



**Performance Based Regulation of
Privately Owned Electricity Distribution Utilities**

**PRELIMINARY CALCULATION OF THE REGULATORY
WEIGHTED AVERAGE COST OF CAPITAL THAT WOULD
APPLY DURING THE SECOND REGULATORY PERIOD**

July 26, 2006

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1. INTRODUCTION

Clause 4.11 of the Distribution Wheeling Rate Guidelines (DWRG)¹ issued by the Energy Regulatory Commission (ERC), describes the calculation of the regulatory weighted average cost of capital (WACC) that will apply for the Second Regulatory Period. During consultation on the Issues Paper for the Second Regulatory Period² and as described in section 4.3 of the subsequent Position Paper³, it was noted by the ERC that a preliminary regulatory WACC would be calculated and communicated to the privately owned Distribution Utilities (the Regulated Entities) by May 31, 2006.

As the ERC was consulting on the setting of the WACC for TransCo under Performance Based Regulation at the time of the publication of the Issues Paper, and intended to adapt a similar methodology for the setting of the WACC for Regulated Entities, it did not invite consultation on the latter parameter at that stage.

Following its final determination of the regulatory WACC that will apply to TransCo, the ERC confirms its decision to adopt a similar approach in setting the WACC for Regulated Entities, modified where appropriate to reflect different asset beta figures and the requirements of the DWRG. This methodology is described below.

1.1 Preliminary calculation of the WACC

To illustrate the application of the methodology discussed below, the ERC prepared a preliminary calculation of the regulatory Vanilla WACC that will apply to Regulated Entities during the Second Regulatory Period. This resulted in a preliminary WACC of 16.07% per annum, as described below.

It is stressed that this is a preliminary and indicative figure only and that no in-depth research had been done on an appropriate asset beta figure for the Regulated Entities. In addition, drawing from the methodology and calculations used to determine the WACC for TransCo, the ERC applied interest rates and inflation rates that were current in January or early February 2006. For its final decision on the WACC, the appropriate beta figures will be more formally researched and current interest and inflation rates (at the time of the decision) will be used.

The preliminary WACC figure is provided to Regulated Entities solely for the following purposes :

- to assist them in understanding the WACC methodology that will be used by the ERC as part its Draft and Final Determinations on the price-caps that will apply to Regulated Entities under Performance Based Regulation; and
- to provide an indicative figure to Regulated Entities that can be used for the purposes of their rate applications under Performance Based Regulation, due on August 31, 2006.

This preliminary figure will not be used in any statutory or rate-setting decision.

¹ ERC document “*Guidelines on the Methodology for Setting Distribution Wheeling Rates : Privately owned Distribution Utilities*”, dated December 10, 2004.

² Published by the ERC on September 30, 2005

³ Published by the ERC on December 9, 2005

1.2 Process going forward

The ERC will finalize the calculation of the regulatory WACC as part of its Draft Determination on the price cap that will apply for the Second Regulatory Period. This Draft Determination is scheduled to be published on February 16, 2007 and will be subjected to a formal public consultation and public hearing process. As part of this consultation and hearing process, submissions will be invited on the regulatory WACC as determined for the Draft Determination.

Based on the outcome of the process, a final decision will be made on the WACC for the Second Regulatory Period, which will be published as part of the ERC's Final Determination on the price-cap for Regulated Entities. The Final Determination is due to be published on May 31, 2007.

2. DETERMINATION OF THE WACC PARAMETERS

2.1 Risk Free Rate in the Philippines

There are a number of ways a risk free rate can be estimated for the Philippines. The two prime ways for purposes of calculating the WACC are as follows:

- through a direct measure using the yields on long dated Philippines Treasury bonds denominated in peso; or
- an indirect measure using yields on long dated USA Treasury bonds denominated in US\$ and adjusting these for the inflation differential and the country risk.

The ERC has used both methods to obtain the most reasonable estimate of the risk free rate for the Philippines. The outcome of each method is discussed in turn.

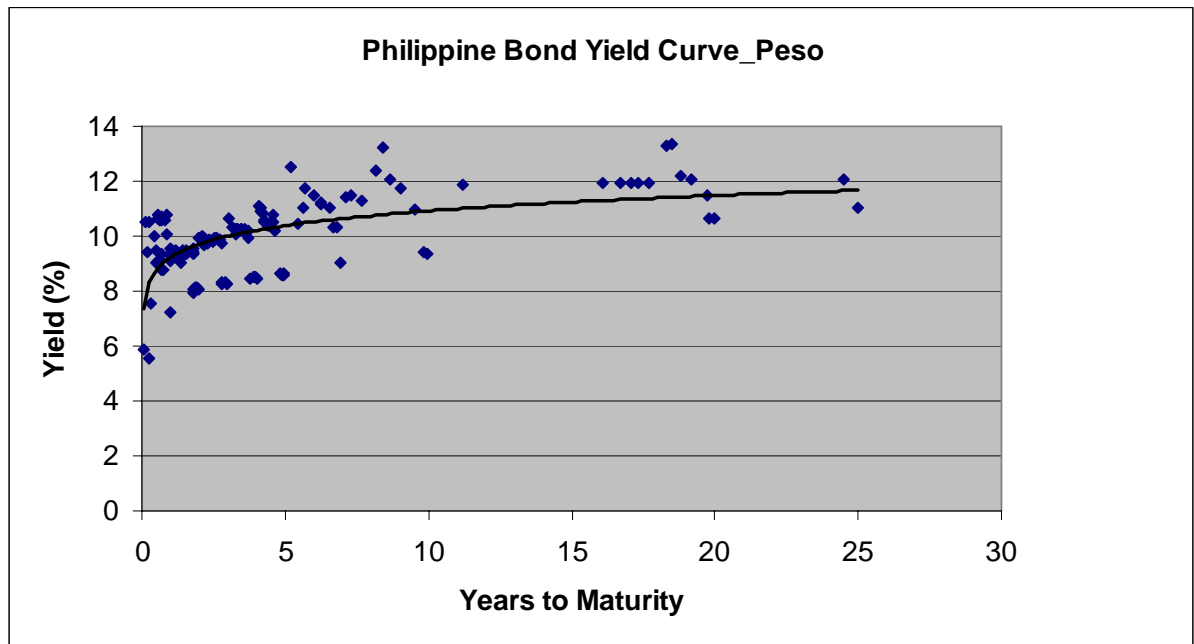
2.1.1 *Direct Measure*

There are two ways of obtaining a direct estimate of the risk free rate in the Philippines to be applied to peso cash flows. These are by looking at the yield curve to find an observed asymptote for long dated Treasury bonds and by looking at the average of the yields over a reasonable number of trading days for Treasury bonds of a particular tenor (usually long dated tenors). These are explored in the following two sections.

(a) **Yield Curve Asymptote**

The ERC sourced the yields of a large number of Philippine Treasury bonds to develop a yield curve. Figure 1 shows the plot of the yield versus the period to maturity. The data shows a normal yield curve, with yields rising with an increased date to maturity.

The data shows a considerable spread of yields at any particular period to maturity which suggests the data is affected by market dynamics or particular bond issuance dates or characteristics, so that the data set is not uniform. The data certainly reflect bonds with variable tenors, but the ERC suspects the differences also arise from the periods at the particular bonds were issued. Indeed the data could easily be drawn from at least three data sets related to tenors of greater than 20 years, 20 years and less than 10 years. Also, the data for the lower yield band is very distinct and suggests these bonds are of a particular characteristic which reduces the observed yield.



Source : Bloomberg, ERC Analysis

Figure 1 : Philippines Treasury Bond Yields (% pa)

Nonetheless, the data can be used to extract average yields of Philippine Treasury bonds around particular maturity dates.

