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Dear Mr Goodeve,

**2010-15 Default Price-Quality Path Starting Price Adjustments Draft Decision Paper:  
Modelling Issues**

**1. Introduction**

***Purpose***

I have been asked to provide advice in relation to a number of issues associated with the Commerce Commission's financial modelling that underpins its draft decision in relation to the starting price adjustment for Powerco, including the appropriateness of:

- the Commission's adjustment to convert revenue and expenses into mid-year terms;
- the treatment of inflation in the modelling; and
- the calculation of the depreciation allowance and the related question of the indexation of capital expenditure.

***Summary***

The findings reached in this note can be summarised as follows:

- *Mid-year timing of cash flows adjustment* – the Commission's adjustment to convert revenues and expenses into mid-year terms is a new, highly material adjustment and inconsistent with the standard calculation performed in Australia. Moreover, the Commission's analysis suffers from error, namely that:<sup>1</sup>

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<sup>1</sup> The method I applied to test the effect of the timing of Powerco's intra-year cash flow follows a method that I developed for the ACCC some years ago: Allen Consulting Group (Balchin, J.), 2002, Working capital – relevance for the assessment of reference tariffs, Report to the Australian Competition and Consumer Commission, March (available at: [http://www.aer.gov.au/content/item.phtml?itemId=681036&nodeId=d36b367fe473b137856ec9be7af87e41&fn=Working%20capital.%20A%20report%20by%20ACG%20\(March%202002\).pdf.](http://www.aer.gov.au/content/item.phtml?itemId=681036&nodeId=d36b367fe473b137856ec9be7af87e41&fn=Working%20capital.%20A%20report%20by%20ACG%20(March%202002).pdf.))

- The Commission is incorrect in its claim that the seasonal profile of Powerco's revenue provides an advantage compared to receiving the revenue mid-year (which the Commission uses to justify its idiosyncratic assumption about the timing of taxation payments). In fact, Powerco receives revenue in arrears for providing distribution services, which imposes a detriment (in present value terms) that more than offsets any benefit from the seasonal profile of its revenue.
- If the Commission does decide to calculate the revenue requirement on the assumption that revenue is received and expenses incurred at the mid-point of the year (that is, after the formula has been changed so that it is assumed that taxation is also paid mid-year), the lagged nature of Powerco's revenue means that its economic costs will be understated, and as such an increment to its revenue requirement is required to meet the Commission's intentions (this increment is analogous to a return on working capital). I estimate on conservative assumptions that the required increment to revenue is at least 0.12 per cent.
- *Treatment of inflation in the financial modelling* – there are a number matters related to inflation indexation where the Commission's treatment is inappropriate (I addressed a number of inflation-related issues in detail in my earlier letter of 13 May 2011).
  - Forecasting method: the Commission has continued to forecast inflation by using the last year of the Reserve Bank of New Zealand's short term forecast as a proxy for the long term. As I remarked in my earlier advice, there is no basis for this assumption and a more reasonable proxy for long term inflation is the midpoint of the Reserve Bank of New Zealand target range for inflation. This latter method reflects the Australian Energy Regulator's standard approach for forecasting inflation in Australia. Indeed, the forecasts that were produced by NZIER in September 2009 suggest that the Banks forecasts of inflation were already very high, especially in the longer term, which argues strongly against the Commission's using the last year of the Bank's forecast (which was high compared to previous years and NZIER) as a proxy for a long term forecast.
  - Use of different annual inflation forecasts: the Commission's updated modelling incorporates uneven annual rates of inflation over the regulatory period, rather than a constant (geometric) average rate that it previously had used. The effect is that the assumed real risk free rate of return and real WACC are assumed to fluctuate substantially over the period. There is no rationale for such an assumption. The evidence that the Commission has considered does not allow it to infer that the expected real rate of return would have been expected to fluctuate materially over the period. The more reasonable assumption is that the expected real rate of return is constant – which is achieved by using a constant forecast of inflation in the financial modelling. This is consistent with how the AER uses forecasts of inflation in its financial modelling.

- Adjusting for actual inflation over the regulatory period: the objective of inflation indexation is to ensure that the same real return is provided irrespective of how the level of outturn inflation. Where price controls are determined using forecasts in nominal ('money of the day') terms, this objective requires an adjustment when setting actual prices to adjust for the difference between the forecast of inflation and actual inflation. Failing to make such an adjustment means that the regulated businesses would make the target nominal return irrespective of whether the forecast of inflation was correct – thus exposing the entity to inflation risk.

In the current matter, the price controls the Commission has determined commence with fixed nominal revenue level for 2012/13, which reflect forecasts of inflation over 2009/10, 2010/11 and 2011/12 (for the years thereafter, the prices will be set with reference to a measure of actual inflation and so this issue ceases). I note that actual inflation over 2009/10 and 2010/11 (that is, the change in the CPI between the start and end of the year) was 2.05 per cent and 2.42 per cent, which compares to the September 2009 forecasts of 1.72 per cent and 1.98 per cent. An adjustment to the 2012/13 revenue should be made for the difference between the forecast and actual inflation as available at the time the price controls are set.

- Removal of the GST-related change in inflation: the Commission has removed the one-off increase in inflation arising from the change in the GST rate from being incorporated into prices and asset revaluations without considering the matter in detail against the purpose statement and the principle of financial capital maintenance. It is not obvious that the one-off inflation increase should be removed in this manner – if it is not passed through into prices and asset values, then the real value of the dividends generated by the regulated assets in the hands of investors would have decreased, which means that financial capital maintenance would not be met.
- *Adjusting the regulatory asset base* – there are four separate elements to the Commission's method for adjusting the regulatory asset base over the regulatory period that are illogical, namely:
  - Setting depreciation in beginning of year dollars: the Commission's model does not apply inflation to depreciation within each year (thus setting the allowance in beginning of year terms), which is inconsistent with the implicit assumption in the Commission's target revenue formula that the depreciation allowance be specified in end of year terms.
  - Remaining lives of assets: the Commission's model applies a static remaining life for existing assets, whereas the remaining life of each asset decline by a year each year, which should be applied. In addition, the Commission should apply a life to capital expenditure that reflects the life of the assets in question.

- Depreciation on capital expenditure: the Commission also commences the depreciation of capital expenditure from the year after projects have commenced, whereas it would be more appropriate to calculate half a year of depreciation for the projects that commence within a particular year.
- Inflation on capital expenditure: equally, the Commission’s model does not escalate capital expenditure for inflation in the year in which projects commence, whereas it would be more appropriate to apply half year of inflation indexation for the projects that commence within a particular year.

