Appendix R

Treatment of Previously 'Optimised' Transmission Assets

The Allen Consulting Group

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Appropriate recognition in the Regulatory Asset Value

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Report to ElectraNet

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The National Electricity Rules permit a Transmission Network Service Provider's regulatory asset value to be adjusted to include the value of 'past capital expenditure that has not been included in that value [calculated using the 'roll-forward' method],[1] but only to the extent that such past capital expenditure' meets certain requirements, most notably that it is needed to provide prescribed transmission services and has not otherwise been recovered.[2] The National Electricity Rules do not provide any further explicit guidance as to how those assets should be valued; however, the AER's decision would be guided by:

- the market objective, which emphasises economic efficiency;[3]
- and the specific guidance for pricing,[4] which emphasises financial incentives and cost recovery as two mechanism for encouraging economic efficiency.

ElectraNet's network assets were valued for regulatory purposes at an estimate of their 'optimised depreciated replacement cost' (ODRC). As part of that process, it was determined that a number of ElectraNet's assets had a greater physical capability than required at the time, and as a consequence its regulatory asset value was set with reference to the cost of installing an asset with a lower physical capability (and lower cost) than the asset that was actually in place. By way of example, ElectraNet had a number of double-circuit lines where it was judged that only a single circuit line was required. The assets that were valued on the basis of an asset with a lower level of service capability are said to have been 'optimised down', and the assets that were deemed to be sufficient are the 'optimised assets'.

Since that time, the use of ElectraNet's network has increased to the extent that the surplus capacity that existed when these assets were 'optimised down' is now required. In the absence of that surplus capacity, capital expenditure would be required. As a result, ElectraNet has a number of assets that would qualify for being included in its regulatory asset value under the clause discussed above.

The purpose of this report is to advise ElectraNet as to how those assets should be valued for regulatory purposes.

Asset valuation principles

While economic principles do not provide unambiguous guidance as to how assets that are economically 'sunk' should be valued for regulatory purposes, there are two methods that have a strong basis in economic principles that could be employed for this purpose (and, if applied correctly, would deliver the same valuation).

1 The 'roll forward method refers to updating the regulatory asset value by adding in new capital expenditure, deducting depreciation and disposals, adjusting for inflation, but not making any other adjustments (either positive or negative).

2 National Electricity Rules, schedule 6A.2.1(f)(8)(ii).

3 National Electricity Law, section 7.

4 National Electricity Law, section 16.

Avoided cost valuation

As noted above, if ElectraNet actually had the previously optimal assets in place (i.e. without the surplus capacity), then additional capital expenditure would be required over time to meet growing demand. However, the fact that ElectraNet's assets have a greater physical capability than the assets that were previously considered optimal means that the capital expenditure will be avoided. The cost of the expenditure avoided is equal to the value of the additional capability of ElectraNet's assets that is now being used.

'ORDC' valuation

At the time that formal cost-based regulation was introduced to electricity transmission businesses across the NEM, there was a consensus that assets should be valued at an estimate of their ODRC.[5] The original National Electricity Code referenced the agreement of the Council of Australian Governments that electricity transmission assets should be valued at their 'optimised deprival value', which reduces to ODRC in many situations. The Australian Competition and Consumer Commission advocated the use of the ODRC method in its first regulatory guidance for the setting of transmission revenues,[6] and the ODRC method has been used almost universally to set the initial regulatory asset value for transmission businesses across the National Electricity Market,[7] including for ElectraNet.

Accordingly, a second method that could be employed to value the previously surplus – but now utilised – capacity in ElectraNet's assets is to value the surplus capacity in an ORDC framework. That is, to preserve (to the extent practicable) the intention for the initial regulatory asset value to be set at an estimate of the ODRC value.

Applying an 'avoided cost' valuation

Ignoring depreciation for the moment, the 'avoided cost' that is caused by the previously surplus capacity in ElectraNet's assets is the expenditure that would be required now to serve growing demand if that surplus capacity did not already exist.[8] On the assumption that the previously surplus capacity is what is now required, then avoided cost is given by:

$$Avoided\ Cost = Capex_{Old\ Optimal}$$

where $Capex_{Old\ Optimal}$ refers to the capital expenditure that would have been required if ElectraNet had the previously optimal assets in place and hence no surplus capacity.

By including a number of additional terms (that collectively sum to zero), this equation can be re-expressed as follows:

5 The acronyms 'ODRC' and 'DORC' refer to precisely the same method.

6 Australian Competition and Consumer Commission, Draft Statement of Principles for the Regulation of Transmission Revenues, May 1999, p.53 (principle S4.2).

7 The only exceptions have been the asset values for the 'market network service providers' at the time of conversion, where the ACCC described its decision as being to set the initial regulatory asset value by using the regulatory test. However, it was shown during that matter that the ACCC's method was identical to a fully-specified application of the ODRC method.

8 The expenditure levels should relate to the same level of physical capability. If expenditure is also required with the actual assets in place, then the 'avoided cost' is that additional expenditure that would have been required if ElectraNet actually had the assets that were judged to be optimal in the previous period.

$$Avoided\ Cost = Cost_{New\ Optimal} - Cost_{Old\ Optimal} + (Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal})$$

where $Cost_{New\ Optimal}$ is today's replacement cost of the asset that is now considered optimal (i.e. the actual asset) and $Cost_{Old\ Optimal}$ is today's construction cost of the asset that was previously deemed optimal.

The first part of the formula is merely the difference in today's construction costs between the asset now considered optimal (the actual asset) and the previously optimal asset – thus, the value for the previously surplus capability should reflect at least the difference in cost between the lesser capacity asset and the actual (greater capacity) asset. However, the second term implies that an additional value should be attributed to the previously surplus capacity. This is the difference in the cost that results from installing a single higher-capacity asset compared to installing a number of lesser capacity assets, and is equivalent to the economies of scale that now are being realised as a result of ElectraNet's pre-building of capacity.

Lastly, one further adjustment is required, which is to allow for the fact that the 'avoided' asset would have had a cost advantage over the actual asset in place arising from the fact that it is newer and hence would have more years of service remaining and also likely to have fewer maintenance requirements. Accordingly, it is necessary to depreciate the amount calculated above. This is discussed further below.

