

APPENDIX

Review Of The Weighted Average Cost Of Capital (WACC) For Setting Vesting Price For Period 1 Jan 2007 To 31 Dec 2008

Note: This is a Draft Report solely for the purpose of seeking feedback on the assumptions and approach to setting the WACC in the Vesting Price for 1 Jan 2007 to 31 Dec 2008.

Introduction

The Energy Market Authority (“EMA”) implemented vesting contracts on 1 Jan 2004 to control the market power of generation companies (“gencos”). The vesting contracts commit the gencos to sell a specified amount of electricity (viz. the vesting contract level) at a specified price (viz. the vesting price). Such contracts control market power by removing the incentives for gencos to exercise their market power by withholding their generating capacity to push up spot prices in the wholesale market.

2. The vesting price is set at the Long Run Marginal Cost (“LRMC”) of the most efficient electricity generation technology serving at least 25% of our total electricity demand. Presently, the most efficient generation technology is the combined cycle gas turbine (“CCGT”).
3. The existing LRMC parameters were determined in Sep 2004. In accordance with the established procedures for determining the LRMC parameters, the existing parameters will apply until 31 Dec 2006.
4. EMA had in Mar 06 met the gencos and some large customers (“the industry”) to gather feedback on EMA’s proposed methodology to determine the parameters that are applicable for the calculation of the Weighted Average Cost of Capital (“WACC”).

Weighted Average Cost of Capital (“WACC”)

5. The Capital Asset Pricing Model (“CAPM”) is adopted to estimate the WACC. The formula is given by:

$$WACC = [g \times (r_f + DP)(1-t)] + \{(1-g)[r_f + \beta(r_m - r_f)]\}$$

- Where:
- | | |
|------------------|--|
| r_f | is the risk-free rate of return; |
| DP | is the debt premium paid by the company; |
| r_m | is the market rate of return |
| $(r_m - r_f)$ | is often referred to as the market risk premium (MRP); |
| β (equity) | is the measure of the risk premium required by investors to hold the company’s equity. Under CAPM, it is a measure of risk relative to the market; |

- g*** is the level of gearing, i.e. debt as a proportion of debt and equity; and
- t*** is the marginal corporate tax rate

Determination Month

6. At the start of the WACC review, EMA will adopt a “Determination Month” as a base reference point. The last day of the month preceding the Determination Month shall serve as the “cut off” date for the calculation of data inputs for the draft WACC parameters.

7. For this draft WACC determination, EMA has adopted May 2006 as the Determination Month. This means that available data over a selected time period up to the last business day of April 2006 will be used for the calculation of the WACC parameters.

8. It is proposed for the final WACC determination the Determination Month of October 2006 is used to set the vesting price for January 2007 to December 2008. This means that available data over a selected time period up to the last business day of September 2006 will be considered for the update to determine the final WACC parameters. This proposed update is in consideration of feedback provided to EMA by the gencos at the meeting in March 2006. However, EMA would point out that if this proposal is adopted, then EMA would be able to publish the new vesting parameters at end Oct/early Nov 06.

9. EMA seeks the gencos confirmation that they and their retailers would still have sufficient time to update their systems and notify their customers etc. before the new vesting parameters take effect.

Risk Free Rate

10. To derive the risk-free rate, EMA proposes to use the yield of the Singapore Government Bond (“SGB”) with the longest tenure that is closest to the lifespan of the relevant asset. The risk-free rate shall then be determined as the average of the daily closing yield of that SGB for the month preceding the Determination Month.

11. The latest 15-year SGB is the SGB maturing in September 2020 (Issue code: NY05100N).

Industry Comments

12. One of the industry participants commented that as the Singapore dollar interest rate has been rising, it would be reasonable to expect the current yield on the SGB to be higher than the risk free rate calculated at the last determination. In the event that the SGB’s yield does not show an increase, EMA should investigate further whether there is an illiquidity issue with respect to the particular SGB selected as proxy.

