affect efficient expenditure;
- v. consideration of the efficiency of the total forecast expenditure, as distinct from the efficiency of each individual component of that expenditure;
- vi. consideration of alternative options for meeting the expenditure objectives, including potential trade-offs between capital and operating expenditure, and network and non-network expenditure; and
- vii. consideration of the efficiency of expenditure over the longer term, beyond the five year regulatory period.

The addressing of these considerations in the regulatory proposal could be either through substantiation in the regulatory proposal itself, or through the use of independent expert opinion to verify that the DNSPs forecasting process addresses these issues, or a combination of both. We expand on each of these considerations below.

5.2.1.1. A clear link between activities required to meet the expenditure objectives and the forecast expenditure

We noted above that a DNSP's proposal should clearly set out the link between the expenditure included within the forecasts and the expenditure objectives set out in clauses 6.5.6(a) and 6.5.7(a). Once this link is established, a DNSP's proposal could also be expected to demonstrate the link between each activity and the relevant forecast expenditure. This step is likely to involve the identification of the key factors that give rise to the required expenditure, where possible.

For example, maintenance of electricity poles is required in order to maintain the reliability, safety and security of the distribution system, ie, objective 4. The expenditure associated with this activity is driven by the expected number, asset condition and type of electricity poles in the particular DNSP's network, over the forecast period. The DNSP could therefore be expected to demonstrate in its regulatory proposal both the link between one of the required objectives (eg, objective 4) and an activity (maintenance of electricity poles), as discussed in section 5.1, and then between that activity and the associated expenditure forecast.

5.2.1.2. Consideration of key uncertainties and consequences

The focus of clauses 6.5.6 and 6.5.7 is on the *forecasting* of required expenditure. As discussed, such forecasting necessarily takes place against a background of uncertainty as to how various factors affecting expenditure will develop over the regulatory period.

An important dimension of prudence, as discussed in section 4.3.3, is the ‘careful consideration of consequences’ and in particular ‘care to avoid undesired consequences’. In economics, a person displaying these characteristics would be characterised as ‘risk-averse’. In this context, a DNSP could therefore be expected to demonstrate in its regulatory proposal that it has addressed significant uncertainties in developing its forecasts, and also that it has considered the consequences of alternative levels of expenditure. Key areas of uncertainty affecting expenditure forecasts are the level of future demand, input costs for both labour and materials and the likelihood that any given asset will fail over the regulatory period.

The level of future demand will affect the expenditure forecasts in a number of ways. For example, DNSPs have an obligation to connect new customers, and so the expenditure required to comply with a DNSP’s regulatory obligations in this area (obligation (2)) will depend on the expected number of new customers. The number of new customers in turn depends on expectations of, for example, the number of new housing developments. This further depends on expectations of economic growth in the DNSP’s area.

All of these factors are uncertain, and so a DNSP would need to demonstrate that it has considered ‘realistic expectations’ of demand outcomes over the period in developing its forecasts. This is both a consequence of compliance with expenditure criterion (3) and of demonstrating that the forecasts reasonably reflect the outcome of a prudent process to develop the expenditure forecasts (criterion (2)).

A DNSP could also be expected to demonstrate that it has considered alternative consequences in developing its expenditure forecasts and that its forecast expenditure appropriately minimises the occurrence of adverse consequences. For example, where assets such as a sub-station are reaching the end of their expected life, a DNSP will need to decide whether to replace those assets or to continue to maintain them. A prudent operator would be expected to consider the relative risk of asset failure and the consequence if such a failure occurs, in making this judgement.

In circumstances where the failure of an asset (such as a large sub-station located in a CBD area) would give rise to significant costs, a DNSP may decide that it would be prudent to replace the asset in order to avoid these consequences. In areas where failure (eg, of a small sub-station located at the end of a rural feeder) would give rise to a much lower cost, the DNSP may consider it prudent to continue maintaining the asset until it is closer to the end of its expected life. In both cases, ‘prudence’ is reflected in the weighing up of the costs of alternative activities compared with the costs and likelihood of the potential consequences, and in the adoption of a more-a risk-averse approach to avoiding more adverse consequences. This issue was discussed in detail in section 4.3.3.

5.2.1.3. The approach to forecasting for different expenditure categories

The expenditure forecasts developed by a DNSP can be expected to draw on its recent experience of the costs of getting work done. Such experience is likely to provide a direct indication of the costs faced by the DNSP ~~„given its ‘particular circumstances.’”~~

There are various approaches that can be taken in developing expenditure forecasts using this recent cost information:

- a **bottom-up approach**, whereby the DNSP undertakes a detailed examination of the costs of each task necessary to achieve the outcome;
- a **top-down approach**, whereby the DNSP considers a current component of its work program and projects this forward on the basis of an underlying set of drivers; or
- a **hybrid** of the two approaches, eg, a DNSP may employ a top-down approach based on current tasks and expected drivers but because of a change in obligations combine this with a bottom-up assessment of the *incremental* costs of the change in the obligations.

The costs of each of the above approaches and the potential benefits (in terms of greater forecast accuracy) associated with each will differ according to the particular expenditure category being forecast. A ‘prudent operator’ could be expected to tailor its forecasting approach for different expenditure categories to reflect an appropriate trade-off between the costs and benefits of that approach for that particular expenditure category. Such an approach would reflect ‘exercising good judgement’ and ‘having good sense’, which are both aspects of ‘prudence’ as discussed in section 4.3.3.

A DNSP’s regulatory proposal could therefore be expected to explain the rationale behind the forecasting methodology it has adopted for each expenditure category and to demonstrate that the approach it has adopted in forecasting different categories of expenditure is appropriate, given the relative costs and benefits of alternative approaches for that category.

A bottom up approach to forecasting is the most rigorous. However, the costs of this approach may well outweigh the resulting benefits in terms of greater confidence in a forecast in circumstances such as:

- where the number of assets is high, which may mean the costs of a bottom-up approach are prohibitive. For example, the costs of undertaking an annual condition assessment of every electricity pole owned by a DNSP are likely to outweigh any benefits obtained in terms of forecasting confidence. Rather a sampling-based approach that forecasts expenditure on the basis of asset age and periodic condition assessment, rather than a full annual condition report for each pole is likely to be more appropriate;
- when expenditure in relation to a certain category is difficult to forecast, because the precise tasks are unknown at the time of the submission of the regulatory proposal. For example, a DNSP could reasonably expect that over the regulatory period it will need to respond to AEMC Rule change proposals. However, without being able to foresee the exact nature and extent of Rule change proposals over the period a DNSP

cannot make a ‘bottom-up’ forecast of the costs of such responses, and will instead need to rely on a top-down approach which builds on the costs incurred in the previous regulatory period; and

- obligations are not expected to change from the preceding period, in which case there is likely to be little difference in the accuracy of forecasts derived from either a top-down or bottom-up approach. For example, a DNSP’s corporate functions are unlikely to change from one period to the next, and so a top-down approach that projects future costs by reference to past costs is likely to be just as accurate as a bottom-up approach that assesses the costs of each separate corporate function.

In contrast, a ‘bottom-up’ approach to forecasting is likely to be appropriate for major, lumpy expenditure (such as a new sub-transmission line or new zone sub-station) or for expenditure that is highly uncertain.

5.2.1.4. Specific circumstances of the DNSP

~~Clauses 6.5.6(c) and 6.5.7(c) require the AER to determine whether the expenditure forecasts reasonably reflect the ‘costs of a prudent operator in the circumstances of the relevant DNSP’.~~

~~Notwithstanding the fact that clauses 6.5.6(c) and 6.5.7(c) have been amended to remove the explicit requirement to consider the circumstances of the relevant DNSP, there remains an implicit requirement to take account of those circumstances that would affect the expenditure of efficient DNSPs. In particular, it is not possible to consider the consequences of a decision, and hence the prudence with which that decision was made, without also considering the circumstances that affected the decision. While it may not be appropriate to consider all of the factors that distinguish one DNSP from another, an assessment of the costs of a prudent operator will require that certain factors are accounted for.~~

~~The specific aspects of a DNSP’s operating environment can be expected to affect the costs of meeting the expenditure objectives in a number of ways. For example, for DNSPs in rural areas, the distances between customers increases the travel time that its maintenance workers must travel, affecting its overall maintenance costs. DNSPs in metropolitan areas are likely to face restrictions in relation to undertaking maintenance work during business hours, in order to avoid disruption to the CBD. As a result, repairs are likely to need to be scheduled during the late evenings, again affecting the cost.~~

In taking account of this requirement, a DNSP’s regulatory proposal could be expected to set out clearly how its expenditure forecasts are affected by specific aspects of its operating environment, including any particular restrictions it faces. Basing the expenditure forecasts on the DNSP’s recent experience of the costs it has incurred for defined functions, as discussed in section 5.1.3 above, is one way in which the ~~affect-effect~~ of specific circumstances of the DNSP can be taken into account.

~~The specific aspects of a DNSP’s operating environment can be expected to affect the costs of meeting the expenditure objectives in a number of ways. For example, for DNSPs in rural areas, the distances between customers increases the travel time that its maintenance workers must travel, affecting its overall maintenance costs. DNSPs in metropolitan areas are likely to face restrictions in relation to undertaking maintenance work during business hours, in~~

~~order to avoid disruption to the CBD. As a result, repairs are likely to need to be scheduled during the late evenings, again affecting the cost.~~

5.2.1.5. Efficiency of the total forecast expenditure

The requirement for the AER to consider whether the ‘total’ of the operating and capital expenditure forecasts reasonably reflects the expenditure criteria means that the efficiency of expenditure needs to be considered in total rather than on a project by project basis.

A DNSP’s regulatory proposal could therefore be expected to demonstrate that it has considered the implications of the *total* level of expenditure being forecast and has sought to establish the efficient level of total forecast expenditure.

In most circumstances, forecasting the delivery of individual projects on the most efficient basis is also likely to result in the most efficient *overall* forecast of required expenditure. However, efficient forecasts also need to take into account real world constraints. For example, a DNSP could be expected to consider whether it faces any resource constraints, either within its own business or in relation to those it would generally contract. A forward looking work program that includes maintenance and replacement projects at the optimal time for each individual project may, once taken together, imply the need for additional resources over relatively short periods in order to deliver the overall program. Such an approach may end up being more costly in total (due to the need to hire and train additional workers) than a program that either brought forward or delayed some individual aspects of the work program compared to their ‘optimal’ timing considered on a stand-alone basis, so that the overall work program can be completed using a DNSP’s existing labour resources and contracting pool.

5.2.1.6. Consideration of alternative options

A prudent process is also likely to be one that included consideration of alternative ways of meeting the required expenditure objectives. The focus of the expenditure criteria set out in clauses 6.5.6(c) and 6.5.7(c) is on whether the DNSP is proposing to produce the required outputs (ie, the expenditure objectives) in an efficient way. A critical task in assessing efficiency involves assessing whether the same outputs could be produced more cheaply by some alternative means.

A DNSP’s regulatory proposal should therefore clearly set out where it has considered alternative ways of meeting the expenditure objectives. These alternatives may include:

- operating and capital expenditure trade-offs;
- alternative ways of achieving the same objective, eg, in-house versus outsourcing; and/or
- network versus non-network alternatives.

These alternatives are also reflected in the specific expenditure factors to which the AER is to have regard in evaluating the expenditure forecasts. Specifically, consideration of the relative prices of operating and capital inputs, and of operating and capital expenditure substitution possibilities is required under factors (6) and (7). Consideration of efficient non-network alternatives is required under factor (10).