Applying an ODRC valuation to previously surplus capacity

Should previously surplus assets have a value?

A key rationale for the ODRC method is that it provides an estimate of the value that the relevant assets would have in a competitive market. In other words, it provides an estimate of the maximum price that a person would pay for the actual assets, if the option exists to purchase new assets (i.e. the 'second hand value' the assets would have if a hypothetical, liquid second hand market for these assets existed). Using this latter concept as a guide, the ODRC for 'old' assets is the cost of new (and optimal) assets, but adjusted for the difference in the cost of using the old assets compared to the new.

Within this framework, it is clear that assets that are considered to be surplus at a point in time have a value in the ODRC framework. As the requirements for physical capability of the network increases over time (e.g. as demand increases), capacity that was previously surplus may become used. In the absence of that surplus capacity, capital expenditure would have been required. So, the value of the surplus capacity is equal to the future expenditure avoided.

However, where the ODRC method is used to set the regulatory asset value for network assets, there are two methods that could be used to deliver the value of surplus capacity to the asset owner.[9]

[9] While the regulatory asset values would be different under Method 1 compared to Method 2, the market values should not (at least if each is undertaken in a consistent manner). The reason is that, implicit in Method 2 is that the regulatory asset value (and hence the revenue cap) would rise in the future independent of capital expenditure, which would not be the case under Method 1.

- *Method 1* – the ODRC could include the test estimate of the value of surplus capacity when the ODRC valuation is performed (i.e. by estimating the future expenditure that would be avoided as a result of the surplus capacity and discounting the difference back to today's dollars).
- *Method 2* – the ODRC could assign a zero value to the currently surplus capacity, but then commit to including a value for surplus assets if and when they are required.

Both methods should deliver the same value for surplus capacity (at least in *ex ante* terms) if applied consistently. Importantly, under Method 2, the regulatory asset value must be adjusted over time to add in the value of surplus assets as they become required in order to meet the intention to value assets at the competitive market equivalent.

It is clear from the available evidence that Method 2 was adopted in relation to the electricity transmission network businesses, including for ElectraNet. In particular:

- when estimating the original ODRC for ElectraNet, where it was judged that an asset had greater physical capacity than required, the ODRC estimate was set with reference to the cost of a lower capacity asset – the surplus capacity in the actual asset was not assigned any value; and
- the ACCC's stated policy at the time was to reset the regulatory asset value at a new estimate of ODRC.

Therefore, it can be concluded that the intention to set ElectraNet's (and other TNSPs') regulatory asset value at an estimate of ODRC – i.e. commensurate with the outcome of a competitive market – would only be realised if a value is ascribed to the previously surplus assets as they become used.

How would the previously surplus assets be valued under an ODRC regime?

The value that would be assigned to previously surplus capacity under a regulatory regime whereby assets are periodically re-valued to an estimate of their ODRC is given by the change in the regulatory asset base that would be expected at the time the previously surplus capacity became used. This amount is given by the difference between the new ODRC estimate for the network as a whole and the written down value of the network immediately before the revaluation (and similarly for each asset considered separately).

While this principle appears simple, it is important to derive correctly what the written down value of the previously optimal assets would have been immediately prior to their revaluation under an ODRC regime. In particular, a key requirement under an ODRC regime is to ensure that depreciation is derived in a manner such that the 'rolled-forward' regulatory asset value at the time of each re-optimisation is an unbiased forecast of the new ODRC value. If this condition is not met, then the prospect exists that a TNSP would not expect to recover costs, or make systematic windfall gains. In turn, the important constraint for the calculation of regulatory depreciation (and hence the written down value of the assets prior to the new optimisation) is that it must pre-empt the expected redundancy of a businesses' assets that a new optimisation will cause.

- This redundancy derives from the fact that an ‘optimisation’ exercise assumes that a network can ‘transform’ from one optimal configuration to the next. In reality, however, a network can only be expanded incrementally – and so re-optimisation assumes implicitly that economies of scale are able to be realised (i.e. that would derive from building today’s optimal network) that cannot be realised in practice (i.e. because the actual cost incurred will reflect incremental construction). The forecast of these economies of scale that cannot be realised in practice needs to be written off of the regulatory asset value (and recovered through regulatory depreciation allowances) in advance of the re-optimisation to ensure that an efficient TNSP is able to recover its costs.

If age-related depreciation is ignored for now, then the regulatory depreciation required in the period prior to the re-optimisation must meet the following condition:

$$Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Reg\ Dep_{Old\ Optimal} = Cost_{New\ Optimal}$$
$$\Rightarrow Reg\ Dep_{Old\ Optimal} = Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal}$$

where the terms are as used above, that is $Cost_{Old\ Optimal}$ is today’s construction cost of the asset that was previously considered optimal, $Capex_{Old\ Optimal}$ is the expenditure that would be required to augment the previously optimal network incrementally to meet the growing demand and $Cost_{New\ Optimal}$ is today’s construction cost of the asset that will be judged to be optimal after the re-optimisation and $Reg\ Dep_{Old\ Optimal}$ is the regulatory depreciation allowance for the previously optimal asset that would have been required over the previous regulatory period.

Thus, the extent of redundancy that would have needed to be foreseen and written off of the asset in advance of the re-optimisation is just the difference in what it would cost to serve the market if the TNSP actually had the optimal asset at the time of the previous optimisation (i.e. the sum of the cost of that asset, $Cost_{Old\ Optimal}$, and the cost of the incremental expansion to that asset, $Capex_{Old\ Optimal}$) and the cost of constructing the asset that is now considered to be optimal ($Cost_{New\ Optimal}$).

The change in the regulatory asset value (ΔRAV) that is caused by the re-optimisation – and hence the value that is ascribed to the capacity that previously was surplus – is then given by:

$$\begin{aligned}\Delta RAV &= Cost_{New\ Optimal} - WDV_{Old\ Optimal} \\ &= Cost_{New\ Optimal} - (Cost_{Old\ Optimal} - Reg\ Dep_{Old\ Optimal}) \\ &= Cost_{New\ Optimal} - Cost_{Old\ Optimal} + (Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal})\end{aligned}$$

Thus, at a minimum, the value that should be ascribed to the surplus capacity is the difference between the cost of the asset that was previously considered to be optimal and the higher-capacity asset that is now considered optimal. However, an additional increment should also be added, which reflects the cost advantage (economies of scale) that now are being realised as a result of ElectraNet’s pre-building of capacity.