## **2. Analysis**

### **2.1 Cash flow timing assumptions in the Commission’s financial modelling**

In its previous analysis, the Commission has calculated prices on the assumption that revenue is received at the end of each year. In the Draft Decision, the Commission changed its approach, and has instead derived the price control on the assumptions that:

- Revenue is received at the midpoint of each year and operating expenditure is also assumed to be received at the midpoint of the year, but
- Company taxation is assumed to be paid at the end of the year – the Commission does not claim that tax is actually paid at the end of the year, but instead has made this assumption (which has the effect of reducing prices) to offset what it considers would otherwise be a bias in favour of the EDBs arising from more revenue being received in the first half of the year than in the second half:<sup>2</sup>

*However, this assumption ignores the fact that—due to seasonal factors—revenues are likely to be higher in the first half of the year than in the second half of the year. This provides a slight timing benefit in favour of EDBs. To offset this effect, and to improve the accuracy of our modelling overall, we have modelled tax costs as falling at the year-end (rather than throughout the year as would be likely in practice).*

I address first how this matter has been dealt with in Australia, and secondly address the merits of the Commission’s assertion that its idiosyncratic treatment of taxation improves the accuracy of the modelling.

#### **Assumptions about the timing of cash flows in Australian regulatory practice**

The standard practice across Australian regulators has been to set price controls on the assumption that most or all of the revenue is received at the end of the year.<sup>3</sup> It has been

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<sup>2</sup> Commerce Commission, 2010-15 Default Price-Quality Path for Electricity Distribution – Draft Decisions Paper, July, para.2.12.

<sup>3</sup> Operating expenditure and taxation are generally just added to target revenue, which merely requires the assumption that the revenue allowance for these costs is received at the same time they are paid. Different regulators have at times made different assumptions about the timing of capital expenditure, and where the rate of return is applied to an

well known amongst Australian regulators that the timing assumptions in the simple target revenue formulae are likely to overstate financing costs. However, with the exception of IPART (described further below), while a rethink of this matter have at times been proposed, the simple and transparent approaches for calculating target revenue have been maintained, with the ‘conservatism’ being used to justify not including an additional allowance for working capital. The Australian Energy Regulator’s (AER) most recent statement on this matter was as follows:<sup>4</sup>

*The PTRM for transmission models revenues and expenditures on an annual basis, and revenues and expenditures (with the exception of capex) are assumed to occur on the last day of the regulatory year. Capex is recognised in the middle of each year and earns a half-year return which is capitalised before being rolled into the RAB. This particular timing assumption recognises that capex can occur evenly throughout the year, which is approximated by the middle of the year assumption.*

*These timing assumptions are internally inconsistent as they make no allowance for the time value of intra-year cash flows, most notably revenues and opex, which are also likely to occur evenly throughout the year. Specifically, the PTRM does not provide compensation to businesses for the opportunity cost of funding opex throughout the year, nor does it recover the time value of cash benefits given that businesses also receive revenues throughout the year.*

*In addressing this inconsistency, and in assessing the appropriateness of these timing assumptions in general, the AER has considered the competing objectives of achieving greater accuracy in modelling revenue requirements and making the PTRM simple and transparent. In commenting on the transmission PTRM, service providers found the existing assumptions to be pragmatic while users expressed concern over a potential bias in favour of service providers.*

While the AER proceeded to ask whether it should adopt a more precise (but commensurately more complex) method for deriving target revenues – reflecting the fact that the document in question was an issues paper – it has nonetheless retained its pre-existing simple approach. The original analysis provided to the ACCC in 2002 that the AER referred to (which was a report that I prepared) included the following conclusion:<sup>5</sup>

*Several alternative target revenue formulae are presented in the report, and the option exists for the Commission to model the within-year timing of revenue and costs for a regulated entity for a ‘test year’ (using the approach described in this report), and to make an explicit adjustment to target revenue to remove whatever bias is found to exist. Against this, however, simplicity has a number of advantages – including that it adds to the transparency of regulation, and reduces administrative and compliance costs. The level of imprecision with respect to the other factors that affect the assessment of reference tariffs is also relevant when considering the degree of precision warranted with respect to the within year timing of cash flow. Ultimately, these are trade-offs the Commission is best placed to resolve.*

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average asset value then a slightly more complex timing assumption is applied (namely that half of the additional net investment is incurred at the midpoint of the year).

<sup>4</sup> Australian Energy Regulator, 2007, Issues paper: guidelines, models and schemes for electricity distribution network service providers, p.11.

<sup>5</sup> Balchin, J., Op. Cit., 2002, p.3.

This trade-off identified between simplicity and transparency on the one hand, and perceived precision – and in a context where a far greater level of imprecision exists with respect to other inputs – remains equally relevant to the matter being considered by the Commission.

As noted above, the one Australian regulator that I am aware of that has altered its timing assumptions when calculating target revenue is the NSW regulator (Independent Pricing and Regulatory Tribunal, IPART), which has recently signalled its intent to calculate target revenue using a formula that assumes mid-year timing of revenue and expenses.<sup>6</sup> However, IPART has recognised that as regulated businesses bill in arrears for providing services, revenue is typically received later than mid-year (on average). As a consequence, it has included a return on working capital in the calculation of target revenue, as it noted below:<sup>7</sup>

IPART calculates a mid-year value of return on and of assets in the cost building blocks, because it is assumed revenue is received evenly through the regulatory year rather than in full at year-end as assumed by the AER (see discussion of timing assumptions below). Because of this, IPART recognises a need for an explicit working capital allowance and therefore includes a return on working capital in the cost building blocks. The AER's return on and of assets are year-end values, and no allowance is made for working capital.

If the Commission decides to continue to assume a mid-year timing of revenue when it sets its target revenue, then the same imperative applies. The justification and approximate quantification of such a working capital allowance is addressed next.

I note for completeness that no Australian regulator that I am aware of has used a target revenue formula that combines the assumption of mid-year timing revenue, operating and capital expenditure with an assumption that taxation is paid at the end of the year.

### Assessment of the Commission's cash flow assumptions

#### **TIMING OF REVENUE**

The Commission observed that EDBs tend to receive more than half of their revenue in the first half of the year.

