FINAL DETERMINATION

LONG RUN MARGINAL COST (LRMC) PARAMETERS FOR SETTING VESTING PRICE FOR 1 JANUARY 2007 TO 31 DECEMBER 2008

18 DECEMBER 2006

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Review of The LRMC Parameters For Setting Vesting Price For 1 Jan 2007 To 31 Dec 2008

Introduction

The Energy Market Authority ("EMA") implemented vesting contracts on 1 Jan 2004. The objective of the vesting regime is to control the market power of generation companies ("gencos") in order to promote efficiency and competition in the electricity market for the benefit of consumers. 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).

2 The specified price under the vesting contract i.e. vesting price is set taking into account both the long run marginal cost (LRMC) of the most efficient technology that accounts for at least 25% of our system demand and the policy objective to promote efficiency and competition in the electricity market for the benefit of consumer. At this time the most efficient generation technology is the combined cycle gas turbine ("CCGT").

3 The existing LRMC parameters were determined in Sep 2004. These parameters are used to set the vesting price for the 2 years from 1 Jan 2005 to 31 Dec 2006.

4 A summary of EMA's determination of the LRMC parameters to be used to set the vesting price for 1 Jan 2007 to 31 Dec 2008 is set out in Appendix 1. In its determination of the parameters, EMA has taken into consideration the comments and feedback it received from the industry through plenary submissions, e-mails and letters. EMA's response to feedback from participants is given in Appendix 2. The details pertaining to the key LRMC parameters[1] are set out below.

Key LRMC Parameters

Plant Load Factor (PLF)

5 The plant load factor ('PLF") is an important component in the determination of the vesting price. The PLF is the average proportion of plant capacity that is used to generate electricity in a year and taken together with the plant capacity determines expected plant output. It is important to the determination of the vesting price because the expected plant output is the denominator in the calculation of unit costs and average prices.

6 EMA has adopted an approach to setting PLF based on the actual performance of the most efficient CCGTs in operation in the system. This is then projected forward for the two years of the review period and if necessary adjusted downwards to take account of any constraints on the operation of this capacity.

[1] In setting the LRMC parameters, EMA took into consideration the advice of its consultant, Kema International BV ("KEMA") on the technical parameters. KEMA's Final Report dated 13 December 2006: "Setting of Technical Parameters for LRMC of CCGT" (hereinafter referred to as KEMA's report) is available for download at EMA's website.

7 The most efficient CCGTs currently in operation are the 'F' class technology machine. The average PLF of these CCGTs (Senoko CCP 3 to 5, Seraya CCP1 and CCP2, Tuas CCP 1 to 4) over the latest 12 months (i.e. October 2005 to September 2006) is calculated to be 75%. This number is then checked to ensure that this plant load factor is achievable for 2007 and 2008. The plant factor is therefore set at 75%.

Land, Infrastructure & Development Cost

8 The EMA's procedures paper 'EMA's Procedures For Calculating The Components of the Vesting Contracts' notes that in calculating costs, it should be assumed that the plant construction captures all the economies of scale associated with the baseline technology and that the cost of common facilities are shared evenly between units. In its assessment of this cost, EMA has assumed that the new genco will develop 2 units of 400 MW CCGT so as to achieve economies of scale through sharing the costs of common items such as land, site development and basic infrastructure to support the operation of the CCGT. These shared costs are allocated evenly to each of the 2 units.

9 The total land, infrastructure and development costs amounts to $162.03 million for each 400 MW unit. The detailed cost breakdown (for one 400 MW CCGT unit) is given below:

a. Land Cost: $8.94 million

The land cost comprises of land lease cost, water front fees and land preparation costs.

The land lease cost is based on Jurong Town Corporation's (JTC) quotation of $1,240,000 per ha[2] in the Jurong area for a period of 30 years, or $15.5 million for 12.5 ha of land.

The figure of $450 per meter per annum is used for the water front fees based on the centre value of JTC's quotation of $360-540 per meter per annum. The water front fees value of $450 per meter per annum is converted into an upfront premium for 30 years using a discount rate of 8.61%[3], which translates into $4788 per meter, or $0.958 million for a 200 meters water front area.

The land preparation cost is estimated to be $113,000 per ha, which works out to be $1.413 million for 12.5 ha of land.

The total land cost amounts to $17.871 million for two CCGT units, or $8.94 million per unit.

b. Facilities cost: $23.00 million

[2] With effect from 1 July 2006
[3] 8.61% is the weighted average cost of capital in the vesting price

This includes the cost of ancillary buildings, demineralization plant, seawater intake/outfall structures, construction of the jetty for emergency fuel unloading facility, and gas receiving facilities.

Facilities costs include a cost of $4 million for the ancillary buildings, $4 million for the demineralization plant, $11 million for the seawater intake/outfall structures, $16 million for the jetty for emergency fuel unloading facilities and $11 million for the gas receiving facilities. The facilities cost works out to $46 million for two units of 400 MW plants, or $23.00 million per unit.

c. Emergency fuel facilities: $18.29 million

The cost for the emergency fuel facilities is estimated to be $209 per cubic meter of fuel storage capacity. The cost works out to be $18.29 million for one unit of 400 MW plant.

d. Connection charge: $28.10 million

This includes the standard connection charge and the cost of 230kV switchgear.

The standard connection charge is $50,000 per MW quoted by SP Power Assets, or $37.7 million for 754 MW (or two units of 377 MW capacity[4]).

The cost of the switchgear is estimated to be $18.5 million.

The connection charge for two units of 400 MW plant is $56.2 million, or $28.10 million per unit.

e. Installation cost: $63.50 million

This includes the civil works for the plants, erection and assembly, detailed engineering and start-up costs, as well as contractor soft costs.

The civil works cost is estimated to be $13 million, erection and assembly costs to be $57 million, engineering & power island start-up costs to be $13 million and contractor soft cost (such as contractors fee, construction insurance and miscellaneous spare parts and material cost) to be $44 million.

This amounts to $127 million in installation costs for two units of 400 MW plant, or $63.50 million per unit.

f. Consultancy cost: $6.00 million

[4] This is the maximum site capacity, adjusting for local conditions for the 400 MW units, where local air and cooling water temperature are at its lowest. The site capacity where average air and cooling water temperature is used is 364 MW. For connection charges, the maximum site capacity is used to calculate the charges.