It is clear that the value of the previously surplus capacity that is derived by reference to the avoided cost and ODRC methods are identical.

Depreciation of the 'new asset' (ORC) values

In the discussion above, it was noted that it would be appropriate to apply depreciation to the amount that is added to the regulatory asset value in respect of the previously surplus capacity. The value for the previously surplus capacity that would be derived using the formulae set out above assumes implicitly that the asset in place is a new asset (given that the costs used in the calculations reflect the cost of a new asset). Both the avoided cost and ODRC methods require this value to be depreciated to reflect the difference between the cost incurred in operating the actual asset compared to the new asset, in particular:

- to the extent that the actual asset has a higher ongoing cost than a new asset, then the costs that would be avoided by using the surplus capacity in the actual asset would be reduced by this amount; and
- the ODRC value is intended to reflect the hypothetical 'second hand' value for any asset, which would be lower to the extent that the actual asset has a higher ongoing cost of operation than a new asset.

In principle, the appropriate depreciation adjustment is one that adjusts carefully for the difference in the total cost that would be incurred in running the business using the actual asset compared to the new (optimal) asset. This would include deducting an amount to reflect:

- any additional operations and maintenance costs associated with the old asset compared to the new;
- the value of any inferior service performance associated with the old asset compared to the new; and
- the difference in capital costs from using the old asset compared to the new (in the absence of spare capacity, this may reflect the fact that the old asset would need to be replaced earlier).

In practice, we note that straight-line depreciation has been used in many estimates of ODRC values to date (that is, scaling down linearly the gross value to reflect the proportion of the asset's life that has already expired). Notwithstanding this standard practice, we consider it likely that the application of straight line depreciation would result in the relevant assets being over-depreciated, and so the use of straight line depreciation would be more likely than not to lead to the value of the previously surplus asset being understated.

Conclusions and recommendations

The conclusions of this report are as follows.

- Two methods are appropriate for valuing the previously surplus capacity in ElectraNet's network, namely the future expenditure that is avoided as a result of having that greater capacity or the value that would be assigned to that surplus capacity in a regime that set (and reset) the regulatory asset value at ODRC. If applied correctly, both methods deliver the same result.
- Putting aside age-related depreciation, the value for the previously surplus assets that is derived with reference to avoided cost or the value under an ODRC regime is the sum of:

  - the difference between today's construction cost of the asset that was previously considered optimal (i.e. the one that is reflected in the regulatory asset value at present) and today's construction cost of the higher-capacity asset that is now considered optimal (assumed to be the actual asset); and
  - an amount that reflects the economies of scale that now are being realised as a result of the higher-capacity asset having been built (this is the difference between what it would now cost to serve demand using the previous optimal asset and the next (incremental) expansion and what it would cost to serve demand using the single, higher-capacity asset).

  The second of the amounts set out above may not be simple to estimate, however, as it requires knowledge of how the network would have been augmented if the TNSP actually had the hypothetical optimised asset rather than its actual asset. It would not be expected that a TNSP naturally would have (or could easily generate) this information, given that networks are planned on the basis of the assets that actually are in place. If the second of the elements is ignored, then the value assigned to the previously surplus assets would be likely to understate the avoided costs and the value that would be implied by an ODRC regime.

- The value calculated using the method above needs to be depreciated to reflect the difference in the forward-looking cost of operating the actual asset compared to the 'new' asset used in the calculations. In principle, this should reflect a consideration of the differences in costs of operating (and renewing) the actual asset compared to the asset in place. In practice, such a calculation is complex, and straight line depreciation is often used for simplicity. However, we consider it likely that straight line depreciation would over-depreciate the asset, and hence lead to the value of the surplus capacity being understated.

Chapter 1

Introduction

1.1 Task

We have been engaged by ElectraNet to advise on the economic principles that are relevant to the matter of:

- whether the assets that were 'optimised out' of its regulatory asset base when it was determined should be readmitted once they either re-enter into service or are used to a greater extent than assumed in its original regulatory asset base; and, if so
- how the value of those readmitted assets should be determined.

1.2 Background

Effect of the Rules and Law

ElectraNet will soon lodge a Revenue Proposal with the Australian Energy Regulator setting out its proposed revenue cap for the regulatory period commencing from 1 July 2008. An important input into the derivation of the new revenue cap is the regulatory asset base at that time.

The new 'revenue rules' prescribe that a transmission business' regulatory asset base normally should be updated over time using the 'roll forward' method. That is, by adding in new capital expenditure (at cost), deducting depreciation and disposals and adjusting for inflation. However, the rules also provide the flexibility for the regulatory asset base to be adjusted to include the value of past capital expenditure that had not previously been reflected (or fully reflected) in the regulatory asset base. The relevant clause is as follows:[10]

> (8) Without prejudice to the application of any other provision of this paragraph (f), the previous value of the regulatory asset base may be increased by the inclusion of:
>
> …
>
> (ii) past capital expenditure that has not been included in that value, but only to the extent that such past capital expenditure:
>
> (A) relates to an asset that is used for the provision of *prescribed transmission services*;
>
> (B) is considered by the *AER* to be reasonably required in order to achieve one or more of the *capital expenditure objectives*;
>
> (C) is properly allocated to *prescribed transmission services* in accordance with the principles and policies set out in the *Cost Allocation Methodology* for the relevant *Transmission Network Service Provider*; and
>
> (D) has not otherwise been recovered.

10 National Electricity Rules, schedule 6A.2.1(f)(8)(ii).

While the Rules provide no further guidance as to how the value for assets that meet these principles should be determined, the National Electricity Law provides the AER with some guidance as to how it should seek to exercise its various discretions. The AER in all cases is required to seek to advance the objective for the National Electricity Market, which is as follows:[11]

> The national electricity market objective is to promote efficient investment in, and efficient use of, electricity services for the long term interests of consumers of electricity with respect to price, quality, reliability and security of supply of electricity and the reliability, safety and security of the national electricity system.