If this statement related to when revenue was *accrued* (or created) – as distinct from the revenue being *received* – then the statement would be correct. In practice, however, Powerco (in common with many EDBs) bills in arrears for distribution services, and so receives revenue much later than it is accrued.

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<sup>6</sup> The Victorian Essential Services Commission calculated target revenue on the assumption that revenue is received at the end of the year, but then applied inflation to prices on the assumption that revenue was received at the midpoint of the year.

<sup>7</sup> Independent Pricing and Regulatory Tribunal of NSW, 2009, Comparison of financial models – IPART and the AER, November, p.4.



Table 1 sets out the average breakdown of Powerco’s accrual of revenue by month over the last five years, which shows that (on average) 52.9 per cent of annual revenue has been accrued by the end of September, compared to 50 per cent of the days until that time (at least in a leap year).

**Table 1**  
**Seasonal profile of Powerco’s revenue accrual: average over 2005/05 to 2010/11**

	<i>Monthly share</i>	<i>Cumulative</i>
<b>April</b>	7.91%	7.91%
<b>May</b>	8.59%	16.51%
<b>June</b>	8.87%	25.37%
<b>July</b>	9.32%	34.70%
<b>August</b>	9.45%	44.15%
<b>September</b>	8.71%	52.86%
<b>October</b>	8.38%	61.24%
<b>November</b>	7.91%	69.16%
<b>December</b>	7.84%	76.99%
<b>January</b>	7.77%	84.76%
<b>February</b>	7.39%	92.15%
<b>March</b>	7.85%	100.00%

However, the Commission’s analysis ignores the fact that Powerco does not receive its revenue as it is accrued (that is, on a continuous basis) or, as a proxy, at the midpoint of each month. Rather, Powerco bills (and receives payment) in arrears for distribution services. I am informed that Powerco’s approach, which is also used by a number of other EDBs, is to invoice the retailers monthly in arrears and to be paid on the 20<sup>th</sup> of the month after the service was provided. Thus, the revenue that is accrued in respect of April is not received until the 20<sup>th</sup> of May. Combining the invoicing assumptions with the seasonal profile set out above implies the following timing of revenue receipts for Powerco for the year commencing 1 April 2011 and ending on 31 March 2012 year:

**Table 2**  
**Powerco’s actual intra-year timing of revenue**

<i>Receipt Date</i>	<i>Share</i>
20-May-11	7.91%
20-Jun-11	8.59%
20-Jul-11	8.87%
20-Aug-11	9.32%
20-Sep-11	9.45%
20-Oct-11	8.71%
20-Nov-11	8.38%
20-Dec-11	7.91%
20-Jan-12	7.84%
20-Feb-12	7.77%
20-Mar-12	7.39%
20-Apr-12	7.85%

A casual observation of the table shows that, on average, less than 45 per cent of the revenue in respect of any year is received by the midpoint of that year. Moreover, I understand, that Powerco (and the electricity industry in general) uses a system of ‘wash-ups’ that enable retailers and EDBs to correct data for up to 14 months. I am led to



believe that Powerco's experience is that the 'wash-ups' systematically favour Powerco, implying that it would generally not receive all of the payments relating to services provided in April 2011 until July 2012 (14 months after the invoice for April was issued, and approximately 15 months after the service was provided). I have not included this additional lag in my calculations.

The Commission's assertion that it is being conservative by assuming that Powerco receives its revenue at the midpoint of the year can be tested more thoroughly using the following method.

- First, assume a notional annual revenue stream (\$100), and then calculate the value of that revenue if all were received at the midpoint of the year.
- Secondly, calculate the value that the same revenue would have when received according to the actual timing of Powerco's revenue, and compare to the first.<sup>8</sup>

The value of \$100 received in six months is \$95.9, using the Commission's WACC assumption of 8.77 per cent. In contrast, if the same \$100 is received across the dates and in the proportions set out in Table 2 it would have a value of \$95.2,<sup>9</sup> which is 0.7 per cent *lower* than the value that the same revenue when received at the midpoint of the year.<sup>10</sup>

Accordingly, the Commission is incorrect to assert that the seasonal profile of Powerco's revenue implies that assuming mid-year revenue receipt is conservative. Rather, the fact that Powerco receives its revenue in arrears more than offsets any benefit that Powerco receives from the favourable season profile of its revenue. Thus, the Commission's justification for the idiosyncratic assumption about the timing of taxation payments is without basis.

#### **TIMING OF POWERCO'S CASH FLOW GENERALLY**

The above analysis suggests that even assuming that revenue is received at the midpoint of the year – that is, after the Commission's financial model is changed to assume that taxation is paid at the midpoint of the year, along with other expenses – will generate prices that understate the true cost of providing distribution services. This is because Powerco's revenue is materially less valuable than if it was received at the midpoint of the year (as the Commission has done).

The analysis described above can be extended to include more realistic assumptions about the timing of expenses (as well as revenue) during the relevant year, and thus testing more

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<sup>8</sup> This analysis follows a method set out in a report that I prepared (while with my previous employer) for the Australian Competition and Consumer Commission: Allen Consulting Group, 2003, Working capital – relevance for reference tariffs, Report to the Australian Competition and Consumer Commission, August.

<sup>9</sup> This value has been calculated by discounting the revenue receipts on a daily basis, with the daily WACC calculated as:  $(1 + 8.77\%)^{1/366} - 1$ , or 0.02 per cent, noting that 2012 is a leap year.

<sup>10</sup> In fact, the favourable season profile of revenue is relatively unimportant – if revenue was created at a constant rate but in arrears, the value of the \$100 of revenue would be \$95.1, so that the favourable season profile only raises the value of revenue by approximately 0.1 percentage points, whereas billing in arrears, all else constant, reduces the value of revenue by 0.8 percentage points.



generally the precision of the calculation of the price controls. I have undertaken this analysis using the following timing assumptions:

