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Review of the Commerce Commission financial cost model

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1 Introduction

1. Vector has asked CEG to review the Commerce Commission's Preliminary version of the financial model for electricity default price-quality paths from 2015 and the extent to which it reflects previous CEG recommendations.

2. The concerns that we have previously expressed about the Commission's financial model can be summarised as follows:

   - it fails to depreciate assets over their remaining life – creating back loading of cost recovery beyond an asset's economic life. This is inappropriate even if there is no present value impact on businesses/customers; and
   - the definition of the 'Cost of debt' (cell B15 of the Inputs sheet used to calculate interest deductions for tax purposes) must be defined differently to the cost of debt used to estimate the Vanilla WACC (75^{th} percentile) (cell B14 of the Inputs sheet). Specifically, the latter is defined as the annual interest rate 'as if' all interest is paid as a lump sum at the end of the year. However, in order to be consistent with the timing assumptions in the model, the former must be defined as the annual interest rate if all interest is paid as a lump sum in the middle of the year.

2 Failure to escalate depreciation for inflation creates volatile real prices

3. This section discusses an identified problem with the Commission's preliminary model in that higher expected inflation causes real prices to fall. We regard this as a problem; however, its solution lies outside a simple change to the DPP preliminary model. Specifically, changes to the DPP IM's and consequential changes to the ID IMs to preserve internal consistency would be required.

4. The remainder of this section is divided into the following subsections:

   - Section 2.1 provides a conceptual overview of the problem with the Commission's preliminary model;
   - Section 2.2 provides a more technical discussion, providing cell references and descriptions of scenario runs using the Commission's preliminary model;
   - Section 2.3 provides the recommended solution to the problem and discusses regulatory precedent in other jurisdictions; and
   - Section 2.4 considers whether the Commission's previous commentary has addressed this problem.

2.1 Conceptual overview

5. The Commission's new preliminary model (consistent with earlier models) does not escalate the depreciation allowance by inflation in the year in which that depreciation occurs.

6. This means that depreciation delivers lower real revenue compensation to the EDB the higher is inflation. This reduction in the present value of prices during the modelled regulatory period must, if the present value principle is to be adhered to, result in higher prices in future regulatory periods.[1] It should be noted that the operation of compound interest means that prices have to be materially higher in the future in order to counterbalance depressed near term prices in present value terms.

7. This property of the preliminary model is at odds with the accepted purpose of inflation escalation in regulatory regimes – specifically to provide for a stable path for

[1] The mechanism by which the preliminary model attempts to achieve these higher real prices in future regulatory periods is by higher escalation of the real RAB. That is, what is 'lost' in real depreciation finds its way into a higher real RAB in the next regulatory period. This is because depreciation is netted off the RAB during the roll forward process. Consequently, lower real depreciation during the regulatory period results in a smaller amount being netted off the RAB and a higher real RAB in future regulatory periods.

real prices that is independent of the level of inflation. In the Commission's preliminary model, higher expected inflation during the modelled period actually reduces real prices in that period and increases real prices in subsequent periods.

2.1.1 Illustrative example of back-loading of cost recovery

8. In the Commission's model it is assumed that the regulatory asset base (RAB) in total is depreciated over its average remaining life. This is consistent with a steady state network where new capital expenditure is replacing assets that are retired. The example below demonstrates the issue in this context.

9. Imagine that an EDB starts "year 1" with an opening RAB of $100 and the average remaining life of the assets is 10 years – such that real depreciation should be $10 ($100/10). Also imagine that at the end of every year there is $10 of real expenditure[2] replacing the assets that wear out during that year - such that the real value of the RAB should remain at $100.

10. If inflation is zero this is precisely what the Commission's model does.[3] However, if inflation is positive the Commission's model allows less than $10 in real depreciation. The effect is that the real value of the RAB continues to rise – even though the EDB is only spending to maintain the real value of the assets.

11. To see this, consider an example with 10% inflation. Note that the Commission's model will:

- Allow depreciation of $10 in the first year (being $100 asset value at the beginning of year 1 divided by remaining life of 10);
- Reset the value of the RAB at $111 at the end of year 1 (beginning of year 2). This $111 is calculated as:
  - $100 starting RAB; plus
  - $10 revaluation (inflation of 10% multiplied by the $100 starting RAB); less
  - $10 in depreciation (calculated in the Commission's model as $100 divided by an average remaining life of 10 years); plus
  - $11 in new expenditure to replace the depreciated assets ($11 is required to replace 10% of the initial RAB because inflation has increased 10% over the course of the first year).