Section 16(2) then provides the AER with more specific guidance as to the making of transmission determinations, as follows:

> (2) Without limiting subsection (1)(a), the AER, in making a transmission determination, must in accordance with the Rules—
>
> (a) provide a reasonable opportunity for the regulated transmission system operator to recover the efficient costs of complying with a regulatory obligation; and
>
> (b) provide effective incentives to the regulated transmission system operator to promote economic efficiency in the provision by it of services that are the subject of the transmission determination, including—
>
> (i) the making of efficient investments in the transmission system owned, controlled or operated by it and used to provide services that are the subject of the transmission determination; and
>
> (ii) the efficient provision by it of services that are the subject of the transmission determination; and
>
> (c) make allowance for the value of assets forming part of the transmission system owned, controlled or operated by the regulated transmission system operator, and the value of proposed new assets to form part of that transmission system, that are, or are to be, used to provide services that are the subject of the transmission determination; and
>
> (d) have regard to any valuation of assets forming part of the transmission system owned, controlled or operated by the regulated transmission system operator applied in any relevant determination or decision.

The objective for the National Electricity Market gives primacy to the pursuit of economic efficiency with the use and investment in electricity services, which can be defined in broad terms as maximising the net benefit to all participants in the electricity supply industry. The objective also notes an expectation or intention that the maximising the net benefits to all participants in the electricity supply industry should deliver long-term benefits to customers (with benefits defined to extent to price and the quality, reliability and security of supply). Section 16 then mandates the use of a number of mechanisms through which economic efficiency should be achieved. These include:

- providing financial incentives for regulated businesses to make decisions that are consistent with maximising economic efficiency; and
- providing a degree of certainty that transmission businesses will be permitted to recover the costs of delivering the transmission services (including a return on investments made), thereby providing an incentive to continue to invest over the long term.

[11] National Electricity Law, section 7.

ElectraNet's position

The starting point for the calculation of ElectraNet's regulatory asset base for the next regulatory period is prescribed by the Rules to be $823.75 million (as at 1 January 2003).[12] However, it is understood that this amount is based upon a previous estimate of an 'optimised depreciated replacement cost' for ElectraNet's transmission activities. It is further understood that this 'optimised depreciated replacement cost' estimate for ElectraNet either:[13]

- declined to place a value on certain assets because, at that time, those assets were not necessary to deliver the transmission services; or
- placed a value on certain assets that reflected the cost of replacing the actual assets with assets that have a lesser physical capacity because, at that time, an asset with that lesser physical capacity would have been sufficient to deliver the transmission services.

At the time of the current revenue review, it is understood that:

- there are a number of such assets whose value in ElectraNet's regulatory asset value reflects an asset with less physical capacity than the asset has in reality (that is, reflecting a previous partial optimisation); and
- the demand for transmission services has increased to the extent that the physical capacity that is required by the actual assets is now required (and, in the absence of having that 'surplus' capacity available, other capital expenditure would have been required).

The 'understandings' that are set out in the paragraphs above are assumed to be facts for the purpose of this report.

1.3 Structure of the report

The structure of this report is as follows. Chapter 2 discusses some of the concepts from economic principles and the National Electricity Rules that are relevant to how previously optimised transmission assets may be valued. Chapter 3 then applies those principles to the specific case of assets that were previously declared as unnecessary for the demand that existed at that time.

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[12] National Electricity Rules, schedule 6A.2.1(c)(1).

[13] The assigning of a lesser value to ElectraNet's assets for the reason that those assets were not, at that time, either required or required to have the physical capacity that was installed, is referred to in this report as those assets having been 'optimised out' of ElectraNet's regulatory asset base, and the assets themselves are referred to as the 'optimised assets'.

Chapter 2

Regulatory valuation of assets – general principles

2.1 Introduction

Economic analysis takes as given that we have only limited resources available, and the goal of an economy – economic efficiency – is to use those limited resources in a manner that maximises the net benefit to society. While there are a number facets of economic efficiency – which include that only goods and services sought by customers are produced, that they are produced for least cost, and that these conditions continue to be met over time in the face of changing tastes and technology – the underlying requirement is that an economy makes best use of the resources it has. The fact that these assets already exist and may be productively used (and hence avoid transmission investment that otherwise would have been required) means that economic efficiency would be advanced by their use. Final customers would benefit directly from the use of previously surplus assets. The use of the previously surplus capacity would contribute to the reliability and security of the transmission system and/or permit expenditure that otherwise would have been required to meet a given level of security and reliability to be avoided.

Economic principles do not provide unambiguous guidance as to how infrastructure assets that had been established prior to the introduction of formal cost-based regulation should be valued for regulatory purposes. In particular, as most of the assets have little value in alternative uses, the opportunity cost of continuing to use the current assets is generally very low. Having said that, there are two methods that have a grounding in economic principles that would provide an appropriate method of assigning a regulatory value to previously surplus assets. These methods are:

- an estimate of the costs that would be avoided as a result of being able to use previously surplus capacity; and
- the value that would be ascribed to that previously surplus capacity under an 'optimised depreciated replacement cost' valuation method.

These are discussed in turn. It will be demonstrated in Chapter 3 that these methods will deliver the same result if applied correctly.

2.2 'Avoided cost' valuation of previously surplus capacity

As discussed above, to date ElectraNet's regulatory asset value has been set on the basis of assets that were 'optimised' to meet the system demand over the assumed planning horizon at the time. As a result, a number of ElectraNet's actual assets have a greater service capability than the assets that are implied by its regulatory asset value. In other words, ElectraNet's assets were adjudged to have surplus capacity at the time.

At the time when the original optimisation was undertaken, the surplus capacity would have provided little benefit to the system (assuming that the optimisation was undertaken correctly), given that ElectraNet would have had the ability to meet its reliability and security requirements even if those assets were absent. However, in the period since then, demand has grown (and demand over the planning horizon is forecast to continue to grow) to the point where the original surplus capacity is now required to meet the relevant reliability and security requirements.

As the previously surplus capacity is now needed to meet service requirements, it necessarily follows that if that capacity did not exist – that is, if ElectraNet actually had the 'optimised' assets in place with the lesser amount of capacity – then capital expenditure now would be required. Therefore, the previously surplus capacity would permit capital expenditure that otherwise would have been required to be avoided. The amount of avoided capital expenditure resulting from the spare capacity is the difference between the capital expenditure that would have been required to meet reliability and security requirements:

- in the absence of the surplus capacity; compared to
- with the surplus capacity in place.