This includes consultant's fees for basic engineering studies, legal and financial advice.

The consultancy costs is estimated to be $12 million for two units of 400 MW plant, or $6.00 million per unit.

g. Miscellaneous owners' & start-up cost: $8.00 million

Miscellaneous owners' & start-up cost includes the cost up to and including the contract award, owners' manpower cost during construction, taxes and insurance during construction, as well as purchased electricity, water and fuel during construction.

The owners' manpower cost up to and including the contract award is estimated to be $3.5 million, owners' manpower cost during construction to be $7.5 million, taxes and insurance during construction to be $3 million, and purchased electricity, water and fuel during construction to be $2 million.

This amounts to a miscellaneous owner and start-up cost of $16 million for two units of 400 MW plant, or $8.00 million per unit.

h. Reinvestment Cost (after subtraction of residual value): $6.20 million

A reinvestment cost would be incurred after 12 operating years to enable the plant to perform at the same level as a new plant. The lifetime extension after the re-investment is 12 years (giving 24 years lifetime in total). The reinvestment cost is estimated to be $120 million i.e. a present value of $44.539 million[5] for two 400MW CCGT units.

The present value of the residual value[6] is $32.130 million.

The reinvestment cost after subtraction of the residual value is $12.409 million for two 400 MW CCGT units, or $6.20 million per unit.

Capital Cost of Power Plant

10 The capital cost includes the equipment cost, cost for dual hot switching capability and transport cost. The capital cost excludes the costs of installation, switchgears, fuel tanks, transmission and fuel connections, land, buildings and site development. These costs are included as part of the "land, infrastructure and development costs".

11 The equipment cost is estimated to be US$432 per kW under ISO conditions[7]. This yields an equipment cost of $271.296 million per 400 MW unit[8]. The cost for

[5] $120 million / (1+ 0.0861)^{12} = $44.5 million

[6] Residual value = (Initial total capital, land, infrastructure and development cost + reinvestment cost) * remaining lifetime / total lifetime. This works out as $167.615 million which is $32.130 million in present value i.e. $167.615 million / (1+ 0.0861)^{20} = $32.130 million

dual fuel hot switching capability is estimated to be $10.100 million per 400 MW unit. The transport costs is estimated to be at 2% of the equipment cost and cost for dual fuel hot switching capability, or $5.628 million. The total capital cost for one 400 MW unit is $287.02 million.

Heat Rate

12 EMA has used a simple average of the heat rates over 20 years. This heat rate value takes into account the average plant heat rate on site, the impact of ageing, or plant degradation over the 20 years, part load, the number of starts, life time extension and reserve allocation over the 20 years. The heat rate for the proxy plant is 6929 Btu/kWh.

Fixed Annual Running Cost & Variable Non-Fuel Cost

13 The fixed annual running cost includes costs that are incurred annually to keep the plant in a ready state for supplying energy and reserves. The variable non-fuel cost includes the costs, other than fuel costs, that vary with the level of energy output.

14 The fixed annual running cost consists of manpower and overhead costs, cost of carrying backup fuel and maintenance cost. The manpower and overhead costs are estimated to be $16 million, the cost of carrying backup fuel to be $21 million[9] and maintenance cost to be $39 million. This amounts to $76 million per annum for two units of 400 MW plant, or $38 million per annum for each unit.

15 The variable non-fuel cost consists of market operation ($0.38/MWh), system operation ($0.208/MWh) and consumables, such as feed water, oil and chemicals ($0.40/MWh). This amounts to $0.99/MWh for the variable non-fuel cost.

Weighted Average Cost of Capital (WACC)

16 Consistent with its past determinations, EMA has used the following formula (based on CAPM) to determine the WACC.

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

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 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;

[7] Based on the average of the cost of equipment quoted by Alstom, General Electric, Mitsubishi and Siemens manufacturers in Gas Turbine World 2006.
[8] Using an exchange rate of 1 US$ = S$1.57, based on the average of 3-months forward exchange rate quoted in Sep 2006 by the Association of Banks in Singapore.
[9] Using 8.61% discount rate

g is the level of gearing, i.e. debt as a proportion of debt and equity; and

t is the marginal corporate tax rate

17 In setting the WACC, EMA adopted a "Determination Month" as a base reference point. The last day of the month preceding the Determination Month serves as the "cut off" date for the calculation of data inputs for the WACC parameters.

18 Taking into consideration feedback from the industry, EMA has used October 2006 as the Determination Month. This means that available data up to the last business day of September 2006 was used to determine the WACC parameters.

Risk Free Rate

19 In deriving the risk-free rate, EMA adopted the yield of the Singapore Government Bond ("SGB") with the longest tenure that is closest to the lifespan of the relevant asset. This is the latest 15-year SGB maturing in September 2020 with issue code of NY05100N. The risk-free rate is determined as the average of the daily closing yield of this SGB for the month of September 06.

20 Using the above method, EMA has determined the risk free rate to be 3.35%.

Comparator Companies

21 EMA has used the following criteria to select the comparator companies used as benchmarks in the assessment of debt and equity capital. The criteria were developed based on industry feedback, to ensure that the comparator company chosen matches the risk profile of the new entrant. Criterion b) is included to reflect EMA's assessment that the risk profile of the new entrant should be higher than the market average.

a) Availability of data in the period examined;
b) Equity beta of the comparator company is above 1;
c) Absence of financial distress;
d) Operation in developed markets of comparable country risk to Singapore;
e) Sales revenue is primarily from power generation activities;
f) Majority of existing generation revenues accrues from merchant activities; and
g) Absence of significant ownership by individual investors/funds that could distort liquidity.

22 The summary table in Appendix 3 shows the comparator companies proposed by the gencos and consumers scored against the 7 selection criteria above. In deciding the appropriate comparator companies, EMA has adopted a binary "Yes/No" system for criterion (a) to (c). A scale-rating system is adopted for criterion (d) to (g). Any company with a "No" for any of the criterion (a), (b) or (c) would be excluded regardless of its score for criterion (d) to (g). Any company with total score

less than 10 out of 20 (i.e. summation of the score given for criterion (d) to (g)) would be excluded.

23 Based on the above selection criteria, the following companies are used to form the comparator group:

a) Energy Development Limited, Australia
b) International Power PLC, UK

24 These 2 comparator companies best match the risk profile of the new entrant and will appropriately reflect the new entrant's risk. Data from these companies are used for the determination of the proxy beta and gearing and are taken into consideration in determining the appropriate credit rating for the new entrant.