Although a DNSP could be expected to consider alternatives in developing its forecasts, the choice of alternatives should itself reflect prudence and efficiency in terms of the nature and number of alternatives selected. Definitions of ‘prudence’ commonly include references to being ‘cautious’, ‘wisely cautious’ or ‘circumspect’. Electricity assets are long-lived, with the result that the DNSP is likely to be saddled with the consequences of the adoption of a particular technology for a relatively long period. Given this, a prudent operator is unlikely to be an early adopter of new technologies across all aspects of its business, both as a result of already being ‘locked-in’ to a particular technology in some areas and also in order to avoid the potential for negative consequences as a result of adopting unproven approaches (except where the risk and cost of those consequences are considered to be outweighed by the potential benefits).

A DNSP could be expected to demonstrate in its proposal where non-network alternatives (expenditure factor (10)) have been considered. For example, a DNSP may be able to defer a planned network augmentation by employing demand side management to manage the growth in peak demand. Overall this may be a lower cost solution than undertaking the network augmentation earlier. In this case the non-network alternative is ‘efficient’. In other circumstances the deferral of network augmentation by non-network means may ~~neither~~ be ~~neither~~ possible nor cost effective, resulting in ~~non~~-network alternatives ~~not~~ being efficient.

A DNSP’s proposal could also be expected to highlight any limitations on the consideration of non-network alternatives in developing its expenditure forecasts. For example, at the time the regulatory proposal is submitted it may be difficult to identify appropriate non-network solutions. However, this does not imply that the DNSP’s expenditure forecast is not efficient. Importantly, as discussed in section 3, the concept of efficiency does not mean that a firm is always operating on the efficiency frontier (even if this could be observed with certainty). Rather, it is more important that a firm is moving towards the frontier. In the case of non-network options, as the regulatory period progresses, the regulatory framework provides DNSPs with an incentive to consider the potential for non-network alternatives to network expenditure incorporated in the expenditure forecast, where this is efficient, ie, lower cost.

5.2.1.7. Longer-term perspective

Efficiency is both a static and dynamic concept, and an efficient operator should be concerned with minimising both its current and future expenditure. Similarly, definitions of ‘prudence’ encompass both ‘providing for the future’ as well as ‘carefully considering consequences.’

Assessing the efficiency and prudence of proposed expenditure therefore requires assessment over a period of time. In particular, there will often be a trade-off between, on one hand, greater expenditure today and, on the other, lower expenditure today with the consequence of ~~but~~ higher expenditure in the future. Moreover, given the long-lived nature of electricity distribution assets, this trade-off between current and future expenditures is not limited to a single regulatory period.

For example, expenditure today to maintain a distribution asset can defer the timing of when that asset would otherwise need to be replaced (in the absence of any maintenance). However, since distribution assets have effective lives of around 40 years the benefits of near term maintenance expenditure in the form of deferral of the future need to replace the asset

will often materialise beyond the end of the regulatory period. It follows that a DNSP needs to demonstrate in its regulatory proposal that, ~~it~~ in developing its expenditure forecasts, it has considered the path of future expenditure beyond the regulatory period, and that its forecasts are prudent and efficient in the light of this path.

An accepted method for assessing costs that occur at different times is to convert all expenditure to present value terms using an appropriate discount rate. Consequently, expenditure that happens in the near term involves a greater cost than expenditure that occurs at a relatively later date. For regulated businesses such as DNSPs the appropriate discount rate would be the regulatory weighted average cost of capital (WACC).

Continuing with the above example, a DNSP could demonstrate that its proposed maintenance expenditure was efficient by showing that the present value of an incremental increase in maintenance expenditure was less than or equal to the present value of the benefit associated with the resulting deferral of replacement expenditure.

5.2.2. Demonstration that the level of forecast expenditure is efficient

The discussion in section 3 highlighted that there are no objective, external factors that can be relied upon to demonstrate that the overall level of a DNSP's expenditure forecasts is efficient. Notwithstanding, there are some *partial* indicators that can be used to assess the efficiency of specific items included within a DNSP's forecast expenditure. Demonstration by the DNSP that these aspects of its expenditure forecasts reasonably reflect an efficient *level* of costs, as well as having been derived as the result of a prudent process, provides comfort that the processes used to develop the forecasts are indeed prudent (and that they reflect efficient overall costs). Importantly, however, the scope of these indicators is limited and so cannot cover all of the activities included within the expenditure forecasts.

In addition, the discussion in sections 3 and 4 highlights that a DNSP does not need to demonstrate that the level of expenditure reflects the 'perfectly efficient' cost benchmark or is the 'least cost.' The relevant benchmark is not a DNSP that is constantly operating on the efficiency frontier. Rather, a more realistic benchmark, which is also reflected in the wording of section 7(2) of the NEL, is of an averagely efficient business, that is moving towards the frontier (which will ~~itself~~ also be moving).

The partial indicators that a DNSP could reference in its regulatory proposal, so as to assess the efficiency of the *level* of costs incorporated in its expenditure forecasts include:

- i. comparison between past and forecast expenditure, including the extent to which past expenditure may be taken to be efficient due to the incentives present in the regulatory regime;
- ii. the extent to which activities have been outsourced to third parties, by means of contestably awarded contracts, eg, construction contracts for new substations;
- iii. benchmarking against the costs of other DNSPs, having adjusted for differences in the relevant circumstances; and
- iv. application of the regulatory test to any relevant aspects of the capital augmentation program.

We discuss each of these briefly in turn below.

5.2.2.1. Comparison between forecast expenditure and past expenditure

One of the expenditure factors to which the AER is required to have regard in making its decision on the reasonableness of the expenditure forecasts is the actual and expected expenditure of the DNSP during any preceding regulatory control periods, ie, expenditure factor (5).

In section 3 we discussed that the efficiency frontier is not ~~itself~~ directly observable and is ~~itself~~ constantly evolving. It follows that the focus of regulation is often on providing incentives for firms to ‘move in the right direction’ and so become more efficient. To the extent that the regulatory regime is considered to be effective in providing firms with an incentive to become more efficient, the level of costs that a firm has been able to achieve in the preceding regulatory period is likely to be a good starting point in assessing the efficiency of its costs going forward. This is particularly the case where the obligations a firm faces in a particular area have not changed between regulatory periods and so where the scope of activities required to meet those obligations is expected to remain the same.

~~The AER has The Essential Services Commission in Victoria~~ placed a great deal of reliance on outturn costs being a good indicator of future costs for operating and maintenance expenditure. ~~For instance~~, in the context of its ~~2006-2010~~2011-2015 price review for Victorian electricity distribution services, it noted:²⁰

A significant aspect of the AER’s assessment approach is its review of historical expenditure, to serve as a point of reference in the initial testing of whether the business’s proposals of forecast future expenditure are a reasonable estimate of efficient costs.

Previous levels of activity are taken as the starting point to assess future needs, with adjustment to take account of changing circumstances. These changes include an ageing asset base, continuing growth in demand and in numbers of customers, increases in financing costs, wages and material costs, and changes in operational circumstances, such as in relation to safety and other service obligations.

The Victorian electricity distributors have been operating under a framework of incentives to reward efficiency for 10 years and the AER expects that as a result there is a high likelihood that the historic unit cost and business practices are a reliable indication of efficient costs.

In formulating its framework and approach for the 2006-10 price review, the Commission assumed that it could rely on the incentive properties of the efficiency carryover mechanism such that the level of operating and maintenance expenditure incurred in 2001-04 was efficient. The framework and approach established also assumed that, due to the recurrent nature of operating and maintenance expenditure, the 2004 reported operating and

²⁰ AER, Final Decision – Victorian Electricity Distribution Network Services Providers: Distribution Determination 2011-2015, October 2010, p.I-II.

~~*maintenance expenditure would provide a reasonable representation of at least the efficient base operating and maintenance expenditure for the 2006-10 regulatory period.²¹*~~

A DNSP's proposal could be expected to highlight where its expenditure forecasts reflect recent outturn expenditure and the extent to which that expenditure can be considered to be efficient, given the incentive properties of the regulatory framework. This is likely to be particularly relevant for those expenditure categories for which the DNSP has undertaken a top-down forecast, as discussed in section 5.2.1.3 above.

A DNSP's proposal could also be expected to highlight where its expenditure forecasts differ from outturn expenditure, and to provide a rationale for why such previous expenditure is not a relevant indicator of the efficient expenditure level going forward. For example, where new obligations on the DNSP have been introduced, the level of required expenditure forecast for the next regulatory period is likely to be higher than that required in the earlier period, since the comparison between outputs is no longer like-for-like.

5.2.2.2. Use of Outsourcing

Where a DNSP's expenditure forecasts are based on cost estimates for activities that have been sourced from an effectively competitive market, this provides a prima facie indicator that the level of that expenditure is efficient. For example, a DNSP's capital expenditure forecast may include a distribution line augmentation. Where the forecast costs of that augmentation are derived from information derived from an effectively competitive market (such as previous tender costs for similar augmentations), the presumption should be that the costs can be taken to be efficient.

We note that one of the expenditure factors to which the AER is required to have regard is the extent to which forecasts are referable to arrangements with a person other than the DNSP that in the opinion of the AER do *not* reflect arm's length terms, ie, factor (9). This factor potentially acts to limit the extent to which contract costs can be presumed to be efficient, in circumstances where the relationship is not arm's length. On the other hand, where the relationship clearly is at arm's length, then the use of cost information derived from an effectively competitive market provides a strong basis for the presumption of efficiency.

5.2.2.3. Use of benchmarks

The fourth expenditure factor to which the AER is to have regard is the benchmark expenditure that would be incurred by an efficient DNSP over the regulatory control period. A benchmark comparison of the *relative* efficiency of a firm's expenditure forecasts is one means by which regulators attempt to gauge whether the forecast level of expenditure is efficient.

²¹ ~~—ESC, Electricity Distribution Price Review 2006-10: Final Decision Volume 1—Statement of Purpose and Reasons, October 2005, page 200~~

In section 4.3.7 we highlighted that the reference to an ‘efficient’ DNSP should be interpreted as being to a DNSP of ‘average’ rather than ‘perfect’ efficiency. In addition, ~~the application of clauses 6.5.6(c)(2) and 6.5.7(c)(2) means that, in considering benchmarking evidence, the AER also needs to consider how costs are affected by the circumstances of the DNSP. we noted that as soon as one moves away from the theoretical ideal of perfect competition, the particular circumstances of a firm are highly relevant for any assessment of how efficiently that firm is operating.~~

A DNSP’s regulatory proposal should clearly set out the factors affecting its expenditure and contrast this with the factors ~~than~~that may be expected to affect the expenditure of other DNSPs, against whom the DNSP may be compared. This is to ensure that comparisons are made on as like-for-like a basis as possible. As noted in section 3, once all of the relevant particular characteristics of each DNSPs’ business and operating environment are considered, there may be very little that can validly be said about the relative efficiency of ~~the a~~ businesses.

5.2.2.4. Application of the regulatory test

The final indicator that a DNSP may be able to refer to in assessing the efficiency of the *level* of its expenditure is where the forecasts include expenditure for network augmentation that has separately been through the regulatory test process.

The regulatory test process set out in the NER requires a DNSP to go through a consultation process on alternative options for augmenting the distribution network, where the augmentation is above a certain size. Where such a process has been undertaken, the DNSP’s cost estimates for the augmentation and the non-network alternatives considered would already have been exposed to external scrutiny, prior to being incorporated in the forecast.

However, there are likely to be only a limited number of cases in which the regulatory test process has been completed prior to the expenditure forecasts being submitted as part of the DNSP’s regulatory proposal. In the majority the regulatory test process is likely to occur at a later stage, during the regulatory period. However, in the event that there are projects that have already been assessed under the regulatory test and are incorporated in the forecasts, then the fact that these projects have already been subject to a consultation process may be taken as an indicator of the efficiency of the level of expenditure proposed. It should be noted that such projects are likely to be large and therefore to have a material effect on the expenditure forecast. The NER requires the DNSP to identify in its regulatory proposal any forecast capital expenditure associated with an option that has satisfied the regulatory test.²²

For augmentation projects that are included in the forecast but which have not yet undergone the regulatory test process, the DNSP could be expected to apply a similar process to the regulatory test in assessing non-network alternatives to the augmentation. This process should be demonstrated in the regulatory proposal, as discussed in section 5.2.1.6.