If the surplus capacity is deemed appropriate to meet current demand, then the second of these terms falls away (as no additional expenditure would be required). The avoided cost caused by the surplus capacity would then just become the amount of capital expenditure that would have been required to replicate the surplus capacity on the assumption that the TNSP actually had the optimised assets in place.

There are strong grounds for viewing the avoided cost as described above as an indicator of the value to network users of the surplus capacity, and hence as the amount by which the TNSP's regulatory asset base should be increased. In economic terms, the avoided cost provides a direct estimate of the worth of the previously surplus assets to the economy and to customers, as it describes the amount of society's resources that will be saved as a result of those assets, and it also describes the amount of capital expenditure that customers will not have to finance through their regulated charges.

2.3 Optimised Depreciated Replacement Cost valuation of previously surplus capacity

Rationale for the method

The second method that we consider has a strong basis for being used to set the value of previously surplus assets is the 'optimised depreciated replacement cost' (ODRC) method.[14]

[14] The acronyms 'ODRC' and 'DORC' refer to precisely the same method.

Previous regulatory decisions for TNSPs provide a strong precedent for using the ODRC method for this purpose. An estimate of ODRC has been used almost universally to set the initial regulatory asset value for transmission businesses across the National Electricity Market.[15] The ODRC method was used to determine ElectraNet's initial regulatory asset value and had been advocated by the Australian Competition and Consumer Commission in its regulatory guidance for transmission revenue setting at the time.[16]

The main justification for an ODRC value is that it provides an estimate of the value that existing assets (that is, those that are inputs to production) would have in a market where the price was set at the level consistent with effective or workable competition in the relevant market. The method itself is directed to estimating the value for an incumbent provider's assets that would generate a cost structure consistent with that of a hypothetical (efficient) new entrant into that market. Prices that would permit such a hypothetical (efficient) new entrant with reasonable – but not excessive or inadequate – returns is consistent with no net entry or exit into or from the market, which is the condition for long run equilibrium in a competitive market.

The more specific – and operational – objective of an ODRC valuation is to estimate the maximum price that a person would be willing to pay for existing assets if the person has the alternative of constructing a new asset. This becomes, in effect, an estimate of the price that such an asset would sell for if that asset was traded in a liquid second-hand market (like used cars). In turn, the value of the old asset in such a market would reflect the cost of the new – and optimum – asset, but then adjusted to reflect differences between the forward-looking service potential and costs associated with the old asset compared to the new asset (for example, to reflect higher maintenance and renewals capital expenditure of old assets, differences in service potential, etc), all discounted to a present value or cost.[17]

[15] The only exceptions have been the asset values for the 'market network service providers' at the time of conversion, where the ACCC described its decision as being to set the initial regulatory asset value by using the regulatory test. However, it was shown during that matter that the ACCC's method was identical to a fully-specified application of the ODRC method.

[16] Australian Competition and Consumer Commission, Draft Statement of Principles for the Regulation of Transmission Revenues, May 1999, p.53 (principle S4.2).

[17] The Commission has discussed the theoretical foundations of the DORC valuation in similar terms: Australian Competition and Consumer Commission, Draft Statement of Principles for the Regulation of Transmission Revenues, May 1999, pp.39-40. An ODRC valuation seeks to replicate the second-hand value of assets, *on the assumption that such a market existed*. In practice, the presence of substantial sunk costs and economies of scale and scope implies that such a market does not exist. Indeed, if a liquid second hand market for regulated assets did exist, then there would be no need for regulation.

ODRC and surplus capacity

It is clear from the operational definition of an ODRC valuation that assets that are considered to be surplus at a point in time have a value in the ODRC framework (provided that the capacity is eventually used or expected to be used). Where the existing asset is considered to be overbuilt (i.e. contains capacity that is currently surplus), the optimal asset may be sized to meet a lower level of demand. In this case, the old asset may be able to meet the future growth in demand for little or no additional cost, whereas the new 'optimal' asset may require substantial augmentation. If the existing assets had surplus capacity, then the cost of meeting future demand using the actual assets would be lower than the cost of meeting that demand using the hypothetical optimal asset, given that more demand could be served by the former before augmentation expenditure was required.[18]

We note here that the ODRC valuation methodology as described here is what would be most consistent with the theory – namely, the objective to replicate the outcome that would occur in a competitive market. As the methodology is applied in practice, a number of simplifications are made to make implementation practicable.[19] However, notwithstanding that pragmatic simplifications are often made, the theoretical objectives provide the appropriate reference point when considering how novel situations should be addressed, in this case the value that should be assigned to capacity that was previously deemed surplus.

Delivering the 'benefit' from surplus capacity

While it is clear that surplus capacity should be assigned a value in an ODRC valuation framework, two different methods that could be used to deliver the value of that surplus capacity to the regulated business.

- *Method 1* – when the first ODRC is estimated for the regulated business, the value of surplus capacity could be estimated, namely by estimating the future expenditure that would be avoided as a result of the surplus capacity and discounting the difference back to today's dollars.
- *Method 2* – any surplus capacity at the time of an ODRC valuation could be assigned a zero value, but with a commitment to resetting the regulatory asset value at ODRC in the future (in whole or in part). The act of resetting the regulatory asset value (or part thereof) at a new estimate of ODRC would include previously surplus assets from when they again contribute to the delivery of the regulated services (and thereby avoid capital expenditure that would otherwise have been required).

Comparing these methods:[20]

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[18] Similarly, where an existing asset is considered to have service potential that would not be reflected in the optimal asset, the existing asset may deliver benefits in excess of its optimal replacement. Again, this excess service potential would be reflected (as a positive addition) to the estimated ODRC value – in this case, the ORC would need to be adjusted for the difference in forward-looking cost of serving the market in the future if we start with the existing assets rather than the optimum assets as well as the value of the expected difference in service potential that the different assets may deliver.

[19] These simplifications were described in some detail in our previous report: Allen Consulting Group, 2003, Methodology for updating the regulatory value of electricity transmission assets, report to the Australian Competition and Consumer Commission, August, pp.25-30.

