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Memorandum

TO: **Phil Gall**

FROM: **Tom Hird**

SUBJECT: **ACCC's Proposed Treatment of Depreciation**

DATE: **24 January 2005**

This note examines the practical implementation issues and the implications for investment incentives of the ACCC's proposed inclusion of the depreciated "actual" value of the capital expenditure during the regulatory period.

Summary

The ACCC DRP can be read as suggesting that the roll forward of the RAB will ignore return of capital during the regulatory period and will instead deduct 'actual depreciation' from outturn capital expenditure in calculating the closing RAB. The effect of this is to, on average, increase the penalty associated with any overspending relative to forecast (and increase the benefit associated with any reduction in expenditure relative to forecast). As a consequence this approach can be interpreted as increasing the power of the incentive mechanism applied to capex.

However, we regard this approach a poor way in which to increase the power of the incentive regime. The reason for this is that the approach effectively ties the level of incentive to the length of the life of each asset. As a result, it creates an extremely (and inefficiently) strong incentive not spend on short-lived assets (eg, asset management software) and a relatively weak incentive to reduce expenditure on long-lived assets. This is likely to give rise to a number of perverse incentives and perverse outcomes. In the example given below this would result in TNSP having an incentive not to invest in a one off expenditure on asset management software even if this resulted in perpetual savings in long-lived assets of an equivalent amount per annu.

If it is desirable to have a more high-powered incentive regime applied to capex than simply relying on the incentive to avoid foregone return on capex then a number of superior alternatives exist to the deduction of 'actual depreciation' in calculating the RAB. For example, an additional penalty/reward of X% of the NPV of any overspend/underspend could be imposed on the businesses. If X was set equal to the average rate of depreciation on capital expenditure then the same overall incentive to reduce capital expenditure could be preserved without the perverse incentives created to avoid capital expenditure with short (accounting) lives.

The ACCC's Proposed Approach

The ACCC's Statement of Principles states that:

> *At the end of the regulatory period the closing RAB will be set equal to the depreciated value of the actual investment undertaken during the regulatory period… The effect of this…(*Page 57*)*

The ACCC's meaning in this statement is ambiguous as the term 'depreciated value of the actual investment undertaken during the regulatory period' is open to at least two interpretations. The first interpretation is that the depreciated value of the actual investment is the level of actual investment less the return of capital associated with capital expenditure allowed for in regulated revenues during the regulatory period. This interpretation gives rise to the following RAB roll forward rule:

Interpretation 1: The opening RAB for regulatory period n+1 equals:

> Opening RAB for regulatory period n *plus* outturn capital expenditure in regulatory period n *less* return of capital allowed for in regulated revenues during regulatory period n, all adjusted for inflation during regulatory period n.

The alternative interpretation is that 'depreciated value' does not refer to the 'regulatory return of capital' but rather refers to a different but undefined concept of 'depreciation' of outturn expenditure until the end of the regulatory period (such as straight line depreciation or economic depreciation).

Interpretation 2: The opening RAB for regulatory period n+1 equals:

> Opening RAB for regulatory period n *less* return of capital in period n regulated revenues associated with the opening RAB *plus* outturn capital expenditure in regulatory period n less an amount of 'depreciation' defined in a manner independent of regulatory return of capital.

Practical Implementation

Under interpretation 1 the TNSP is indifferent (in present value terms) to the amount of regulatory return of capital allowed on forecast capital expenditure as this amount is always deducted from its asset base at the end of the regulatory period. Under interpretation 2 the there is no 'claw back' of the amount of regulatory return of forecast capital expenditure setting the opening RAB for the next period. This difference imposes a number of requirements for the implementation of interpretation 2 that are not required (or are automatically satisfied) under interpretation 1. Specifically:

i. The regulator's revenue decision must separately report the return of capital associated with the opening RAB and the return of capital associated with the forecast level of capex.

ii. The regulator's methodology for determining the 'actual depreciation' of capital expenditure at the end of that regulatory period must be consistent with the methodology for determining the return of capital associated with forecast capital expenditure and must be known prior to the beginning of the current regulatory period.

iii. The regulator's methodology for determining return of *forecast* capital expenditure must be capable of being rigorously applied to *outturn* expenditure in a transparent manner.

Requirement i) follows from the fact regulatory return of capital associated with forecast capex in regulatory period "n" is irrelevant to the calculation of the opening RAB in regulatory period "n+1". However, regulatory return of capital associated with the opening RAB in period "n" is relevant to the calculation of the opening RAB in regulatory period "n+1". Consequently, the regulator must separately report what these values are in order to facilitate calculation of the opening RAB for regulatory period "n+1".

If requirement ii) is not met then even if the TNSP's capex exactly matches forecast capex the TNSP may still under/over recover that expenditure – as return of capital allowed need not match capital removed through 'actual depreciation'. Requirement iii) follows naturally from requirement ii).