2 References to "real dollars" mean dollars with the same purchasing power as exists at the start of year 1

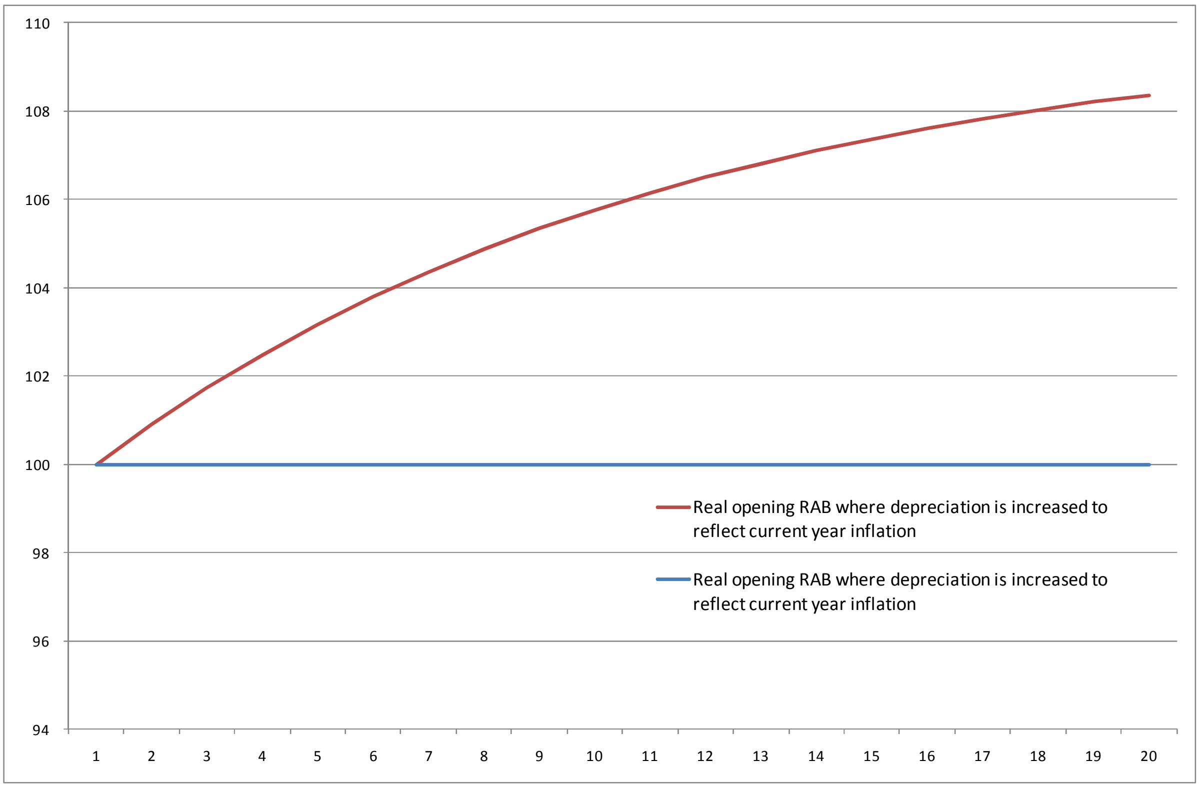
3 In fact, the Commissions real RAB will fall very slightly due to the 0.999 factor the Commission has introduced as a solution to the problems raised by CEG previously. However, this results in a trivially different outcome to that described above.

12. However, an $111 nominal RAB at the end of the first year is an increase in the real RAB of 0.9% - from $100.0 to $100.9. This occurs because the Commission's model does not escalate depreciation in the year in which it occurs for the inflation in the same year. In this example, depreciation should exactly match new expenditure because, by construction, new expenditure is purely to replace existing assets. That is, depreciation *should* equal $11.