Beta

25 To compare betas across companies with different capital structures, EMA first derive the adjusted equity beta using the following formula[10]:

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

where $\beta_{equity-raw}$ is derived through a regression of individual monthly data points for a period of 5 years, ending on the last business day of September 2006.

26 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:

$$\beta_{asset} = \beta_{equity-adjusted} / \left(1 + (1 - T_c) * \frac{D}{E}\right) \qquad \textit{- Equation (1)}$$

Where T_c is the corporate tax rate
D/E is the debt-to-equity ratio

27 Table 1 shows the beta values of the comparator companies based on available data.

Table 1: Beta of the comparator companies (using monthly data)

Comparator Company	Equity Adjusted Beta	Debt to Market Capital Ratio (D/E)	Corporate Tax Rate	Asset Beta – derived using Equation (1)
International Power PLC	1.71	1.16	0.3	0.94
Energy Developments Ltd	1.23	0.70	0.3	0.83

Source: Bloomberg

[10] Bloomberg's formula to derive Blume-adjusted beta, which based on the assumption that a company's beta typically moves towards unity.

28 The average of the resulting asset betas is then taken to derive the proxy asset beta of 0.885. The proxy asset beta is then re-levered to derive the proxy equity beta. The following re-levering formula is used:

$$\beta_{equity} = \beta_{asset} * \left(1 + (1 - T_c) * \frac{D}{E}\right) \quad \textit{- Equation (2)}$$

Where T_c is the Singapore's corporate tax rate
D/E is the proxy debt-to-equity ratio.

29 The proxy debt-to-equity ratio used in Equation (2) is derived using Equation (3) and the proxy gearing of 0.456 (rounded to 3 decimal points for calculation purpose). The derivation of the proxy gearing is explained in the section on "Gearing" below.

$$\frac{D}{E} = \frac{Gearing}{1 - Gearing} \quad \textit{- Equation (3)}$$

Gearing

30 EMA has derived the proxy gearing based on the average gearing of the selected comparator companies. The gearing of each of the selected comparator company is derived from its debt-to-equity ratios using Equation (4) below.

$$Gearing = \frac{D}{E} / \left(1 + \frac{D}{E}\right) \quad \textit{- Equation (4)}$$

Where D/E is the debt-to-equity ratio which is calculated for the most recent 5-years period from the respective comparator's audited financial statements.

31 The average gearing of comparator companies ranges from 0.39 to 0.53 (figures rounded to 2 dec places, see Table 2). Taking arithmetic average, the proxy gearing for the new entrant is 0.46.

Table 2: Capital structure of comparator companies

Comparator Companies	International Power PLC	Energy Developments Ltd
Debt/Equity	0.53	0.39

Source: Bloomberg

Debt Premium

32 The debt premium represents the excess return over the risk-free rate, which a provider of finance or an investor expects when providing credit to an investment.

A credit rating of BB+, which is the highest sub-investment credit rating, is set for the new entrant. This is determined taking into account the credit ratings of the comparator companies where available (see Table 3) and the industry comments received.

Table 3: Credit ratings of comparator companies	
Comparator Companies	**S & P Credit Rating**
International Power PLC	BB-
Energy Developments Ltd	Not Rated

Source: Bloomberg

33 In determining the debt premium, the term of the debt used as comparator information will be based on available debt premium or debt spread information with term closest to 15-years. The debt spread data is sourced from the corporate debt spread reports published by the Bondsonline Group (based on Reuters market data). In its determination, EMA has derived the debt premium by benchmarking against the debt spread of the 10-year BB+ rated corporate bonds issued by the utilities companies. The debt premium is determined as 210 basis points ("bps") (see Appendix 4).

Market Risk Premium

34 The Market Risk Premium ("MRP") of 6% is determined by taking into consideration the information from the latest available published reports of Singapore- listed companies, such as SembCorp Industries, Keppel Corporation, CapitaLand and Singapore Food Industries. EMA notes from these published reports that the MRP is 6%. As a crosscheck, EMA has also noted that regulators in Australia, which has similar country-risk profile as Singapore, have also kept their MRP at 6%.

35 EMA notes from the industry comments that there is no objection to our setting of MRP at 6%.

~ End ~

Appendix 1

REVISED LRMC PARAMETER VALUES TO SET VESTING PRICE FOR 1 JAN 2007 TO 31 DEC 2008

S/No.	Parameter	Revised Value
	Technical Parameters	
1	Base Year	2006
2	Capacity per generating unit (MW)	364
3	HHV Heat Rate (Btu/kWh)	6929
4	Build Duration (months)	27
5	Plant Factor	75%
6	Capital Cost (S$million)	287.02
7	Land, Infrastructure & Development Cost, including re-investment cost (S$million):	162.03
8	Total Capital and Land, Infrastructure & Development Cost (S$million)	449.05
9	Variable Non-Fuel Cost (S$/MWh)	0.99
10	Fixed Annual Running Cost (S$million /year)	38
	WACC Parameters	
11	Risk Free Rate, rf	3.35%
12	Debt Premium, DP	210 bps
13	Market Risk Premium, MRP	6%
14	Gearing Ratio, g	0.46
15	Equity Beta, β_{equity}	1.48
16	Corporate Tax Rate, t	20%
17	Nominal Post Tax WACC	8.61%

Appendix 2

(I) EMA'S RESPONSE TO INDUSTRY FEEDBACK ON EMA'S DRAFT DETERMINATION OF 23 OCT 06 ON LRMC TECHNICAL PARAMETERS FOR 1 JANUARY 2007 TO 31 DEC 2008