**Table 3**  
**Assumptions about timing of all cash flow**

Revenue		Opex		Capex		Taxation		Opening RAB		Closing RAB	
Date	Share	Date	Share	Date	Share	Date	Share	Date	Share	Date	Share
20-May-11	7.91%	20-May-11	8.20%	20-May-11	8.20%	28-Jun-11	16.67%	1-Apr-11	100.00%	31-Mar-12	100.00%
20-Jun-11	8.59%	20-Jun-11	8.47%	20-Jun-11	8.47%	28-Aug-11	16.67%				
20-Jul-11	8.87%	20-Jul-11	8.20%	20-Jul-11	8.20%	28-Oct-11	16.67%				
20-Aug-11	9.32%	20-Aug-11	8.47%	20-Aug-11	8.47%	15-Jan-12	16.67%				
20-Sep-11	9.45%	20-Sep-11	8.47%	20-Sep-11	8.47%	28-Feb-12	16.67%				
20-Oct-11	8.71%	20-Oct-11	8.20%	20-Oct-11	8.20%	7-May-12	16.67%				
20-Nov-11	8.38%	20-Nov-11	8.47%	20-Nov-11	8.47%						
20-Dec-11	7.91%	20-Dec-11	8.20%	20-Dec-11	8.20%						
20-Jan-12	7.84%	20-Jan-12	8.47%	20-Jan-12	8.47%						
20-Feb-12	7.77%	20-Feb-12	8.47%	20-Feb-12	8.47%						
20-Mar-12	7.39%	20-Mar-12	7.92%	20-Mar-12	7.92%						
20-Apr-12	7.85%	20-Apr-12	8.47%	20-Apr-12	8.47%						

The assumption about the timing of revenue is the same as described above. Operating and capital expenditure are also assumed to be billed in arrears (this time favourable to Powerco) and paid on the 20<sup>th</sup> of the following month, and the timing of taxation reflects one of the options actually available to large firms. Lastly, the opening and closing RABs are assumed to be cash flows at the start (negative) and end (positive) of the relevant year.

Given these assumptions about the timing of revenue and expenditure (including the RAB), a 'precise' target revenue can be calculated, being the revenue that ensures that the present value of benefits (revenue and the closing RAB) is exactly equal to the present value of costs (including the opening RAB). The results of this calculation using the figures for 2011/12 (as set out in the Commission's July 2011 Po model) are set out in Table 4.

**Table 4**  
**Revenue requirement assuming the actual timing of cash flow**

	Revenue	Opex	Capex	Tax *	Opening RAB + DTB	Closing RAB + DTB	Net Cash Flow
<b>Annual amount</b>	214,222	58,573	68,894	13,350	1,335,267	1,376,081	1,449,486
<b>NPV</b>	204,027	55,725	65,545	12,620	1,335,267	1,265,130	0

\* The tax payment assumes the mid-year timing of cash flow (Equation 3 from Appendix A). No account is taken of the fact that the increment to revenue would also imply an increment to taxation

Table 5 compares the results from the calculation described above to the Commission's target revenue calculation for 2011/12, as well as to the target revenue that would result if the Commission's formula was modified so that taxation was assumed to be paid at the midpoint of the year. The formulae that were used for these calculations are set out in Appendix A.



**Table 5**  
**Required revenue for actual timing compared to the Commission's formula**

	<i>Target Revenue</i>	<i>Difference</i>
Required Revenue	214,222	
Commission's Calculation	213,287	-0.44%
Mid year revenue and expenses	213,955	-0.12%

The results in this table imply that:

- The Commission's target revenue formula (i.e., with the idiosyncratic assumption about taxation) understates the true cost of service by approximately 0.44 per cent; and
- Even if the Commission was to adopt a revised target revenue formula that assumed all expenses (and revenue) occurred at the midpoint of the year, then an increment to revenue would be required to compensate properly for the actual financing costs incurred of approximately 0.12 per cent of revenue (this allowance is in the nature of a return on working capital).

Lastly, I observe that there are conservative elements to these timing assumptions. I noted above that the 'wash up' process tends (on average) to lead to Powerco recovering part of its revenue later than assumed above. In addition, I understand that Powerco tends to commission more than half its capital expenditure in the first half of the April-to-March year.

## **2.2 Inflation issues**

### Introduction

In my letter of 13 May 2011,<sup>11</sup> I addressed in detail two inflation-related issues. The first related to how inflation should be forecast over the regulatory period. The second addressed the importance of how inflation is applied in financial modelling, setting and price controls and measuring profit to ensure that the main objective of inflation indexation is met – which is to provide investors with the same real return, irrespective of the actual rate of inflation.

In the discussion below, I address again these issues briefly and point out first where I consider the Commission's method for forecasting inflation to be inappropriate, and secondly where I consider that the Commission's method for setting the price control will result in the EDBs inappropriately bearing inflation risk.

In addition, I address two further issues, namely:

- The Commission's use of different annual forecasts of inflation in its financial modelling (which is a change from its previous approach); and

<sup>11</sup> PricewaterhouseCoopers (Balchin, J.), 2011, 2010-15 Default price-quality path starting price adjustments update paper: Importance of the forecast of inflation, May.



- The question of whether or not the one-off impact on inflation arising from the change in the GST rate should be removed from prices and asset revaluations.

#### Method for forecasting inflation

The Commission's September 2009 forecast of inflation uses the Reserve Bank of New Zealand's explicit forecast of inflation for the period that those forecasts exist, and then extends that series to the required five and a half year period by assuming that the Bank's explicit forecast for the last year continues thereafter. The Bank's September 2009 explicit forecasts extended only to the March 2012 quarter, and so the Commission's simple proxy (i.e., extending the last year of the Bank's forecast into the future) accounts for 2.5 years out of the 5 years for which an inflation forecast is required.<sup>12</sup>