If a straight-line methodology were to be adopted by the regulator then the above three requirements would mean that:

- the expected life of all possible investment classes would need to be specified by the regulator in advance (even if its *ex ante* cap did not include an expectation of investment in that asset class);

- the *ex ante* cap would need to be broken down into specific asset classes with a dollar value attached to each asset class.

- given that the *ex ante* cap will inevitably be a probabilistic estimate of capital expenditure this will presumably mean that each asset class is also a probabilistic estimate (we discuss below why this will inevitably create windfall gains/losses). This will require the regulator to clearly specify:

    - all the potential projects that have been given a positive probability in the formulation of the *ex ante* cap;

- the breakdown of asset classes within each project and the $ value of expenditure expected for each asset class if the project proceeds; and

- the probability attached to that project proceeding;

- the business would need to report all capital expenditure in the same asset classes as specified by the regulator. The regulator would also have to audit not only reported actual expenditure but also the asset class breakdown of expenditure.

The breakdown of target capital expenditure and actual capital expenditure will potentially become more important to TNSPs than the absolute level of capital expenditure. This will increase the scope for regulatory disputes in setting the *ex ante* cap as now TNSPs and the regulator will need to agree on not only about the level of the cap but the composition of the cap (in terms of projects and asset classes). The implication of this is that the regulator will need to form a detailed view on investments in asset classes that it would not have to engage in if depreciation is simply defined as return of capital (ie, interpretation 1 above).

It will also increase the scope for regulatory disputes at the end of the regulatory period when TNSPs and the regulator must agree on a classification of expenditure into each asset category. Moreover, to the extent that TNSPs mix of expenditure was more heavily weighted to assets with shorter assumed lives they would be penalised under interpretation 2. This gives TNSPs an incentive to present evidence that this reweighting of expenditure was efficient and that the regime unfairly penalises them for this.

It is also worth noting that even if a TNSP's actual expenditure exactly matches forecast expenditure they are still likely to experience windfall gains and losses under interpretation 2. This is due to the probabilistic nature of capital expenditure forecasts and an example can be used to illustrate why this is the case. Imagine that there were only two potential capex projects (A and B) to be included in the *ex ante* cap and that it is known with certainty that one, and only one, of them will occur but it is not known which (with the optimal choice of project depending on how circumstances develop during the regulatory period). Further imagine that each project has the same expected cost ($Z in year 2) and that each is equally likely (ie, each has a 50% probability of being the project that proceeds). In this case the *ex ante* forecast of capital is simple and is equal to:

> *Ex ante* forecast of capex = $Z in year 2 and $0 in all other years (which is simply the weighted average of the costs of project A and B)

Now imagine that the regulator commits to the use of straight-line depreciation over the expected life of an asset as the appropriate methodology for determining both return of capital and *the depreciated value of the actual investment*. Also assume that the average asset life of project A is 20 years and the average asset life of project B is 40 years. Assuming that outturn expenditure is equal to forecast costs (ie, whichever project is actually implemented

actually costs $Z), the regulator will add to the RAB expenditure less one, and only one, of the following values for **'actual depreciation'**:

'actual depreciation' of project A = $Z*(3/20) - if project A proceeded; or

'actual depreciation' of project B = $Z*(3/40) - if project B proceeded.

However, the **regulatory return of capital** within the period can only ever be a single unique value – which would probabilistically been equal to the average of the above values. That is, the probabilistic level of expected depreciation based on the probabilistic forecasts capex will be equal to:

Regulatory return of capital = 0.5*$Z*(3/20) + 0.5*$Z*(3/40)

If circumstances develop such that project A is the optimal project then the TNSP will receive a windfall loss of regulatory return of capital less 'actual depreciation' of project A (=0.5*$Z*[3/40 – 3/20]). If circumstances develop such that project B is the optimal project then the TNSP will receive a windfall gain of regulatory return of capital less 'actual depreciation' of project B (=0.5*$Z*[3/20 – 3/40]). These windfall losses and gains occur even though outturn capital expenditure is perfectly consistent with the assumptions underlying forecast *ex ante* cap.

Even if the TNSP perfectly matches its actual and forecast expenditures it is still exposed to the risk that the depreciation profile of actual expenditure will not match the forecast depreciation profile. While the level of the cap does not place any penalty on the TNSP substituting project A for project B the treatment of 'actual depreciation' does place a penalty on the TNSP. This is clearly inappropriate in the above example as both projects were, by assumption, equally efficient responses to outturn circumstances.

The above is a reflection of the general problem that when forecasts are probabilistic regulatory return of capital will be based on a weighted average of expected 'actual' depreciation. However, actual depreciation will only ever be a single value based on the actual outturn expenditure. This means that windfall losses/gains will be unavoidable to the extent that circumstances are such that optimal substitution within the *ex ante* cap results in a lower average life of assets than was (probabilistically) forecast.