Choice of Plant Type

Table 1: Industry Comments on Choice of Plant Type

Company	Comment
PowerSeraya	The EMA has stated in their response that they are agreeable to KEMA's assumptions that a new entrant will buy the version of technology available at the time of procurement. We disagree with the EMA decision and would like to reiterate that the choice of plant type defined in the vesting contract states that the LRMC technical parameters should be calculated based on the plant type which **is available and operational within Singapore** and the type of plant must **generate more than 25% of load in Singapore.** The principle that the technical parameters to be used for LRMC determination shall reflect what is available and operational within Singapore is paramount and reasonable because vesting contract is imposed on the generation companies and set the price for a significant portion of the units sold by the generation companies. It is only fair that figures that reflect the actual plant characteristics of the vesting contract holders would be used to ensure that a reasonable return is given to the vesting contract holders (i.e. investors). In addition, we would like to articulate that the rational for the inclusion of the 25% criteria before a new technology type would replace the current F-class technology is also a safeguard that the industry has agreed to include to ensure that the vesting contract holders are not unduly disadvantaged by change in technology type because vesting contract holders are "forced" to contract this portion as mandated by the Authority. Therefore, we would like to request for the EMA to clearly articulate the agreed principle that the plant type shall reflect what is available and operational within Singapore and must generate more than 25% of the load in Singapore.
Tuas Power	In the last determination of the LRMC, the choice of a proxy plant has been based on newly installed CCPs in the Singapore Electricity Market. This is in line with the criteria established that the technology is used in at least 25% of the electricity generation in Singapore. We urge EMA to adhere to this methodology. EMA's point that a new entrant will install the latest F-technology plant, in support of KEMA's recommendation, does not turn out true in the Singapore context. A recent new build for a competitor plant was based on an older technology ie the Alstom GT13E2 CCGTs.

EMA agrees with the principle that the plant type shall reflect what is available and operational within Singapore and must generate more than 25% of the load in Singapore. There is consensus among the industry, KEMA and EMA that the plant type, which is **available and operational within Singapore** and **generate more than 25% of load in Singapore,** refers to the class type, and not limited to the

specific model which is in operation in Singapore. Currently, the class type that fulfils this criterion is the 'F' class CCGT technology, which is consistent with the methodology used by KEMA in determining the plant type. The area of difference between EMA and the gencos is in that the gencos contend that the newer models of the 'F' class CCGTs that are not in use by the incumbents should not be included in the consideration of the proxy plant. EMA disagrees with the gencos' view. EMA agrees with KEMA's assessment that it is reasonable to expect that a new entrant will buy the latest models within the 'F' class technology available at the time of procurement.

2 Tuas Power also pointed out that EMA's point that a new entrant will install the latest F-technology plant, in support of KEMA's recommendation, does not turn out true in the Singapore context. A recent new build for a competitor plant was based on an older technology i.e. the Alstom GE13E2 CCGTs.

3 EMA disagrees with Tuas Power's view. EMA notes that the Alstom GE13E2 CCGT is an "E" class CCGT. There may be circumstances where a generator chooses to adopt a different technology to better suit its business model. This does not by itself invalidate the assessment by KEMA that a new entrant would buy the latest models within the 'F' class technology available at the time of procurement.

4 In an e-mail to EMA on 30 Nov 06, Tuas Power informed EMA that EMA should update its determination based on the figures in the 2006 Edition of Gas Turbine World Handbook ("GTW 2006"). On the other hand, gencos had on various occasions provided feedback that EMA should use the figures in the 2003 Edition of the GTW Handbook so as to reflect the LRMC of a unit that is available and operational in Singapore. For example, Power Seraya in its letter dated 13 Oct 06 informed EMA that they "appeal for the use of the 2003 figures to represent the characteristics of the plant operational in Singapore now rather than the latest figures from the manufacturers for the LRMC determination." EMA has in its Final Determination used the data from GTW 2006 as it is in line with its assessment that a new entrant would buy the latest models within the 'F' class technology available at the time of procurement.

Plant Load Factor

Table 2: Industry Comments on Plant Load Factor	
Company	**Comment**
PowerSeraya	EMA has decided to retain its approach to set PLF based on the actual performance of the most efficient Combined Cycle Gas Turbines ("CCGTs") in operation in the system and projected forward for the two years of the review period that is currently being contested in the Ministerial Appeal for the 2004 LRMC determination. We are baffled with how the EMA could reach the final determination to continue to use a "snap-shot" approach when KEMA Consulting, EMA's appointed consultant, had also agreed and recommended a life-cycle approach to determine the PLF. We would like to reiterate that the underlying concept of LRMC is to find the **average price** at which the a generation facility in operation in Singapore will cover its variable and fixed costs and provide reasonable return to investors over the life of the plant. Therefore, we would like to urge the EMA to re-consider the Genco's approach to take a simple average of expected PLF over the life of a plant as it is important to take into account the decline in the performance capacity over its economic life span in order to arrive at the **average price** for LRMC determination.
Tuas Power	We disagree with the EMA's approach in the determination of the plant load factor and note with regret that EMA has continue to dismiss the substantive arguments put up by Gencos that the derivation of the long run marginal cost (LRMC) has to take into account the life cycle of the plant. EMA's approach, of taking a past one year of actual data for plant load factor and projecting it forward for the next two years of the review period, cannot be a suitable proxy for the plant load factor over the 20 years life cycle of the Combined Cycle Plant (CCP). The approach also runs contrary to the rationale of adopting the LRMC of a new entrant which is set to cover variable and fixed costs and provide reasonable returns to investors. This rationale is as provided in the EMA's Procedures for Calculating the Components of the Vesting Contracts. EMA has rejected the Gencos proposed approach as "it gives undue weight to projections of the future that were subject to considerable uncertainty". EMA also said that there is no certainty there would be a decline in plant performance. EMA's rejection of the Gencos proposed approach, on the basis that there is no certainty of a decline in plant performance, misses the point. In our view, EMA's approach is less suited as it introduces even greater uncertainty and error and there is no certainty that the estimates would turn out to be correct as conditions can change over time. In making estimates for the various parameters of the LRMC, robust assumptions have to be made. For information, a new plant will decline in performance through the years due to factors such as ageing and displacement by technologically superior plant coming on stream. This is a reasonable assumption supported by hard operating data locally and overseas. This view is also supported by KEMA, who had recommended calculating PLF based on economic plant life cycle of 20 years.

5 While EMA agrees with Tuas Power that robust assumptions have to be made in making estimates for the various parameters of the LRMC, EMA disagrees with Tuas Power's view that 'EMA's approach is less suited as it introduces even greater uncertainty and error and there is no certainty that the estimates would turn out to be correct as conditions can change with time.'

6 Power Seraya has urged EMA to 're-consider the Genco's approach to take a simple average of expected PLF over the life of a plant as it is important to take into account the decline in the performance capacity over its economic life span in order to arrive at the **average price** for LRMC determination'.