²² NER, 6.5.7(b)(4).

6. Conclusion

Efficiency is both a foundation concept and a term of art in economics. Economists typically distinguish three dimensions of efficiency: productive; allocative; and dynamic. A firm that was efficient in all of these dimensions would (to put it simply, ~~and doing it~~) be doing the right thing ~~doing it~~ at least cost ~~and doing it~~ all the time.

The theoretical, constantly optimising concept of efficiency is underpinned by the parallel concept of perfect competition. In reality, firms operate in less than perfectly competitive markets and no firm can be expected to achieve perfect efficiency in every aspect of its operations, in perpetuity. Some firms will also simply be better than others in certain aspects of their operations, at any point in time. The relevant benchmark is therefore not a DNSP that is constantly operating on the efficiency frontier. Rather, the more realistic benchmark, and the one that is reflected in the wording of section 7(2) of the NEL, is that of an averagely efficient business moving towards the frontier.

An important consequence of this interpretation of the concept of efficiency is that the efficient outcome will itself be constantly changing, and so 'efficiency' is a moving target that few (if any) firms can be expected to achieve in practice.

The discussion in section 3 highlights that there are no objective, external factors that can be relied upon to demonstrate that the level of a DNSP's total expenditure forecasts is *productively efficient*. However, it is possible to assess the *process* that the DNSP has adopted in developing the forecasts by reference to its prudence and efficiency. It follows that a DNSP's regulatory proposal can be expected to emphasise that the process it has applied is consistent with the process that would be applied by a prudent operator.

Notwithstanding these considerations, some *partial* indicators are typically available to assess the efficiency of the level of expenditure associated with specific items in a DNSP's expenditure forecasts. Demonstration by a DNSP that these aspects of its expenditure forecasts reasonably reflect an efficient *level* of costs, as well as having been derived as the result of a prudent process, provides comfort that the processes used to develop the forecasts overall are indeed prudent (and are therefore likely to reflect efficient costs).

Importantly, however, the scope of these indicators is limited and is unlikely to be able to cover all of the activities included within the expenditure forecasts. It therefore remains important for the DNSP to demonstrate the prudence and efficiency of the process that it has followed in developing its expenditure forecasts.

~~Appendix A. Terms of Reference~~

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Economic Interpretation of Clauses 6.5.6 and 6.5.7 of the National Electricity Rules

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1. Introduction

This report has been prepared by NERA Economic Consulting (NERA) following a request by Ausgrid to provide an economic analysis of provisions in the National Electricity Rules (NER) concerning the capital and operating expenditure forecasts submitted by a Distribution Network Service Provider (DNSP). In particular, Ausgrid has asked NERA to analyse both the overall structure and terms within the relevant provisions, including the concepts of ‘the efficient costs of achieving the [capital and operating] expenditure objectives’ and ‘the costs that a prudent operator would require to achieve the [capital and operating] expenditure objectives.’ We understand that this report may also be relied upon by Essential Energy and Endeavour Energy.

The remainder of this report is structured as follows:

- Section 2 sets out the relevant provisions in the National Electricity Law (NEL) and the NER in relation to the criteria that must be applied by the AER when it determines whether or not a DNSP’s operating and capital expenditure forecasts reasonably reflect those criteria;
- Section 3 explains the term ‘efficiency’ as used by economists in general and how it should be interpreted in the context of its fundamental importance as a reference point for the assessment of operating and capital expenditure forecasts;
- Section 4 analyses the structure of clauses 6.5.6 and 6.5.7 of the NER from an economic perspective as well as relevant terms or phrases appearing in the clauses and in the NEL, including ‘efficient costs’ and ‘the costs that a prudent operator would require to achieve the [capital and operating] expenditure objectives’;
- Section 5 sets out the practical implications of our analysis for the processes and principles that a DNSP could be expected to apply in developing operating and capital expenditure forecasts and in presenting them in its regulatory proposal to the AER; and
- Section 6 provides concluding comments.

2. Relevant Provisions in the NEL and NER

This section sets out the relevant provisions of the NEL and the NER that govern the criteria that must be applied by the AER in assessing the operating and capital expenditure forecasts submitted by a DNSP, including the factors to which the AER is to have regard when determining whether to accept those forecasts.

In performing or exercising an AER economic regulatory function or power – including the assessment of expenditure forecasts put forward by a DNSP – section 16 of the NEL imposes overarching requirements on the AER. These require it to:

- perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the national electricity objective (16)(1)(a); and
- to take into account the revenue and pricing principles when exercising a discretion in making those parts of a distribution determination relating to direct control services (16)(2)(a)(i).

The national electricity objective is set out at section 7 of the NEL:

Section 7: The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –

- (a) price, quality, safety, reliability and security of supply of electricity; and
- (b) the reliability, safety and security of the national electricity system.’

The revenue and pricing principles set out in the NEL (Section 7A) include:

Section 7A

(2) A regulated network service provider should be provided with a reasonable opportunity to recover at least the efficient costs the operator incurs in –

- (a) providing direct control network services; and
- (b) complying with a regulatory obligation or requirement or making a regulatory payment.

(3) A regulated network service provider should be provided with effective incentives in order to promote economic efficiency with respect to direct control services the operator provides. [..]

The NER also contain provisions governing the specific operating and capital expenditure criteria that must be applied by the AER in determining whether or not it is satisfied that the expenditure forecasts submitted by a DNSP reasonably reflect these criteria. These are that:

6.5.6(c)/6.5.7(c):

The AER must accept the forecast of required operating (capital) expenditure of a Distribution Network Service Provider that is included in a *building block proposal* if the AER is satisfied that the total of the forecast operating (capital) expenditure for the *regulatory control period* reasonably reflects:

- (1) the efficient costs of achieving the *operating expenditure objectives (capital expenditure objectives)*; and
- (2) the costs that a prudent operator would require to achieve the *operating expenditure objectives (capital expenditure objectives)*; and
- (3) a realistic expectation of the demand forecast and cost inputs required to achieve the *operating expenditure objectives (capital expenditure objectives)*.

The provisions in 6.5.6(c) and 6.5.7(c) are termed the *operating expenditure criteria* and the *capital expenditure criteria*, respectively.

In deciding whether or not it is satisfied that the expenditure proposals put forward by a DNSP reasonably reflect these expenditure criteria,¹ the AER is exercising its discretion, and must therefore take into account the revenue and pricing principles.² Clauses 6.5.6(e) and 6.5.7(e) set out a number of factors to which the AER must also have regard in making its decision. These factors are termed the *operating expenditure factors* and *capital expenditure factors*, respectively. These factors are discussed further in section 4.4.

The *operating expenditure objectives* and *capital expenditure objectives* referred to in clauses 6.5.6(c) and 6.5.7(c) are set out in clauses 6.5.6(a) and 6.5.7(a):

6.5.6(a)/6.5.7(a)

A *building block proposal* must include the total forecast operating (capital) expenditure for the relevant *regulatory control period* which the *Distribution Network Service Provider* considers is required in order to achieve each of the following (the *operating expenditure objectives*) (the *capital expenditure objectives*):

- (1) meet or manage the expected demand for *standard control services* over that period;
- (2) comply with all applicable *regulatory obligations or requirements* associated with the provision of *standard control services*;
- (3) to the extent that there is no applicable *regulatory obligation or requirement* in relation to:

¹ NER, 6.12.1(3) and (4).

² NEL section 16(2)(a)(i).

- (i) the quality, reliability or security of supply of *standard control services*; or
- (ii) the reliability or security of the *distribution system* through the supply of *standard control services*,

to the relevant extent:

- (iii) maintain the quality, reliability and security of supply of *standard control services*; and
 - (iv) maintain the reliability and security of the *distribution system* through the supply of *standard control services*; and
- (4) maintain the reliability safety and security of the *distribution system* through the supply of *standard control services*.

In light of its fundamental importance as a reference point for the NER provisions, the following section explains how the term ‘efficiency’ is interpreted and applied by economists, with particular attention to the context of assessing expenditure forecasts.

3. 'Efficiency' in the Context of Expenditure Forecasts

This section explains the term 'efficiency', as it is understood by economists, with particular attention to its interpretation in the context of the assessment of operating and capital expenditure forecasts.

3.1. Definition of 'efficiency'

'Efficiency' is a term of art in economics. Economists typically distinguish three types of efficiency:

- *productive* efficiency concerns itself with how goods and services are produced, and is attained when this takes place at least cost;
- *allocative* efficiency concerns itself with what is produced and for whom, and is attained where the optimal set of goods and services is allocated so as to provide the maximum benefit to society; and
- *dynamic* efficiency is concerned with the achievement of productive and allocative efficiency over time in the face of changing technology and consumer tastes, and is attained when the optimal set of goods and services is produced at the least cost, as the world changes.

In considering the interpretation of the concept of 'efficiency' in the context of the assessment of a regulated business's expenditure forecasts, it is important to distinguish between efficiency as a theoretical construct, against an assumed background of perfect competition, and efficiency as economists would generally apply the concept in practical terms to businesses in the real world, operating in less than perfectly competitive markets.

A firm that was efficient in all of the above three dimensions would, to put it simply, be doing the right thing, doing it at least cost and doing it all the time. However, in practice, just as there are no perfectly competitive markets, no firm can realistically be expected to achieve this level of efficiency in every facet of its operations, in perpetuity.

3.2. The 'efficient' outcome is constantly changing

A key consequence of the above definition of efficiency is that what constitutes an efficient outcome will be ***constantly changing***. Consumer preferences change over time, altering the most efficient mix of goods and services. Technology also changes over time, changing production costs and potential alternatives for producing a given mix of goods and services.

The economics textbook definition of efficiency is underpinned by the concept of perfect competition. A perfectly competitive market ensures that firms are always producing at least cost, and are constantly evolving to ensure that they continue to produce the optimal mix of goods and services at least cost over time.

In the real world there are constraints on firms constantly altering their mix of goods and services and production processes, to take account of new technology and changes in consumer tastes. Companies' abilities to transform inputs into outputs efficiently will vary over time and will be constrained by their specific operating environments. This is

particularly true for firms operating in industries that are capital intensive and where there are long-lived assets, such as infrastructure businesses.

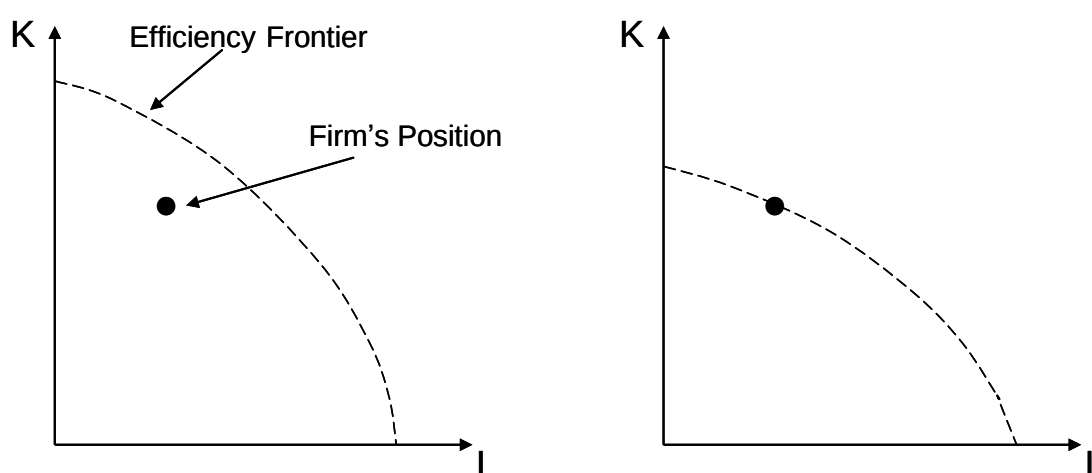
It is therefore unrealistic to expect a firm to *always* be operating on the efficiency frontier.³ Even if a firm is on the efficiency frontier at one point in time, it is unlikely also to be on it a moment later, as the frontier itself will have moved. In practical terms, efficiency is something that firms may be constantly working towards, without ever actually achieving.