13. EMA notes that for April 2004, the volume turnover for the 15-year benchmark SGB (maturing in 2018) is about 4% of total market turnover, whereas for April 2006, the volume turnover for the 15-year benchmark SGB (maturing in 2020) is about 5% of total market turnover¹. Though the increase is marginal, this suggests there has been increasing interest in the trading of the 15-year SGB.

14. Some industry participants also commented that a SGB with a tenure that reflects the lifetime of the plant i.e. 20 or 25 years should be used to determine the risk-free rate. In the absence of such a SGB, it is reasonable to use the longest available tenure SGB. However, the risk-free rate obtained should be adjusted in order to reflect the bond maturity period against the 20/25 years lifetime of the plant based on an agreed formula. EMA notes that other industry participants do not consider such an adjustment to be justified. These companies viewed that such an adjustment is subjective and that the current methodology to benchmark the yield of the latest SGB with the longest tenure that is **closest** to the lifespan of the plant, i.e. 15 years, is reasonable.

Comparator Companies

15. As a proxy to derive the beta and the optimal capital structure i.e. gearing of the new entrant, EMA will first look for local comparator companies operating in similar businesses, regulatory environment and market structure before considering comparator companies from overseas. EMA proposes to adopt the following criteria in the selection of suitable comparators:

- a) Does the company do business in competitive markets?
- b) Is power generation its main business activity?
- c) Is the company publicly listed and are beta values available?

Industry comments

16. The gencos had fed back to further refine the criteria EMA should adopt to assess the suitability of potential comparators. The proposed criteria are:

- a) Operation in developed markets of comparable country risk to Singapore (AAA);
- b) Reliance primarily on power generation activities;
- c) Majority of existing generation revenues accruing from merchant activities;
- d) Absence of significant (distorting) ownership by individual investors/funds; and
- e) Absence of financial distress (such as indicated by Chapter 11 or high levels of gearing).

¹ Source: Financial Database, www.mas.gov.sg

17. Based on these criteria, the gencos recommended the following 4 comparator companies:

- a) British Energy Group PLC, UK
- b) Constellation Energy Group Inc, US
- c) International Power PLC, UK
- d) Dynegy Inc, US

18. The gencos further noted that comparators that are financially distressed are representative of aspects of the current/recent business climate in merchant generation. These companies should be excluded from the beta estimates since financial distress will distort beta estimates as its share price will fall. Moreover, beta estimates measured during financial distress may result in spurious correlation results. Dynegy Inc should thus be excluded from the beta calculation. However, it could be considered for the calculation of gearing.

EMA's Comments

Criteria for comparators

19. EMA notes that the criteria proposed by the gencos are generally consistent with EMA's proposed principles. In addition, companies in financial distress would not be considered as a comparator in the beta calculation. Further EMA also proposes that such companies would also not be used as a proxy to derive the optimal capital structure of the new entrant. To include companies in financial distress would cause the proxy gearing level to be biased upwards.

20. EMA notes that British Energy ("BE") had on 5 September 2002 applied to the Department of Trade and Industry ("DTI") for financial assistance to meet its financial commitments, without which it would have to begin insolvency proceedings. EMA notes that BE's shares had subsequently been re-listed on the UK stock exchange on 17 January 2005.

21. In view of the financial difficulties faced by BE during EMA's period of assessment for WACC parameters i.e. 5 years from April 2001, EMA has removed BE as a comparator.

Proposed Comparators

22. EMA proposes to use the following companies to form the comparator group:

- a) The AES Corporation, US
- b) Constellation Energy Group Inc, US
- c) Energy Development Limited, Australia
- d) International Power PLC, UK

23. Data from these companies will be used for the determination of the beta, the gearing and the debt premium.

Beta

24. To compare betas across companies with different capital structures, EMA first derive the adjusted beta using the following formula:

$$\beta_{equity-adjusted} = (0.67) * \beta_{equity-raw} + (0.33) * 1.0$$

where $\beta_{equity-raw}$ is derived through a regression of individual weekly data points for a period of 5 years, ending on the last day of the month preceding the Determination Month. A 5-year period is the most widely used industry and regulatory practice and a 5-year time period is likely to lead to more accurate estimates.