7 EMA disagrees with the Gencos' view on the following basis. EMA notes that KEMA had recommended using a discounted approach over 20 years in its modeling to calculate the plant load factor. Despite this, EMA also notes that it is stated in KEMA's report that for the plant factor, opinions range from using the values forecast for the two years of application of the technical parameters (i.e. 2007, 2008) to applying a simple arithmetic average of the same over the 20 years period (i.e. that this was one of the many ways in which PLF can be calculated.). According to the report, the former has the benefit of being more accurate than the latter as the accuracy of forecasting diminishes as years go forward[11]. KEMA also adds that taking the figures of the first 2 years is more accurate than taking a simple average over the 20 years period on the basis that taking a simple average over 20 years would give undue weight to projections of the future that were subject to considerable uncertainty, and hence provide investors with windfall gains as there is no certainty there would be a decline in plant performance. EMA notes that KEMA as such agrees with EMA that projections of the future are subject to considerable uncertainty. EMA agrees with KEMA that the gencos' approach, which assumes that the PLF falls in the future and does not apply any discounting for the projection of the future, is subject to considerable uncertainty which may allow the gencos to make a windfall that is more than a reasonable rate of return.

8 EMA also noted KEMA's view that although taking 2 years is more accurate than a simple 20 years average, 'if we only look at the first two years, we overestimate the yearly income and underestimate the yearly cost of the investor'[12]. However, EMA disagrees with KEMA that taking the discounted approach would correct for the uncertainty and subjectivity of the 20-years approach. KEMA's approach of discounting adds further subjective elements of judgment in the way the discount rate is applied. In contrast, EMA's approach of setting the PLF is based on the actual and achievable performance of efficiently based-loaded capacity. PLF may increase or decrease in the future. EMA's approach allows this to be taken into consideration at each biannual review. EMA's approach is objective and as such more suitable.

9 Predicting the PLF over the lifecycle of the plant presents real difficulties given the uncertainties over the rate at which the plant would be displaced by more efficient technologies, and how market conditions would evolve over the lifespan of the plant. EMA's approach is better aligned with the key underlying policy objective

[11] Page 9 of KEMA's report.
[12] Page 41of KEMA's report.

of the vesting contract regime, and achieves a good balance between the interests of the Gencos and the consumers.

Re-investment cost on heat rate

Table 3: Industry Comments on Re-investment cost on heat rate	
Company	**Comment**
PowerSeraya	KEMA Consulting recommended a re-investment (or refurbishment) cost to be incurred at the end of year 12 of the plant operation to extend the economic life by another 12 years. With the increase in the plant lifetime, KEMA held the view that the heat rate of the proxy machine will be re-set back to its as-new values after the refurbishment. PowerSeraya strongly feels that the assumption that a proxy machine will be able to reset back to its as-new is not realistic and would like to request the EMA to review this assumption before determining the Heat Rate for the LRMC determination.

10 KEMA has assumed that improved upgrades of the parts to be replaced will be available. These improved upgrades are expected to have better performance than the original parts as they follow in the wake of evolving gas turbines technology. Therefore KEMA expects these upgrades will more than compensate for the 'non-recoverable' deterioration incurred. KEMA has confirmed with an equipment manufacturer that gas turbine performance after 100,000 operating hours for instance can be restored to as-new performance by fitting upgrade packages offered by the equipment manufacturers or OEMs. EMA also notes that KEMA has accounted for the costs of the improved upgrades (which will reset the proxy machine back to at least the original performance) in the re-investment costs.

Miscellaneous Issues

One of the gencos reflected that the emergency fuel facilities are grossly underestimated at $11.6 million which is based on a cost of $132 per cubic metre. The genco has submitted the details of the relevant contract documents for EMA's consideration to determine the cost of emergency fuel facilities.

11 EMA has assessed the genco's submission to EMA and has adjusted the cost for the emergency fuel facilities to $209 per cubic meter

(II) EMA'S RESPONSE TO INDUSTRY FEEDBACK ON EMA'S DRAFT DETERMINATION OF 23 OCT 06 ON WACC PARAMETERS FOR 1 JANUARY 2007 TO 31 DEC 2008

Risk Free Rate

Table 1: Industry Comments on Risk Free Rate	
Company	**Comment**
PowerSeraya	In the final draft determination on WACC, the EMA has determined the Risk Free Rate based on the average of the daily closing yield of this SGB for the month of September 2006. To remove any short term volatility in the determination of the Risk Free Rate, we would like to request for the EMA to re-visit the methodology and adopt a 6 month average daily closing yield of the latest 15 year SGB instead of just using the average daily closing yield of the SGB for the month of September 2006.
Tuas Power	The EMA mentioned that there has been a declining trend in the averaging of the daily closing yield of the latest SGB since July 06 and hence for the month preceding the determination month would be sufficient for smoothening out any short-term volatility. EMA's 1-month model however is susceptible to immediate short-term volatility and shocks that can come in at unpredictable times. The proposal of using the daily average of 6-month period preceding the determination month will reduce the impact of such unexpected drastic events.

EMA has determined the Risk Free Rate based on the average of the daily closing yield of the latest 15 years SGB for the month of September 2006.

2 EMA disagrees that our "1 month model" is unduly susceptible to immediate short-term volatility and shocks. Averaging the daily closing yield for the month would be sufficient for smoothening out any short-term volatility experienced in the month of September while reflecting the markets' latest assessment of the risk free rate. EMA has looked at the monthly yields of the latest SGB for all the months since it was issued in September 2005 (as shown in Fig 1 below). There is a downward trend in the monthly yield since July 2006. This indicates that the monthly yield of September 2006 is not affected by any market abnormality or unexpected drastic events but results from the markets' valuation of the risk free rate.