13. However, the Commission's model calculates depreciation 'as if' inflation were zero – giving rise to a $10 depreciation allowance. In this example, this underestimates true nominal depreciation which is $11 (being $10 of real depreciation plus $1 of compensation for inflation on that real depreciation).

14. As a consequence, even though investment is purely in the form of asset replacement, depreciation does not keep track with replacement expenditure – with the effect that the RAB grows in real terms. The following figure describes the course of the real RAB under the Commission's model and this stylised example. It compares this course with the 'correct' course where the real asset value is maintained at real depreciated replacement cost of $100.

Figure 1: Real RAB when depreciation is/is not adjusted for inflation



15. This figure shows an ever escalating real RAB which is the result of under-compensating for real depreciation in the preceding years.

2.1.2 Inefficiencies of back-loading

16. This outcome creates inefficient real price volatility that imposes costs on customers and EDBs and which is ultimately inefficient. By reducing real prices in a period of high inflation electricity consumption becomes relatively cheaper – artificially encouraging consumption in that period. Equally, in future regulatory periods real prices must be inflated – artificially discouraging consumption in the future. Customers who deliberately, or by happenstance, have high consumption in high inflation periods will benefit at the expense of customers whose consumption is higher in future periods.

17. EDBs are also affected by this unnecessary inflation induced volatility in real prices. EDBs are likely to find periods of high inflation are correlated with periods when cash-flow problems exist. This is because high inflation environments tend to be associated with high nominal debt payments and uncertainty about future costs. Establishing a regulatory regime that reduces real revenues in periods of high expected inflation exacerbates this problem and, thereby, adds to the 'beta' risk faced by EDBs as a result of exposure to inflation. It is also likely to materially reduce the ability to find (willingness to commit) both debt and equity capital to fund capital expenditure in high inflation periods.

18. These are not risks that are faced by Australian or US regulated business on which the Commission's equity beta estimates are largely based. It is also a departure from all regulatory financial models that we are familiar with, including the Australian Energy Regulator's PTRM model.

19. It is also worth noting that it is a well-accepted empirical observation in finance theory that back-loading of compensation exposes investors to maturity risk and raises the required rate of return. That is consistent with the commonly observed upward sloping term structure for assets including risk free assets. Back-loading of compensation for NZ EDBs can be expected to raise their cost of funding relative to other EDBs whose revenues are not so back-loaded (such as Australian and US EDBs).

2.2 Technical description of the problem

20. The Commission's modelling provides a nominal amount of depreciation in each year equal to the opening RAB (ORAB) in that year divided by the remaining life of the asset (RL) (e.g., see row 28 in f the RAB sheet in the preliminary model). However, the Commission also applies a revaluation to the ORAB equal to the assumed rate of inflation multiplied by 0.999 of the ORAB (e.g., see row 27 of the RAB sheet in the preliminary model). The net effect of these two operations is that the actual closing RAB (CRAB) returned to investors is given by:

21. $$CRAB = ORAB - ORAB/RL + 0.999*ORAB*inflation \qquad (1)$$

= ORAB*(1+0.999*inflation) – ORAB/RL (2)

22. The real CRAB (i.e., expressed in the same dollars as the ORAB) is simply the above value divided by (1+inflatoin) which is equal to:

$$\text{Real CRAB} = \frac{\text{ORAB}*(1+0.999*\text{inflation})}{(1+\text{inflation})} - \frac{\text{ORAB}}{\text{RL}*(1+\text{inflation})} \qquad (3)$$

23. It follows that the amount of real depreciation (expressed in dollars of the beginning of the year) is equal to the ORAB less the Real CRAB which is equal to:

$$\text{Real depreciation} = \frac{\text{ORAB}*0.001*\text{inflation}}{(1+\text{inflation})} + \frac{\text{ORAB}}{\text{RL}*(1+\text{inflation})}$$

$$= \frac{\text{ORAB}}{\text{RL}} * \frac{(1+0.001*\text{inflation})}{(1+\text{inflation})} \qquad (4)$$

24. This formula for real depreciation shows what is, in our view, an unsatisfactory element of the Commission's modelling. The amount of real depreciation returned to investors is:

- in the presence of positive inflation, less than the real depreciation implied by the remaining life of the asset; and
- reduces with increases in the level of inflation.