[20] While the regulatory asset values would be different under Method 1 compared to Method 2, the market values should not (at least if each is undertaken in a consistent manner). The reason is that, implicit in Method 2 is that the regulatory asset value (and hence the revenue cap) would rise in the future independent of capital expenditure, which would not be the case under Method 1.

- Method 1 would result in a *higher* estimate of ODRC than Method 2, originally. However, a key component of Method 2 (if consistently applied) would be a commitment to revise upwards the regulatory asset value as previously surplus assets become used, and so Method 2 would result in a regulatory asset value that rises over time by more than would occur under Method 1 (all else constant).
- Under Method 1, there need never be a further review of the original ODRC estimate as all costs or benefits associated with running the old asset compared to the new would be determined at the outset. In contrast, Method 2 relies upon the regulatory asset value being reviewed over time to add in the value of the previously surplus assets once they contribute to the delivery of the regulated services.

Both of these approaches could be claimed to assign a value the surplus capacity at an estimate of its ODRC value, but they are distinguished by the time at which the surplus capacity formally is included in the regulatory asset value.

It is clear from the available evidence that the second of these methods was intended for the treatment of initially surplus capacity for ElectraNet. That is, to assign a zero value to surplus capacity when undertaking an estimate of ODRC, but then reviewing the regulatory asset value over time as that surplus capacity becomes used. In particular:

- when estimating the original ODRC for ElectraNet, where it was judged that an asset had greater physical capacity than required, the ODRC estimate was set with reference to the cost of a lower capacity asset – the surplus capacity in the actual asset was not assigned any value; and
- the ACCC's stated policy at the time was to reset the regulatory asset value at a new estimate of ODRC.

It follows from the discussion above that the application of an ODRC value to ElectraNet's previously surplus assets would require an appropriate amount to be added to its regulatory asset value. How this amount should be calculated is discussed next.

Chapter 3

Regulatory valuation of assets – application to ElectraNet's optimised assets

3.1 Introduction

The previous chapter set out two methods that are considered appropriate for setting the regulatory value for ElectraNet's previously surplus assets. These methods were to value the previous surplus assets according to:

- the costs that would be avoided as a result of having those assets in place; or
- the value that would be assigned to those assets under a regime that valued assets at regulatory purposes at an estimate of their ODRC.

This chapter discusses how each of these methods would be applied in practice, and provides a simple example of both methods. Depreciation is a component of both methods are for simplicity it is discussed separately as the last topic.

3.2 Application of the 'avoided cost' valuation technique

It was noted above that the avoided cost permitted by the previously surplus capacity is merely the difference between:

- the expenditure that would have been required if ElectraNet actually had the asset that was previously considered optimal; and
- the expenditure that is actually required, given the existence of the surplus capacity.

In notational terms, this can be expressed as follows:

$$Avoided\ Cost = Capex_{Old\ Optimal} - Capex_{New\ Optimal}$$

where $Capex_{Old\ Optimal}$ refers to the capital expenditure that would have been required if ElectraNet had the previously optimal assets in place and hence no surplus capacity, and $Capex_{New\ Optimal}$ refers to the capital expenditure that is needed to meet the relevant reliability and security requirements given the existence of the previously surplus capacity.

If the difference in the cost of operating an old asset compared to the new asset is ignored for now, and if the amount of capacity in the actual asset is the amount of capacity that now is required, then the $Capex_{New\ Optimal}$ term falls away and the expression above becomes:

$$Avoided\ Cost = Capex_{Old\ Optimal}$$

Thus, if the actual asset has the required amount of capacity, the cost that is avoided by the previously surplus capacity is merely what it would have cost to increase the capacity of the asset that was previously considered optimal to the same level.

However, a more meaningful expression can be derived by adding a few terms that collectively sum to zero. In particular, the above expression can be re-stated as:

$$Avoided\ Cost = Cost_{New\ Optimal} - Cost_{Old\ Optimal} + (Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal})$$

where $Cost_{New\ Optimal}$ is today's replacement cost of the asset that is now considered optimal (i.e. the actual asset) and $Cost_{Old\ Optimal}$ is today's construction cost of the asset that was previously deemed optimal.

The first part of the formula is merely the difference in today's construction costs between the asset now considered optimal (the actual asset) and the previously optimal asset. Thus, the value for the previously surplus capacity should reflect at least the difference in cost between the lesser capacity asset and the actual (greater capacity) asset. However, the second term implies that an additional value should be attributed to the previously surplus capacity – which is the difference in the cost that results from installing a single higher-capacity asset compared to installing a number of lesser capacity assets. This addition is equivalent to the economies of scale that now are being realised as a result of ElectraNet's pre-building of capacity.

Box 3.1 sets out a simple example of how this method would be applied in practice, and some of the implications.

Box 3.1

APPLLICATION OF THE 'AVOIDED COST' VALUATION METHOD

Assume the following facts:

- At the time of the previous optimisation, the TNSP has a double circuit line that had a replacement cost of $200 million. However, the optimal asset at the time was considered to be a single circuit line, which had a replacement cost of $130 million.
- The rate of increase in construction costs has been 3.5 per cent per annum, implying that the current construction costs for the double circuit and single circuit lines now are $282 million and $176 million (i.e. as at the beginning of year 11).
- It is now ten years since the previous optimisation, and a double circuit line is now required (more specifically, it is required at the commencement of year 11). If TNSP actually had the single circuit line previously assumed, then an identical duplicate second circuit would need to be constructed and in service. However, given that this can share the same easement, its construction cost is $162 million at the beginning of year 11 (equivalent to $115 million at the start of the period).
- Asset age-related depreciation is ignored.

It is clear in this simple example that the fact that the surplus capacity exists implies that the duplicate single circuit line (albeit at lower cost than the original line) is avoided, and so the avoided cost caused by the previously surplus capacity is $162 million (= $Capex_{Old\ Optimal}$).

Turning to the expanded expressions above:

- the first term – the difference between the current replacement cost of the actual (now optimal) asset and the existing asset – is $106 million (= $Cost_{New\ Optimal} – Cost_{Old\ Optimal}$);
- the second of the terms – the economies of scale that has been permitted as a result of the pre-building of capacity – is $56 million (= $Cost_{Old\ Optimal} + Capex_{Old\ Optimal} – Cost_{New\ Optimal}$); and
- these items sum to the avoided cost permitted by the previously surplus capacity ($162 million) noted above.