Implication for Incentives

Interpretation 2 of depreciation would raise the importance of the depreciation profile adopted for assets. Previously the ACCC and other regulators have adopted straight-line depreciation, largely on pragmatic grounds that it is simpler than attempting to measure economic depreciation. Moreover, provided that the RAB is set consistent with

interpretation 1 above the depreciation rate used to determine regulated revenues does not affect incentives (it only affects the timing of revenues between regulatory periods).

This is not true under interpretation 2, since the depreciation profile would directly impact how much depreciation was 'subtracted' from outturn expenditure prior to it being included in the regulatory asset base. Under interpretation 2 'depreciation' is a penalty/reward for over/under spending against forecast.

We believe that such a reward/penalty regime creates perverse investment incentives for the following reasons:

- depreciation is not an economic cost associated with an overspend;
- penalising businesses on the basis of non-economic factors creates perverse incentives within the regulatory regime; and
- non-economic penalties also create an arbitrary and inconsistent regulatory regime.

Depreciation is not an economic cost of overspending on a project

Depreciation is commonly referred to as a 'cost' both in an accounting (including regulatory 'building block' accounting) and an economic sense. However, depreciation is not relevant in terms of determining the *economic cost* to society of an 'overspend' on a particular project. The economic cost of any (inefficient) overspend on a project is simply equal to the magnitude of that overspend. This is true irrespective of the average life of the assets associated with that project.

For example, if the efficient cost of a substation is $100 and the TNSP actually spends $110 on the substation, then the economic cost to society is the opportunity cost of the additional $10. This remains true whether the substation has a life of 20 years or of 50 years. If this absolute cost is to be annualised then the cost to society is captured by the foregone return on the $10. (See appendix A for alternative proofs and discussion of why the underlying life of an asset is irrelevant to the cost of overspending on that asset.)

The one situation in which depreciation is a social cost associated with overspending is when that overspending has resulted from an inefficient 'bring forward' of investment. In that situation the social cost of bring forward is the capital financing costs associated with making that investment earlier than efficient *plus* the economic depreciation of the asset over the years during which it was inefficiently brought forward. However, economic depreciation of long lived assets (20 years plus) is immaterial in the fist few years of their lives. As described in appendix A, compared with capital financing costs of 7% economic depreciation associated with a 50 year asset in the first year of its life is equal to around 0.2%

of its value. This means that under interpretation 1 the TNSP already bears 97% of the full economic costs of inefficient bring forward of expenditure (7/7.2).

Moreover, adding 'depreciation' based on straight-line depreciation of 2% (for a 50 year asset) would actually involve the business facing a greater than a 125% penalty/reward for bring forward/deferral of projects ((7+2)/7.2). This would give rise to inefficient incentives to delay expenditure as the business would receive more than the true value of doing so. In the above scenario a business would have an incentive to delay expenditure by one year even if doing so raised the cost of the project rose by 125% of the true economic value of the delay.

Customers pay more when firms achieve efficiencies

The inclusion depreciation penalty reward also creates the perverse result that customers end up paying more (in present value terms) for TNSPs services when they are efficient than when they are not efficient. To see this is the case take the following two examples:

Example 1. Take the above example of a deferral of expenditure from year 4 to year 5 of the regulatory period on an investment in a 50 year asset. As described above, the TNSP receives 125% of the economic benefits associated with that deferral. Customers finance the 25% surplus to the TNSP in the form of higher prices in future periods (due to a higher than appropriate RAB).

Example 2. Imagine:

- in year 1 of the regulatory period the business spends $10m less than was the target level of expenditure for project A with an average asset life of 20 years; then

- in year 2 of the regulatory period the business spends $10m more than was the target level of expenditure for project B with an average asset life of 20 years.

By under spending on project A the business made an efficiency of $10m in year 1. However, by overspending against the target for project B in the second year the business exactly offset this inefficiency. In effect, the efficient under investment of $10m only existed for one year. The net social value of this efficiency is given by the cost of capital on $10m for one year (ie, $0.7m=$10m*7%). This is exactly the reward that the business would receive under interpretation 1 above – where the business bears capital financing costs of any deviation from target expenditure.

However, under interpretation 2 the business receives this $0.7m reward ***plus*** it receives $0.5m ($10m/20) in return of capital during the regulatory period that is greater than the

value of actual depreciation that is removed from its outturn expenditure at the end of the regulatory period. That is, the business receives 171% ((0.7+0.5)/0.7)[1] of the total associated with the temporary 'dip' in expenditures below benchmark levels. Customers finance this 71% windfall to the TNSP in the form of higher prices in future periods (due to a higher than appropriate future RAB).