Table 1 provides the data for the average yields from around the three primary dates to maturity of 5, 10 and 20 years, plus and minus one year. As expected the yield rises as the date to maturity increases.

Years to Maturity @ Jan 31, 2006 (years)	Data Points Averaged	Yield (% pa)
5	22	10.45%
10	5	10.68%
20	6	11.32%

Source : Bloomberg, ERC Analysis

Table 1 : Philippines Treasury Bond Yields Sourced from Yield Curve (% pa)

The ERC believes the best estimate of the risk free rate which is derived from this data has a value of 10.68% pa for 10 year tenor bonds, which can be seen to level of the curve of best fit for the available bond yields at this maturity.

(b) Average Yield of Long-Dated Treasury Bonds

The ERC sourced the yields of three Philippines Peso Treasury Bonds from the Bloomberg service. The yields resulting from three bonds with tenors of 5, 10 and 20 years were obtained from an average of the yields over the previous four to five weeks of trading days up to February 6, 2006. As anticipated the yield rises with increased tenor, as indicated in table 2.

Bond Ticker	Tenor (years)	Years to Maturity @ Jan 31, 2006 (years)	Data Averaged to Feb 6, 2006 (days)	Yield (% pa)
EC3217949 Corp	5	4.9	26	8.79%
EF2372235 Corp	10	9.9	19	9.53%
EC3137659 Corp	20	19.8	26	11.40%

Source : Bloomberg, February 6, 2006

Table 2 : Philippines Peso Treasury Bond Yields

Section 4.11.5 of the DWRG indicates that the ERC shall use the yield of a 10 year treasury bill as the risk free rate “unless there is insufficient liquidity, or the time to maturity is too short, for that market yield to be a satisfactory estimate of the risk-free rate”. Table 2 indicates that the time to maturity for these bonds is quite long, so the anticipated drop in yield as maturity is approached should not affect the results.

However, the results are of concern to the ERC. In particular there is a distinct lower yield from the bonds with tenors of both 5 and 10 years. This is evident by examination of the raw data and by comparison of Table 1 and 2. The ERC also notes that these bonds are of very recent issue and is concerned that for such new bonds the lower yields may reflect either economic or trading conditions at the date of issue, or particular contractual obligations associated with these bond issues, and that the yields are therefore not a reasonable measure of the risk free rate.

Thus while preferring a 10 year tenor to represent the bonds to use to estimate the risk free rate, the ERC believes the better estimate of the risk free rate using a direct approach lies somewhere between 9.53% and 11.40% pa from Table 2, being reflective of central point in the long-dated data as seen in Figure 1.

(c) Conclusions on a Direct Measure of Risk Free Rate

From the above discussion, the ERC prefers a measure of 10.68% pa as the risk free rate using a direct measure of the Philippine Treasury bonds yields.

2.1.2 Indirect Measure

The indirect measure of the risk free rate can be estimated using the following formula.

$$r_f = [(1 + r_{f\text{USA}}) / (1 + i_{\text{CPI USA}})] * (1 + i_{\text{CPI}}) * (1 + \text{CRP}) - 1$$

where:

r_f = risk free rate estimated for the Philippines using an indirect method.

$r_{f\text{USA}}$ = risk free rate estimated in the USA using a direct method.

$i_{\text{CPI USA}}$ = inflation rate estimated for the USA.

i_{CPI} = inflation rate estimated for the Philippines.

CRP = country risk premium expected by investors for investing the Philippines, which does not include any adjustment for exchange rate risk.

These inputs are derived and discussed in turn in the following paragraphs.

(a) USA Risk Free Rate

The ERC sourced the yields of three US\$ Treasury Bonds from the Bloomberg service. The yields resulting from three tenors of 5, 10 and 20 years were obtained from an average of the yields over the previous trading days up to February 6, 2006. As anticipated the yield rises with increased tenor.

Bond Ticker	Tenor (years)	Years to Maturity @ Jan 31, 2006 (years)	Data Averaged to Feb 6, 2006 (days)	Yield (% pa)
912828EQ Govt	5	4.9	26	4.38%
912810DT Govt	10	9.8	26	4.47%
912810EV Govt	20	19.5	26	4.66%

Source : Bloomberg, February 6, 2006

Table 3 : US\$ Treasury Bond Yields

A 10 year treasury bond is used as indicated by Section 4.11.5 of the DWRG. Table 3 indicates that the time to maturity for these bonds is quite long, so the anticipated drop in yield as maturity is approached should not affect the results. Also the US bond market is accepted as having strong liquidity in any of these bonds.

The estimate of the USA risk free rate using a direct approach is 4.47% pa.

(b) USA Inflation Rate

The ERC sourced the data for the USA CPI from the Bureau of Labor Statistics in the USA. Table 4 shows the CPI data available to the end of January 2006.

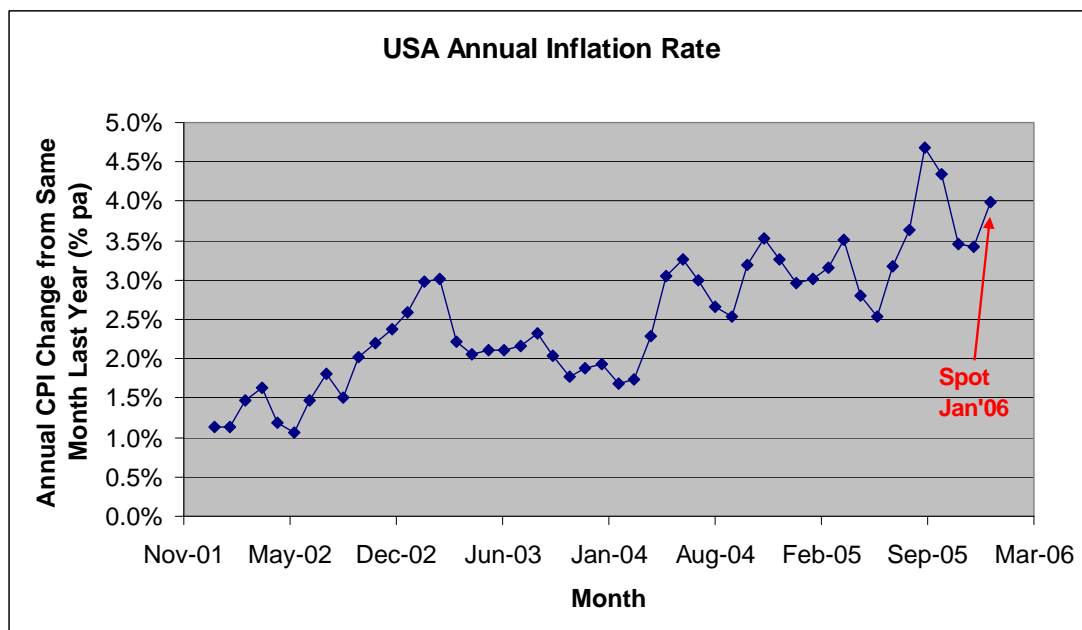
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	HALF1	HALF2
1996	154.4	154.9	155.7	156.3	156.6	156.7	157	157.3	157.8	158.3	158.6	158.6	156.9	155.8	157.9
1997	159.1	159.6	160	160.2	160.1	160.3	160.5	160.8	161.2	161.6	161.5	161.3	160.5	159.9	161.2
1998	161.6	161.9	162.2	162.5	162.8	163	163.2	163.4	163.6	164	164	163.9	163	162.3	163.7
1999	164.3	164.5	165	166.2	166.2	166.2	166.7	167.1	167.9	168.2	168.3	168.3	166.6	165.4	167.8
2000	168.8	169.8	171.2	171.3	171.5	172.4	172.8	172.8	173.7	174	174.1	174	172.2	170.8	173.6
2001	175.1	175.8	176.2	176.9	177.7	178	177.5	177.5	178.3	177.7	177.4	176.7	177.1	176.6	177.5
2002	177.1	177.8	178.8	179.8	179.8	179.9	180.1	180.7	181	181.3	181.3	180.9	179.9	178.9	180.9
2003	181.7	183.1	184.2	183.8	183.5	183.7	183.9	184.6	185.2	185	184.5	184.3	184	183.3	184.6
2004	185.2	186.2	187.4	188	189.1	189.7	189.4	189.5	189.9	190.9	191	190.3	188.9	187.6	190.2
2005	190.7	191.8	193.3	194.6	194.4	194.5	195.4	196.4	198.8	199.2	197.6	196.8	195.3	193.2	197.4
2006	198.3														

Source : www.bls.gov, Series ID CUUR0000SA0, Not seasonally adjusted, US City Average, All Items, 1982-84 = 100.

