

CHAPTER IV

FINANCIAL & ECONOMIC ANALYSIS

4.1 Introduction

This chapter has an intention to show the result of financial value and also economic value of the project case study in base case (no supporting from any CDM execution) to see the difference of each outcome and understand why such kind of project requires additional option from the CDM. In the episode, economic Value Added (EVA) analysis and most commonly, on financial tools such as net present value, minimum attractive rate of return, payback period and levelized production cost will be shown the attractiveness or unattractiveness of a capital investment project.

4.2 Project Cost Estimation

In the first step of making the analysis, a quantitative assessment of the cost of all resources required to complete the entire project is the first thing that have to be clear before determine the adequacy of the funds to be provided for financing all activity resources in financial analysis For the project case study, budget for the equipment and construction have been determined based on EGAT's in-house data as shown below:

- Handling Fuel Equipment 100,000 Baht/ kW
(Including waste separation equipment, cutting equipment, conveyor, waste storage room and waste transmission line)
- Generating System 35,000 Baht/ kW
(Including Boiler, Turbine, Generator and Control System)
- Emission Reduction Equipment 12,000 Baht/ kW
- Execution, Land, Facilities cost 20% of entire investment

From the inventory, it shown that the cost of project (direct cost) relies on the power capacity, which the power plant can perform (being 12.84 MW or equivalent 12,840 kW).

In estimation, the indirect costs are figured at around 10.82% of total direct costs for Environmental Impact Assessment (EIA), engineering service and import duty including contingency of 5% on entire cost for additional design changes (source: EGAT in-house data). Energy fund, Interest during construction (IDC; source: a report of Jaroensompong Corporation) and financing fees are also calculated. By expected period in construction is in two years and having a portion in expenditure is 30: 70.

However, in doing such the business, there are some privileges that have been offered by Thai government in order to motivate productivity and utilizing of renewable energy in Thailand. By MSW is also counted as one type of renewable energy that can get the assist from this offer. The privileges, which the researcher mentioned about, are comprised of: (source from: ECO Forum 1: "Innovation on Biofuel in Thailand")

1. Adder cost in purchasing electricity from source, the project will get adder cost (2.50 baht/ kWh) being money support throughout the first 7 years of its operation.
2. Low interest loan rate (4%- give for 50 million Baht/ scenario at maximum 7 years of loan repayment)
3. Exemption from payment of surface under the law on promotion of investment, import duty, vat and excise tax on imported machinery, components, etc. and material imported for factory construction.
4. Corporate income tax exemption for the first 8 years. (source: BOI website)

All of them will be added up into the estimated cost model so as to be an initiative step to find the feasibility of the project in form of both financial and economic result and so on. According the criterions, the estimated capital cost is shown in Table 4-1.

Base on year 2007		Million Baht	
Description	Total	Year 2008 (at 30%)	Year 2009 (at 70%)
1. Handling Fuel Equipments	1,284	385.06	898.46
2. Generating System	449.23	134.77	314.46
3. Emission Reduction Equipment	154.02	46.21	107.82
4. Execution, Land, Facilities Cost	377.35	113.21	264.15
Sub-Total 1	2,264.13	679.24	1,584.89
5. Environmental Impact Assessment (Net Cost for Small Project)	1	1	-
6. Engineering (4%)	90.57	27.17	63.40
7. Import Duty and Taxes (0%)	-	-	-
8. Contingency (5%)	117.78	35.37	82.41
Sub-Total 2	2,473.48	742.04	1,731.44
9. Escalation	104.57	12.87	91.69
Sub-Total 3	2,578.04	754.92	1,823.13
10. Energy Fund (Pay during Construction period only)	1.28	0.64	0.64
11. Interest During Construction (10%)	169.16	31.43	137.73
12. IDC (4%- for part of getting the privileges)	1.60	0.30	1.30
12. Front-End-Fee (1.5%)	31.35	31.35	-
13. Commitment Fee (0.375%)	5.52	5.52	-
Grand-Total	2,786.96	824.16	1,962.80

TABLE 4-1: Cost Estimation for Incineration Power Plant

In assumption, the total cost which was early estimated will be financed by both debt and equity in portion of 75: 25 (Source: EGAT in-house data). Each of which is delineated as shown:

Description	Total	Year 2008 (at 30%)	Year 2009 (at 70%)
Debt @ 75%	2,090.22	618.12	1,472.10
Equity @ 25%	696.74	206.04	490.70

4.3 Financial Analysis

To determine the adequacy of the funds to be provided for financing all activity resources; to judge whether the proposed cash flow is likely to make the activity financially viable during the activity operating period. Both of economic and financial analysis is conducted and used to answer the question in this research.