3.3. 'Efficiency' cannot be directly observed

Importantly, the attainment of perfect frontier efficiency is not directly observable. Under the construct of a perfectly competitive market, whether or not a firm is operating on the efficiency frontier can be deduced from observing whether or not it remains in business. Firms that are not perfectly efficient will be undercut by firms that are, so that inefficient firms will no longer be able to sell their output. However, in the real world firms operate in markets that are less than perfectly competitive and so this external gauge of whether or not a firm is achieving frontier efficiency is no longer available.

Figure 3.1 below illustrates the difficulty of determining whether or not a firm is efficient, if the efficiency frontier cannot be directly observed. If the efficiency frontier is assumed to be as depicted in the diagram on the left hand side, then a firm operating at the point indicated would be considered not to be perfectly efficient. However, if the frontier it is assumed to be as depicted in the right hand side diagram, then the same firm would be considered to be perfectly efficient. If there is no external measure of where the efficiency frontier lies, then there is no way of knowing which of these cases applies.

Figure 3.1: The Difficulty of Measuring Efficiency



³ The 'efficiency frontier' is defined as the combinations of labour and capital inputs that, taken together, result in the lowest cost of production of a given bundle of goods and services. A firm that is operating on the efficiency frontier is perfectly efficient.

3.4. Measurement of 'efficiency' is relative to others

Given that a firm's efficiency in relation to the efficiency frontier cannot be directly observed in real-world circumstances of less than perfect competition, the assessment of efficiency typically becomes a *relative* concept. A given firm's efficiency is measured by considering the firm's costs relative to the costs of other firms. However, it is again difficult to measure when a firm is behaving efficiently, once you move away from the perfectly competitive market paradigm.

In a perfectly competitive market, firms produce homogenous outputs. The efficiency of one firm can therefore be directly compared to the efficiency of another, since the outputs produced are the same. However, as soon as the assumption of homogeneity is relaxed, it becomes difficult to measure the efficiency of one firm against another, since the outputs they are producing are different. One firm may be producing its output at a lower cost than another; however the output may also be of a lower quality and be valued less by consumers.

Equally, differences in the circumstances facing a firm will affect the costs incurred by that firm and so whether, without taking into account those circumstances, a firm is thought to be operating efficiently. For instance, a firm serving a major city will likely serve a much larger or more densely located customer base than a similar firm serving a rural area, leading to lower capital and operating costs per customer. Alternatively, the customers of the rural firm may be fewer in number and located across a much wider geographic area than its urban counterpart, resulting in higher capital and operating costs per customer.

In making a comparison it is therefore necessary to control for all of the relevant differences in the circumstances between the businesses and the differences in the outputs produced. Often, this may leave little that can be said about the relative efficiency of the two businesses.

Once viewed as a *relative* concept, it is also clear that not all firms can be operating at the efficiency frontier. By definition, some firms will be more efficient than others, so that there will always be a distribution of firms around an average level of efficiency. The average firm will only be averagely efficient, and so will be inside the efficiency frontier rather than on the frontier.

3.5. Average efficiency is a realistic benchmark for regulation

The subtle but important distinctions between perfect and real world efficiency, and the perfect and effectively competitive market thresholds that are consistent with these concepts, give rise to the question as to whether the benchmark concept for an 'efficient' firm applied by regulators should be one of 'average' efficiency or 'perfect' efficiency.

Each business is an amalgamation of different operations. Some firms will simply be better at some of these operations than others. It would be unrealistic to expect any one firm to be able to attain frontier efficiency across *all* of its operations. It follows that setting expenditure benchmarks by reference to 'perfect' efficiency runs the risk of establishing tariffs that are *below* the lowest sustainable cost of delivering the service that is practically achievable for *all* firms. Tariffs set by reference to 'perfectly efficient' costs risk undermining service providers' incentives to undertake efficient investment and may therefore be detrimental to dynamic efficiency and so to the long-term interests of consumers.

Related aspects of the regulatory regime applying to DNSPs also throw light on the appropriate interpretation of 'efficient costs'. The NEL requires the service provider to be provided with the opportunity to earn 'more than' its efficient costs (Section 7A(2)). This implies that efficient costs are not to be interpreted as 'perfectly efficient' costs which, by definition, cannot be bettered (this is discussed further in section 4.4). The NEL also requires the service provider to be given effective incentives,⁴ which forms the basis for the efficiency benefit sharing scheme set out in the NER.⁵ If every firm could attain 'perfect' efficiency on an ongoing basis, then there would be no need for either of these provisions, which have the primary purpose of incentivising improved efficiency performance.

Notwithstanding that, in practice, perfectly competitive markets and perfectly efficient firms amount to an unattainable threshold and so represent an unrealistic benchmark against which to assess regulated firms' expenditure, the regulatory regime seeks to ensure that profit maximising firms are always striving to improve their efficiency. Adopting a benchmark of 'average' efficiency in assessing expenditure does not therefore mean that a regulated firm's incentives to improve its efficiency are in any way diminished.

In summary, in practical terms it is difficult to assess a firm's efficiency at a given point in time. This is because the absolute efficiency frontier is not directly observable and comparisons with other firms may have limited relevance. Even if the efficiency frontier was directly observable, it is constantly shifting and therefore constitutes a moving target. Given these considerations, the focus of regulation is typically on providing incentives for efficiency that encourage firms to 'head in the right direction'.

The following section considers the wording of the provisions of the relevant NER clauses in more detail, by reference to the above principles.

⁴ NEL, section 7A(3)

⁵ NER, clause 6.5.8

4. Analysis of Relevant Terms and Phrases

This section analyses the implications for the assessment of the expenditure forecasts put forward by the DNSPs of a number of critical terms and phrases used in clauses 6.5.6 and 6.5.7, together with related provisions in the NEL, in light of the conclusions on the practical application of the concept of efficiency.

4.1. Overall structure and focus of clauses 6.5.6 and 6.5.7

The construction of the expenditure assessment clauses 6.5.6 and 6.5.7 of the NER reflects the dimensions of efficiency discussed in the previous section. Clauses 6.5.6(a) and 6.5.7(a) provide a set of expenditure objectives, which effectively define the outputs (or the process and principles for determining the outputs) that a DNSP is required to produce. The effect of these objectives is to establish the services to be produced by DNSPs, with the implication that the Ministerial Council on Energy (MCE)⁶ intended these to reflect the desired outcomes or benefits to society. In other words, clauses 6.5.6(a) and 6.5.7(a) effectively determine the parameters of **allocative efficiency** for the DNSPs.

Clauses 6.5.6(c) and 6.5.7(c) then set out the criteria to be adopted by the AER in determining whether the DNSP is proposing to produce the required goods and services in a **productively efficient** way, ie, whether the *costs* are efficient and are the *costs* that a prudent operator would require to achieve the expenditure objectives. The evaluation of costs in these clauses is not limited to current costs, and so is also able to encompass a longer-term view of efficiency over time, ie, **dynamic efficiency**.⁷

The focus of the two clauses is on DNSPs' *forecasts* of expenditure. Forecasts are inherently uncertain, since they depend on expectations of demand and future cost inputs required to produce the expenditure objectives, as recognised in 6.5.6(c)(3) and 6.5.7(c)(3).

Section 3 discussed the difficulty of identifying whether or not a firm is behaving efficiently. This difficulty is magnified in the context of forecasts, which is the focus of clauses 6.5.6 and 6.5.7. If it is difficult to recognise efficiency today, it likely to be *even more difficult* to recognise now what constitutes efficiency looking into the future.

This difficulty in recognising what constitutes efficiency in the context of a forecast is compounded by the fact that the regulator is also not in a position to know *ex post* whether a firm has in fact behaved efficiently. In looking ahead and forecasting an exchange rate for 31 December 2014, it will always be possible after that date to observe the outturn exchange rate, and so to assess how good or bad the forecast was. By contrast, in forecasting efficient expenditure for the year 2014, no such objective measure is available, even *ex post*. Although actual expenditure for the year 2014 will be known, there is no objective means of gauging whether the *forecast* made of the required level of expenditure for that year was

⁶ The MCE was the decision maker in establishing the transitional NER.

⁷ In section 4 we consider further the implications of the wording in these clauses in relation to consideration of costs over the longer term. In particular, the term 'prudent' encompasses consideration of the future (see section 4.3.3).

efficient and, in particular, whether it was efficient *given the circumstances in which the forecast was made and the uncertainties in relation to actual outturns*.

Outturn expenditure below the forecast level does not indicate that the original forecast encompassed a degree of inefficiency, since the forecast needs to be able to accommodate a range of potential outturn outcomes (that will in turn drive actual expenditure), which are uncertain at the time at which the forecast is made, whilst still meeting the expenditure objectives.

To summarise, the construction of the expenditure assessment clauses 6.5.6 and 6.5.7 reflects the dimensions of efficiency whilst the focus of the clauses is on the *forecasts* of efficient expenditure, which cannot be objectively verified, either at the time that the forecasts are made or after the event.

4.2. The expenditure objectives (clauses 6.5.6(a) and 6.5.7(a))

Clauses 6.5.6(a) and 6.5.7(a) specify a set of objectives or outputs that a DNSP is required to produce, thereby effectively performing the function of establishing the services to be produced by a DNSP that reflect the desired outcomes or benefits to society. In other words, clauses 6.5.6(a) and 6.5.7(a) effectively determine the parameters of allocative efficiency for the DNSPs.

The DNSP must determine the total expenditure that it considers ‘is required’ to achieve the expenditure objectives. This is consistent with our earlier conclusion that there is no objective measure of required expenditure; rather, the DNSP’s opinion as to the adequacy of the forecast is of principal relevance. Similarly the clauses make reference to ‘*expected demand*’⁸, which also reflects the fact that the expenditure forecasts are being made against an uncertain background.

4.3. The expenditure criteria (clauses 6.5.6(c), 6.5.7(c))

Clauses 6.5.6(c) and 6.5.7(c) address the question of how much expenditure is needed to meet the objectives defined and interpreted (by DNSPs) in clauses 6.5.6(a) and 6.5.7(a).

4.3.1. ‘Reasonably reflects’

Clauses 6.5.6(c) and 6.5.7 (c) establish a threshold in the form of whether the AER is satisfied that the forecasts ‘reasonably reflect’ the relevant expenditure objectives. The use of the term ‘reasonably’ recognises that an assessment is required (ie, it is subjective), rather than the expenditure criteria reflecting objective standards. This is consistent with the view set out in section 3 that whether or not a firm is operating efficiently cannot be directly observed.

The clause also refers to ‘the *total*’ of the expenditure for the regulatory control period reasonably reflecting the expenditure criteria. This is consistent with the reference to ‘total

⁸ 6.5.6(a)(1); 6.5.7(a)(1).

forecast expenditure’ in clauses 6.5.6(a) and 6.5.7(a) and implies that the AER must consider the reasonableness of the forecasts overall, and take account of the role of each element as part of an overall assessment.

4.3.2. ‘Efficient costs’

Clauses 6.5.6(c)(1) and 6.5.7(c)(1) refer to ‘the efficient costs of achieving the operating (capital) expenditure objectives.’

As discussed in section 3, in circumstances of less than perfect competition, it would be unreasonable to expect all firms to be operating on the efficiency frontier all of the time (although it would be reasonable to expect all firms to be striving for improvement). The reference to ‘the efficient costs’ in 6.5.6(c)(1) and 6.5.7(c)(1) should not therefore be interpreted as being a reference to ‘perfectly efficient’ costs.