Table 4 : USA CPI

Figure 2 shows the annual inflation rate on a monthly basis through to end January 2006.

Table 5 indicates the USA inflation rate in % per annum from spot and average data based on this source. The data type used for the USA inflation rate should match the data type used for the Philippines inflation rate for the regulatory WACC estimate.



Source : www.bls.gov, Series ID CUUR0000SA0, ERC Analysis

Figure 2 : USA Inflation Rate (% pa)

Period for Average	Average of Monthly Inflation Rates (% pa)
Spot	3.99%
6 m	3.92%
12 m	3.47%

Source : www.bls.gov, Series ID CUUR0000SA0, ERC Analysis

Table 5 : USA Inflation Rate Averaged to End January 2006

The estimate of the USA inflation rate using a spot measure at end January 2006 is 3.99% pa.

(c) Philippines Inflation Rate

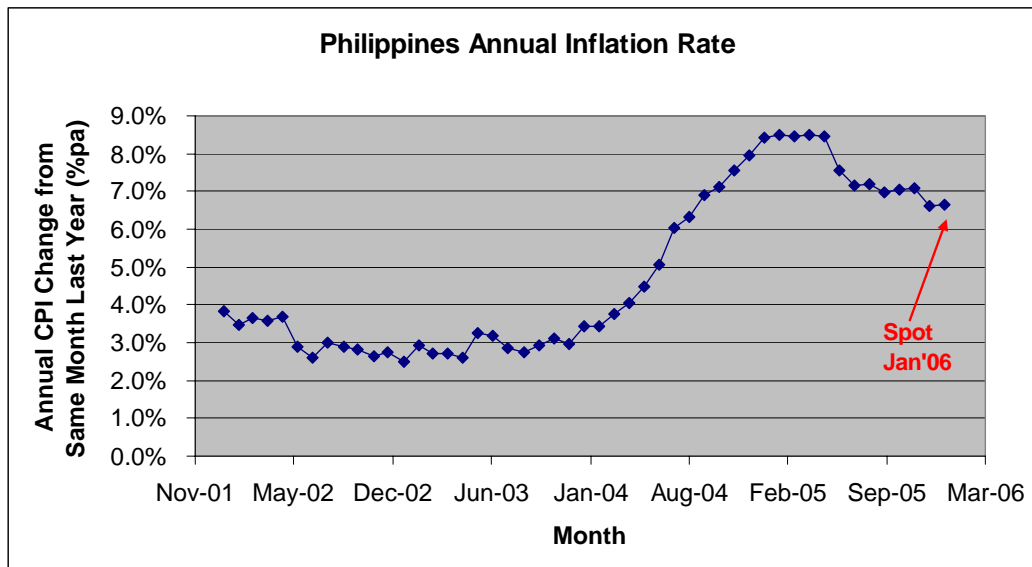
The ERC sourced the data for the Philippines CPI from the National Economic and Development Authority (NEDA) in the Philippines. Table 6 shows the CPI data available to the end of January 2006.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Series
1996	115.1	116	116.4	116.7	117	117.8	118.1	119	118.9	119.1	119.2	119.9	1994=100
1997	121.5	122	122.6	122.8	123	124.5	124.8	125.5	126.6	127.2	130	128.7	1994=100
1998	130.1	131.9	133	133.8	135.4	137.8	138.1	138.8	139.3	140.2	142.3	142.1	1994=100
1999	145	144.9	144.6	144.4	144.4	145.7	146	146.4	147.2	147.7	147.9	148.1	1994=100
2000	165.1	164.8	165.2	165.5	165.9	166.3	166.7	167.6	167.9	167.8	167.9	168.6	1994=100
2001	159.3	159.4	159.8	160	161.6	162.5	162.7	163.2	163.2	163.6	164.1	165.1	1994=100
2002	165.1	164.8	165.2	165.5	165.9	166.3	166.7	167.6	167.9	167.8	167.9	168.6	1994=100
2003	169.2	169.6	169.7	170	170.2	171.7	172	172.4	172.5	172.7	173.1	173.6	1994=100
2004	116.5	116.7	117.1	117.7	118.3	120.3	121.8	122.3	123	123.5	124.5	125.4	2000=100
2005	126.3	126.6	127	127.7	128.3	129.4	130.5	131.1	131.6	132.2	133.3	133.7	2000=100
2006	134.7												2000=100

Source : <http://localweb.neda.gov.ph/~ioneda/National/Prices2.html> , EIO Data Base, CPI, All Items, 1994 = 100 and 2000 = 100, ERC Analysis.

Table 6 : Philippines CPI

Figure 3 shows the annual inflation rate on a monthly basis through to end January 2006.



Source : www.neda.gov.ph, CPI, ERC Analysis.

Figure 3 : Philippines Inflation Rate (% pa)

Table 7 indicates the Philippines inflation rate in % per annum from spot and average data based on this source. The data type used for the Philippines inflation rate should match the data type used for the USA inflation rate for the regulatory WACC estimate.

Period for Average	Average of Monthly Inflation Rates (% pa)
Spot	6.65%
6 m	6.93%
12 m	7.51%

Source : www.neda.gov.ph, CPI, ERC Analysis.

Table 7 : Philippines Inflation Rate Averaged to End January 2006

The estimate of the Philippines inflation rate using a spot measure at end January 2006 is 6.65% pa.

(d) Country Risk Premium

There are a number of sources for data on the country risk premium (CRP). These sources of data are explored in the following paragraphs.

(i) Yield Curve Difference

The ERC has sourced Philippine Treasury and corporate bond data for US\$ denominated bonds which are traded in the Philippines. These yields can be compared to the USA Treasury bond data for US\$ denominated bonds traded in the USA. The difference in the yields between these two sets of yield data can be used to infer an estimate of the country risk. This is the premium expected by current investors for investing in the Philippines as opposed to investing in the USA. This CRP excludes a return to compensate for the exchange rate risk of converting peso to US\$, because the bonds are both denominated in US\$.