The 12.84 MW Incineration Power Plant Project will be carried out using the discounted cash flow method or net present value (NPV) to determine return on equity, payback period, the levelized production cost and EVA of the project in base year (2008).

4.4 Assumptions

Most assumptions used in the research are obtained from EGAT in-house data, the manipulative result or reliable sources which will be mentioned in each topic below, and all of them will be categorized in form of the diverse parameters as follows:

Technical Parameters

As specified in the conceptual design and the technical result, the power plant has the following performances:

Gross plant output	12.84	MW
Commercial Operation Date	1 January 2010	
Plant Life	20	Years

	MSW 1,000 ton/day	
	Peak	Off peak
Energy Purchase from PEA * (kWh/yr)	-	-
Energy Sell To PEA (kWh/yr)	48,352,000	41,999,000

* PEA = Provincial Electricity Authorities

4.4.2 Cost Parameters

4.4.2.1) Total Project Costs

The project cost consists of fuel handling equipment cost, power plant capital cost and other associated cost such as working capital, Interest during Construction (IDC) and financing fees. The estimated total project cost of Incineration MSW Power Plant Project is about 2,786.96 Million Baht as mentioned above.

4.4.2.2) Operating Costs

The operating costs consist of operation & maintenance cost, insurance premium and depreciation. The operating cost parameters are as follows:

Operation and Maintenance Cost

Operation and maintenance cost, which comprises operation and maintenance, is supposed at 13% of the equipment cost (referred from Phuket incineration power plant data- compare and convert into an appropriate percentage for the project case study being capacity setting at 12.84 MW).

Insurance Premium

Insurance premium is 0.75 % of the investment cost.

4.4.2.3) Revenues

Revenue of project gains from net selling electricity to PEA under Small Power Producer (SPP) program is approximately 285.38 Million Baht per annum (include ADDER, detailed see Appendix A). Moreover, from the collecting data, there is the MSW eradication charge rate that can be counted as the project revenue. The rate is 300 Baht per ton MSW and will be increased 10 percent every 3 years (data from Thaklong municipality in 2007). The income of MSW eradication concession is about 133.01 Million Baht for MSW 1,000 ton/year. Besides, there is another income getting from selling some of MSWs that cannot be used in the combustion process to any outside buyers such as metal, glass and etc. The revenue from this selling is 47.83 Million Baht per annum. Total revenue of the project is about 435.93 Million Baht per annum.

4.4.3 Financial Parameters

The assumptions for the financial analysis are as follows:

• Base Year	2008	
• Debt/Equity Ratio	75:25	
• Grace Period	2	Years
• Repayment Period	10	Years
• Repayment Period (part getting privileges)	7	Years
• Front End-Fee	1.5	%
• Commitment Fee	0.375	%
• Interest Rate (following by cost of debt calculation shown below: after taxes)	10.42	% p.a.
• Dividends & Bonuses	70	% of net income
• Interest Rate (part getting privileges)	4	% p.a.
• Income Tax	30	%
• Discount Rate *	Vary in each year	%
• Exchange Rate (US\$)	34	Baht/US\$

*For the discount rate as mentioned in Chapter 2, it carries out by using Weighted Average Cost of Capital (WACC) method because the company's assets are assumed to be financed by both debt and equity. WACC is the average of the costs of these sources of financing, each of which is weighted by its respective use in the given situation. By taking a weighted average, we can see how much interest the company has to pay for every baht in finances.

The firm's WACC is the overall required return on the firm as a whole and, as such, it is used to determine the economic feasibility. It is appropriate discount rate to use for cash flows with risk that is similar to that of the overall firm.