25. Each adjusted equity beta is then de-levered using the respective debt-to-equity ratio and the current corporate tax rate for the home country of the company to derive the asset beta. The following de-levering formula is used:

$$\beta_{equity-adjusted} = \beta_{asset} * \left(1 + (1 - T_c) * \frac{D}{E} \right) \quad - \text{Equation (a)}$$

Where $\beta_{equity-adjusted} = (0.67) * \beta_{equity-raw} + (0.33) * 1.0$

T_c is the corporate tax rate

D/E is the debt-to-equity ratio

26. An average is then taken for the resulting asset betas to derive the proxy asset beta for the LRMC review. The proxy asset beta is then re-levered by applying the average debt-to-equity ratio of the comparators and Singapore's corporate tax rate using Equation (a) to derive the equity beta for the LRMC parameter.

Industry comments

27. The gencos had proposed an alternative formula for de-levering and re-levering purposes:

$$\beta_{equity-adjusted} = \beta_{asset} * \left(1 + \frac{D}{E} \right) \quad - \text{Equation (b)}$$

The gencos quoted Miller (1977) who proposed that the value of debt tax shields can disappear altogether when both personal and corporate income taxes are considered. This theory is based on the assumption that there are different personal tax rates on interest income across the economy. As the level of debt in the economy rises, then firms and individuals with higher tax rates on debt would have to be attracted into the market for holding debt. The Miller "equilibrium" predicts that the relationship between the cost of equity and gearing is as stated in Equation (b). The industry also commented that Equation (b) will "capture all the complex effects of how the value of the debt shield changes with changes in gearing".

EMA's comments

28. EMA notes that in general corporate finance, Equation (a) signifies the relationship between the beta of the unlevered firm and the beta of the levered equity in a world with corporate taxes, whereas Equation (b) is more applicable in a theoretical world where there are no corporate taxes. EMA also recognizes any further debate on which equation is more applicable could become protracted and increasingly academic; hence EMA's preference is to consider the applicability of the equation in a market context.

29. EMA has consistently applied Equation (a) as a basis to derive the proxy beta for its past regulatory decisions. The affected licensees have accepted that this is a conventional and well-accepted approach towards de-levering the equity beta. EMA proposes to continue using Equation (a) for this review.

30. Table 1 shows the Coefficient of Determination (R-squared) for each comparator's beta derivation using weekly and monthly data. As R-squared is a measure of how well the regression line i.e. regression of stock returns against market returns fits the data, a higher R-squared is more representative of the variation of stock returns against market returns. EMA thus proposes to use monthly data to derive the equity betas for the comparator companies.

Table 1: R-squared of beta regression			
Comparator Company		Weekly	Monthly
Constellation Energy Group		0.14	0.14
International Power PLC		0.27	0.58
Energy Developments Ltd		0.05	0.08
AES Corp		0.05	0.24

Source: Bloomberg

31. Table 2 shows the beta values of the comparator companies based on available data.

Table 2: Beta of the comparator companies (using monthly data)					
Comparator Company	Adjusted Equity Beta	Debt to Market Capital Ratio (D/E)	Tax Rate	Asset derived Beta using Equation (a)	– using
Constellation Energy Group	0.80	0.85	0.4	0.53	
International Power PLC	1.77	1.16	0.3	0.98	
Energy Developments Ltd	1.04	0.70	0.3	0.70	
AES Corp	2.28	4.24	0.4	0.64	

Source: Bloomberg

Debt Premium

32. The debt premium represents the excess return over the risk-free rate, which a financing institute or an investor expects when providing credit to an investment. EMA will benchmark the credit ratings of comparator companies (from Singapore and/or overseas) to ascertain a suitable credit rating for the new entrant.

33. Based on the benchmark credit rating, EMA will then determine the debt premium by benchmarking against local comparators if available, international debt spread and credit rating reports obtained from reliable sources, e.g. latest available study by Damodaran, New York University, Stern Business School or corporate debt spread data from Bondsonline.com, with the cut off date being the last day of the calendar month preceding the Determination Month.