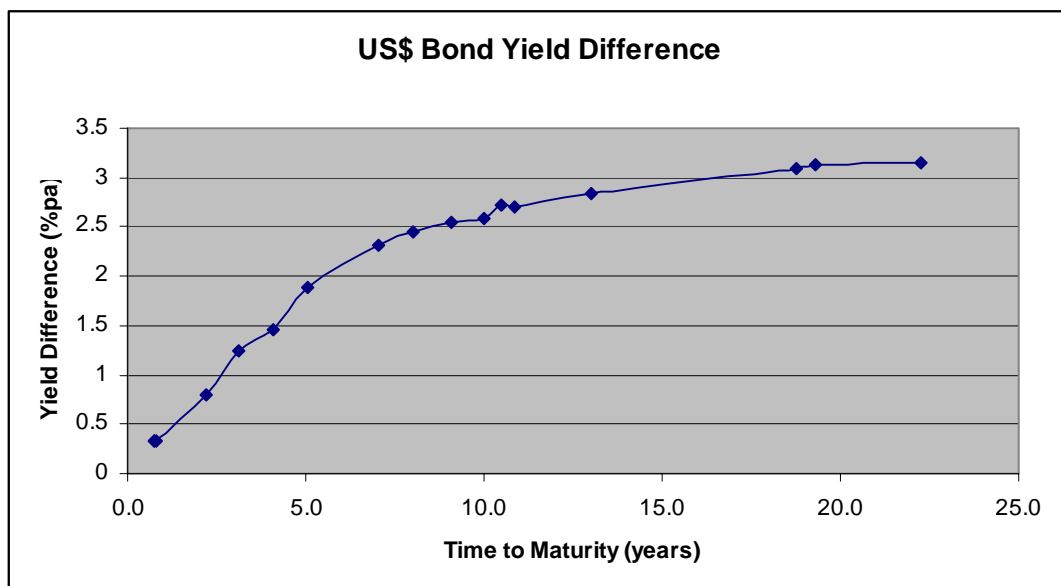
The primary assumption again is that the US\$ denominated bonds in the Philippines have sufficient liquidity that the yields provide a measure of yield from free and open market transactions at any point in time.

The ERC has sourced the data on US\$ bond yields from the Bloomberg data service. Table 8 shows the yield difference between bonds of closely similar times to maturity.

Philippines US\$ Bond Ticker	USA US\$ Bond Ticker	Average Years to Maturity (years)	Yield Difference (%pa)
ED223494 CORP	912828BP Govt	0.8	0.329
ED2234943 corp	9128277F Govt	0.8	0.333
ED2234943 corp	912828DD Govt	0.8	0.322
TT3420581 corp	912828AZ Govt	2.2	0.796
EC5327928 corp	912828CC Govt	3.1	1.25
EC2382587 corp	912828DP Govt	4.1	1.466
ED3287684 corp	9128276T Govt	5.0	1.894
EC7637191 corp	912828AU Govt	7.0	2.31
ED0526993 corp	912828CA Govt	8.0	2.457
ED3739049 corp	912810DP Govt	9.1	2.555
EF0867467 corp	912810DV Govt	10.0	2.595
TT3297781 corp	912810DW Govt	10.5	2.719
EC5050488 corp	912810DX Govt	10.9	2.707
EC0869999 corp	912810EC Govt	13.0	2.836
EC1901817 corp	912810ES Govt	18.8	3.082
EC2382561 corp	912810EV Govt	19.3	3.124
ED7964643 corp	912810EX Govt	22.3	3.15

Source : Bloomberg, ERC Analysis.

**Table 8 : Difference between Philippine and USA
US\$ Denominated Bond Yields**



Source : Bloomberg, ERC Analysis.

Figure 4 : US\$ Bond Yield Difference (% pa)

Figure 4 shows the yield difference plotted against time to maturity. The average of the three longest dated yield differences is 3.12% pa, which is one estimate of the CRP for the Philippines as at end January 2006. This estimate is taken from the longest maturity bond data sourced and this is closest to the 25 year period of the concession being offered by the Philippines Government through the Power Sector Assets & Liabilities Management Corporation (PSALM).

(ii) Average Yield Difference by Maturity

The ERC undertook further analysis, using the available US\$ bond data from three bonds with tenor of 5, 10 and 20 years, to determine the average of the yield difference over 26 data points at the three different time-to-maturity profiles. Table 9 presents the results.

Tenor (years)	Yield Difference (% pa)
5	1.73%
10	2.79%
20	3.19%

Source : Bloomberg, ERC Analysis.

Table 9 : Philippine and USA US\$ Bond Yield Difference (% pa) versus Maturity

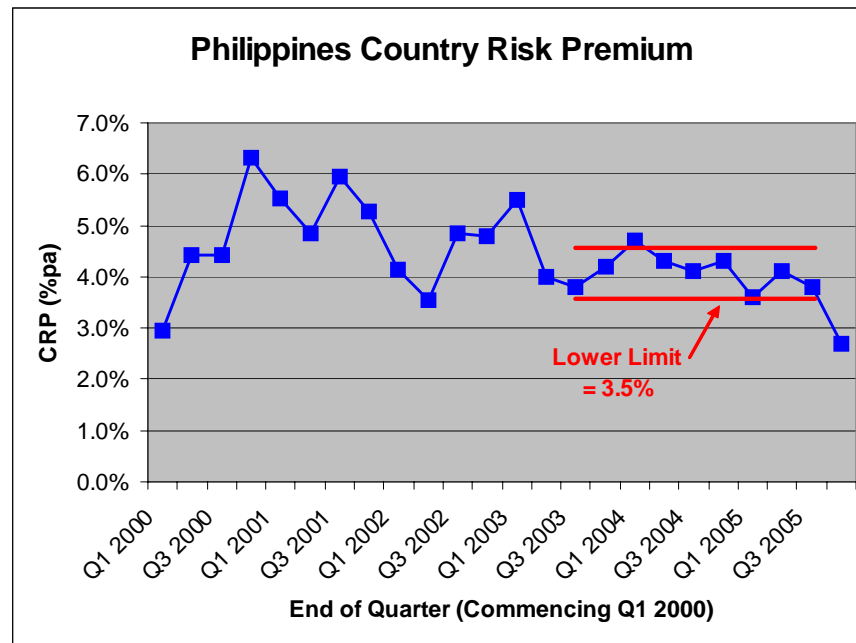
The yield difference from the longest dated US\$ bonds is 3.19% pa. This is another estimate of the CRP for the Philippines as at end January 2006. The ERC prefers this measure of the CRP because it represents an average using more data points than the first measure.

(iii) Independent Data Source

The ERC also sought data on the CRP measured by an independent source to the current regulatory debate. The data shown in Figure 5 was sourced from independent data sourced from the UK office of PricewaterhouseCoopers (PwC), who use US\$ bond yields and country rating statistics to derive measure of CRP on a quarterly basis. The data suggests the CRP for the Philippines has below the range it was previously tracking between 3.5% and 4.5% using data from the period, Q2 2004 to Q3 2005. The latest data for Q4 2005 shows the CRP is now 2.7% pa for international investors into the Philippines.

This is a considerable improvement on the last two years of data. Refer to Figure 5 below.

During the public hearings on the TransCo WACC, Professor Anthony van Zijl the independent expert for TransCo on WACC, expressed concern over the lack of disclosure of the methodology by which this data was derived. The ERC sourced the information from the web site www.costofcapital.net which describes in detail the way in which PwC of the UK have developed the information on its estimate of CRP. The ERC believes the statistical approach used is probably more robust than the direct measures it has been able to employ using available bond yield information.



Source : PwC, UK Cost of Capital Centre of Excellence.

Figure 5 : Philippines CRP (% pa)

The information on CRP from this figure suggests that the CRP for the Philippines has been quite volatile over the period in which the data has been gathered, but that this volatility has settled down over the last two years to within a band between 3.5% and 4.5% pa. More recently in Q4 2005, it has broken out of this range on the low side, at 2.7%. Given the moderate volatility seen in the last two years of data, the ERC believes the lower bound of the previous two years of data is the most reasonable estimate of the CRP based on this information. Thus the ERC estimate of the CRP from this source is 3.5%.