This interpretation is consistent with the revenue and pricing principles in the NEL. In particular, clause 7A(2) requires that the regulated service provider be provided with a ‘reasonable opportunity’ to recover ‘*at least* the efficient costs’ that it incurs (emphasis added). Interpreting an ‘efficient cost’ standard as being something closer to ‘perfectly efficient costs’ would be inconsistent with this principle, since it would provide no scope for a firm to recover *more* than its efficient costs.

4.3.3. ‘A prudent operator’

The second expenditure criterion set out in the NER is:

‘the costs that a *prudent operator* would require to achieve the operating (capital) expenditure objectives.’

4.3.3.1. Definitions of ‘prudent’

‘Prudent’ is defined in the dictionary in the following ways:

1. wise, judicious, or wisely cautious in practical affairs, as a person; sagacious or judicious; discreet or circumspect.
2. careful of one's own interests; provident, or careful in providing for the future
3. characterised by or proceeding from prudence, as conduct, action, etc

(The Pocket Macquarie Dictionary, Macquarie Library 1981)

1. (or a person or conduct) careful to avoid undesired consequences; circumspect
2. discreet

(The Australian Concise Oxford Dictionary, Fourth Edition, 1987)

1. discrete or cautious in managing ones activities, circumspect
2. practical or careful in providing for the future
3. exercising good judgment or common sense

(Collins Dictionary 5th Australian Edition 2003)

1. having good sense: having good sense in dealing with practical matters
2. carefully considering consequences: using good judgment to consider likely consequences and act accordingly
3. careful in managing resources: careful in managing resources so as to provide for the future

(Encarta: http://encarta.msn.com/dictionary/_prudent.html)

In addition, in the utility regulation context a ‘reasonable and prudent person’ is defined in three distinct Western Australian regulations.⁹ All three are broadly consistent, and define a ‘reasonable and prudent person’ as:¹⁰

‘Reasonable and prudent person means a person acting in good faith with the intention of performing his or her contractual obligations and who in doing so and in the general conduct of his or her undertaking exercises that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be exercised by a skilled and experienced person complying with recognised standards and applicable laws engaged in the same type of undertaking under the same or similar circumstances and conditions.’

As defined above, the concept of prudence has relevance both in relation to:

- the *process* followed by the DNSP in developing its expenditure forecasts; and
- the *principles* adopted in deriving the forecasts, and hence the *level* of those forecasts.

Section 3 explained that whether or not a firm is on the efficiency frontier is not directly observable, and that the efficiency frontier itself is always moving. Given this context, the inclusion of the term ‘prudent’ within the expenditure criteria provides guidance on how the assessment of the ‘efficiency’ of the expenditure forecasts should be approached in practice.

4.3.3.2. Implications for the process of developing expenditure forecasts

The definitions of prudence all have in common references to ‘carefully considering consequences’, ‘carefully managing resources’ and being ‘careful to avoid undesired consequences.’ These are all concepts that can be applied in assessing the *process* that the DNSP has followed in developing the expenditure forecasts. The costs that would be incurred by a prudent operator are likely to be those costs that are the outcome of a process that reflected these considerations. An assessment of the *process* followed by the DNSP is important because the efficiency of the level of a DNSP’s forecasts cannot be measured directly against an objective, external standard. This makes it necessary to consider other indicators of the likely efficiency of a DNSP’s forecasts that *can* be directly observed.

⁹ Dampier to Bunbury Pipeline Regulations 1998; Electricity Referee and Dispute Resolution Regulations 1997; Gas Referee Regulations 1995.

The concept of ‘prudence’ also encompasses a time element, since it includes both the consideration of consequences (which by definition is forward looking) and also ‘making provision for the future’.

In addition, definitions of ‘prudent’ make reference to ‘wise’, ‘judicious’, ‘exercising good judgement or common sense’ and ‘having good sense’. The reference to a ‘prudent operator’ therefore implies the application of judgement. This is consistent with the focus of the clause on the development of forecasts and the uncertainty associated with these. It is also consistent with the reference to ‘*reasonably* reflects’ in the introduction to the clause and with the reference to ‘*the DNSP considers*’ in clause 6.5.6(a) and 6.5.7(a).

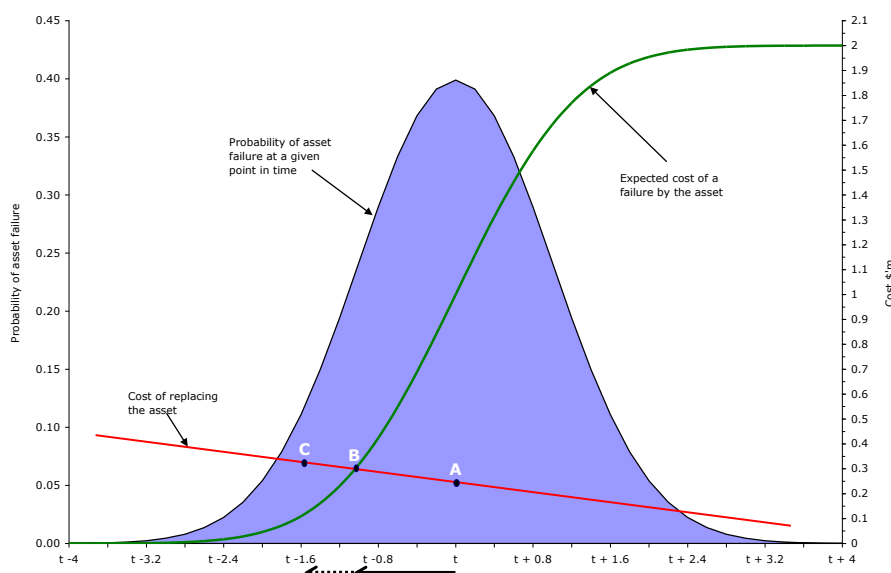
4.3.3.3. Implications for the principles adopted in developing forecasts

The references to ‘carefully considering consequences’, ‘carefully managing resources’ and being ‘careful to avoid undesired consequences’ also have implications for the principles applied in developing expenditure forecasts, which ultimately affect the *level* of expenditure forecasts made by a prudent operator. From an economist’s perspective, an operator that is careful to avoid undesired consequences can be characterised as being ‘risk-averse.’

A ‘prudent’ or ‘risk-averse’ operator would be expected to avoid risks that give rise to high cost consequences by incorporating in its expenditure forecasts the costs of measures to guard against such outcomes, even where these are not the most likely outcomes. For example, a failure of a sub-station in a CBD area would have high cost consequences in terms of customer disruption and would be likely to result in the DNSP failing to meet the expenditure objectives. A prudent operator may decide to include in its forecasts the cost of replacing an aging sub-station, even where the *most likely* outcome in the absence of such expenditure would not be the failure of the sub-station. The total expenditure forecast by a prudent or risk-averse operator could therefore be expected to be higher than an expenditure forecast prepared by a party with a greater appetite for risk.

Figure 4.1 illustrates this point.

Figure 4.1
Expected Costs and Benefits of Asset Replacement



The bell shaped curve represents the probability (depicted on the left axis) that a given asset will fail. In the scenario shown, point t represents the time that the asset is most likely to fail (for example, due to its age). There is also a fifty per cent chance that the asset will fail at or before point t .

The cost of replacing the asset (in net present value terms) is represented by the red line in the diagram. The net present value (NPV) of the replacement cost is falling over time since the later replacement date reduces the long term costs associated with the asset, by delaying the timing of future replacements.

The expected costs that would result from a failure of the asset are illustrated by the green line. For illustrative purposes we have assumed that a cost of \$2m would be incurred if the asset failed. The expected cost of failure is therefore this cost multiplied by the probability of failure occurring. This expected cost increases over time, as the probability of failure increases (with the age of the asset).

When assessing the optimal time to replace the asset, a prudent and efficient DNSP could be expected to compare the cost of replacing the asset with the consequences that would flow from not replacing it by a given point in time. The efficient replacement time will be given by the point where the cost of replacing the asset is equal to the expected costs that would be incurred if the asset failed, ie, point B in the diagram. Point B occurs at an earlier point in time than the most likely date of asset failure. Given the downward sloping nature of the cost of replacement over time, this also implies that the costs of replacement at point B are above the costs of replacement at point A.

Point B represents the efficient timing for replacement of the asset, assuming the probability of failure is indeed as depicted in the diagram. However, the probability of failure is necessarily uncertain. A risk-averse DNSP may take a more cautious view of the distribution

of risks than implied by the curve depicted above. The consequence of a more cautious view of the probability distribution is that the efficient replacement date would occur earlier, eg, at point C. The replacement costs at point C are greater than the replacement costs at point B, in net present value terms.

An important factor in the DNSP's choice between points A, B and C will be its assessment of the likelihood of asset failure, the consequences of such failure, and the implied costs of failure as compared with the costs of replacement. An assessment of these consequences is consistent with behaving in a prudent and risk-averse manner, and is likely to result in a higher expenditure in net present value terms than would be implied by focusing only on the most likely outcomes.

This example also demonstrates the importance of considering the circumstances of the particular DNSP. The likelihood of asset failure, the consequences of such failure, and the implied costs of failure will depend on the nature of the firm. The failure of an asset located in a CBD area would give rise to significantly higher costs than the failure of a similar asset located in a rural area. It follows that the firm providing services to a CBD location may decide that it would be prudent to replace the asset in order to avoid these consequences, whereas the firm providing services in a regional location may decide to continue maintaining the same or similar asset until it is closer to the end of its expected life. In both cases, 'prudence' is reflected in the weighing up of the costs of alternative activities compared with the costs and likelihood of the potential consequences, and in the adoption of more or less a risk-averse approach to avoiding adverse consequences.

4.3.4. 'Realistic expectation'

Clauses 6.5.6(c)(3) and 6.5.7(c)(3) refer to 'a realistic expectation of the demand forecast and cost inputs required to achieve the operating expenditure criteria.'

This sub-clause again reflects the focus of clauses 6.5.6 and 6.5.7 on the *forecasting* of expenditure and the uncertain background against which this takes place, including uncertainty in relation to future demand and input costs. The use of the term 'realistic' expectation again recognises that these aspects of forecasting are subjective.

4.3.5. Overall structure of sub-clause 6.5.6(c) and 6.5.7(c)

The expenditure criteria require the AER to accept the expenditure forecasts if it is satisfied that the total reasonably reflects:

- (1) the efficient costs of achieving the expenditure objectives; *and*
- (2) the costs that a prudent operator would require to achieve the expenditure objectives; *and*
- (3) a realistic expectation of the demand forecast and cost inputs required to achieve the operating expenditure objectives.

The AER must be satisfied that the expenditure forecasts reasonably reflect *all three* of the expenditure criteria.

If the AER is not satisfied that the expenditure forecasts reasonably reflect all three of the expenditure criteria, then it must set out an estimate of the expenditure that the AER is satisfied reasonably reflects the expenditure criteria.¹¹ Again, the AER must be satisfied that its alternative estimate satisfies *all* of the expenditure criteria.

In principle, a distinction could be drawn between the ‘efficient costs’ required by the first criteria and ‘the costs that a prudent operator would require’, as set out in the second criteria, as illustrated in Figure 4.1. However, the structure of clauses 6.5.6(c) and 6.5.7(c) effectively rules this out for the purposes of the AER’s assessment of the expenditure forecasts. If such a distinction were to be drawn (ie, if the AER considered that the forecasts reflected the costs a prudent operator would require, but not the *efficient* costs) then the forecasts could not simultaneously satisfy the first two expenditure criteria.

This conclusion begs the question of the relationship between efficiency and prudence. Figure 4.1 illustrated that the efficient timing of investment is conditional on the view taken as to the probability distribution of asset failure, which is inherently uncertain. A prudent DNSP may take a more pessimistic view of the probability of asset failure, and decide to replace assets earlier. Such replacement is both prudent (since it reflects a degree of risk-aversion) and efficient (based on the DNSP’s view of the probability distribution).