WACC is calculated by multiplying the cost of each capital components by its proportional weight and then summing:

$$WACC = \frac{Equity}{(Equity + Debt)} \times Cost_of_Equity + \frac{Debt}{(Equity + Debt)} \times Cost_of_Debt \times (1 - Tax)$$

To calculate WACC, investors need to determine the company's cost of equity and cost of debt. Here's a breakdown:

Cost of equity is the minimum rate of return a firm must offer shareholders to compensate for their returns, and for bearing some risk. The cost of equity is broadly

defined as the risk weighted projected return required by investors, where the return is largely unknown. The cost of equity is therefore inferred by comparing the investment to other investments with similar risk profiles to determine the “market” cost of equity. On this basis the most commonly accepted method for calculating cost of equity is capital asset pricing model (CAPM)

$$\text{Cost of Equity} = \text{Risk Free Rate} + (\beta_{\text{levered}} \times \text{Market Risk Premium})$$

Where:

- Risk free rate is the amount obtained from investing in securities considered free from credit risk (the government bond yield)
- β -beta: this measure how much a company’s share price reacts against the market as a whole. A beta of one, for instance, indicates that the company moves in line with the market. If beta is in excess of one, the share is exaggerating the market’s movements; less than one means the share is more stable.
- Market risk premium represents the returns investors expect to compensate them for taking extra risk by investing in the stock market over and above the risk free rate. In other words, it is the difference between the risk free rate and the market rate. The market risk premium frequently cited is based on the historical average annual excess return obtained from investing in the stock market above the risk free rate. The average may either be calculated using an arithmetic mean or a geometric mean. In the research, market risk premium of the incineration power plant will follow with the rate that EGAT used by believing in both of them are in the same business (electricity generating company), the returns rate should be the same.

During cost of debt is the effective rate that the company pays on its current debt. When compared to cost of equity, it is fairly straightforward to calculate. The rate applied to determine the cost of debt should be the current market rate the company is paying on its debt. If the company is not paying market rates, an appropriate market rate payable by the company should be estimated. Since the debt expense is a deductible expense, the cost of debt is computed as an after tax cost to make it comparable with the cost of equity.

$$\text{Cost of Debt} = \text{Risk Free Rate} + \text{Credit Risk Premium}$$

Where:

- Risk free rate is the amount obtained from investing in securities considered free from credit risk (the government bond yield)
- Credit Risk Premium is an additional amount included in a security's yield which reflects what could be lost if issuer were to default.

4.4.3.1) WACC Parameters

- **Risk free rate:** Getting from the government bond yield by looking at the longest year to maturity. In analysis, this rate will be assumed as a fixed rate throughout its plant life.

Interpolation of T-Bill Yield & Government Bond Yield Curve																						
DATE	Bond Equivalent Yield of T-Bill				Government Bond Yield																	
	1 M	3 M	6 M	1 Y	2 Y	3 Y	4 Y	5 Y	6 Y	7 Y	8 Y	9 Y	10 Y	11 Y	12 Y	13 Y	14 Y	15 Y	16 Y	17 Y	19 Y	
10/16/2007	3.08	3.05	3.20	3.48	3.64	3.86	4.02	4.26	4.57	4.65	4.76	4.83	4.91	5.03	5.12	5.14	5.17	5.19	5.20	5.21	5.22	5.22
10/17/2007	3.08	3.06	3.19	3.48	3.65	3.85	4.02	4.25	4.53	4.63	4.75	4.83	4.91	5.03	5.10	5.13	5.16	5.18	5.19	5.20	5.20	5.22
10/18/2007	3.08	3.06	3.19	3.47	3.65	3.84	4.03	4.25	4.51	4.61	4.75	4.82	4.90	5.02	5.09	5.12	5.16	5.17	5.19	5.20	5.20	5.22
10/19/2007	3.09	3.09	3.23	3.47	3.65	3.82	4.01	4.23	4.47	4.59	4.72	4.80	4.88	5.00	5.07	5.11	5.13	5.15	5.16	5.16	5.19	5.19
10/22/2007	3.10	3.10	3.23	3.45	3.64	3.80	3.99	4.21	4.42	4.55	4.70	4.77	4.85	4.97	5.04	5.08	5.11	5.12	5.13	5.14	5.15	5.15
10/24/2007	3.10	3.10	3.23	3.45	3.64	3.82	4.01	4.23	4.44	4.57	4.73	4.80	4.87	4.99	5.05	5.09	5.11	5.12	5.13	5.14	5.15	5.15
10/25/2007	3.10	3.10	3.23	3.45	3.64	3.82	4.00	4.22	4.44	4.57	4.72	4.80	4.86	4.98	5.05	5.08	5.11	5.12	5.13	5.14	5.15	5.15
10/26/2007	3.11	3.12	3.24	3.45	3.66	3.84	4.02	4.23	4.45	4.59	4.73	4.81	4.88	4.99	5.05	5.08	5.11	5.11	5.13	5.14	5.15	5.15
10/29/2007	3.12	3.11	3.23	3.45	3.66	3.84	4.02	4.23	4.46	4.60	4.74	4.82	4.88	5.00	5.06	5.09	5.11	5.13	5.14	5.15	5.16	5.16
Source: http://www.bot.or.th/bothomepage/data/bank/FinMarkets/BondE_Yield_menu.htm																					Average	
																					4.89	