From this analysis it is interesting to note the difference between the direct measures of yield difference (giving the CRP between 3.12% and 3.19%) and the statistical measure from PwC UK (giving a CRP of between 4.0% and 2.7% with current estimate of 3.5%). A clue to one potential source of this difference is that the US bonds used for this analysis may have different issue characteristics from the Philippines issued bonds. For example, on Brady bonds, PwC UK makes the comment that *“these have several particular characteristics – the most notable being that the par value of these instruments is guaranteed by the US Government. This means that only the stream of coupon payments is truly representative of the risk of the sovereign issuer. Stripped yields – that strip out the yield of par value – must therefore be used in any comparison (and can be sourced from a data provider such as Bloomberg).”* The ERC have checked and none of the USA bonds used are Brady bonds, nor are any of the Philippine bonds used.

However, as mentioned above, Figure 1.1 also displays a broad spread of yields at any given maturity (from 9.5% to 11% at 10 years) which suggests there are possibly differences between the characteristics or contract arrangements for groups of the Philippines bonds which may stem from their issue date or other issues, and which affect the yields observed.

(iv) Conclusion on CRP

The ERC suggests this analysis means that the CRP estimated from direct measures of yield difference using US and Philippines Government bonds is that the CRP may be underestimated. Hence its preference to use the lower bound of the Figure 5 data.

The ERC believes that the most reasonable estimate of the CRP to use for the Final Determination is 3.5% pa.

(v) Conclusion on Indirect Estimate of Risk Free Rate

Using the data above, the ERC estimate of the risk free rate for the Philippines using an indirect method is as follows:

$$r_f = [(1 + 0.0447) / (1 + 0.0399)] * (1 + 0.0665) * (1 + 0.035) - 1$$

$$r_f = 0.1090 \text{ or } 10.90\% \text{ pa}$$

2.1.3 Conclusions on Risk Free Rate

The direct (10.68% pa) and indirect (10.90% pa) measure of the risk free rate provide comparable numbers for the Philippines. The analysis suggests there are properties of Philippines Treasury Bonds which strongly affect the yields observed from an independent market source, which would require considerable additional research in order to isolate the characteristics which are impacting on the measured yield. Currently adjusting for these differences is too subjective given the absence of such research.

As such the ERC prefers to rely on the indirect measure of the risk free rate in the Philippines as this approach appears more robust. As such the ERC adopted the 10.90% measure of the risk free rate for the Philippines for the preliminary WACC.

2.2 Return on Equity

In Section 4.11.4 of the DWRG, the ERC has accepted the use of the Capital Asset Pricing Model (CAPM) as the methodology to use to develop the cost of equity for Regulated Entities.

$$r_e = r_f + \text{Beta}_e \times (r_m - r_f)$$

which simplifies to :

$$r_e = r_f + \text{Beta}_e \times \text{MRP}$$

where:

r_e = the nominal cost of equity.

r_f = risk free rate estimated for the Philippines as estimated above.

Beta_e = the Equity Beta for electricity distribution business as determined by the ERC for regulatory purposes in accordance with Sections 4.11.6 to 4.11.8; and

$(r_m - r_f)$ = the Market Risk Premium (MRP), which the ERC has set as 6% pa in the DWRG and reiterated this position in the TransCo Draft and Final Determinations.

These inputs are derived and discussed in turn in the following paragraphs.

2.2.1 Equity Beta

The equity beta to apply to Distribution Utilities must be estimated from the betas seen in overseas markets for electricity transmission and distribution companies whose prime activity is the provision of poles, wires, transformers and switching infrastructure for the delivery of electrical energy from generators to loads. This is necessary as there is only one electricity distribution company in the Philippines traded on the Philippines stock exchange (Meralco), and this is for the vertically integrated company (not indicating the relative price movements of distribution business in isolation).

The process for estimating the equity beta requires two steps:

- de-levering the equity betas seen in overseas markets into asset betas for companies with comparable businesses to that of local Distribution Utilities, by removing the impacts of financial leverage (or gearing) and of effective taxation rates on the equity betas observed in the market place ; and
- re-levering the asset beta into an equity beta for Distribution Utilities using the assumed regulatory gearing specified by the ERC (a tax adjustment to the WACC is not considered necessary for the Second Regulatory Period as this is estimated in the cash flows against which the overall WACC is applied).

These two steps are discussed in turn in the following paragraphs.

(a) Estimate of Equity Beta for Distribution Utilities

The ERC sourced the data from that provided by Prof Anwath Damodaran on the Stern University website⁴ for various electricity companies from overseas markets. This included distribution companies, transmission companies and vertically integrated companies (all or combinations of transmission, distribution, generation and supply). For reference, figures for gas distribution companies, which normally display many similar characteristics to electricity distribution companies, were also obtained. The primary information derived from this source is the un-levered (asset) beta for the industry categories, for emerging markets, the US and Canada, and Europe.

This data was used as described in the following paragraphs.

(i) De-levering of Observed Equity Betas to an Estimate of Asset Beta

The DWRG specifies a de-levering formula in Section 4.11.8 as follows:

$$\text{Beta}_a = \text{Beta}_e / [1 + (1 - T_e) \times D_m / E_m]^5$$

Where new terms are defined as:

T_e = the effective corporate tax rate for that business as ascertained from information provided by an independent international ratings agency or financial market reporting company or, in the absence of such data, the corporate income tax rate for the country in which the relevant business is located (in either case expressed in decimal terms);

⁴ <http://pages.stern.nyu.edu/~adamodar/>

⁵ This formula is the Hamada levering / de-levering formula.

D_m = the amount of debt funding in the capital structure of that business as ascertained from information provided by an independent international ratings agency or financial market reporting company; and

E_m = the amount of equity funding in the capital structure of that business as ascertained from information provided by an independent international ratings agency or financial market reporting company.

This formula is used to take an observed market “equity beta” for a particular stock and to de-lever it to an “asset beta”. There are a number of assumptions used in this analysis, but the primary assumption is that the observed variability of a stock price in the market place is a result of ‘systematic’ risk arising from ‘operational’ risk (usually thought of as the fixed to variable cost structure of the particular type of business) and ‘financial’ risk (or leverage risk associated with the proportion of debt used to fund the company). The ‘asset’ beta is assumed to embody the ‘operational’ risk seen by the market for assets of a similar type relative to the average risk of the market portfolio (the so-called market line). Where the asset has a systematic risk which is equal to the average of the market portfolio, the asset beta is equal to 1.0. If it is perceived to be less risky than the market portfolio, the asset beta will be less than 1.0, if more risky it will be greater than 1.0.

The de-levering formula gets rid of the impact of the financial leverage (including the tax effect). It should be noted there is a preference to use the ‘effective’ tax rate for the observed stocks, but in some instances the data on these stocks does not include the effective tax rate, or such rate is clearly distorted through one-off annual tax payments anomalies. In these instances the corporate tax rate or the highest marginal corporate tax rate is used as a proxy for the effective tax rate.

In the Damodaran data used, Hamada de-levering has already been applied, using the effective tax rates. Table 10 below shows the estimates of the asset betas as drawn from this source.

While the aggregated data does not provide any information on specific companies, it represents a substantial data-set and is therefore considered reasonable for use in the preliminary calculations. (The full list of companies from which the data has been drawn is available on the site. For the draft determination these may be analyzed in more depth, as well as other data sources explored.)

The average beta figure for all distribution companies is 0.55 (or 0.57 if weighted according to sample sizes). However, the bulk of the companies are in stable markets. The ERC believes that the figure for emerging markets is more appropriate to the environment in which the Philippine Distribution Utilities find themselves and has therefore adopted a de-levered beta figure of 0.67, this being the average for the distribution companies in emerging markets.