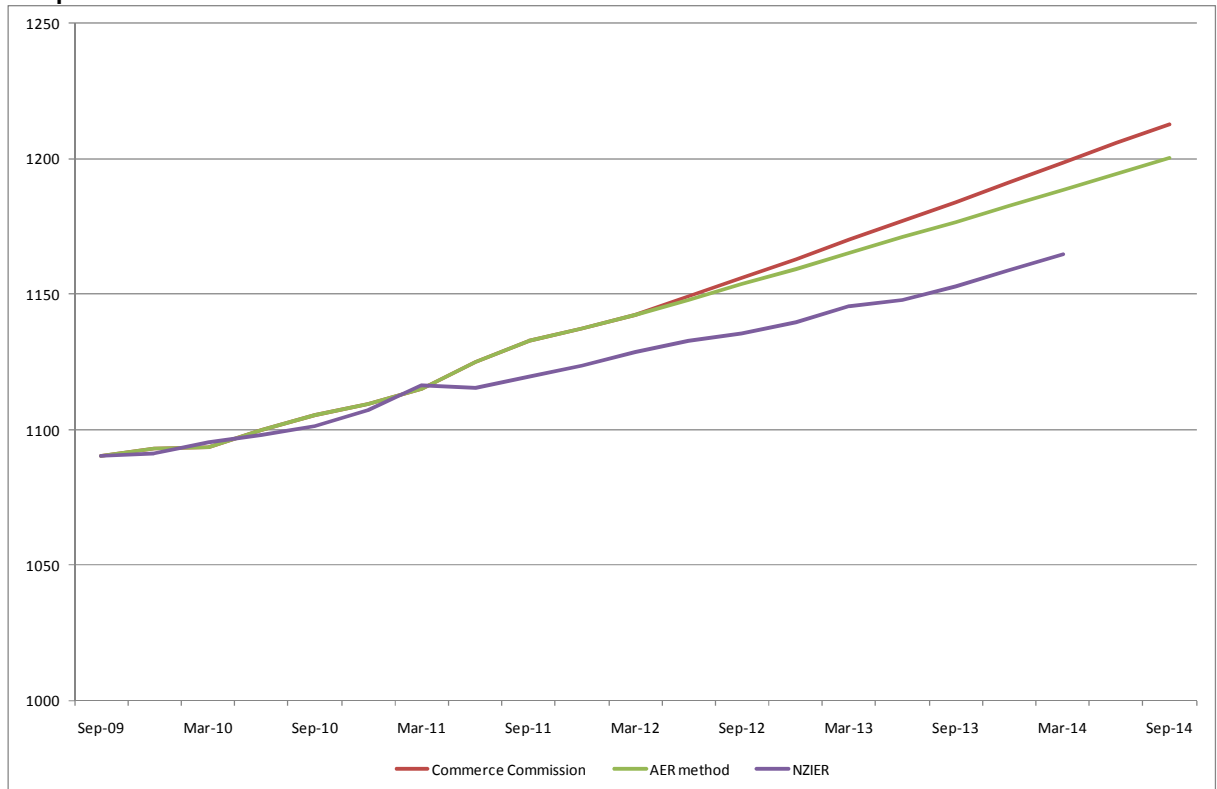
As I pointed out in my earlier advice, there is no sound basis for assuming that the last year of the Reserve Bank of New Zealand's explicit forecast of inflation was in fact a long term forecast. The Bank does not hold its forecast out as such and, as I pointed out earlier, the Bank's forecasts vary substantially from quarter to quarter, implying that the forecasts themselves have the appearance of being short term forecasts only. In that earlier letter, I advocated using the Bank's explicit forecasts for the period for which they are available, and then using the midpoint of the Bank's target range for the period thereafter. I noted that this is the standard approach to forecasting inflation for regulatory purposes in Australia and that, given the similarity in the roles and functions of the two central banks, the same forecasting method would be equally applicable in the equivalent context in New Zealand.

Since that time I have obtained the NZIER inflation forecasts that were made in September 2009 (like the Reserve Bank of New Zealand forecasts, the NZIER forecasts commence from the June 2009 actual inflation index). Figure 1 shows NZIER's explicit forecasts of inflation to the Banks, and to the different methods of extrapolating those figures (being the Commission's and the approach that I have advocated).

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<sup>12</sup> Note that the requirement is for the inflation forecast to match the term of the risk free rate of return that is employed, which implies five years from September 2009.

**Figure 1**  
**Comparison of inflation forecasts**



Note: NZIER forecasts have been rebased to provide the same starting point as the Reserve Bank of New Zealand in September 2009. NZIER's inflation forecast for the September 2009 quarter was -0.9 per cent, compared to the Bank's forecast of 0.85 per cent.

Two observations can be made from this comparison.

- First, the NZIER explicit forecasts extend much further than those of the Bank's – ending with the March 2014 quarter (four and a half years) compared to the Banks that end with the March 2012 index.
- Secondly, NZIER's forecasts were also substantially lower than the Banks, especially after the March 2011 quarter. I note in particular that while the Commission has assumed an inflation rate of 2.43 per cent for the years to March 2013 and 2014 (and I have advocated 2 per cent as the midpoint of the Bank's target range), NZIER has forecast 1.52 and 1.67 per cent.

I note that a strong argument can be made on consistency grounds for using the NZIER forecasts for inflation – after all the Commission has used the lower NZIER forecasts when forecasting the change in EDBs' unit costs (in which case a low inflation forecast is



detrimental to the EDBs),<sup>13</sup> but has used the higher Reserve Bank of New Zealand forecasts in this case where a high inflation forecast is detrimental to the EDBs. However, in any event, the NZIER forecasts demonstrate that the Bank's forecasts were high compared to other professional forecasters at the time, and provide a case against extending the Bank's very high forecast of inflation for the year to March 2012 for the remaining two and a half years as the Commission has done.

#### Preserving the real rate of return – adjusting for actual inflation to date

As I noted in my earlier advice, the objective of indexing revenue and asset values is to protect asset owners against inflation. This requires prices be set such that an asset owner would receive the target *real return* plus *actual inflation*. The corollary of this is that the nominal return must be permitted to rise and fall depending on how actual inflation compares to the inflation that was embedded in the WACC.

Where price controls are set, it is not unusual for financial modelling to be undertaken in nominal terms, which embeds within it a forecast of inflation. However, the actual control that applies during the year is escalated for actual inflation – this process has the effect of adjusting for the difference between forecast and actual inflation, thus preserving the objective noted above.

However, in the current matter, the Commission has set price controls that commence a number of years into what would normally be the regulatory period, with the starting control being based upon a fixed (nominal) target for revenue in 2012/13. This revenue amount is based upon the original forecasts of inflation over 2009/10, 2010/11 and 2011/12 rather than the actual inflation over these periods. For the years thereafter, the price control is escalated for a measure of actual inflation, and so the implicit adjustment for the difference between forecast and actual inflation is being made.

The absence of an adjustment for the difference between forecast and actual inflation means that a constant nominal return – rather than a constant real return – is being factored into prices.<sup>14</sup> In this case, I note that actual inflation over 2009/10 and 2010/11 (that is, the change in the CPI between the start and end of the year, assuming that the Commission's GST adjustment is appropriate) was 2.05 per cent and 2.42 per cent, which compares to the September 2009 forecasts of 1.72 per cent and 1.98 per cent. An adjustment should be made to the extent possible for the observed difference between forecast and actual inflation prior to the commencement of the new price controls.

#### Use of different annual inflation forecasts

The Commission's new financial model uses a different rate of inflation for each year of the regulatory period, with these rates being materially different – ranging from 1.72 per cent for

<sup>13</sup> I assume here that there is a relationship between output price indices and input price indices (which exists unless large changes in productivity are forecast).