25. In order to understand the first dot point, note that real depreciation (expressed in the dollars of the beginning of the year) must be equal to ORAB/RL if the asset is to be depreciated evenly over the remainder of its life. In terms of equation 4, this means that the second term must have a value of one (1.0). However, the only way for the second term to have a value of 1.0 is for inflation to be zero.[4]

26. The effect of this is that the higher the inflation rate the more backloaded is the level of real cost recovery. Indeed, with high enough inflation EDBs would be required under the Commission's model to pay their customers to use the network. To see this, all that is required is to take the Commission's model as published and insert inflation forecasts of 15% in 2015/16 (cells E7 and E8 of the inputs sheet). Once this is done there is a 'blip' in inflation in 2015/16 (with all other years' forecast inflation remaining at 0%). This blip in inflation causes the Building Block Allowed revenues in that year become negative (see cell G52 in the BBAR sheet of the model).

27. It is important to note that the above outcome is in *nominal* terms. That is:

- it is not building block allowable revenues fail to rise by the full amount of inflation; rather

4 As soon as inflation takes on a positive value the second term in equation 4 will be greater than 1.0 because the numerator must be less than the denominator (the denominator grows by the amount of inflation while the numerator grows only by 0.1% of the amount of inflation).

- it is that building block allowable revenues actually *fall* due to *higher* inflation. That is, higher inflation leads to not just lower real allowable revenues but also lower nominal allowable revenues.

28. Indeed, in the example above, nominal allowable revenues actually become negative (i.e., but for smoothing of revenues over the 5 years, EDBs need to write cheques to customers in 2015/16).

29. Moreover, the same point is illustrated by examining smoothed revenues. Without the inflation blip in 2015/16 the smoothed revenues are $10.0 per annum over the entire regulatory period (see row 45 of the MAR sheet). With the inflation blip smoothed real revenues fall to $9.3 per annum in each year. That is, other things equal, higher inflation at the beginning of the regulatory period reduces *nominal* revenues over the regulatory period.

30. It might be argued that these illustrative examples are unlikely to eventuate. That is, an expected blip in inflation of 15% is unlikely – as is the implicit assumption that the nominal WACC is zero (which is the default value in the Commission's published model). However, these settings for the model simply serve to starkly illustrate a property of the model that exists in all situations. Namely, the fact that higher inflation backloads real cost recovery as illustrated in equation 4.

31. A modestly more 'realistic' example using the Commission's model can be used to illustrate this. In this example, instead of the WACC (cell B14 of the inputs sheet) being set equal to zero, set the WACC equal to 10%. Instead of amending the model to set inflation forecasts of 15% in 2015/16, let the model be amended to:

    - Include two inflation scenarios:
        - forecast inflation is zero in all years; and
        - forecast inflation is 3% in 2015/16 and all subsequent years;

32. The effect of introducing higher inflation is to reduce both real and nominal smoothed revenues in 2015/16 by 10% (relative to a scenario with zero inflation).[5] Both real and nominal revenues in the high inflation scenario remain below their respective values in in the zero inflation scenario. Only in the last year of the regulatory period (2019/20) is this situation (marginally) reversed. The overall impact is that the present value of maximum allowable revenue over the regulatory period (cell C47 of the MAR sheet) is reduced by 4.5% (from $57.6 to $55.0).[6]

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5 Smoothed real (and nominal) revenues are provided in row 45 (and 46) of the MAR sheet.

6 A further scenario that illustrates the same point can be made holding the real WACC constant rather than the nominal WACC. For example, if we set the real WACC at 7% and the nominal WACC at 7% plus inflation we have the nominal WACC varying with inflation. In this scenario it can be seen that real smoothed revenues are 1.1% lower when inflation is 3% compared to when it is zero - and this is true even though the nominal WACC has also been increased by 3%. Nominal revenues do actually rise with

2.2.1 Internal inconsistency in timing assumptions

33. It is worth noting that failing to escalate depreciation for inflation year implies that this component of revenue is assumed to be received at the start of the year (in start of the year dollars). This is internally inconsistent with the timing assumptions in the preliminary model.

34. The Commission's target revenue formula assumes implicitly that the depreciation allowance is specified in end of year terms. This formula assumes that all revenue is received at the end of the year, and then discounts this to the 'revenue date' (3 November) at the WACC in order to reflect its estimate that revenue is received, on average, at that time.