> Implementing interpretation 2 can result in customers being made worse off as a result of the business outperforming the target expenditure profile (and *vice versa*). That is, customers will **pay more** as a result of the business achieving an efficiency.

The above examples are just two of many such examples that can be used to show the perverse results that will inevitably come to light when penalties/rewards for actions are not set on the basis of the true economic costs/benefits of those actions. Implementation of interpretation 2 would give rise to the above perverse results due to its focus on depreciation as a regulatory penalty/reward when depreciation is not an (or is only a very small) economic cost/benefit.

Interpretation 2 distorts incentives

Unsurprisingly, recognising that asset lives are generally irrelevant to the economic cost of any overspend means that penalising businesses more heavily for overspending on short-lived creates uneconomic incentives. In particular, interpretation 2 will give TNSPs inefficient incentives to:

- delay expenditure from the beginning of the regulatory period to the end of the regulatory period (as discussed above);
- shift investment into assets where the regulator has set relatively slow depreciation rates (long lives); and
- shift reporting of investments from short lived to long lived assets.

We have already described why interpretation 2 gives the TNSP an inefficiently high incentive to delay expenditure. It is also true that it gives a strong incentive to shift expenditure into asset categories that have relatively low depreciation rates ascribed to them by the regulator. This can best be illustrated by asking whether a TNSP would have an incentive to spend $5m in year 1 of the regulatory period on asset management software that would result in a $5m reduction in expenditure on assets with 40 year lives in every following year? This represents a perpetual return of 100% p.a. on the initial $5m outlay.

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[1] In fact, the true benefit to the TNSP is even higher than this in present value terms.

Clearly, if the incentive scheme is working the answer should be 'yes'. However, under interpretation 2 the answer is likely to be 'no, the TNSP would not spend $5m today to save $5m p.a. in perpetuity'.

To see why this is the case, note that if software is depreciated over a less than 5 year period (consistent with most accounting treatments) then the value of the $5m investment in software to the TNSP at the end of the regulatory period is $0. The TNSP will rationally choose whichever option maximises its closing RAB less the present value cost of capital expenditure during the period. If the TNSP invests in the software the closing RAB less present value of investments is equal to:

= $0 - $5m*(1+WACC)^4 = negative $6.6m at a WACC of 7%

Where $0 is the addition to the closing RAB associated with the direct investment in software and $5m*(1+WACC)^4 is the present value of the $5m investment in software at the end of the regulatory period.

If the TNSP chooses not to invest in the software its closing RAB less present value of investments is equal to:

$$= \sum_{t=2}^{5} 5 \cdot (1 - \frac{t-1}{40}) - \sum_{t=2}^{5} 5 \cdot (1+WACC)^{t-1} = \$23.7\text{m} - \$18.75\text{m} = \$5\text{m}$$

Where $\sum_{t=2}^{5} 5 \cdot (1 - \frac{t-1}{40})$ is the depreciated value of annual investments of $5m in 40 year assets added to the RAB at the end of the regulatory period and $\sum_{t=2}^{5} 5 \cdot (1+WACC)^{t-1}$ is the present value of those annual investments at the end of the regulatory period.

In the above example we show that interpretation 2 would give the TNSP an incentive not to invest in a five-year asset even if that investment would provide a 100% perpetual return in the form of lower expenditure on 40 year assets. The same distortions to incentives will exist for substitution between other asset classes.

There is also an incentive created to shift the reporting of capital expenditure away from short-lived towards long-lived assets. This creates an unnecessary role for the regulator in closely monitoring reported expenditure.

The above examples illustrate that interpretation 2 will not only result in perverse outcomes that may well lead to appeals to the regulator/courts for rectification but also creates perverse incentives. It may be possible to interpret this as inconsistent with incentive regulation as used in the Code.

Higher powered incentives best achieved in other ways

If a view exists that incentives under interpretation 1 do not give sufficient incentive to control capital expenditure then higher powered incentives can be achieved in a way that:

- is simpler to implement that interpretation 2;
- is not arbitrary (and does no inaccurately attribute 'depreciation' as a cost of overspend);
- does not create perverse incentive and equity outcomes.

One such approach would be to increase the length of time over which the TNSP is penalised/rewarded for the capital financing costs incurred/avoided with any overspend. Under the current regime the magnitude of the penalty/reward reduces the closer to the end of the regulatory period the over/under spend occurs.

A further alternative would be to set the penalty/reward for any overspend equal to capital financing costs incurred/avoided plus x% of any over/under spend - irrespective of the asset class or the timing of the over/under spend. This approach would add to inefficient incentives to shift expenditure to the end of the regulatory period or create inefficient incentives to shift expenditure from short to long lived assets.

It is not our recommendation to recommend either of these alternatives as giving 'optimal' incentives. Rather, it is simply our intention to highlight that they are simpler to administer than interpretation 2 and that they have better incentive properties.