<sup>14</sup> I observe that this shortcoming will only apply during the regulatory period. Under the Input Methodologies, the regulatory asset base will be updated for actual inflation for future price reviews.



the year to March 2010 to 2.43 per cent for the years to March 2012, 2013, 2015 and 2015. This is a change to the financial model that the Commission previously released, which used a constant inflation forecast input (calculated as the geometric average of the five years of inflation forecasts).

Importantly, the objective behind the inflation forecast that is used in the financial modelling is to use a figure that as closely as possibly mirrors the forecast of inflation that was built into the regulatory WACC (and in turn, reflected in the nominal risk free rate of return). Adopting such a forecast ensures that the price controls deliver the same real rate of return that investors expected at the time the WACC was determined. Indexing for actual inflation after that time then ensures that the nominal returns achieve the target real return.

The implication of using different annual rates of inflation in the financial modelling as the Commission now has done is that the assumed real risk free rate of return and real WACC are assumed to fluctuate substantially over the period. However, there is no rationale for such an assumption.

With respect to the risk free rate that is used in the WACC, the interest rates on the bonds that the Commission observed show only the *cumulative nominal return* that investors could have earned from the risk free asset in September 2009. After deducting the investors' expectations of *cumulative inflation* over the same period, this provides an estimate of the *cumulative real rate of return* on a risk free asset that investors would have expected at that time. The evidence the Commission has considered does not allow it to infer that the expected real rate of return would have been expected to fluctuate materially over the period. The more reasonable assumption is that the expected real rate of return was constant, which is achieved by using a constant forecast of inflation. In turn, this should be determined as the geometric average of the annual rates over the five years from September 2009.

I note that the AER's standard practice is to use a constant forecast of inflation in its financial modelling.

#### Removal of the GST-related change in inflation

The Commission has removed the one-off increase in inflation arising from the change in the GST rate from being incorporated into prices and asset revaluations. This change has not been accompanied with any analysis of the merits of this adjustment.

While I note that the matter is complex, it is far from clear that the one-off increase in inflation should be removed in this manner.

The Commission has advocated during its consultation over the Input Methodologies that an objective of how the Commission intends to carry forward the regulatory asset base and set price controls is to achieve 'financial capital maintenance'. All parties have accepted, amongst other things, that this requires revaluations to be treated as income (that is, once the starting point for the regime has been determined).



However, financial capital maintenance also implies that the financial value of investments should be preserved when adverse events occur. In the case of the change in the GST rate, if the one-off increase in inflation is not passed through into prices and asset values, then the real value of the dividends generated by the regulated assets (that is, in terms of the goods and services that investors may purchase with those dividends) would have fallen. As a consequence, financial capital maintenance would not be maintained.

While the Commission may consider there to be policy reasons for denying the pass through, it is important for the issue to be analysed carefully against the purpose statement and the key principles the Commission has developed, most notably the important objective of financial capital maintenance.

### **2.3 Adjusting the regulatory asset base**

There are four separate elements to the Commission's method for adjusting the regulatory asset base over the regulatory period that are inappropriate, with all except one of the matters implying an assumption about the timing of cash flow within a year that is not consistent with the timing assumptions the Commission has made when deriving target revenue.

It is also noted that, at least in an *ex ante* sense, all of these matters affect the timing of cash flow rather than the value of cash flow (on the assumption that all of the regulatory inputs are correct).

#### *Depreciation is set in beginning of the year dollars*

The Commission calculates the depreciation allowance by applying a remaining life to the regulatory asset base at the beginning of the year. This calculation implies that no inflation is applied to depreciation within each year, implying in turn that this component of revenue is assumed to be received at the start of the year.

However, the Commission's target revenue formula assumes implicitly that the depreciation allowance is specified in end of year terms. As shown in Appendix A, the target revenue formula the Commission has employed commences with a target revenue formula that assumes that all revenue is received at the end of the year, and then discounts this by six months (at the WACC) to reflect its view that revenue is received at the midpoint of the year. Accordingly, calculating depreciation 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.

This is remedied quite simply by adding a year of inflation to the depreciation allowance in each year. It is noted that the additional depreciation allowance that is factored into prices would have a corresponding impact on the regulatory asset base.



### Static remaining lives of assets

The Commission has applied a static remaining life for existing assets, whereas the remaining life of each asset will decline by a year, each year. Accordingly, the Commission's method would understate what would be a normal calculation of straight line depreciation. The calculation would also appear to be inconsistent with the requirements of the Input Methodologies, as the term 'remaining asset life', which feeds into the calculation of depreciation, is defined in a manner that envisages the life being re-determined each year.<sup>15</sup>

**remaining asset life** means term remaining of an asset's **asset life** at the commencement of the **disclosure year** in question

This matter can be remedied within the Commission's simplified calculation by reducing the starting remaining asset life by one year each year.

In addition, it is also noted that the Commission has applied the weighted average life for existing assets to capital expenditure, which would be expected to have a longer remaining life (being new). A standard calculation of depreciation would imply depreciating new assets according to their expected lives.

### No depreciation on capital expenditure during the year

The Commission has commenced the depreciation of capital expenditure from the commencement of the year after the relevant projects would have commenced operation.

However, the Commission's target revenue formula assumes implicitly that capital projects enter into service evenly over the year. Consistency with this timing assumption implies would imply applying half a year of depreciation for the projects that commence within a particular year.

Adjusting for this matter requires only that half a year of depreciation be attributed to capital expenditure in the year that it enters into service.

### No inflation escalation applied to capital expenditure during the year

Equally, the Commission's model does not escalate capital expenditure for inflation in the year in which projects commence.

Again, given the Commission's assumption that projects are commencing over the course of the year, consistency again would imply that the regulatory asset base 'roll-forward' calculation would include half year of inflation indexation for the projects that commence within a particular year. It is noted that this escalation would be classified as a revaluation gain and treated accordingly in the calculation of target revenue.

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<sup>15</sup> Input Methodologies, Part 1.



\* \* \*

Should you wish to discuss this note in any way, please do not hesitate to contact me on +61 3 8603 4973.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Jeff Balchin', written in a cursive style.

Jeff Balchin  
**Principal**

## **Target Revenue Formulae**

This appendix sets out the formulae for the target revenue under different assumptions about the timing of cash flows within a year. The formulae are asserted and then demonstrated with a simple example. Mathematical derivations can be provided on request.