TABLE 4-2: Thai Government Bond Yield in year 2007

- **Beta:** In order to use CAPM to calculate the return on assets or the return on equity, one needs to estimate the asset (un-levered) beta or equity (levered) beta of the firm. The relationship between the beta is:

$$\beta_{\text{levered}} = \beta_{\text{unlevered}} \times \left[1 + (1 - \text{Tax}) \times \frac{\text{Debt}}{\text{Equity}} \right]$$

When estimating a beta for particular line of business, it is better to use the beta of an existing firm in that exact line of business rather than an average beta of several firms in similar lines of business. But, in the research, the incineration power plant is just a study case which there is no existence yet. It is impossible to find a beta- rate from such kind of this business, so the average beta of several firms in similar line of

business is an appropriate criterion in this situation, and also this rate will be fixed throughout its plant life.

List of Companies & comparing data "unlevered beta" for electrical business					
Unlevered Beta					
Company's Name	Country	2542		2543	
		Mid year	End of year	Mid year	End of year
Electricity Generating Plc	Thailand	N/A	N/A	N/A	N/A
Ratchaburi Electricity	Thailand	N/A	N/A	0.93	0.81
Hubei Chanyuan Electric-A	China	N/A	N/A	N/A	N/A
Guangdong Shaoneng Group-B	China	N/A	N/A	0.37	0.30
Cez As	Czech	N/A	N/A	N/A	N/A
Datang INTL Power Gen Co.	HongKong	N/A	N/A	0.69	0.94
Average		N/A	N/A	0.66	0.68
Mean		N/A	N/A	0.69	0.81

List of Companies & comparing data "unlevered beta" for electrical business					
Unlevered Beta					
Company's Name	Country	2544		2545	
		Mid year	End of year	Mid year	End of year
Electricity Generating Plc	Thailand	N/A	N/A	1.03	1.06
Ratchaburi Electricity	Thailand	1.05	0.92	0.85	0.74
Hubei Chanyuan Electric-A	China	0.56	0.48	0.47	0.46
Guangdong Shaoneng Group-B	China	0.32	0.32	0.23	0.25
Cez As	Czech	N/A	N/A	N/A	N/A
Datang INTL Power Gen Co.	HongKong	0.75	0.54	0.49	0.25
Average		0.67	0.57	0.61	0.55
Mean		0.66	0.51	0.49	0.46

List of Companies & comparing data "unlevered beta" for electrical business						
Unlevered Beta						
Company's Name	Country	2546		2547		Average
		Mid year	End of year	Mid year	End of year	
Electricity Generating Plc	Thailand	1.07	1.00	0.79	0.77	0.95
Ratchaburi Electricity	Thailand	0.57	0.58	0.58	0.80	0.78
Hubei Chanyuan Electric-A	China	0.51	0.57	0.57	0.69	0.54
Guangdong Shaoneng Group-B	China	0.31	0.32	0.39	0.38	0.32
Cez As	Czech	0.23	0.36	0.45	0.48	0.38
Datang INTL Power Gen Co.	HongKong	0.20	0.63	1.01	0.99	0.65
Average		0.48	0.58	0.63	0.68	0.61
Mean		0.41	0.58	0.58	0.73	0.59

TABLE 4-3: Unlevered Beta from Listed of Companies

- **Market Risk Premium:** Getting from EGAT in-house data assuming at 8% (fixed rate- throughout the power plant life span) because both of the case study and EGAT are entirely in the same business.
- **Credit Risk Premium:** an additional amount included in a security's yield which reflects what could be lost if issuer were to default. From experts' opinion (referred from a report of Jaroensompong

Corporation: Rachathewa Landfill Gas to Energy Project in Thailand). There are two kinds of risk premium supposed to be in such kind of this project. The first kind is the risk of private projects in general as opposed to government lending (5%) and another one is the risk of the project for being the first of its commercial kind in the country (5%). Two of them are expected to be a credit risk premium for this project and will be used throughout its plant life as a fixed rate.