Fig 1

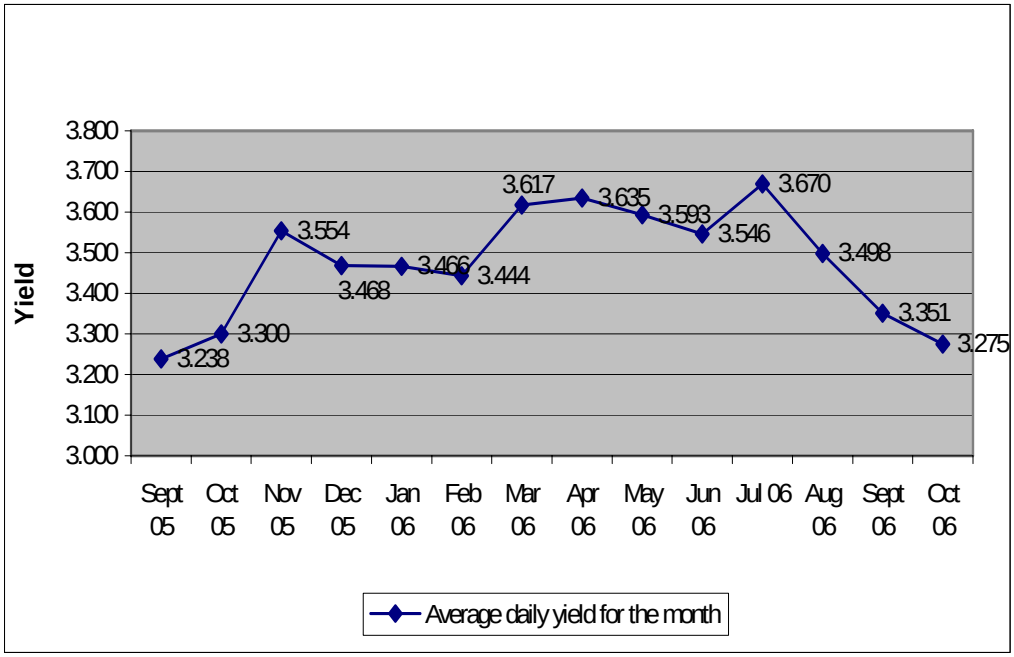
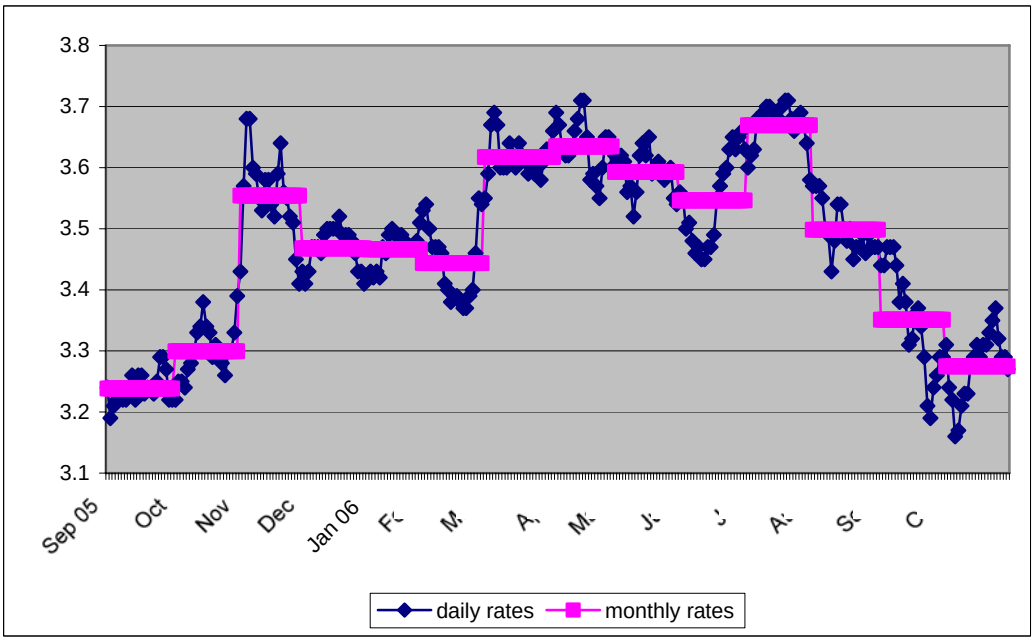


Fig 2



3 By comparing the monthly yield and the daily yield of the latest SGB for the months of September 2005 to October 2006 as shown in Fig 2, we can see that averaging the daily closing yield for the month would be sufficient for smoothening out any short-term volatility. If we were to take an average over a longer period, for example 6-months, valuable information on the markets' latest valuation of the risk free rate will be lost.

4 In view of the above, determining the Risk Free Rate (by using the average of the daily closing yield of the latest 15-years SGB for the month of September 2006) is reasonable. This method is also consistent with the previous determination.

Comparator Companies

Table 2: Industry Comments on Comparator Companies	
Company	**Comment**
PowerSeraya	We empathize with the difficulty that the EMA is going through to identify suitable comparator companies that reflects the Singapore market conditions to be used for the LRMC determination. We would like to reiterate our objection to the use of Energy Development Limited (Australia) as one of the comparator companies in the WACC review because 90% of Energy Development Limited (Australia) revenue is secured by long term Power Purchase Agreements (PPAs) and Power Supply Agreements (PSAs). Long term PPAs add certainty to the company earnings as they provide steady revenue and cash flow as well as certainty in borrowings. In our opinion, the criteria that majority of existing generation revenues accruing from merchant activities is the most important criteria. Failing to meet this criterion shall result in immediate exclusion from being one of the comparator companies for the WACC determination. Therefore, we would like to request for the EMA to re-consider our proposal for the removal of EDL from the list of comparators and the inclusion of British Energy as a comparator because EDL, backed by long-term Power Purchase Agreements, has guaranteed steady stream of income.

5 EMA notes PowerSeraya's request to remove Energy Development Limited (EDL) from the list of comparators and to include British Energy (BE) as a comparator because EDL, backed by long-term Power Purchase Agreements (PPAs), has a guaranteed steady stream of income.

6 The comparator companies have been selected based on the selection criteria developed from industry feedback, to ensure that the comparator companies chosen match the risk profile of the new entrant.

7 EMA disagrees that the criteria that the majority of existing generation revenues must accrue from merchant activities is the most important criteria. Although the majority of EDL's revenue comes from long-term PPAs, it is possible for Singapore gencos to earn stable streams of revenue by securing long-term agreements with retailers or large consumers (i.e. similar to EDL). There is accordingly no reason to exclude EDL solely on this premise. EMA has given recognition to EDL's reliance on PPAs by awarding it a low score in the relevant category on the grading criteria. Overall, EDL satisfies the criteria that have been set out for the selection of comparators.