The discussion in section 3 highlighted that efficiency is a dynamic process. Whether or not a firm is operating on the efficiency frontier is also something that cannot be objectively verified. The reference to a ‘prudent operator’ in the expenditure criteria provides some guidance as to how efficiency may be identified in practice. We have already identified that a key aspect of prudence is the *process* followed by the DNSP. An important dimension of the prudence of a process is the degree to which it is motivated by (or reflects) improvements in efficiency. A process that is motivated by efficiency will in turn ensure that the DNSP moves closer to the efficiency frontier, even though that frontier will itself be moving.

For example, a prudent process is likely to be one that considers alternative options for undertaking an augmentation. The motivation behind such a process would be to select the least cost option for that augmentation (all other factors being equal), ie, to ensure it is an efficient option.

A prudent process can therefore be expected to result in the DNSP moving towards maximum cost efficiency, even as that efficiency benchmark is itself moving. In other words, an assessment of prudence, ie, satisfaction of criterion (2), can be expected also to lead to satisfaction of criterion (1), over time.

4.4. The expenditure factors

Clauses 6.5.6(e) and 6.5.7(e) set out a number of expenditure factors to which the AER is to have regard in deciding whether or not it is satisfied that the DNSP’s expenditure forecasts reasonably reflect the expenditure criteria.

¹¹ NER 6.12.1 (3)(ii) and (4)(ii).

The fourth factor is the ‘benchmark’ expenditure that would be incurred by ‘an efficient’ DNSP over the regulatory control period. Consistent with the use of the term ‘efficiency’ in the expenditure criteria, an ‘efficient’ DNSP in this context should be assessed by reference to that which would arise under workable competition rather than ‘perfect efficiency’. We discussed in section 3 that, as soon as the theoretical ideal of perfect competition is departed from, the circumstances of a firm are highly relevant for assessing how efficiently that firm is operating. In practice, this means that, in considering benchmarking evidence, the AER needs to consider how relative efficiency may be affected by the circumstances of the DNSP.

The sixth and seventh expenditure factors are:

- (6) the relative prices of operating and capital inputs; and
- (7) the substitution possibilities between operating and capital expenditure.

These factors make clear that the AER is to consider the potential trade-off between operating and capital expenditure in assessing the expenditure forecasts. The reference to ‘the efficient costs of achieving the operating expenditure forecasts’ (6.5.6(c)(1)) and ‘the efficient costs of achieving the capital expenditure forecasts’ (6.5.7(c)(1)) therefore need to be interpreted in relation to the total expenditure forecasts of the DNSP, rather than separately in relation to operating and capital expenditure.

A paper prepared by NERA economist Graham Shuttleworth (2005) highlights that the risks intrinsic in regulating to perfect efficiency are exacerbated when regulators apply benchmarking to different sub-sets of total costs, such as capital and operating expenditure forecasts under the NER.¹²

‘For each subset, companies may achieve the lowest costs only by spending money on other subsets, eg, they may lower opex by investing in new capital equipment and vice versa. The danger with such partial measures of “efficiency” is that the regulator combines the lowest (or “most efficient”) costs for each subset from different companies, thereby producing an overall estimate of costs which is simply infeasible and an unreasonable basis for setting targets.’

4.5. The revenue and pricing principles in the NEL (section 7A)

In exercising its discretion in determining whether it is satisfied that the DNSP’s proposed expenditure forecasts reasonably reflect the expenditure criteria set out in clauses 6.5.6(c) and 6.5.7(c), the AER is required to take into account the relevant revenue and pricing principles set out in the NEL.¹³

In particular, clause 7A(2) requires the regulated service provider to be provided with a ‘reasonable opportunity’ to recover ‘*at least* the efficient costs’ that it incurs.

¹² Shuttleworth (2005), ‘Benchmarking of electricity networks: Practical problems with its use for regulation, *Utilities Policy*, Vol.13, p314.

¹³ NEL (16)(2)(a)(i). See section 2.

The ‘at least’ threshold in the NEL reflects the recommendation of the Expert Panel.¹⁴ This recommendation was in turn based on a desire to achieve consistency between the cost recovery principles in the NEL and the new NGL, and the regulatory principles established in the COAG Competition and Infrastructure Reform Agreement for third party access regimes. The COAG principles include a revenue sufficiency condition that access prices should generate revenue at least sufficient to meet efficient costs.¹⁵

Providing a firm with the opportunity to earn a stream of revenue that recovers *at least* its efficient costs is quite a different matter to allowing it only to recover its perfectly efficient costs. For a regulated business facing regulatory incentive mechanisms, there is an opportunity for that business to earn *more* than its efficient costs, at a given point in time, where it has made efficiency gains that it is allowed to retain for a period. Importantly, such efficiency gains may result from the firm ‘doing things better’ than it did previously and therefore moving closer to the frontier, rather than from innovation and technological change moving the efficiency frontier itself (although the latter would also be captured).

It follows that the term ‘efficient costs’ in clauses 6.5.6(c)(1) and 6.5.7(c)(1) of the NER needs to be interpreted as distinct from ‘perfectly efficient’ costs, in order to be consistent with clause 7A(2) in the NEL.

¹⁴ Expert Panel on Energy Access Pricing, Report to the Ministerial Council on Energy, April 2006, p.113.

¹⁵ COAG Background Paper: COAG National Competition Policy Review, February 2006, Recommendation 4.2 page 31

5. Addressing the Expenditure Criteria in Practice

This section sets out the practical implications of the preceding analysis for the principles and processes that a DNSP could be expected to apply in developing expenditure forecasts. It also addresses how a DNSP's regulatory proposal should be structured so as to address the capital and operating expenditure criteria.¹⁶

5.1. Demonstration of Allocative Efficiency

We discussed the construction of clauses 6.5.6 and 6.5.7 in the NER in section 4.1 and concluded that this reflects the different dimensions of efficiency. In particular, clauses 6.5.6(a) and 6.5.7(a) provide a set of expenditure objectives, which constitute the output that the DNSP is required to produce. These clauses effectively determine the parameters of **allocative efficiency** for the DNSPs. Clauses 6.5.6(c) and 6.5.7(c) then set out the criteria to be adopted by the AER in determining whether the DNSP is proposing to produce the required goods and services in a **productively efficient** way.

In the first instance, a DNSP's proposal could therefore be expected to set out clearly the link between the expenditure objectives in clauses 6.5.6(a) and 6.5.7(a) and the programs that are captured within its expenditure forecasts. A DNSP's demonstration that the coverage of its expenditure forecasts reflects the outputs identified in clauses 6.5.6(a) and 6.5.7(a) amounts to establishing that the forecasts are consistent with allocative efficiency.

In particular, the DNSP's proposal could be expected to set out what the expenditure objectives in clauses 6.5.6(a) and 6.5.7(a) mean in its specific circumstances, and to link the activities included within its forecasts to one or more of these objectives. For example, the DNSP's proposal could be expected to set out all of the regulatory obligations or requirements it faces, at an appropriate level of detail (consistent with clause 6.5.6(a)(2) and 6.5.7(a)(2)), and to explain how compliance with these requirements affects its forecast expenditure over the period.

Consideration of what the forecast expenditure is intended to achieve (ie, what outputs are being produced) is the first step in assessing whether the proposed expenditure reasonably reflects the cost of achieving those things. This was recognised by the Expert Panel on Energy Access Pricing:

‘The concept of efficient costs is also to be assessed by reference to all relevant regulatory obligations that exist for a particular service provider.’¹⁷

In some instances it is relatively straightforward to link the proposed expenditure with the expenditure objectives. For example, replacement of an aging sub-station may be required in order to maintain the reliability of the distribution system (ie, objective (4)). In other

¹⁶ The first of the expenditure factors to which the AER must have regard in determining whether or not it is satisfied that the expenditure forecasts reasonably reflect the expenditure criteria is ‘the information included in or accompanying the expenditure proposal.’ See: NER 6.5.6(e)(1) and 6.5.7(e)(1).

¹⁷ Expert Panel on Energy Access Pricing, Report to the Ministerial Council on Energy, April 2006, p. 113.

instances the link may not be so direct. For example, DNSPs incur expenditure to maintain corporate functions, such as accounting and contracting departments. These functions contribute to the achievement of all or several of the specific expenditure objectives, by facilitating the activities that are themselves more directly linked to the objectives. For example, in order to replace an aging sub-station, contracts need to be issued and reviewed, requiring the expertise of a corporate contracting function.

In addition, the discussion in section 4.3.3 highlighted that a ‘prudent operator’ may be expected to take steps to avoid negative consequences. Such prudence can be reflected in the activities a DNSP considers are necessary to ensure that a particular expenditure objective is met. For example, a prudent DNSP may consider that in order to continue to meet a given reliability standard for the distribution system (ie, objective 4) it needs to undertake activities that aim to avoid or reduce the probability of certain worst case outcomes.

5.2. Demonstration of Productive Efficiency

Having demonstrated that the expenditure forecasts are derived from the expenditure objectives, and can therefore be taken to be allocatively efficient, the DNSP’s proposal then needs to demonstrate that the expenditure forecasts comply with the expenditure criteria set out in clauses 6.5.6(c) and 6.5.7(c), ie, that they are also productively and dynamically efficient.

Section 3 highlighted that in the real world it is difficult if not impossible to identify when a firm is operating ‘efficiently’ and that, in addition, ‘efficiency’ itself is a constantly evolving threshold or target. It follows that there are no objective, external factors that can be relied upon to demonstrate that a DNSP’s expenditure forecast is productively efficient.

Consistent with this interpretation, one of the expenditure criterion set out in the NER is the costs that would be incurred by a ‘prudent’ operator. A critical aspect of ‘prudence’ is the *process* that is followed and the reasoning that is applied by the DNSP in developing its expenditure forecasts. Both these aspects of the approach to developing forecasts can be demonstrated, in a way that the ‘efficiency’ of costs cannot. A DNSP’s regulatory proposal could therefore be expected to be structured so as to emphasise the process followed and the reasoning applied by the DNSP in developing its expenditure forecasts. This is discussed in the first part of this sub-section.

Notwithstanding the fact that there are no external, objective factors that can be relied upon to demonstrate that a DNSP’s expenditure forecast reflects efficient costs, there are some partial indicators that can be used to assess the efficiency of expenditure associated with specific items included within the forecasts. These indicators are discussed in the second half of this sub-section. Demonstration by the DNSP that these aspects of its projected level of expenditure reasonably reflect efficiency, as well as having been derived as the result of a prudent process, provide comfort that the processes used to develop the forecasts overall are indeed prudent (and that the overall forecasts reasonably reflect efficient costs).

5.2.1. Demonstration that the process is prudent and efficient

In interpreting prudence, the emphasis on ‘carefully considering consequences’, ‘carefully managing resources’ and being ‘careful to avoid undesired consequences’ has implications

for the *process* followed by the DNSP in developing the expenditure forecasts. In light of the discussion in section 4, matters that could be expected to be demonstrated by a prudent DNSP include:

- i. a clear link between the activities required to meet the expenditure objectives and the forecast level of expenditure for those activities;
- ii. clear consideration of key uncertainties, including potential adverse consequences;
- iii. the appropriateness of the approach to forecasting the different expenditure categories, given the nature of the expenditure;
- iv. recognition of the specific circumstances of the DNSP that could be expected to affect efficient expenditure;
- v. consideration of the efficiency of the total forecast expenditure, as distinct from the efficiency of each individual component of that expenditure;
- vi. consideration of alternative options for meeting the expenditure objectives, including potential trade-offs between capital and operating expenditure, and network and non-network expenditure; and
- vii. consideration of the efficiency of expenditure over the longer term, beyond the five year regulatory period.