In this example, the previously surplus capacity is valued at the difference in today's construction cost between the larger and smaller assets, it will understate the cost that is avoided by that surplus capacity by $56 million.

It is noted that estimating the cost that would be avoided as a result of the previously surplus capacity may not be straightforward in practice. This is because the estimate requires knowledge of how the network would have been planned and augmented if a hypothetical asset were in place, whereas the TNSPs' planning activities would be directed towards planning network needs on the basis of the actual assets in place. The formulae set out above suggest that the difference between today's construction cost of the larger and smaller assets may provide an *approximation* for the avoided cost caused by the surplus capacity. However, this approximation would be expected to systematically understate the costs that are avoided as a result of the previously surplus capacity, with the extent of that understatement depending upon the cost advantages (economies of scale) that were realised as a result of constructing the larger asset.

Lastly, one further adjustment is required, which is to allow for the fact that the 'avoided' asset would have had a cost advantage over the actual asset in place arising from the fact that it is newer and hence would have more years of service remaining and also likely to have fewer maintenance requirements. Accordingly, it is necessary to depreciate the amount calculated above, which is discussed further below.

3.3 Application of the ODRC method

The value that would be assigned to previously surplus capacity under the ODRC method is by given the amount that the regulatory asset value for a TNSP – and the components thereof – would change at the time when the previously surplus capacity became necessary (and hence included as part of the optimised network). If age-related depreciation is ignored for the moment, the value of the previously surplus capacity would be given as follows:

$$\Delta RAV = Cost_{New\ Optimal} - WDV_{Old\ Optimal}$$

where ΔRAV is the change in the regulatory asset value that arises as a result of the re-optimisation, $WDV_{Old\ Optimal}$ is the written down value of the asset that was previously considered optimal (and previously reflected in the regulatory asset value) and $Cost_{New\ Optimal}$ is the current construction cost of the asset now considered to be optimal, as defined already above.

The first of the terms – the current replacement cost of the larger asset (i.e. including the previously surplus capacity) that is now considered optimal – is straightforward. The computation of the written down value of the asset that is currently reflected in the regulatory asset value is more complex.

As we pointed out in a previous report for the ACCC,[21] if the regulatory asset value is to be reset at ODRC periodically, then additional constraints must be placed upon how certain elements of the revenue requirement are calculated in order for an efficient operator to have the opportunity to recover its costs (and, given an objective to minimise the extent of monopoly pricing, also to preclude systematic windfall gains). The most relevant element for the current matter is regulatory depreciation.

[21] Allen Consulting Group, 2003, Methodology for updating the regulatory value of electricity transmission assets, report to the Australian Competition and Consumer Commission, August, pp.23-24, 30.

In particular, the ODRC method implies using a benchmark for the investments that have been made by the TNSP rather than observing its actual investments. Consistent with any benchmark method, the key constraint that needs to be applied when deriving the revenue requirement and updating the regulatory asset value over time is to ensure that the TNSP would be able to recover all of its costs (and recover them exactly) if it behaved exactly in a manner that replicated the assumptions behind the benchmark. Provided that the various benchmark assumptions reflect hurdles for behaviour that are reasonably achievable, this condition ensures that a set of decisions exists that would have permitted the TNSP to recover its costs, thus preserving the incentive and capacity for investment.

The ODRC method assumes that the TNSP's actual assets at the start of the regulatory period are the same as the optimised assets at the same time, which is reflected in the fact that a return is provided on that amount (and only on that amount). However, under an ODRC regime, there is an expectation that the regulatory asset value will be reset at a new estimate of ODRC at the end of the regulatory period, and for a return on the new ODRC value only to be provided after that date. The TNSP's actual investment at the end of the regulatory period – i.e. the original ODRC adjusted for new investments (capital expenditure) and funds returned (through depreciation) – must be an unbiased forecast of the new ODRC for it to expect to recover its costs. As the opening and closing ODRC estimates and capital expenditure are fixed, the regulatory depreciation allowance (and hence the written down value at the end of the regulatory period) must be derived to meet this constraint.

If this cost recovery constraint is applied to the single asset in question, and age-related depreciation continues to be ignored, then regulatory depreciation must be set such that following condition is met:

$$Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Reg\ Dep_{Old\ Optimal} = Cost_{New\ Optimal}$$
$$\Rightarrow Reg\ Dep_{Old\ Optimal} = Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal}$$

where $Cost_{Old\ Optimal}$ is the construction cost of the asset that was considered optimal at the time of the previous optimisation, $Capex_{Old\ Optimal}$ is the capital expenditure that would have been required to meet growing demand if the TNSP had the assets previously considered optimal in place, $Cost_{New\ Optimal}$ is the construction cost of the larger capacity asset that becomes optimal at the next optimisation and $Reg\ Dep_{Old\ Optimal}$ is the regulatory depreciation allowance for the previously optimal asset that would have been required over the previous regulatory period to make the equality hold.

This expression can be interpreted as implying that, under an ODRC regime, regulatory depreciation must pre-empt the expected 'redundancy' of the network assets that is expected at the time of the next optimisation. This redundancy derives from the fact that an 'optimisation' exercise assumes that a network can 'transform' from one optimal configuration to the next, when in reality networks can only be expanded incrementally. Hence, the re-optimisation will assume that economies of scale are able to be realised (i.e. that would derive from building today's optimal network at a cost of $Cost_{New\ Optimal}$) that cannot be realised in practice (i.e. because the actual cost incurred will reflect incremental construction, namely the sum of $Cost_{Old\ Optimal}$ and $Capex_{Old\ Optimal}$).

Using the result for regulatory depreciation derived above means that the change in the regulatory asset value for the TNSP that had surplus capacity in place at the start of the previous regulatory period at the time of the re-optimisation can be written as follows:[22]

$$\begin{aligned}\Delta RAV &= Cost_{New\ Optimal} - WDV_{Old\ Optimal} \\ &= Cost_{New\ Optimal} - (Cost_{Old\ Optimal} - Reg\ Dep_{Old\ Optimal}) \\ &= Cost_{New\ Optimal} - Cost_{Old\ Optimal} + (Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal})\end{aligned}$$

Thus, again the value attributed to the previously surplus capacity is the sum of the difference in the cost of the smaller and larger asset, and the economies of scale that are implied by the TNSP's pre-building of capacity. This result is identical to what was derived above for the avoided cost method for valuing the previously surplus capacity. 0 shows how this method would be applied to the simple example considered already above, and demonstrates some of the implications.