8 As explained previously, BE is not included as a comparator company as it had failed to meet one of the binary selection criteria, i.e. it had experienced financial distress recently (from end 2004 to start of 2005). This results in inaccurate correlations for the beta estimates measured during the financial distress period (i.e. the period before delisting). Including companies with financial distress would cause the proxy gearing level for the new entrant to be biased. If EMA was to exclude the data on BE's beta during the period in which it was financially distressed (i.e. estimate of beta to be based on data from January 2005, by which time restructuring was completed), and use only post January 2005 data, there will be insufficient financial data from BE that can be used for deriving the gearing and beta figures. Reliance on the limited information of BE will result in inaccuracies in the gearing and beta level.

9 Detailed analysis of BE's financial position further supports our assessment to exclude BE as a comparator. BE has an S$15 billion liability on its Balance Sheet because of its nuclear decommissioning liabilities. BE is protected from the financial consequences of this liability by an indemnity provided by the United Kingdom government. In return for the indemnity, BE has accepted the imposition of a cash sweep, under which it can end up making payment of more than S$300 million per year to the United Kingdom government. The United Kingdom government also retains the right to convert the cash sweep to BE's equity, which would give the United Kingdom government a 65% stake in the company. In view of its incomparability to the selection criteria and the more detailed analysis above, there is no persuasive case for including BE as a comparator company.

10 In view of the above, EMA will use the following companies to form the comparator group for the new entrant:

1. Energy Development Limited, Australia
2. International Power PLC, UK

Equity Beta

Table 3: Industry Comments on Equity Beta

Company	Comment
Tuas Power	EMA assessed that the risk to investor will be reduced with a lower gearing, and therefore investor will accept a lower return. Equity investor would expect return to be maintained or increased as his risk exposure increases with higher equity. It is important to note that when there are lower debts in a company, as financing costs are tax-deductible item, the company may not enjoy better after-tax returns.

11 EMA notes Tuas Power's comments that an equity investor would expect his returns to be maintained or increased as his risk exposure increases with higher equity, and when there are lower debts in a company, the company may not enjoy better after-tax returns as financing cost is a tax-deductible item.

12 The views expressed by Tuas Power on the cost of equity are not consistent with corporate finance theory and practice. Reducing the proportion of debt finance reduces the risks to equity investors as debt carries with it obligations to make fixed interest payments. Reducing these fixed interest payments reduces the volatility of the residual cash flow available to equity investors and so reduces risk. As for the points made by Tuas Power on corporation tax, EMA notes that in the calculation of vesting prices there is a separate allowance for corporation tax and so before tax and after tax returns should be consistent with the requirements of the investors.

Debt Premium

Table 4: Industry Comments on Debt Premium

Company	Comment
Tuas Power	In EMA's latest draft final determination dated 23 October 2006, the 10-year corporate spread for utilities companies was used which stood at 210 bps (using data as of 29 Sep 06). However, in its draft determination paper dated 22 September 2006, the 10-year corporate spread for industrial which stood at 215 bps was used (using data as of 28 Apr 06). In its September 06 draft, EMA justified that the rationale for choosing the corporate spread for industrials as the 10-year corporate debt spread for utilities companies has displayed a sharp anomaly from credit rating "BBB-" to "BB". EMA has not adopted a consistent approach in determining the 10-year corporate debt spread as it uses data from "utilities" or "industrial" as it sees fit. EMA should stick to the practice used in the last determination i.e. to use "industrial". Since the economic life of the plant is 20 years, which is between the Reuters' 10-year and 30-year corporate bond spread table used by EMA, we propose that the mid point of these two spreads to be used.

13 EMA disagrees with Tuas Power that we have not adopted a consistent approach in determining the debt premium. The utilities sector is a more appropriate benchmark for the new entrant as compared to the industrial sector. We had indicated in the draft determination (circulated on 22 September 06) that we used the corporate debt spreads report of industrial companies as at 28 April 2006 instead of the corporate debt spreads report of utilities companies, because the 10-years corporate debt spreads for utilities companies as at that date displayed a sharp anomaly viz. the BB+ credit rated bonds had a higher spread than the BB and BB- rating. This is contrary to common wisdom that debt spreads should rise as the credit ratings decline. We had also indicated then that we will use the debt spread from the 10-years BB+ rating corporate bonds for utilities companies if the corporate debt spreads report of utilities companies as at 29 September 2006 shows no anomaly for the 10-years corporate debt spreads. Since the corporate debt spreads report of utilities companies as at 29 September 2006 shows no anomaly for the 10-years corporate debt spreads, EMA has used the debt spread from the 10-years BB+ rated corporate bonds for utilities companies to determine the debt premium in the current determination. There is thus no inconsistency on EMA’s part in using the debt spreads for utilities this time.

14 In determining the debt premium, the term of the debt used as comparator information is based on available debt premium information obtained from a reliable source with a term closest to 15 years. As a company can have a mixture of long, medium and short-term bonds when seeking financing for their operations, the term of the debt used as comparator information need not match the lifespan of the asset. EMA further notes that the local gencos for instance, have issued 7-years and 10-years bonds.

15 The debt spread from the 10-years BB+ rating corporate bonds issued by utilities companies would provide a reasonable proxy of the debt premium required and therefore no further adjustments are necessary.

~ End ~

SUMMARY TABLE OF THE COMPARATOR COMPANIES PROPOSED BY THE INDUSTRY AGAINST THE SELECTION CRITERIA

Criteria	The AES Corporation (US)	Constellation Energy Group Inc, US	Energy Development Limited, Australia	International Power PLC, UK	British Energy, UK	Exelon Corp, US	Grading Scale
Availability of data in the period (September 01 to September 06) examined	-	-	-	-	Data not available during the period it was delisted (23 Oct 04- 20 Jan 05). Beta data only available from 21 Jan 05 onwards after it has been relisted.	-	
Y/N	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	
Equity beta of the comparator company is above 1(methodology adopted is as discussed under parameter "Asset Beta")	-	Equity beta is 0.68	-	-	Based on weekly beta data from January 05 onwards after it has been relisted	Equity beta is 0.53	
Y/N	**Y**	**N**	**Y**	**Y**	**Y**	**N**	
Absence of financial distress	Financial distress in 2001.	No financial distress in the period examined.	No financial distress in the period examined.	No financial distress in the period examined.	Financial distress from end 04 to start of 05. Delisted in Oct 04.	No financial distress in the period examined	