According to these data, they will be gathered and taken into the formula as mentioned above to analyze and answer how much interest (WACC) the company has to pay for every baht in finances.

Figure 4-1 shows the calculation of WACC in the first year of the project implementation. For the other years, it varies by depending on the proportion between debt and equity generated in each year following with the basis of the WACC calculation.

Table 4-10 shows the result of WACC generated in each year of operation. However, in this analysis, the net income after tax in each year (counted as one equity of the project) will apply an assumption (in case only getting profit) that it will be used at 70% of total to pay for dividends and bonuses to shareholders; otherwise, the rest (30%) will be added to another year by supposing that investor would like to stock this amount of money as a buffer.

WACC is used as a discount rate for the project. It will be carried to find the net present value of an income stream along with the NPV criterion. Each future income amount in the stream is discounted, meaning that is divided by a number representing the opportunity costs of holding capital from now until the year when income is received or the outgo is spent. The opportunity cost can either be how much you would have earned investing the money someplace else, or how much interest you would have had to pay if you borrowed money.

The net present value (NPV) of a whole income stream is the sum of these present values of the individual amounts in the income stream. If we still assume that

income comes or goes in annual bursts and that the discount rate will be constant in the future, then the NPV has this formula:

$$NPV = I_0 + \frac{I_1}{1+r} + \frac{I_2}{(1+r)^2} + \dots + \frac{I_n}{(1+r)^n}$$

Where: I = income amounts for each year
r = the discount rate

Nevertheless, the future discount rate does not have to be constant for this theory to apply. The discount rate can vary, but that makes the formula messier. For example, if r_1 is the expected discount rate next year, and r_2 is the expected discount rate the year after that, then the present value today of I_2 income in year 2 is $I_2 / (1+r_1)(1+r_2)$.

From this criterion, it will be applied to determine the internal rate of return on investment, payback period, the levelized production cost and EVA of the project in base year (2008) as mentioned above.

WACC'S EQUATION		
$WACC = \left[\frac{E}{E+D} \times \text{Cost_of_Equity} \right] + \left[\frac{D}{E+D} \times \text{Cost_of_Debt} (1 - \text{Taxe}) \right]$		
Equity- E	206.04	Mbaht
Debt- D	618.12	Mbaht
Cost of Equity- Ke	19.52	%
Cost of Debt- Kd	14.89	%
WACC	12.70	%

COST OF EQUITY- Ke		
$K_e = \text{Risk_Free_Rate} + (\beta_{\text{levered}} \times \text{Market_Risk_Premium})$		
when:		
$\beta_{\text{levered}} = \beta_{\text{unlevered}} \times [1 + (1 - T) \times D / E]$		
Risk Free Rate	4.89	%
βlevered	1.83	
βunlevered	0.59	
Taxes- T	30.00	%
Market Risk Premium	8.00	%
Cost of Equity- Ke	19.52	%

COST OF DEBT- Kd		
$K_d = \text{Risk_Free_Rate} + \text{Credit_Risk_Premium}$		
(Pretax cost of debt)		
when:		
Risk Free Rate	4.89	%
Credit Risk Premium	10.00	%
Cost of Debt- Kd (Before Tax)	14.89	

FIGURE 4-1: WACC calculation in first year (2008)

The data in figure 4-1 shown that the incineration power plant project is a project having a risk higher than other commercial power plants in local when compared with the EGAT commercial power plant's data which having 1.02 of beta levered, 15% cost of equity and 5% cost of debt (source: seminar on EVA- EGAT, 2006). That means the expected return shareholders and creditors in the project require from this investment has to be more than the other requirements by following the concept that "*High risk, High Expected return*".