35. Accordingly, calculating depreciation with zero escalation for inflation (i.e., on the assumption that this component of revenue is received at the start rather than the end of the year) is inconsistent with how it has calculated target revenue.

36. This is remedied quite simply by adding a year of inflation to the depreciation allowance in each year as described below in more detail.

2.3 The solution

37. The solution to this problem is for depreciation of RAB to be escalated by inflation in the year in which it occurs and for the 0.999 factor in equation (1) to be dropped (replaced by unity). If this is done then equation (1) and each of the above subsequent equations would change as per below:

CRAB = ORAB – ORAB/RL*(1+inflation) + ORAB*inflation (1')

= ORAB*[1 - 1/RL*(1+inflation) + inflation] (2')

$$\text{Real CRAB} = \text{ORAB}*\frac{[1-1/\text{RL}*(1+\text{inflation})+\text{inflation}]}{(1+\text{inflation})} \quad (3')$$

$$\text{Real depreciation} = \text{ORAB}*(1-\frac{[1-1/\text{RL}*(1+\text{inflation})+\text{inflation}]}{(1+\text{inflation})})$$

$$= \frac{ORAB}{RL} \quad (4')$$

38. Comparing equation (4) and equation (4') it can be seen that higher inflation leads to lower real depreciation

39. We consider that the goal of cost models should be to deliver the same real outcomes no matter what the level of inflation. This is certainly inconsistent with Australian regulatory precedent. The AER's PTRM model first calculates required depreciation

inflation in this scenario, due to the fact that the WACC is increased in line with inflation, but they rise slower than inflation (which is why real revenues fall).

in real terms (ORAB/RL) but then escalates this for inflation. That is, the PTRM adopts the recommended equation (1') above.

40. We recommend that the Commission initiate amendments to the input methodologies in order to escalate depreciation in its model by inflation.

2.4 Previous Commission commentary on this issue

41. The problem identified with the preliminary model in this section does not rely on there being a negative NPV outcome for EDBs as a result of the failure to escalate depreciation for inflation. A negative NPV outcome may, or may not, be associated with this backloading of revenues depending on other factors in the regulatory regime. However, even if there is no negative NPV consequence across multiple regulatory regimes, the problems identified above remain.

42. The Commission has not, to date, engaged with these problems but, rather, has focused on questions surrounding the impact of back-loading on the NPV of compensation.

3 Calculation of interest deductions for tax purposes

43. The other recommended change relates to clarification that the cost of debt figure in cell B15 of the inputs sheet will be the interest rate expressed on a daily compounding basis rather than the annualised interest rate used in determining the WACC.[7]

44. This is necessary because the Commission's modelling estimates tax 'as if' companies pay their tax obligations, on average, in the middle of the year (rather than at the end of the year). This assumption is consistent with the Commission's overall approach where it attempts to reflect the true timing of expenditures and revenues through the year.

45. However, if an annualised interest rate is used in cell B5 of the inputs sheet then the absolute level of interest deductions in the preliminary model will not reflect this approach. Specifically, if an annualised interest rate is used, the Commission would be implicitly assuming that interest is paid on debt in a lump sum at the end of the year.

46. In reality, and consistent with the Commission's timing assumption on when tax is paid, businesses pay interest throughout the year. On any individual debt instrument a business will generally pay at least 2 coupon (semi-annual) payments every 12 months. On many debt instruments businesses pay 4 (quarterly) coupon payments or pay interest calculated daily on outstanding balances. Moreover, businesses stagger their debt issues so that, over the total portfolio of debt, coupon payments are further spread relatively evenly throughout the year

47. The daily interest rate can be calculated from the annualised interest rate in the following manner:

Daily interest rate = ((1+annulaised interest rate)^(1/365)-1)*365

[7] The same issue exists in relation to the term credit spread differential (TCSD) allowance. Where this currently enters directly into rows 49 and 50 of the BBAR sheet as an annualised figure. This needs to be amended to be a middle of the year figure. The simplest way to do this is to amend the formulas in those rows to replace references to "row 27" in rows 49 and 50 of the BBAR sheet with references to "row 27 divided by a scalar factor" – where the scalar factor converts the TCSD allowance (expressed in end of year terms) back to an estimate of the TCSD actually paid by the EDB and therefore deductible for tax purposes (expressed in middle of the year terms). The correct scalar factor depends on the total cost of debt inclusive of the term credit spread. This is not currently an input into the model and will be different for each firm (only the TCSD allowance (as opposed to % TCSD rate) is an input into the model). Absent an estimate based on the cost of debt inclusive of TCSD, the best approximation will be the value of timing factor for mid-year cash flows based on the WACC as calculated in the timing sheet at cell C19 (1.0487).