	Industry	Number of firms	Beta	D/E Ratio	Tax rate	Unlevered Beta	Cash/Firm Value	Unlevered Beta corrected for cash
Emerging markets	Electric-Distribution	32	1.00	62.77%	23.79%	0.67	6.57%	0.72
	Electric-Generation	67	1.39	47.63%	22.27%	1.01	7.26%	1.09
	Electric-Integrated	153	1.37	68.65%	24.32%	0.90	8.80%	0.99
	Electric-Transmission	10	1.75	32.59%	28.72%	1.42	0.69%	1.43
US markets	Gas-Distribution	55	0.86	28.99%	24.08%	0.70	7.49%	0.76
	Electric Util. (Central)	25	0.81	78.84%	26.60%	0.51	1.78%	0.52
	Electric Utility (East)	29	0.80	68.32%	31.02%	0.54	1.33%	0.55
	Electric Utility (West)	15	0.90	72.52%	28.00%	0.59	4.51%	0.62
Europe markets	Natural Gas (Distrib.)	29	0.70	73.20%	26.20%	0.46	3.25%	0.47
	Electric-Distribution	10	0.63	54.68%	19.53%	0.44	3.53%	0.46
	Electric-Generation	4	0.43	27.41%	36.61%	0.36	2.24%	0.37
	Electric-Integrated	47	0.84	50.81%	28.83%	0.62	4.34%	0.65
	Electric-Transmission	3	1.09	68.20%	37.25%	0.76	0.52%	0.77
	Gas-Distribution	9	0.76	20.72%	40.61%	0.68	4.04%	0.71

Source : Anwath Damodaran (<http://pages.stern.nyu.edu/~adamodar/>), Jan 2006 data

Table 10 : Asset Betas for industry grouping

For the TransCo Final Determination, the un-levered beta was estimated at 0.64, based on an analysis of comparable transmission companies.

(ii) Re-levering of Estimate of Asset Beta to an Equity Beta

The DWRG specifies a re-levering formula in Section 4.11.7 as follows (the terms are defined in the TWRG):

$$\text{Beta}_e = \text{Beta}_a \times [1 + (D / E)]^6$$

Where:

Beta_a = the industry average Asset Beta determined for electricity distribution businesses in the Philippines (excluding electricity distribution business conducted by Electric Cooperatives)

D = the amount of debt funding assumed for regulatory purposes in the capital structure of the Regulated Entity, being 45% of V for the Second Regulatory Period; and

E = the amount of equity funding assumed for regulatory purposes in the capital structure of the Regulated Entity, being 55% of V for the Second Regulatory Period.

This formula is used to take an agreed “asset beta” for a particular stock (usually the average of the de-levered asset betas of other stock with the same type of fundamental assets and physical situation either within the same market or where these do not exist, in overseas markets) and to re-lever it to an “equity beta” for the particular business under consideration. The re-levering adds back the assumed effect of the financial leverage (or financial risk) which the particular business will be assumed to adopt for regulatory purposes. In the case of the DWRG, the assumed financing is 45% debt and 55% equity.

⁶ This formula is the Harris – Pringle formula which is normally used in conjunction with the ‘classical’ WACC formula, which is expressed as the post-tax nominal WACC. See Ogier T., Rugman J., and Spicer L., *The Real Cost of Capital – A business field guide to better financial decisions*, Prentice-Hall, 2004, Chapter 1 and page 208.

Using the ERC estimate of the asset beta and the assumption above the estimated equity beta for TransCo for the Second Regulatory Period are calculated as follows:

$$\text{Beta}_e = 0.67 \times [1 + (0.45 / 0.55)] = 1.23$$

Thus the ERC estimate of the equity beta for preliminary WACC is a value of 1.23.

(iii) Comparable Overseas Regulatory Decisions

Research of regulatory decisions for companies in overseas jurisdictions was used to provide a comparison of asset betas and resulting equity betas for electricity distribution companies in regulatory regimes similar to that in the Philippines. It should be noted however, that all these decisions are for developed markets in stable environments. The beta figures used are therefore useful as indicators, but lower than that which should apply to the Philippines environment.

Table 11 shows the latest available data from overseas jurisdictions, sourced from various regulatory decision papers produced between 2000 and 2005.

	At origin							Equity beta
	Equity beta	Debt ratio	Debt beta	Debt margin	MRP	Tax	Asset beta	re-levered
ESC 2001	1	0.6	0.22	0.013	0.06		0.53	0.96
ICRC ActewAgl 2004	0.9	0.6	0.22	0.013	0.06		0.49	0.89
IPART 2004	0.78	0.6	0.22	0.013	0.06		0.44	0.80
to	1.11	0.6	0.22	0.013	0.06		0.57	1.04
2005 ECOSA	0.9	0.6	0.22	0.013	0.06		0.49	0.89
2005 QCA Electricity	0.9	0.6	0.22	0.013	0.06		0.49	0.89
ESC 2005	1	0.6	0.22	0.013	0.06		0.53	0.96
OFGEM 2004	0.6	0.5				0.3	0.35	0.64
to	1	0.6				0.3	0.49	0.89
NZ CC (Damodaran)							0.35	0.64
							0.5 including allowance for price-cap	0.91
NZ CC Bloomberg (Lally)							0.27	0.49
							0.42 including allowance for price-cap	0.76
NZ CC Sep 2005							0.4	0.73
							0.55 including allowance for price-cap	1.00

Source : ERC, IPART, OFGEM, ECOSA, NZ Commerce Commission, ERC analysis.

Table 11 : Asset and Equity Betas for Overseas Regulatory Decisions

It will be noted that the de-levering of the equity betas in the Australian regulatory decisions involve the use of a debt beta. For the UK and New Zealand ranges, the asset beta figures were directly provided as part of the decisions.

In the New Zealand decisions, it was noted that for a price-cap regulatory regime, an additional beta allowance should be made – this is include above.

The information from overseas jurisdictions suggests asset betas allowed by regulators for electricity distribution companies typically lie between 0.35 and 0.55. The equivalent equity betas lie in the range from 0.6 to 1.0. However, overseas regulators have in general assumed higher debt ratios ranging from 0.5 to 0.6, than that contemplated by the ERC at 0.45. If the ERC debt ratio is used, the equity betas based on the regulatory decisions would typically lie in the range from 0.65 to 1.0.

(iv) **Comparable Philippines Regulatory Decisions**

The ERC used an asset beta for Meralco of 0.71 in its decision on rates on May 30, 2003. The ERC would expect the asset beta for a ‘stapled’ electricity distribution wires business and a supply business (or in other words an integrated wires / retail business) to be somewhat higher than the asset beta for a ‘separate’ or ‘stand-alone’ electricity distribution business. The ERC’s suggested asset beta for Regulated Entities of 0.67 conforms to this trend.

As such, the ERC believes there is reasonable comparability between its recent cost of capital decisions based on a CAPM analysis.

(v) **Conclusion on Equity Beta**

Using the data above, the ERC preliminary estimate of the equity beta for Regulated Entities for the Second Regulatory Period is equal to 1.23. It believes that the aggregate asset beta for electricity distribution companies in emerging markets is the most appropriate of that it studied. While other regulatory decisions are worthwhile to consider, it is noted that these are for more developed, stable environments where the risk faced by Regulated Entities would be less than that in the Philippines.

2.2.2 *Market Risk Premium*

The ERC has set the value of the Market Risk Premium (MRP) to be 6.0% for the Second Regulatory Period in the DWRG and reinforced this position in TransCo Determination.

The ERC believes this is a reasonable position because:

- there is continuing debate in academic circles and literature as to a reasonable measure to ascribe to this parameter in applying the Capital Asset Pricing Model (CAPM), and such values lie anywhere between 2.5% and 9.0% depending on the time series, market and statistical study techniques used;
- the time series data on stock market equity returns and debt market returns to develop such a measure for the Philippines does not have sufficient duration to allow a statistically meaningful measure to be undertaken;
- the data necessary on the Philippines market returns does not exist over a sufficient duration to allow meaningful statistical estimates of ‘relative volatility’ to allow MRP adjustments to the MRP for those cost of equity methodologies which require such adjustment;
- to the greatest extent possible the ERC has adopted a DWRG which has cash flow adjustments and safeguards which mitigate to a large extent many of the systematic and additional operational risks which are absent in regulatory WACC analysis in the UK, New Zealand and Australia, but which might otherwise suggest a higher MRP for the Philippines investment climate.