Criteria	The AES Corporation (US)	Constellation Energy Group Inc, US	Energy Development Limited, Australia	International Power PLC, UK	British Energy, UK	Exelon Corp, US	Grading Scale
					Underwent a restructuring and was relisted in Jan 05.		
Y/N	**N**	**Y**	**Y**	**Y**	**N**	**Y**	
Operation in developed markets of comparable country risk to Singapore	23-28% of total revenue generated from developed countries (UK and US) in 03 to 05. The remainder was from Brazil, Latin American, and Middle East region (Source: Bloomberg). 32% of operation in US and UK (AES Fact Sheet May 06, pg2-6).	All sales revenue from US (Source: Bloomberg).	Majority of revenue was from Australia and Asia (71%-74% in 03 to 05). Remainder of revenue is from UK and US.(Source: Bloomberg). Majority of operation in Australia (68%), UK (11%), US (15%) (Source: EDL Annual Report 05, pg 6).	Majority of revenue from Australia, Europe, N. America (87% in 03, 93% in 04, 100% in 05) (Source: Bloomberg).	All revenue from UK (source: Bloomberg).	All revenue from US (Source: Bloomberg).	Equal and above 90% is 5, 70%-89% is 4, 50%-69% is 3, 30% -49% is 2, 10%-29% is 1, below 10% is 0.
Comparability (out of 5)	**1**	**5**	**5**	**5**	**5**	**5**	
Sales revenue generated primarily from power generation activities	47-48% of total revenue was generated from power generation activities in 03 to 05 (Source:	Data not available.	100% of total revenue was from power generation activities (Source: Bloomberg and Annual Report 05, pg 6).	100% of total revenue attributed to generation. (Source: Bloomberg and Annual Report 05 segmental	84% of total revenue was from generation (Source: Bloomberg and Annual Report 2005).	37% to 41% of total revenue was from generation activities in 03 to 05. (Source: Bloomberg	Equal and above 90% is 5, 70%-89% is 4, 50%-69% is 3, 30% -49% is 2, 10%-29%

Criteria	The AES Corporation (US)	Constellation Energy Group Inc, US	Energy Development Limited, Australia	International Power PLC, UK	British Energy, UK	Exelon Corp, US	Grading Scale
	Bloomberg and AES Fact Sheet May 06, pg 1).			reporting).		and Form 10-K 05, pg 108 and 128).	is 1, below 10% is 0.
Comparability (out of 5)	**2**	**-**	**5**	**5**	**4**	**2**	
Majority of existing generation revenues accruing from merchant activities	Revenue from competitive supply was 10-12% in 05 and 06 (Source: Form 10-Q filed in 8 May 06, page 18) and 10-11% in 04 and 03 (Source: Form 10-Q filed in 8 Nov 04, page 14).	Data not available.	10% of revenue was generated from merchant activities in 05. 90% of revenue was secured using long term Power Purchase Agreements (PPAs) and Power Supply Agreements (PSAS) in 05 (Source: Energy Development Ltd's briefing to Shareholders on 1 July 05).	41% of the plant capacity was supplied under short-term contracts, 15% is uncontracted and 35% is long-term contracts or PPAs. (Source: May 06 data from "International Power: At a Glance")	Virtually all revenue was generated from short-term contracts or pure merchant after restructuring (Source: Preliminary Results for FYE 31 Mar 06 Pg 7 and 21).	16% to 21% of total revenue in 03 to 05 was generated from wholesale and retail electric sale. Revenue from sales to affiliates was generated under long term PPA (Form 10-K 05, pg 108 and 128).	Equal and above 90% is 5, 70%-89% is 4, 50%-69% is 3, 30% -49% is 2, 10%-29% is 1, below 10% is 0.
Comparability (out of 5)	**1**	**-**	**1**	**3**	**5**	**1**	
Absence of significant ownership by individual investors/funds that could distort liquidity	Ownership of more than 5% of outstanding stocks: Legg Mason Funds Management, Inc (19.72%) and FMR	Ownership of more than 5% of outstanding stocks: Barclays Bank PLC (7.6%) (Source: Form 10K/A YE 2005, pg 15).	Ownership of more than 5% of outstanding stocks: Infratil Australia Ltd (18.3%), JP Morgan Nominees Australia	Ownership of more than 5% of outstanding stocks: AXA S.A. (5.08%) (Source: Annual Report 2005, directors' report).	Ownership of more than 5% of outstanding stocks: Deutsche Bank (14.3%), Invesco Asset Management (6.1%), B J Stark	Ownership of more than 5% of outstanding stocks: Capital research and management company (7%) and	Less than 5% ownership by individual investors/funds is 5, 5%-20% ownership is 4, 21%-40%

Criteria	The AES Corporation (US)	Constellation Energy Group Inc, US	Energy Development Limited, Australia	International Power PLC, UK	British Energy, UK	Exelon Corp, US	Grading Scale
	Corporation (8.28%) (Source: FAQ on website, annual disclosure in Proxy dated 4 April 06).		(12.12%), Westpac Custodian Nominees (11.08%), National Nominees Ltd (8.1%), RBC Global Services Australia (11.46%) (Source: Annual Report 05, pg 68).		Esq (5.4%), Schroder Investment Management (5.4%) (Source: Directors' Report for the period ended 05)	Wellington Management Company (6.19%) (Source: Form 10K YE 05, pg 466).	is 3, 41% - 60% is 2, 61%-80% is 1, above 81% is 0.
Comparability (out of 5)	**4**	**4**	**4**	**4**	**4**	**4**	
Total Score (out of 20)	8	-	15	17	18	12	

Appendix 4

EXTRACT OF REUTERS CORPORATE BOND SPREAD TABLES PUBLISHED BY BONDSONLINE GROUP

Reuters Corporate Spreads for Utilities
09/29/2006

Rating	10 yr
Aaa / AAA	52
Aa1 / AA+	61
Aa2 / AA	71
Aa3 / AA-	87
A1 / A+	90
A2 / A	106
A3 / A-	111
Baa1 / BBB+	122
Baa2 / BBB	141
Baa3 / BBB-	147
Ba1 / BB+	210
Ba2 / BB	220
Ba3 / BB-	230
B1 / B+	265
B2 / B	320
B3 / B-	395
Caa / CCC+	470

Spread values in the table above represent basis points (bps) over a US Treasury security of the same maturity, or the closest matching maturity as at the last working day in September 2006, i.e. 29 September 2006.