The addressing of these considerations in the regulatory proposal could be either through substantiation in the regulatory proposal itself, or through the use of independent expert opinion to verify that the DNSPs forecasting process addresses these issues, or a combination of both. We expand on each of these considerations below.

5.2.1.1. A clear link between activities required to meet the expenditure objectives and the forecast expenditure

We noted above that a DNSP's proposal should clearly set out the link between the expenditure included within the forecasts and the expenditure objectives set out in clauses 6.5.6(a) and 6.5.7(a). Once this link is established, a DNSP's proposal could also be expected to demonstrate the link between each activity and the relevant forecast expenditure. This step is likely to involve the identification of the key factors that give rise to the required expenditure, where possible.

For example, maintenance of electricity poles is required in order to maintain the reliability, safety and security of the distribution system, ie, objective 4. The expenditure associated with this activity is driven by the expected number, asset condition and type of electricity poles in the particular DNSP's network, over the forecast period. The DNSP could therefore be expected to demonstrate in its regulatory proposal both the link between one of the required objectives (eg, objective 4) and an activity (maintenance of electricity poles), as discussed in section 5.1, and then between that activity and the associated expenditure forecast.

5.2.1.2. Consideration of key uncertainties and consequences

The focus of clauses 6.5.6 and 6.5.7 is on the *forecasting* of required expenditure. As discussed, such forecasting necessarily takes place against a background of uncertainty as to how various factors affecting expenditure will develop over the regulatory period.

An important dimension of prudence, as discussed in section 4.3.3, is the ‘careful consideration of consequences’ and in particular ‘care to avoid undesired consequences’. In economics, a person displaying these characteristics would be characterised as ‘risk-averse’. In this context, a DNSP could therefore be expected to demonstrate in its regulatory proposal that it has addressed significant uncertainties in developing its forecasts, and also that it has considered the consequences of alternative levels of expenditure. Key areas of uncertainty affecting expenditure forecasts are the level of future demand, input costs for both labour and materials and the likelihood that any given asset will fail over the regulatory period.

The level of future demand will affect the expenditure forecasts in a number of ways. For example, DNSPs have an obligation to connect new customers, and so the expenditure required to comply with a DNSP’s regulatory obligations in this area (obligation (2)) will depend on the expected number of new customers. The number of new customers in turn depends on expectations of, for example, the number of new housing developments. This further depends on expectations of economic growth in the DNSP’s area.

All of these factors are uncertain, and so a DNSP would need to demonstrate that it has considered ‘realistic expectations’ of demand outcomes over the period in developing its forecasts. This is both a consequence of compliance with expenditure criterion (3) and of demonstrating that the forecasts reasonably reflect the outcome of a prudent process to develop the expenditure forecasts (criterion (2)).

A DNSP could also be expected to demonstrate that it has considered alternative consequences in developing its expenditure forecasts and that its forecast expenditure appropriately minimises the occurrence of adverse consequences. For example, where assets such as a sub-station are reaching the end of their expected life, a DNSP will need to decide whether to replace those assets or to continue to maintain them. A prudent operator would be expected to consider the relative risk of asset failure and the consequence if such a failure occurs, in making this judgement.

In circumstances where the failure of an asset (such as a large sub-station located in a CBD area) would give rise to significant costs, a DNSP may decide that it would be prudent to replace the asset in order to avoid these consequences. In areas where failure (eg, of a small sub-station located at the end of a rural feeder) would give rise to a much lower cost, the DNSP may consider it prudent to continue maintaining the asset until it is closer to the end of its expected life. In both cases, ‘prudence’ is reflected in the weighing up of the costs of alternative activities compared with the costs and likelihood of the potential consequences, and in the adoption of a more risk-averse approach to avoiding more adverse consequences. This issue was discussed in detail in section 4.3.3.

5.2.1.3. The approach to forecasting for different expenditure categories

The expenditure forecasts developed by a DNSP can be expected to draw on its recent experience of the costs of getting work done. Such experience is likely to provide a direct indication of the costs faced by the DNSP.

There are various approaches that can be taken in developing expenditure forecasts using this recent cost information:

- a **bottom-up approach**, whereby the DNSP undertakes a detailed examination of the costs of each task necessary to achieve the outcome;
- a **top-down approach**, whereby the DNSP considers a current component of its work program and projects this forward on the basis of an underlying set of drivers; or
- a **hybrid** of the two approaches, eg, a DNSP may employ a top-down approach based on current tasks and expected drivers but because of a change in obligations combine this with a bottom-up assessment of the *incremental* costs of the change in the obligations.

The costs of each of the above approaches and the potential benefits (in terms of greater forecast accuracy) associated with each will differ according to the particular expenditure category being forecast. A 'prudent operator' could be expected to tailor its forecasting approach for different expenditure categories to reflect an appropriate trade-off between the costs and benefits of that approach for that particular expenditure category. Such an approach would reflect 'exercising good judgement' and 'having good sense', which are both aspects of 'prudence' as discussed in section 4.3.3.

A DNSP's regulatory proposal could therefore be expected to explain the rationale behind the forecasting methodology it has adopted for each expenditure category and to demonstrate that the approach it has adopted in forecasting different categories of expenditure is appropriate, given the relative costs and benefits of alternative approaches for that category.

A bottom up approach to forecasting is the most rigorous. However, the costs of this approach may well outweigh the resulting benefits in terms of greater confidence in a forecast in circumstances such as:

- where the number of assets is high, which may mean the costs of a bottom-up approach are prohibitive. For example, the costs of undertaking an annual condition assessment of every electricity pole owned by a DNSP are likely to outweigh any benefits obtained in terms of forecasting confidence. Rather a sampling-based approach that forecasts expenditure on the basis of asset age and periodic condition assessment, rather than a full annual condition report for each pole is likely to be more appropriate;
- when expenditure in relation to a certain category is difficult to forecast, because the precise tasks are unknown at the time of the submission of the regulatory proposal. For example, a DNSP could reasonably expect that over the regulatory period it will need to respond to AEMC Rule change proposals. However, without being able to foresee the exact nature and extent of Rule change proposals over the period a DNSP

cannot make a ‘bottom-up’ forecast of the costs of such responses, and will instead need to rely on a top-down approach which builds on the costs incurred in the previous regulatory period; and

- obligations are not expected to change from the preceding period, in which case there is likely to be little difference in the accuracy of forecasts derived from either a top-down or bottom-up approach. For example, a DNSP’s corporate functions are unlikely to change from one period to the next, and so a top-down approach that projects future costs by reference to past costs is likely to be just as accurate as a bottom-up approach that assesses the costs of each separate corporate function.

In contrast, a ‘bottom-up’ approach to forecasting is likely to be appropriate for major, lumpy expenditure (such as a new sub-transmission line or new zone sub-station) or for expenditure that is highly uncertain.

5.2.1.4. Specific circumstances of the DNSP

Notwithstanding the fact that clauses 6.5.6(c) and 6.5.7(c) have been amended to remove the explicit requirement to consider the circumstances of the relevant DNSP, there remains an implicit requirement to take account of those circumstances that would affect the expenditure of efficient DNSPs. In particular, it is not possible to consider the consequences of a decision, and hence the prudence with which that decision was made, without also considering the circumstances that affected the decision. While it may not be appropriate to consider all of the factors that distinguish one DNSP from another, an assessment of the costs of a prudent operator will require that certain factors are accounted for.

The specific aspects of a DNSP’s operating environment can be expected to affect the costs of meeting the expenditure objectives in a number of ways. For example, for DNSPs in rural areas, the distances between customers increases the travel time that its maintenance workers must travel, affecting its overall maintenance costs. DNSPs in metropolitan areas are likely to face restrictions in relation to undertaking maintenance work during business hours, in order to avoid disruption to the CBD. As a result, repairs are likely to need to be scheduled during the late evenings, again affecting the cost.

In taking account of this requirement, a DNSP’s regulatory proposal could be expected to set out clearly how its expenditure forecasts are affected by specific aspects of its operating environment, including any particular restrictions it faces. Basing the expenditure forecasts on the DNSP’s recent experience of the costs it has incurred for defined functions, as discussed in section 5.1.3 above, is one way in which the effect of specific circumstances of the DNSP can be taken into account.

5.2.1.5. Efficiency of the total forecast expenditure

The requirement for the AER to consider whether the ‘total’ of the operating and capital expenditure forecasts reasonably reflects the expenditure criteria means that the efficiency of expenditure needs to be considered in total rather than on a project by project basis.

A DNSP’s regulatory proposal could therefore be expected to demonstrate that it has considered the implications of the *total* level of expenditure being forecast and has sought to establish the efficient level of total forecast expenditure.

In most circumstances, forecasting the delivery of individual projects on the most efficient basis is also likely to result in the most efficient *overall* forecast of required expenditure. However, efficient forecasts also need to take into account real world constraints. For example, a DNSP could be expected to consider whether it faces any resource constraints, either within its own business or in relation to those it would generally contract. A forward looking work program that includes maintenance and replacement projects at the optimal time for each individual project may, once taken together, imply the need for additional resources over relatively short periods in order to deliver the overall program. Such an approach may end up being more costly in total (due to the need to hire and train additional workers) than a program that either brought forward or delayed some individual aspects of the work program compared to their ‘optimal’ timing considered on a stand-alone basis, so that the overall work program can be completed using a DNSP’s existing labour resources and contracting pool.

5.2.1.6. Consideration of alternative options

A prudent process is also likely to be one that included consideration of alternative ways of meeting the required expenditure objectives. The focus of the expenditure criteria set out in clauses 6.5.6(c) and 6.5.7(c) is on whether the DNSP is proposing to produce the required outputs (ie, the expenditure objectives) in an efficient way. A critical task in assessing efficiency involves assessing whether the same outputs could be produced more cheaply by some alternative means.

A DNSP’s regulatory proposal should therefore clearly set out where it has considered alternative ways of meeting the expenditure objectives. These alternatives may include:

- operating and capital expenditure trade-offs;
- alternative ways of achieving the same objective, eg, in-house versus outsourcing; and/or
- network versus non-network alternatives.

These alternatives are also reflected in the specific expenditure factors to which the AER is to have regard in evaluating the expenditure forecasts. Specifically, consideration of the relative prices of operating and capital inputs, and of operating and capital expenditure substitution possibilities is required under factors (6) and (7). Consideration of efficient non-network alternatives is required under factor (10).

Although a DNSP could be expected to consider alternatives in developing its forecasts, the choice of alternatives should itself reflect prudence and efficiency in terms of the nature and number of alternatives selected. Definitions of ‘prudence’ commonly include references to being ‘cautious’, ‘wisely cautious’ or ‘circumspect’. Electricity assets are long-lived, with the result that the DNSP is likely to be saddled with the consequences of the adoption of a particular technology for a relatively long period. Given this, a prudent operator is unlikely to be an early adopter of new technologies across all aspects of its business, both as a result of already being ‘locked-in’ to a particular technology in some areas and also in order to avoid the potential for negative consequences as a result of adopting unproven approaches (except where the risk and cost of those consequences are considered to be outweighed by the potential benefits).

A DNSP could be expected to demonstrate in its proposal where non-network alternatives (expenditure factor (10)) have been considered. For example, a DNSP may be able to defer a planned network augmentation by employing demand side management to manage the growth in peak demand. Overall this may be a lower cost solution than undertaking the network augmentation earlier. In this case the non-network alternative is 'efficient'. In other circumstances the deferral of network augmentation by non-network means may be neither possible nor cost effective, resulting in network alternatives being efficient.