4.5 Result of Financial Analysis

4.5.1 Base Case

By using the stated assumptions, the results of the analysis can be summarized as follows:

Description	Results
Levelized Production Cost (Baht/kWh)	7.1850
Project IRR (%)	0.14
Project NPV (M. Baht)	-1,569.53
Project Payback Period (Years)	+ 22 years

Table 4-8: details the financial analysis.

FINANCIAL PARAMETERS	
Equity:	
Equity	696.74 M
Loan:	
Loans	2,090.22 M
Loan amount (% of the total project cost)	75 %
Term of Loan (including grace period)	12 years
- Grace period	2 years
- Loan repayment period	10 years
- Loan repayment period (getting privileges)	7 years
Interest rate during operation; IDO	10.42 % p.a.
Interest rate during operation; IDO (getting privileges)	4 % p.a.
Interest rate During Construction; IDC	10.42 % p.a.
Interest rate During Construction; IDC (getting privileges)	4 % p.a.
Energy fund (during construction period)	50,000 Baht/MW/year
Front-end fee	1.5 %
Commitment fee	0.375 %
Rates & Foreign currency	
Exchange rate	34 B/US\$

TABLE 4-4: Financial Assumptions for Incineration Power Plant

TECHNICAL PARAMETERS		
Power plant:		
Plant Life (after COD)	20	yr
COD in year	2010	
Gross Power output	12.84	MW
Auxiliary Power	12.00	%
Net Power output	11.46	MW
Net Plant Efficiency	19.00	%
Plant Factor	90.00	%
Calorific Value of Fuel (Low Heating Value, LHV)	1,446	kcal/kg
Gross Heat Rate (Low Heating Value)	4,041	kcal/kWh
Net Heat Rate (Low Heating Value)	4,526	kcal/kWh
Operating Period:		
Peak Period (8:00-24:00, Mon.-Sat.)	16	hr/day
	293	day/year
Off-Peak Period (24:00-8:00, Mon.-Sat.)	8	hr/day
	293	day/year
Off-Peak Period (00:00-24:00, Sun. and Holidays)	24	hr/day
	72	day/year
Plant Factor	90.00	%
Total Operating Hours	7,884	hr/year
Fuel Consumption:		
- Peak	168,170	ton/year
- Off Peak	146,073	ton/year
Net Energy Generation:		
- Peak	48,352	MWh/yr
- Off Peak	41,999	MWh/yr

TABLE 4-5: Technical Assumptions for Incineration Power Plant

REVENUE PARAMETERS				
Revenue from selling electricity		*see parameters in Appendix A		
Waste disposal charge				
year 1-3		300	Baht/ ton MSW	
year 3-6		330	Baht/ ton MSW	
year 7-9		363	Baht/ ton MSW	
year 10-12		400	Baht/ ton MSW	
year 13-15		440	Baht/ ton MSW	
year 16-18		484	Baht/ ton MSW	
year 19-21		533	Baht/ ton MSW	
- amount of waste @ year 1-20		1000	ton MSW/day	
- Disposal amount		365,000	ton MSW/year	
Byproduct from sorting				
		B/ton	Ton/yr	Mbaht/yr
- Plastic	14.44 %	6,000	52,706.00	-
- Papers	4.86 %	2,000	17,739.00	-
- Straws & Woods	0.84 %	1,000	3,066.00	-
- Textiles	2.07 %	1,000	7,555.50	-
- Glasses	10.21 %	500	37,266.50	18.63
- Metal	1.6 %	5,000	5,840.00	29.2
- Rubber/ Leather	0.32 %	1,000	1,168.00	-
- Stone/ Ceramic	2.11 %	200	7,701.50	-
Income from MSW sorting				47.83
CDM				
CERs price (2010-2012)		0	\$/ton CO ₂	
CERs price (2013 and after)		0	\$/ton CO ₂	
Total Emission reduction		0	ton CO ₂ / year	
CERs contract period		0	years	

TABLE 4-6: Revenue Parameters for Incineration Power Plant

COST PARAMETER	
O&M & Admin cost	
O&M cost	13.00 % of equipment cost
Equipment cost for O&M	1,886.77 Mbaht
Other	
Insurance (% of plant cost)	0.75 %
Income Tax rate year 1-20 (after COD)	30.00 % p.a.
Energy Fund (after COD)	0.01 Baht/kWh
Depreciation	
Depreciation of the project	136.43 Mbaht/yr
Depreciation = (total project cost - working capital) / plant life	