Industry Comments

34. The gencos commented that the credit rating of comparator companies should be of a sub-investment grade or the lowest of the investment grade. They have also commented that it may not be appropriate to use comparator companies for the benchmarking of credit ratings since they are listed and are able to borrow based on their corporate strength. Merchant plants are recommended by the gencos as a better comparison.

35. Some consumers however, commented that a rating of BB+ is too conservative. A credit rating of A is probably more reasonable. The credit rating of the incumbent generation companies should also be considered.

EMA's Comments

36. Based on the list of comparator companies, EMA has extracted the respective credit rating where available (see Table 3).

Table 3: Credit ratings of comparator companies	
Comparator Companies	S & P Credit Rating
Constellation Energy Group	BBB+
International Power PLC	BB-
Energy Developments Ltd	Not Rated
AES Corp	BB-

Source: Bloomberg

37. Taking into account the industry's comments and the results in Table 2, EMA views that a suitable credit rating for the new entrant is BBB- which is the lowest investment-grade credit rating. This represents a balanced view from all parties and which EMA proposes is a fair credit rating.

38. In determining the debt premium, the term of the debt used as comparator information will be based on debts with term closest to 15-years. EMA notes from the corporate debt spread reports from Reuters, the Bondsonline Group that the debts with term closest to 15-years are the 10-years BBB- rating corporate bonds issued by industrial companies.

39. EMA also notes that the corporate debts issued by the comparator companies, with remaining tenure closest to 10-years are as follows:

Table 4: 10 year debts issued by comparator companies					
Comparator Company	Issue Date	Maturity Date	Coupon	S&P rating for the bond issue	Spread over 10-year US Treasury Bill
Constellation Energy Group	13/6/2003	15/6/2015	4.55	BBB	98
AES Corp	27/3/2000	2/1/2017	9	BB+	222

Source: Bloomberg, US Dept of Treasury website (www.treasury.gov)

Market Risk Premium

40. EMA proposes that the Market Risk Premium (“MRP”) shall be determined by taking into consideration the advice of bankers, as well as information from published reports of MOF, reputable consultants and Singapore listed companies. It will also be crosschecked against the MRP as adopted in other countries such as Australia that have similar country risk profile as Singapore. The determination shall be based on the most current information up to the month preceding the Determination Month.

Industry Comments

41. The gencos commented that local and overseas advisor’s advice should be sought, with solid data backing, to validate the MRP recommended and that EMA would be able to obtain the MRP from international banks. The gencos also commented that the composition of MRP should be broken down to reflect merchant, construction and sovereign risks. One of the gencos commented that a MRP of 6% is an established and sensible rate.

EMA’s Comments

42. EMA notes from the latest available published reports of SembCorp Industries, Keppel Corporation, CapitaLand and Singapore Food Industries that their MRP has remained at 6% in 2005. Regulators in Australia, which have similar country-risk profile as Singapore, have also kept their MRP unchanged at 6%.

Gearing

43. The proxy gearing is derived based on the average gearing of the selected comparator companies over the most recent 5-year period.

Industry Comments

44. Some gencos have commented that the gearing ratio should be in the range of 50-55%, while others have commented that based on their current experience in the financing process, a gearing ratio of 60% is achievable.

EMA's Comments

45. EMA points out that the average gearing of comparator companies over the most recent 5-year period, based on their latest available audited figures ranges from 0.44 to 0.87 (see Table 5).

Table 5: Capital structure of comparator companies				
Comparator Companies	Constellation Energy Group	International Power PLC	Energy Developments Ltd	AES Corp
Debt/Capital	0.53	0.53	0.44	0.87

Source: Bloomberg

Summary

46. Based on the above principles, EMA's draft determination of the WACC parameters are shown in Annex 1.

**DRAFT DETERMINATION OF WACC PARAMETER VALUES TO SET
VESTING PRICE FOR 1 JAN 2007 TO 31 DEC 2008**

Parameter	Values
Risk Free Rate, r_f	3.63%
Debt Premium, DP	165 bps
Market Risk Premium, MRP	6%
Asset Beta	0.71
Gearing Ratio, g	0.59
Equity Beta, β_{equity}	1.70
Corporate Tax Rate, t	20%