2.2.3 *Risk Free Rate*

Using the outcome described above, the ERC estimate of the risk free rate for the Philippines is 10.90%pa.

2.2.4 Return on Equity

From the data developed above, the ERC's preliminary estimate of the regulatory return on equity for Regulated Entities is as follows:

$$\begin{aligned} r_e &= r_f + \text{Beta}_e \times \text{MRP} \\ r_e &= 10.90\% + 1.23 \times 6.0\% = 18.25\% \text{ pa} \end{aligned}$$

It should be noted that this is effectively a post-tax nominal measure of the return on equity as the tax adjustments are undertaken in the regulatory cash flow analysis.

2.3 Return on Debt

The cost of debt (r_d), expressed in decimal terms, is calculated as follows:

$$r_d = r_f + \text{DM}$$

Where:

r_f = the risk-free rate within the Philippines, expressed in decimal terms, as determined above; and

DM = the debt margin (or premium) within the Philippines (expressed in decimal terms) as determined by the ERC, which conceptually represents the margin above the risk-free rate within the Philippines that is requested by debt providers for providing funds to the Regulated Entity to the extent such debt arrangements are representative of arms length negotiated rates in liquid markets and are financially efficient.

2.3.1 Debt Margin

In its TransCo Draft Determination, the ERC used a debt margin of 1.25% pa above the risk free rate as a measure of the additional cost of debt required for the financial risk of lending to TransCo. Such estimates are required as the exact financial structure a concessionaire will use for the financing of TransCo is unclear.

Likewise, this information is also unclear for the Regulated Entities. Thus the ERC must estimate a debt margin assuming a level of debt which is reasonably balanced financially and which could be supported by ownership by either government or private concessionaire.

(a) Public Hearing Feedback

Feedback from the Public Hearing process on the TransCo Determination suggests that 1.25% pa is too low, and PSALM has suggested a figure of 2.5% pa would be more appropriate. Unfortunately no additional information was gathered which could assist this decision.

(b) Loan Guarantee Availability

For the TransCo Final Determination, the ERC demonstrated that the debt margin for TransCo appears to lie between 0.8% and 2.5%.

(c) Conclusion on Debt Margin

The information above suggests that the debt margin could lie between 2.5% pa for US\$ loans and the assumed peso debt margin plus a 1.05% partial guarantee margin for

the Philippines. The ERC therefore concluded that a debt margin of 2.3% would be appropriate for TransCo.

Using the same rationale, but allowing for the fact that the extension of loans to (generally smaller) distribution companies may be viewed as somewhat more risky than to a transmission company, for the purposes of the preliminary WACC calculation for Regulated Entities, the ERC amended the figure to 2.5%.

2.3.2 Conclusion on Return on Debt

From the data developed above, the ERC estimate the regulatory return on debt for Regulated Entities to be as follows:

$$\begin{aligned} r_d &= r_f + DM \\ r_d &= 10.90\% + 2.50\% = 13.40\% \text{ pa} \end{aligned}$$

2.4 Weighted Average Cost of Capital

There are a number of valid ways to represent the weighted average cost of capital (WACC). These include:

- Post-tax nominal;
- Post-tax real;
- Pre-tax nominal;
- Pre-tax real; and
- Vanilla.

The following paragraphs explore these representations of the regulatory WACC and provide estimates of these measures for comparison purposes. The details of the formulae used are also given.

The ERC emphasizes that it is only the “vanilla” WACC which is used by the DRWG. The other representations are estimated in order to provide transparency, and to ensure there is no invalid comparison using different representations of the preliminary cost of capital provided by the ERC.

2.4.1 “Vanilla” WACC

Section 4.11.1 of the DRWG provides that the weighted average cost of capital (WACC) expressed in its “vanilla” form is given by the following equation:

$$\text{WACC} = [r_e \times E / V] + [r_d \times D / V]$$

Where:

r_e = the cost of equity;

r_d = the cost of debt;

E = the amount of equity funding assumed for regulatory purposes in the capital structure of the Regulated Entity, being 55% of V for the Second Regulatory Period;

D = the amount of debt funding assumed for regulatory purposes in the capital structure of the Regulated Entity, being 45% of V for the Second Regulatory Period; and

$$V = E + D.$$

Using the data estimates determined by the ERC above, the “vanilla” WACC for TransCo for the Second Regulatory Period, in post-tax nominal terms, is as follows:

$$\text{WACC (vanilla)} = [18.25\% \times 0.55] + [13.40\% \times 0.45]$$

$$\text{WACC (vanilla)} = \mathbf{16.07\% \text{ pa}}$$

2.4.2 Effective Tax Rate for Regulated Entities

The EVAT Law has been passed by Congress and specifies that the corporate tax rate shall be 35% pa for 2006, 2007 and 2008, then 30% pa thereafter. In order for the ‘effective’ corporate tax rate to be estimated for this period, a discounted cash flow (DCF) analysis was performed using the estimated risk free rate as the discount factor, to derive the tax rate which if applied for five years would have the same impact as the two tiers proposed by the EVAT Law.

This ‘effective’ tax rate could then be used to estimate the range of regulatory WACC. It should be noted that while the change in corporate tax rate will change the pre and post tax WACC analysis, it does not have any impact on the ‘vanilla’ WACC analysis. The ‘effective’ corporate tax rate is estimated to be 32.38% pa. Table 12 shows how this is estimated. Note that the discount rate used for the analysis is equal to the cost of debt assumed for the Regulated Entities.

Effective Tax Rate for Five Year Period							
Year	2006	2007	2008	2009	2010	2011	
Year Counter	0	0	1	2	3	4	
Tax Rate & Shield Value	0.35	0.35	0.35	0.30	0.30	0.30	
Discount Rate	13.40% as at end Jan 2006						
Tax Rates Applied Year-By-Year							
PV at Y0		0.35	0.31	0.23	0.21	0.18	
Sum PV at Y0	1.279						
Effective Tax Rate	0.32377	0.32377	0.32377	0.32377	0.32377	0.32377	0.32377
Uniform Tax Rates Applied Year-By-Year							
PV at Y0		0.32	0.29	0.25	0.22	0.20	
Sum PV at Y0	1.279						

Source : ERC Analysis

Table 12 : Estimation of the Effective Tax Rate for the Second Regulatory Period Resulting from EVAT

2.4.3 Post-tax Nominal WACC

The post-tax nominal WACC can be expressed in the form given by the following equation:

$$\text{WACC (post-tax nominal)} = [r_e \times E / V] + [r_d \times (1 - T_e) \times D / V]$$

$$\text{WACC (post-tax nominal)} = [18.25\% \times 0.55] + [13.40\% \times (1 - 32.38\%) \times 0.45]$$

$$\text{WACC (post-tax nominal)} = \mathbf{14.12\% \text{ pa}}$$

This version of the post tax nominal WACC formula assumes a taxation regime that does not provide for dividend imputation. (Effectively this means no differences between the corporate income tax rate, personal tax rates on dividends and capital gains, and on interest income from debt).