TABLE 4-7: Cost Parameters for Incineration Power Plant

PROJECT: Municipal Solid Wastes Incineration Power Plant Project		Financial Analysis Model																							
CASE: BASE CASE		FINANCIAL & INVESTMENT CALCULATION																							
Years		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		
Total Project Cost		(Million Baht)	2,786.96	824.16	1,962.80																				
Total Project Cost		2,786.96	824.16	1,962.80																					
Equity		696.74	206.04	490.70																					
Debt		2,090.22	618.12	1,472.10																					
- Loan drawdown		603.12	1,437.10																						
For part not getting any privilege		15.00	50.00																						
For part getting privileges (50 million Baht)		15.00	35.00																						
Sub- total		618.12	1,472.10																						
- Outstanding Loan		603.12	2,040.22	1,938.21	1,734.19	1,530.16	1,328.14	1,122.12	918.10	714.08	510.05	306.03	102.01	-	-	-	-	-	-	-	-	-	-		
For part not getting the privileges		15.00	50.00	46.43	39.29	32.14	25.00	17.86	10.71	3.57	-	-	-	-	-	-	-	-	-	-	-	-	-		
For part getting privileges		618.12	2,090.22	1,984.64	1,773.47	1,562.31	1,351.14	1,139.98	928.81	717.65	510.05	306.03	102.01	-	-	-	-	-	-	-	-	-	-		
Sub- total		618.12	2,090.22	1,984.64	1,773.47	1,562.31	1,351.14	1,139.98	928.81	717.65	510.05	306.03	102.01	-	-	-	-	-	-	-	-	-	-		
Principle Loan Repayment		-	-	204.02	204.02	204.02	204.02	204.02	204.02	204.02	204.02	204.02	204.02	-	-	-	-	-	-	-	-	-	-		
For part not getting the privileges		-	-	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14	7.14	-	-	-	-	-	-	-	-	-	-	-		
For part getting privileges		-	-	211.16	211.16	211.16	211.16	211.16	211.16	211.16	211.16	211.16	204.02	204.02	204.02	-	-	-	-	-	-	-	-		
Sub- total		-	-	211.16	211.16	211.16	211.16	211.16	211.16	211.16	211.16	211.16	204.02	204.02	204.02	-	-	-	-	-	-	-	-		
Loan interest (IDO%)		-	-	196.67	175.41	154.14	132.88	111.62	90.36	69.10	47.84	26.58	5.32	-	-	-	-	-	-	-	-	-	-		
For part not getting the privileges	10.42 %	-	-	1.79	1.50	1.21	0.93	0.64	0.36	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-		
For part getting privileges	4%	-	-	198.45	176.91	155.36	133.81	112.26	90.72	69.17	47.84	26.58	5.32	-	-	-	-	-	-	-	-	-	-		
Sub- total		-	-	198.45	176.91	155.36	133.81	112.26	90.72	69.17	47.84	26.58	5.32	-	-	-	-	-	-	-	-	-	-		
		REVENUE CALCULATION																							
Years		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		
Net Electricity Sale	(Million Baht)	-	-	432.20	432.20	432.20	432.20	432.20	432.20	432.20	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32		
Waste disposal charge		-	-	109.50	109.50	109.50	120.45	120.45	120.45	132.50	132.50	132.50	146.00	146.00	146.00	160.60	160.60	160.60	176.66	176.66	176.66	194.55	194.55		
Sorted MSW Sale		-	-	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83		
CERs sale (Included CDM)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Revenue		-	-	589.53	589.53	589.53	600.48	600.48	600.48	612.53	386.65	386.65	400.16	400.16	400.16	414.76	414.76	414.76	430.82	430.82	430.82	448.70	448.70		
		OPERATING EXPENSE CALCULATION																							
Years		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		
Energy fund (after COD)	(Million Baht)	-	-	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90		
O&M Expenses		-	-	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28		
13% of equipment cost		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
CDM Transaction Cost		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Insurance		-	-	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34		
Depreciation		-	-	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35		
Loan Interest		-	-	198.45	176.91	155.36	133.81	112.26	90.72	69.17	47.84	26.58	5.32	-	-	-	-	-	-	-	-	-	-		
Total Expenses		-	-	603.32	581.77	560.23	538.68	517.13	495.58	474.04	452.71	431.44	410.18	404.87	404.87	404.87	404.87	404.87	404.87	404.87	404.87	404.87	404.87		
NET INCOME BEFORE TAX		-	-	(13.79)	7.76	29.31	61.80	83.35	104.90	138.49	(66.05)	(44.79)	(10.03)	(4.71)	(4.71)	9.89	9.89	9.89	25.95	25.95	25.95	43.83	43.83		
NET INCOME AFTER TAX		-	-	(13.79)	7.76	29.31	61.80	83.35	104.90	138.49	(66.05)	(44.79)	(10.03)	(4.71)	(4.71)	6.92	6.92	6.92	18.16	18.16	18.16	30.68	30.68		
- Income Tax (corporate income tax exemption- 30% for 8 yrs)		-	-	(13.79)	7.76	29.31	61.80	83.35	104.90	138.49	(66.05)	(44.79)	(10.03)	(4.71)	(4.71)	6.92	6.92	6.92	18.16	18.16	18.16	30.68	30.68		
NET OPERATING PROFIT BEFORE TAX		-	-	324.01	324.01	324.01	334.96	334.96	334.96	347.01	121.13	121.13	134.84	134.84	134.84	149.24	149.24	149.24	165.30	165.30	165.30	183.18	183.18		
NET OPERATING PROFIT AFETR TAX (NOPAT)- 8 yrs exemption		-	-	324.01	324.01	324.01	334.96	334.96	334.96	347.01	121.13	84.79	94.25	94.25	94.25	104.47	104.47	104.47	115.71	115.71	115.71	128.23	128.23		