48. This interest rate applied to the assumed amount of debt funding will accurately model actual nominal interest payments made throughout the year.

49. It might be open to the Commission to investigate further the actual profile of interest payments made throughout the year and to substitute a different formula to the one proposed that reflected a businesses' actual debt costs. However, in our view it is not open to the Commission to adopt an assumption that 100% of all interest payments are made on the last day of the year because this is patently inconsistent with what EDBs actually do and with the other timing assumptions implicit in the preliminary model.

50. We note that similar points were made in CEG's August 2011 report and the joint report by Balchin and Hird where we stated:

> *This internally consistent modelling of financing costs and interest deductions is also consistent with how an efficient firm would expect to arrange its debt financing obligations to match its cash flow to the extent possible, which may imply an even spread of interest payments over the year to approximate a midyear payment.*
>
> *Giving effect to this proposition is straightforward – the cost of debt that is used when calculating taxation liabilities merely needs to be converted to a midyear interest rate, as demonstrated by Hird. This adjustment should also be applied when applying Equations 3 to 5 from the Balchin report.*
>
> *The Commission did not address these submissions in its most recent decision document. This may be an understandable oversight due to the fact that these submissions were made in the context of a different model that assumed tax was being paid at the end of the year. It may be that the Commission came to the conclusion that changing this approach (the assumed timing of tax payments) made the arguments put by CEG and PwC (Hird and Balchin) moot. However, for the reasons set out above this is not the case and, for the reasons set out above, we respectfully submit that the Commission address this issue in its final model.*

3.1 Subsequent Commission analysis

51. Subsequent to the above quoted submission, the Commission stated:

> *CEG (on behalf of Vector) have submitted that our timing assumptions result in an overestimation of the amount of interest deductions available for tax purposes, and therefore underestimates the amount of tax liabilities. They consider that this arises because we have assumed a year-end timing for interest paid on debt, but mid-year timing for tax payments.231*

> *G6 However, the materiality of this change is relatively low, and is likely to be counterbalanced by other factors that weigh in suppliers favour at this reset. We therefore agree with the submission from Contact Energy, which argued that the low cost forecasting approaches that we have adopted will generally be conservative in favour of suppliers. For example, we have adopted each supplier's forecast of capital expenditure without applying any audit or verification processes.232*
>
> *231 Competition Economists Group, Default Price-Quality Path Reset, October 2012 pp 2-3. In the same report CEG also raised an issue with depreciation. This was addressed in the input methodology amendment paper – Commerce Commission, Specification and Amendment of Input Methodologies as Applicable to Default Price-Quality Paths, 28 September 2012.*

52. In essence, the Commission agreed with the substance of the error identified but declined to correct it on the grounds that there were other areas where businesses were overcompensated so it was reasonable for the financial model to have elements that systematically undercompensated businesses.

53. We do not consider that this was a reasonable basis on which to not correctly develop the financial model at that time. However, even if it was, we note that the Commission would need to reassess the argument in the light of the new regulatory period.

54. In our view, if the Commission believes that there remain areas in which its processes tend to over-compensate businesses it should not deliberately introduce errors that are hoped to be offsetting. Rather, it should correctly develop the financial model in an internally consistent fashion and:

- Correct areas of overcompensation directly if possible;
- If not possible, rather than deliberately insert errors into the cost modelling, it would be preferable to:
  - Simply leave this believed overcompensation unadjusted for; or
  - If the Commission must make some adjustment it should be explicit about this – e.g., by introducing a negative revenue item into the cost model labelled something like "Commission's estimate of areas where EDBs are being overcompensated elsewhere"