A DNSP's proposal could also be expected to highlight any limitations on the consideration of non-network alternatives in developing its expenditure forecasts. For example, at the time the regulatory proposal is submitted it may be difficult to identify appropriate non-network solutions. However, this does not imply that the DNSP's expenditure forecast is not efficient. Importantly, as discussed in section 3, the concept of efficiency does not mean that a firm is always operating on the efficiency frontier (even if this could be observed with certainty). Rather, it is more important that a firm is moving towards the frontier. In the case of non-network options, as the regulatory period progresses, the regulatory framework provides DNSPs with an incentive to consider the potential for non-network alternatives to network expenditure incorporated in the expenditure forecast, where this is efficient, ie, lower cost.

5.2.1.7. Longer-term perspective

Efficiency is both a static and dynamic concept, and an efficient operator should be concerned with minimising both its current and future expenditure. Similarly, definitions of 'prudence' encompass both 'providing for the future' as well as 'carefully considering consequences.'

Assessing the efficiency and prudence of proposed expenditure therefore requires assessment over a period of time. In particular, there will often be a trade-off between, on one hand, greater expenditure today and, on the other, lower expenditure today with the consequence of higher expenditure in the future. Moreover, given the long-lived nature of electricity distribution assets, this trade-off between current and future expenditures is not limited to a single regulatory period.

For example, expenditure today to maintain a distribution asset can defer the timing of when that asset would otherwise need to be replaced (in the absence of any maintenance). However, since distribution assets have effective lives of around 40 years the benefits of near term maintenance expenditure in the form of deferral of the future need to replace the asset will often materialise beyond the end of the regulatory period. It follows that a DNSP needs to demonstrate in its regulatory proposal that, in developing its expenditure forecasts, it has considered the path of future expenditure beyond the regulatory period, and that its forecasts are prudent and efficient in the light of this path.

An accepted method for assessing costs that occur at different times is to convert all expenditure to present value terms using an appropriate discount rate. Consequently, expenditure that happens in the near term involves a greater cost than expenditure that occurs at a relatively later date. For regulated businesses such as DNSPs the appropriate discount rate would be the regulatory weighted average cost of capital (WACC).

Continuing with the above example, a DNSP could demonstrate that its proposed maintenance expenditure was efficient by showing that the present value of an incremental increase in maintenance expenditure was less than or equal to the present value of the benefit associated with the resulting deferral of replacement expenditure.

5.2.2. Demonstration that the level of forecast expenditure is efficient

The discussion in section 3 highlighted that there are no objective, external factors that can be relied upon to demonstrate that the overall level of a DNSP's expenditure forecasts is efficient. Notwithstanding, there are some *partial* indicators that can be used to assess the efficiency of specific items included within a DNSP's forecast expenditure. Demonstration by the DNSP that these aspects of its expenditure forecasts reasonably reflect an efficient *level* of costs, as well as having been derived as the result of a prudent process, provides comfort that the processes used to develop the forecasts are indeed prudent (and that they reflect efficient overall costs). Importantly, however, the scope of these indicators is limited and so cannot cover all of the activities included within the expenditure forecasts.

In addition, the discussion in sections 3 and 4 highlights that a DNSP does not need to demonstrate that the level of expenditure reflects the 'perfectly efficient' cost benchmark or is the 'least cost.' The relevant benchmark is not a DNSP that is constantly operating on the efficiency frontier. Rather, a more realistic benchmark, which is also reflected in the wording of section 7(2) of the NEL, is of an averagely efficient business, that is moving towards the frontier (which will also be moving).

The partial indicators that a DNSP could reference in its regulatory proposal, so as to assess the efficiency of the *level* of costs incorporated in its expenditure forecasts include:

- i. comparison between past and forecast expenditure, including the extent to which past expenditure may be taken to be efficient due to the incentives present in the regulatory regime;
- ii. the extent to which activities have been outsourced to third parties, by means of contestably awarded contracts, eg, construction contracts for new substations;
- iii. benchmarking against the costs of other DNSPs, having adjusted for differences in the relevant circumstances; and
- iv. application of the regulatory test to any relevant aspects of the capital augmentation program.

We discuss each of these briefly in turn below.

5.2.2.1. Comparison between forecast expenditure and past expenditure

One of the expenditure factors to which the AER is required to have regard in making its decision on the reasonableness of the expenditure forecasts is the actual and expected expenditure of the DNSP during any preceding regulatory control periods, ie, expenditure factor (5).

In section 3 we discussed that the efficiency frontier is not directly observable and is constantly evolving. It follows that the focus of regulation is often on providing incentives

for firms to ‘move in the right direction’ and so become more efficient. To the extent that the regulatory regime is considered to be effective in providing firms with an incentive to become more efficient, the level of costs that a firm has been able to achieve in the preceding regulatory period is likely to be a good starting point in assessing the efficiency of its costs going forward. This is particularly the case where the obligations a firm faces in a particular area have not changed between regulatory periods and so where the scope of activities required to meet those obligations is expected to remain the same.

The AER has placed a great deal of reliance on outturn costs being a good indicator of future costs for operating and maintenance expenditure. For instance, in the context of its 2011-2015 price review for Victorian electricity distribution services, it noted:¹⁸

A significant aspect of the AER’s assessment approach is its review of historical expenditure, to serve as a point of reference in the initial testing of whether the business’s proposals of forecast future expenditure are a reasonable estimate of efficient costs.

Previous levels of activity are taken as the starting point to assess future needs, with adjustment to take account of changing circumstances. These changes include an ageing asset base, continuing growth in demand and in numbers of customers, increases in financing costs, wages and material costs, and changes in operational circumstances, such as in relation to safety and other service obligations.

The Victorian electricity distributors have been operating under a framework of incentives to reward efficiency for 10 years and the AER expects that as a result there is a high likelihood that the historic unit cost and business practices are a reliable indication of efficient costs.

A DNSP’s proposal could be expected to highlight where its expenditure forecasts reflect recent outturn expenditure and the extent to which that expenditure can be considered to be efficient, given the incentive properties of the regulatory framework. This is likely to be particularly relevant for those expenditure categories for which the DNSP has undertaken a top-down forecast, as discussed in section 5.2.1.3 above.

A DNSP’s proposal could also be expected to highlight where its expenditure forecasts differ from outturn expenditure, and to provide a rationale for why such previous expenditure is not a relevant indicator of the efficient expenditure level going forward. For example, where new obligations on the DNSP have been introduced, the level of required expenditure forecast for the next regulatory period is likely to be higher than that required in the earlier period, since the comparison between outputs is no longer like-for-like.

¹⁸ AER, *Final Decision – Victorian Electricity Distribution Network Services Providers: Distribution Determination 2011-2015*, October 2010, p.I-II.

5.2.2.2. Use of Outsourcing

Where a DNSP's expenditure forecasts are based on cost estimates for activities that have been sourced from an effectively competitive market, this provides a *prima facie* indicator that the level of that expenditure is efficient. For example, a DNSP's capital expenditure forecast may include a distribution line augmentation. Where the forecast costs of that augmentation are derived from information derived from an effectively competitive market (such as previous tender costs for similar augmentations), the presumption should be that the costs can be taken to be efficient.

We note that one of the expenditure factors to which the AER is required to have regard is the extent to which forecasts are referable to arrangements with a person other than the DNSP that in the opinion of the AER do *not* reflect arm's length terms, ie, factor (9). This factor potentially acts to limit the extent to which contract costs can be presumed to be efficient, in circumstances where the relationship is not arm's length. On the other hand, where the relationship clearly is at arm's length, then the use of cost information derived from an effectively competitive market provides a strong basis for the presumption of efficiency.

5.2.2.3. Use of benchmarks

The fourth expenditure factor to which the AER is to have regard is the benchmark expenditure that would be incurred by an efficient DNSP over the regulatory control period. A benchmark comparison of the *relative* efficiency of a firm's expenditure forecasts is one means by which regulators attempt to gauge whether the forecast level of expenditure is efficient.

In section 4.3.7 we highlighted that the reference to an 'efficient' DNSP should be interpreted as being to a DNSP of 'average' rather than 'perfect' efficiency. In addition, we noted that as soon as one moves away from the theoretical ideal of perfect competition, the particular circumstances of a firm are highly relevant for any assessment of how efficiently that firm is operating.

A DNSP's regulatory proposal should clearly set out the factors affecting its expenditure and contrast this with the factors that may be expected to affect the expenditure of other DNSPs, against whom the DNSP may be compared. This is to ensure that comparisons are made on as like-for-like a basis as possible. As noted in section 3, once all of the relevant particular characteristics of each DNSPs' business and operating environment are considered, there may be very little that can validly be said about the relative efficiency of a businesses.

5.2.2.4. Application of the regulatory test

The final indicator that a DNSP may be able to refer to in assessing the efficiency of the *level* of its expenditure is where the forecasts include expenditure for network augmentation that has separately been through the regulatory test process.

The regulatory test process set out in the NER requires a DNSP to go through a consultation process on alternative options for augmenting the distribution network, where the augmentation is above a certain size. Where such a process has been undertaken, the DNSP's cost estimates for the augmentation and the non-network alternatives considered would already have been exposed to external scrutiny, prior to being incorporated in the forecast.

However, there are likely to be only a limited number of cases in which the regulatory test process has been completed prior to the expenditure forecasts being submitted as part of the DNSP's regulatory proposal. In the majority the regulatory test process is likely to occur at a later stage, during the regulatory period. However, in the event that there are projects that have already been assessed under the regulatory test and are incorporated in the forecasts, then the fact that these projects have already been subject to a consultation process may be taken as an indicator of the efficiency of the level of expenditure proposed. It should be noted that such projects are likely to be large and therefore to have a material effect on the expenditure forecast. The NER requires the DNSP to identify in its regulatory proposal any forecast capital expenditure associated with an option that has satisfied the regulatory test.¹⁹

For augmentation projects that are included in the forecast but which have not yet undergone the regulatory test process, the DNSP could be expected to apply a similar process to the regulatory test in assessing non-network alternatives to the augmentation. This process should be demonstrated in the regulatory proposal, as discussed in section 5.2.1.6.

¹⁹ NER, 6.5.7(b)(4).

6. Conclusion

Efficiency is both a foundation concept and a term of art in economics. Economists typically distinguish three dimensions of efficiency: productive; allocative; and dynamic. A firm that was efficient in all of these dimensions would (to put it simply) be doing the right thing at least cost all the time.

The theoretical, constantly optimising concept of efficiency is underpinned by the parallel concept of perfect competition. In reality, firms operate in less than perfectly competitive markets and no firm can be expected to achieve perfect efficiency in every aspect of its operations, in perpetuity. Some firms will also simply be better than others in certain aspects of their operations, at any point in time. The relevant benchmark is therefore not a DNSP that is constantly operating on the efficiency frontier. Rather, the more realistic benchmark, and the one that is reflected in the wording of section 7(2) of the NEL, is that of an averagely efficient business moving towards the frontier.

An important consequence of this interpretation of the concept of efficiency is that the efficient outcome will itself be constantly changing, and so ‘efficiency’ is a moving target that few (if any) firms can be expected to achieve in practice.

The discussion in section 3 highlights that there are no objective, external factors that can be relied upon to demonstrate that the level of a DNSP’s total expenditure forecasts is *productively efficient*. However, it is possible to assess the *process* that the DNSP has adopted in developing the forecasts by reference to its prudence and efficiency. It follows that a DNSP’s regulatory proposal can be expected to emphasise that the process it has applied is consistent with the process that would be applied by a prudent operator.

Notwithstanding these considerations, some *partial* indicators are typically available to assess the efficiency of the level of expenditure associated with specific items in a DNSP’s expenditure forecasts. Demonstration by a DNSP that these aspects of its expenditure forecasts reasonably reflect an efficient *level* of costs, as well as having been derived as the result of a prudent process, provides comfort that the processes used to develop the forecasts overall are indeed prudent (and are therefore likely to reflect efficient costs).

Importantly, however, the scope of these indicators is limited and is unlikely to be able to cover all of the activities included within the expenditure forecasts. It therefore remains important for the DNSP to demonstrate the prudence and efficiency of the process that it has followed in developing its expenditure forecasts.

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