### **A. Different formulae**

The five different formulae for deriving the target revenue that have been referred to in this report or in other Commission documents – and the assumptions that each makes about the timing of cash flow within a year – are as follows:

#### ***Equation 1: Revenue and all expenses are incurred at the end of the year:***

$$TR = r \cdot OAV + Dep + Def Tax - Reval + TCSD + O\&M + Tax Pay$$

$$Tax Pay = (PTR - Deductions) \frac{T}{1 - T}$$

where the inputs are as follows:

- $TR$  = target revenue;
- $r$  = nominal weighted average cost of capital (vanilla post tax);
- $OAV$  = opening asset value (RAB + Opening Deferred Tax Balance)
- $Dep$  = depreciation
- $Def Tax$  = change in the deferred tax balance (= tax expense – tax payable)
- $Reval$  = revaluation gain over the year
- $TCSD$  = term credit spread differential
- $O\&M$  = operating and maintenance expenses
- $Tax Pay$  = tax payable
- $PTR$  = post tax revenue (that is, sum of the target revenue elements apart from the allowance for tax)
- $Deductions$  = tax deductions, comprising operating and maintenance, interest and tax depreciation
- $T$  = corporate tax rate.

Note that the ‘term credit spread differential’ is an additional interest payment that has been calculated using an interest rate that is expressed as an effective annual rate. Accordingly,



the TCSD is *always* assumed to be paid at the end of the year (which is consistent with the Commission's approach).

**Equation 2: Revenue and all expenses are incurred at the end of the year, except capital expenditure, which is incurred at the midpoint of the year:**

$$TR = r.OAV + ([1 + r]^{1/2} - 1).Capex + Dep + Def Tax + TCSD - Reval + O\&M + Tax Pay$$

where *Capex* is capital expenditure.

The term that is applied to the capital expenditure is *almost* equal to half of the annual WACC. Using the Commission's WACC, this allowance equates to 4.29 per cent, whereas half of the WACC is 4.39 per cent.

**Equation 3: Revenue and all expenses are incurred at the midpoint of the year, including taxation (the midpoint formula):**

$$TR = \frac{r.OAV + ([1 + r]^{1/2} - 1).Capex + Dep + Def Tax + TCSD - Reval}{(1 + r)^{1/2}} + O\&M + Tax Pay$$

where all of the terms are defined as above.

**Equation 4: Revenue and all expenses are incurred at the midpoint of the year, except taxation, which is incurred at the end of the year (almost identical to the Commission's formula):**

$$TR = \frac{r.OAV + ([1 + r]^{1/2} - 1).Capex + Dep + Def Tax + TCSD - Reval}{(1 + r)^{1/2}} + O\&M + Tax Allow$$

$$Tax Allow = \frac{(PTR - Deductions) \cdot \frac{T}{(1 + r)^{1/2}}}{1 - \frac{T}{(1 + r)^{1/2}}}$$

where *Tax Allow* is the allowance for taxation. Note that the allowance for taxation is different to tax payable – as tax is assumed to be paid after revenue is received, the allowance is discounted to reflect the timing benefit that is assumed to be received.

**Equation 5: The Commission's actual formula**

$$TR = \frac{r.OAV + \frac{r}{2}.Capex + Dep + Def Tax + TCSD - Reval}{(1 + r)^{1/2}} + O\&M + Tax Allow$$



$$Tax Allow = \frac{(PTR - Deductions) \cdot \frac{T}{(1+r)^{1/2}}}{1 - \frac{T}{(1+r)^{1/2}}}$$

The only difference between this equation and Equation 4 is the return that is provided on capital expenditure within the year – half of WACC is applied in the Commission’s formula (4.39 per cent), whereas Equation 4 applies a return of  $[1 + r]^{1/2} - 1$ , or 4.29 per cent.

## **B. Demonstration of the different formulae**

Figure A.1 provides the output of an Excel spreadsheet that demonstrates the application of each of these formulae. This demonstration uses the actual inputs that were contained in the Commission’s July 2011 spreadsheet for Powerco so that comparisons can be made directly to the Commission’s calculations, including that Equation 5 set out above delivers the same result as that produced by the Commission. Nothing further should be inferred from the use of the Commission’s figures.

The four sections of the model and the main findings are as follows:

- Section 1 contains the inputs to the calculations, which can be traced to the Commission’s July 2011 model;
- Section 2 shows the target revenue that is derived for 2012/13 to 2014/15 for each of the five equations above using those inputs.
- Section 3 then demonstrates that Equations 1 to 4 deliver a net present value of cash flow of zero over the three years given the timing assumptions that were made when deriving the formula and the inputs themselves. Equation 5 has been omitted because it is a close proxy for Equation 4. All of the equations deliver an NPV=0 and hence correctly reflect the timing assumptions assumed in their derivation.
- Section 4 shows how the ‘smoothed’ revenue for 2012/13 would be calculated given the Commission’s growth assumptions. This section also seeks to demonstrate that when a ‘smoothed’ revenue stream (which is a smooth revenue stream that has the same present value as the target revenue) it does not matter whether revenue is assumed to be received at the end of the year or at the midpoint – all that matters is that the same assumption is applied to the two revenue streams. Lastly, this section also shows that Equation 5 as set out above delivers the same result as the Commission’s calculations – this is seen by comparing the 2012/13 revenue (\$220.935 million, rows 98 or 110) to the equivalent figure obtained by the Commission (the same result, EDB19 sheet, cell O77).