2.4.4 *Post-tax Real WACC*

The post-tax real WACC can be expressed in the form given by the following equation:

$$\text{WACC (post-tax real)} = (1 + \text{WACC (post-tax nominal)}) / (1 + f) - 1$$

where f is the inflation rate

$$\text{WACC (post-tax real)} = (1 + 14.12\%) / (1 + 6.65\%) - 1$$

$$\text{WACC (post-tax real)} = \mathbf{7.00\% \text{ pa}}$$

2.4.5 *Pre-tax Nominal WACC*

The pre-tax nominal WACC can be expressed in the form given by the following equation:

$$\text{WACC (pre-tax nominal)} = \text{WACC (post-tax nominal)} / (1 - T_e)$$

$$\text{WACC (pre-tax nominal)} = 14.12\% / (1 - 32.38\%)$$

$$\text{WACC (pre-tax nominal)} = \mathbf{20.87\% \text{ pa}}$$

This version of the pre tax nominal WACC formula assumes a taxation regime that does not provide for dividend imputation.

2.4.6 *Pre-tax Real WACC*

The pre-tax real WACC can be expressed in the form given by the following equation:

$$\text{WACC (pre-tax real)} = (1 + \text{WACC (pre-tax nominal)}) / (1 + f) - 1$$

$$\text{WACC (pre-tax real)} = (1 + 20.87\%) / (1 + 6.65\%) - 1$$

$$\text{WACC (pre-tax real)} = \mathbf{13.34\% \text{ pa}}$$

2.4.7 *Summary of WACC*

Table 13 provides a summary of the WACC estimates and likely range of the WACC estimate given the uncertainties in selecting the value for various parameters.

		Regulatory WACC Estimate by ERC		
Parameters		Low	Mid	High
Gearing (Debt) ratio	D/(D+E)	45%	45%	45%
Equity ratio	E/(D+E)	55%	55%	55%
Debt to Equity	D/E	0.82	0.82	0.82
Asset beta (degeared empirical beta)	β_a	0.669	0.674	0.679
Risk free rate (nominal - US\$ 20 or 10 Year Bond Yields in USA)		4.22%	4.47%	4.72%
Country Risk Margin (excluding FX Risk)	CRP	3.25%	3.50%	3.75%
Risk free rate used in WACC	R_f	10.38%	10.90%	11.42%
Debt Margin	DM	2.25%	2.50%	2.75%
Cost of debt (pre-tax nominal peso terms)	K_d	12.63%	13.40%	14.17%
Market Risk Premium (Developed Country)	$R_m - R_f$	6.00%	6.00%	6.00%
Corporate tax rate	t_c	32.4%	32.4%	32.4%
Inflation rate (Philippines)	i	6.15%	6.65%	7.15%
Inflation Rate (USA)		3.49%	3.99%	4.49%
Calculated Equity (Regeared) Betas		Low	Mid	High
Equity Beta (1) Simple No Tax Adjustment	1	1.22	1.23	1.23
Equity Beta (2) Simple Tax Adjustment	2	1.04	1.05	1.05
Other Parameters				
Equity beta (geared beta)	β_e	1.22	1.23	1.23
Cost of Equity (post-tax nominal)	K_e	17.68%	18.25%	18.83%
WACC Matrix - Commercial Practice				
Post-tax nominal		13.57%	14.12%	14.67%
Post-tax real		6.99%	7.00%	7.01%
Pre-tax nominal		20.06%	20.87%	21.69%
Pre-tax real		13.10%	13.34%	13.57%
Vanilla WACC (nominal)		15.41%	16.07%	16.73%

Table 13 : Summary of WACC Outcomes

Figure 6 summarizes the cost of equity (on an un-levered basis).

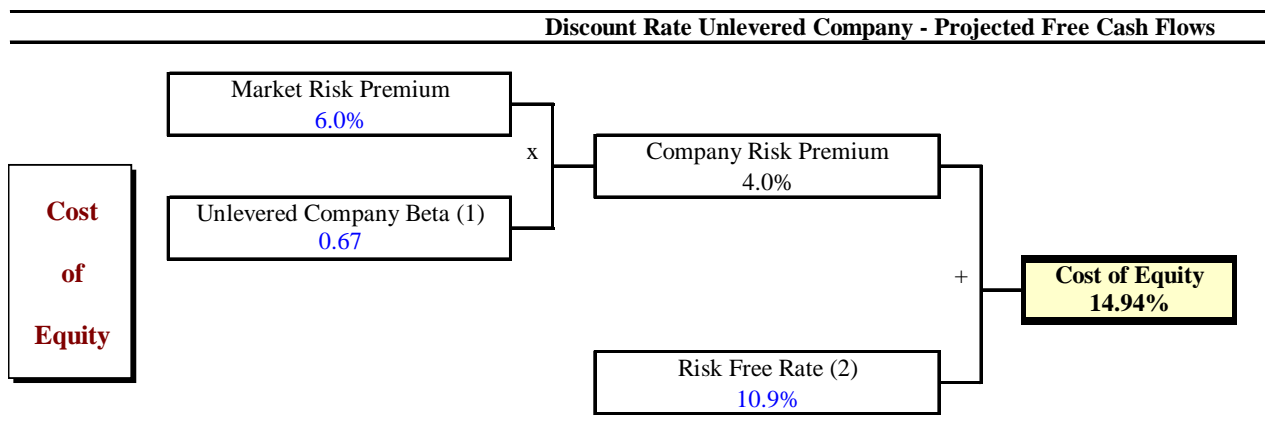


Figure 6 : Un-levered Cost of Equity (% pa)

Figure 7 summarizes the WACC (both “vanilla” and post-tax nominal).

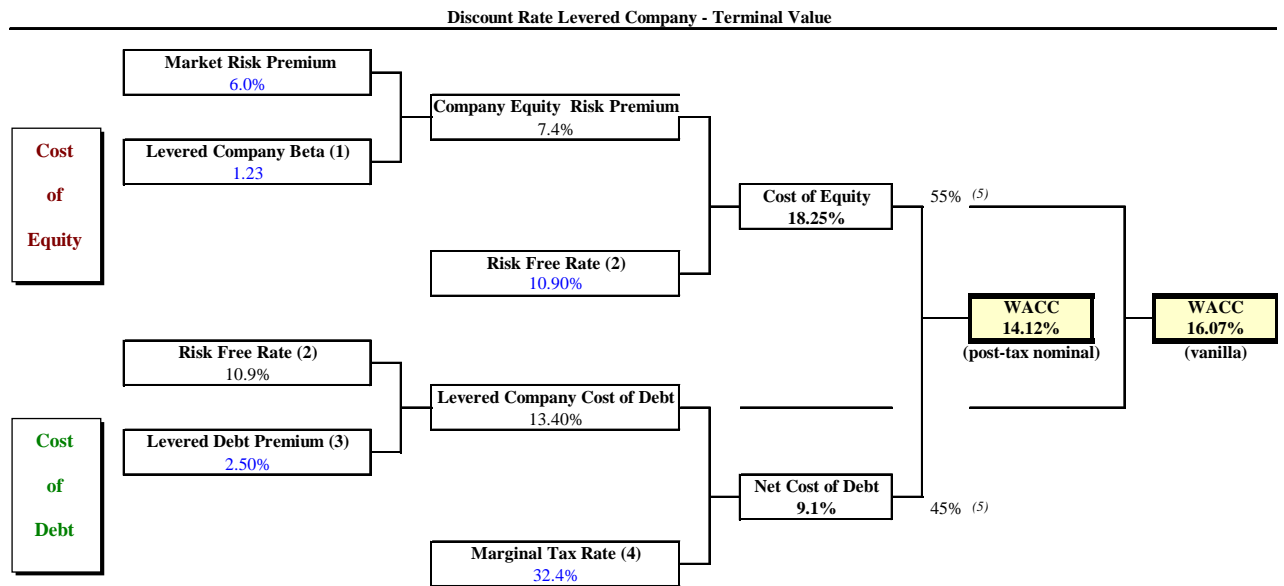


Figure 7 : Vanilla & Post-tax Nominal WACC (% pa)