Again, it is noted that estimating the cost that would be avoided as a result of the previously surplus capacity may not be straightforward in practice. The difference between today's construction cost of the larger and smaller assets again may provide an *approximation* for the avoided cost caused by the surplus capacity. However, this approximation would be expected to systematically understate the value that would be attributed to the previously surplus capacity under an ODRC valuation method, with the extent of that understatement depending upon the cost advantages (economies of scale) that were realised as a result of constructing the larger asset.

Lastly, again it is necessary to allow for the fact that the 'avoided' asset would have had a cost advantage over the actual asset in place arising from the fact that it is newer and hence would have more years of service remaining and also likely to have fewer maintenance requirements. Accordingly, it is necessary to depreciate the amount calculated above, which is discussed further below.

[22] Note that if the TNSP has the larger asset (i.e. that previously had surplus capacity) the TNSP would not need to have undertaken capital expenditure.

Box 3.2

APPLLICATION OF THE ODRC VALUATION METHOD

Again, assume the following facts:

- At the time of the previous optimisation, the TNSP has a double circuit line that had a replacement cost of $200 million. However, the optimal asset at the time was considered to be a single circuit line, which had a replacement cost of $130 million.
- The rate of increase in construction costs has been 3.5 per cent per annum, implying that the current construction costs for the double circuit and single circuit lines now are $282 million and $176 million (i.e. as at the beginning of year 11).
- It is now ten years since the previous optimisation, and a double circuit line is now required (more specifically, it is required at the commencement of year 11). If TNSP actually had the single circuit line previously assumed, then an identical duplicate second circuit would need to be constructed and in service. However, given that this can share the same easement, its construction cost is $162 million at the beginning of year 11 (equivalent to $115 million at the start of the period).
- Asset age-related depreciation is ignored.

Again, it is clear that the change in the regulatory asset value of the relevant asset (and hence the value of the surplus capacity) again is $162 million (= $Cost_{New\ Optimal} - Cost_{Old\ Optimal} + (Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal})$.

For a TNSP that had the optimal assets in place at the start of the previous regulatory period, it would:

- have had an opening asset value of $130 million, which would have escalated to $176 million by the end of the period;
- recovered $56 million through regulatory depreciation (= $Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal}$); but
- spent $162 million in capital expenditure to meet growing demand; implying
- a financial investment in the network of $282 million at the end of the regulatory period (= $Cost_{Old\ Optimal} + Capex_{New\ Optimal} - Reg\ Dep_{Old\ Optimal}$); which
- is the same as the opening regulatory asset value at the commencement of the next regulatory period, and so the 'benchmark' TNSP would expect to recover its costs.

In contrast, for a TNSP that had the larger assets (with surplus capacity) in place, it would:

- have had an opening asset value of $130 million (representing the optimised asset rather than its actual asset), which would have escalated to $176 million by the end of the period;
- recovered $56 million through regulatory depreciation (= $Cost_{Old\ Optimal} + Capex_{Old\ Optimal} - Cost_{New\ Optimal}$); but
- not needed to spend capital expenditure because of the surplus capacity; implying
- a financial investment in the network of $120 million at the end of the regulatory period; and
- with the regulatory asset value being reset at the cost of the new optimised asset of $282 million, implies a value attributed to the spare capacity of $162 million.

3.4 Depreciation of the asset

As noted above, a further adjustment is required to the value derived above for the previously surplus capacity to account for the fact that the actual assets (including the surplus capacity) are part way through their economic life. The formulae set out above assumed implicitly that the TNSP's actual assets are new or that assets are infinitely lived and do not deteriorate as they age. In reality, assets are not infinitely lived and so their replacement date draws nearer as they age. It is also common for maintenance expenses to rise as assets age. Both of these factors imply that the cost of operating an old asset is generally higher than the cost of operating a new asset. More specifically, in relation to the two methods for valuing the previously surplus capacity:

- *under the avoided cost method* – to the extent that the actual asset has a higher ongoing cost than a new asset, then the costs that would be avoided by using the surplus capacity in the actual asset would be reduced by this amount; and
- *under the ODRC method* – the value is intended to reflect the hypothetical 'second hand' value for any asset. A second hand asset with a higher ongoing operating cost and a shorter remaining life than a new asset would have a commensurately lower value compared to a new asset.

This adjustment for the difference in the cost associated with the use of an old asset compared to a new asset is what is accounted for through the depreciation adjustment.

In principle, the appropriate depreciation adjustment is one that adjusts carefully for the difference in the total cost that would be incurred in running the business using the actual asset compared to the new (optimal) asset. This would include deducting an amount to reflect:

- any additional operations and maintenance costs associated with the old asset compared to the new;
- the value of any inferior service performance associated with the old asset compared to the new; and
- the difference in capital costs from using the old asset compared to the new (in the absence of spare capacity, this may reflect the fact that the old asset would need to be replaced earlier).

In practice, we note that straight-line depreciation has been used in many estimates of ODRC values to date (that is, scaling down linearly the gross value to reflect the proportion of the asset's life that has already expired). Notwithstanding this standard practice, it would only be by chance that straight line depreciation was appropriate in a specific case.

Moreover, for the case of a single asset, there is reason to consider that straight line depreciation may lead to an excessive adjustment for the age of the asset. This follows from that fact that if asset maintenance costs were not expected to rise as the asset aged (and so the shorter remaining life was the only factor that distinguished the old asset from the new) then annuity depreciation would provide the appropriate age-related adjustment (which would imply a materially lower adjustment than straight line depreciation). For straight line depreciation to be justified, a strong relationship between the maintenance expenditure on the asset and its age would be required, the plausibility of which may be questioned.

Accordingly, while straight line depreciation conventionally has been used to adjust for the age-related increase in the cost of operating an ‘old’ asset, we consider that it would be more likely than not to lead to the value of the previously surplus asset being understated.