**Figure A1**  
**Test of the target revenue formulae**

[1]	<b>1. Inputs</b>						
[2]							
[3]	WACC		8.77%				
[4]	Company tax rate		28%				
[5]							
[6]	<b>Year</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>
[7]							
[8]	Opening RAB	1,276,926	1,307,367	1,345,904	1,392,254	1,440,467	1,489,011
[9]	Capital expenditure	63,656	66,355	68,894	71,636	72,779	74,138
[10]	Depreciation	52,469	53,720	55,303	57,208	59,189	61,183
[11]	Disposals	12,223	-	-	-	-	-
[12]	Revaluation	31,477	25,902	32,759	33,784	34,954	36,132
[13]	Closing RAB	1,307,367	1,345,904	1,392,254	1,440,467	1,489,011	1,538,098
[14]							
[15]	Opening deferred tax balance	-	(5,069)	(10,637)	(16,173)	(21,691)	(27,207)
[16]	Increase in deferred tax (tax expense - tax payable)	5,069	5,568	5,536	5,518	5,515	5,515
[17]	Closing deferred tax balance	(5,069)	(10,637)	(16,173)	(21,691)	(27,207)	(32,722)
[18]							
[19]	Opening asset value (RAB + DTB)	1,276,926	1,302,298	1,335,267	1,376,081	1,418,776	1,461,805
[20]	Closing asset value (RAB + DTB)	1,302,298	1,335,267	1,376,081	1,418,776	1,461,805	1,505,376
[21]							
[22]	Operating expenditure	54,295	56,433	58,573	61,173	64,799	66,790
[23]	TCSD	(10)	(10)	(11)	(11)	(11)	(12)
[24]	Tax depreciation	59,202	59,485	59,923	60,493	61,202	61,939
[25]	Interest	45,452	46,597	47,792	49,264	50,774	52,299
[26]	<i>Total tax deductions</i>	<i>158,939</i>	<i>162,506</i>	<i>166,277</i>	<i>170,919</i>	<i>176,764</i>	<i>181,016</i>
[27]							
[28]	<b>2. Target revenue formulae</b>						
[29]							
[30]	<i>Formula 1</i>						
[31]	Post tax revenue	192,333	204,020	203,745	210,786	218,964	225,545
[32]	Tax payable	12,987	16,145	14,571	15,504	16,411	17,317
[33]	<b>Target revenue</b>	<b>205,320</b>	<b>220,165</b>	<b>218,316</b>	<b>226,290</b>	<b>235,376</b>	<b>242,862</b>
[34]							
[35]	<i>Formula 2</i>						
[36]	Post tax revenue	195,066	206,869	206,703	213,862	222,089	228,728
[37]	Tax payable	14,049	17,252	15,721	16,700	17,626	18,555
[38]	<b>Target revenue</b>	<b>209,115</b>	<b>224,121</b>	<b>222,424</b>	<b>230,561</b>	<b>239,715</b>	<b>247,282</b>
[39]							
[40]	<i>Formula 3</i>						
[41]	Post tax revenue	189,271	200,677	200,605	207,577	215,614	222,062
[42]	Tax payable	11,796	14,844	13,350	14,256	15,109	15,962
[43]	<b>Target revenue</b>	<b>201,067</b>	<b>215,521</b>	<b>213,955</b>	<b>221,832</b>	<b>230,723</b>	<b>238,025</b>
[44]							
[45]	<i>Formula 4</i>						
[46]	Post tax revenue	189,271	200,677	200,605	207,577	215,614	222,062
[47]	Tax allowance (discounted tax payable)	11,132	14,009	12,599	13,453	14,258	15,064
[48]	<i>Tax payable (used in NPV demonstration below)</i>	<i>11,610</i>	<i>14,610</i>	<i>13,140</i>	<i>14,031</i>	<i>14,871</i>	<i>15,711</i>
[49]	<b>Target revenue</b>	<b>200,404</b>	<b>214,686</b>	<b>213,204</b>	<b>221,030</b>	<b>229,873</b>	<b>237,126</b>
[50]							
[51]	<i>Formula 5</i>						
[52]	Post tax revenue	189,328	200,735	200,666	207,640	215,679	222,128
[53]	Tax allowance (discounted tax payable)	11,153	14,030	12,621	13,477	14,282	15,088
[54]	<b>Target revenue</b>	<b>200,480</b>	<b>214,766</b>	<b>213,287</b>	<b>221,117</b>	<b>229,961</b>	<b>237,216</b>
[55]							



[56] **3. Demonstration of NPV=0 (using 2012/13 to 2014/15)**

[57]		1	2	3
[58]	Discount factor - start of year cash flow	1.000	0.919	0.845
[59]	Discount factor - mid year cash flow	0.959	0.882	0.810
[60]	Discount factor - end of year cash flow	0.919	0.845	0.777
[61]				
[62]	<i>Formula 1</i>			
[63]	Start of year cash flow (opening AV)	(1,376,081)		
[64]	Mid year cash flow			
[65]	End of year cash flow (rev, opex, capex, tax, TCSD, closing AV)	77,988	81,398	1,590,005
[66]	<b>NPV</b>	<b>0</b>		
[67]				
[68]	<i>Formula 2</i>			
[69]	Start of year cash flow (opening AV)	(1,376,081)		
[70]	Mid year cash flow (capex)	(71,636)	(72,779)	(74,138)
[71]	End of year cash flow (rev, opex, tax, TCSD, closing AV)	152,700	157,301	1,667,325
[72]	<b>NPV</b>	<b>0</b>		
[73]				
[74]	<i>Formula 3</i>			
[75]	Start of year cash flow (opening AV)	(1,376,081)		
[76]	Mid year cash flow (rev, opex, capex, tax )	74,767	78,037	81,134
[77]	End of year cash flow (TCSD, closing AV)	11	11	1,505,388
[78]	<b>NPV</b>	<b>0</b>		
[79]				
[80]	<i>Formula 4</i>			
[81]	Start of year cash flow (opening AV)	(1,376,081)		
[82]	Mid year cash flow (rev, opex, capex )	88,221	92,295	96,198
[83]	End of year cash flow (TCSD, tax, closing AV)	(14,020)	(14,859)	1,489,677
[84]	<b>NPV</b>	<b>0</b>		

[85]

[86] **4. Setting 2012/13 Revenue**

[87]				
[88]	<i>Discounting growth and revenue to mid-year</i>			
[89]				
[90]	Growth factor		1.000	1.038
[91]	NPV growth factor (discounted to mid year)	2.75		1.077
[92]				
[93]		<i>Revenue (NPV to mid year)</i>		<i>2012/13 Revenue</i>
[94]	Formula 1	621,294		226,143
[95]	Formula 2	632,797		230,330
[96]	Formula 3	608,998		221,668
[97]	Formula 4	606,751		220,850
[98]	Formula 5	606,984		220,935
[99]				
[100]	<i>Discounting growth and revenue to end of year</i>			
[101]				
[102]	Growth factor		1.000	1.038
[103]	NPV growth factor (discounted to end of year)	2.63		1.077
[104]				
[105]		<i>Revenue (NPV to end of year)</i>		<i>2012/13 Revenue</i>
[106]	Formula 1	595,721		226,143
[107]	Formula 2	606,750		230,330
[108]	Formula 3	583,930		221,668
[109]	Formula 4	581,776		220,850
[110]	Formula 5	582,000		220,935