TABLE 4-8: Financial Analysis Model

CASH INFLOW	2006	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Revenue																						
Net Electricity Sale	-	-	432.20	432.20	432.20	432.20	432.20	432.20	432.20	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32	206.32
Waste disposal charge	-	-	109.50	109.50	109.50	120.45	120.45	120.45	132.50	132.50	132.50	146.00	146.00	146.00	160.60	160.60	160.60	176.66	176.66	176.66	194.55	194.55
Sorted MSW Sale	-	-	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83	47.83
CERs sale (included CDM)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenue	-	-	589.53	589.53	589.53	600.48	600.48	600.48	612.53	386.65	386.65	400.16	400.16	400.16	414.76	414.76	414.76	430.82	430.82	430.82	448.70	448.70
Loan																						
Loan drawdown																						
For part not getting any privilege	603.12	1,437.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
For part getting privileges (50 million Baht)	15.00	35.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Loan	618.12	1,472.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL CASH INFLOW	618.12	1,472.10	589.53	589.53	589.53	600.48	600.48	600.48	612.53	386.65	386.65	400.16	400.16	400.16	414.76	414.76	414.76	430.82	430.82	430.82	448.70	448.70
CASH OUTFLOW																						
Cost																						
Investment cost																						
cost	742.04	1,731.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Import duty & Tax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Escalation	12.87	91.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Working capital	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Fund	0.64	0.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IDC (7%)	31.43	137.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IDC (4%)	0.30	1.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financing fee	36.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fuel expenses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Fund (after COD)	-	-	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
O&M expenses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13% of equipment cost	-	-	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28	245.28
Insurance expense	-	-	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34
Income Tax (8 yrs exemption)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.97	2.97	2.97	7.78	7.78	7.78	13.15	13.15
CDM Transaction Cost	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cost (excluded D&I)	824.16	1,962.80	265.52	265.52	265.52	265.52	265.52	265.52	265.52	265.52	265.52	265.52	265.52	265.52	268.49	268.49	268.49	273.30	273.30	273.30	278.67	278.67
Financing Expenses																						
Preferred dividends & Bonuses	-	-	-	5.43	20.52	43.26	58.35	73.43	96.94	-	-	-	-	-	4.85	4.85	4.85	12.72	12.72	12.72	21.48	21.48
Principal loan repayment	-	-	211.16	211.16	211.16	211.16	211.16	211.16	204.02	204.02	204.02	-	-	-	-	-	-	-	-	-	-	-
Loan interest	-	-	198.45	176.91	155.36	133.81	112.26	90.72	69.17	47.84	26.58	5.32	-	-	-	-	-	-	-	-	-	-
Total Financing Expenses	-	-	409.62	393.50	387.04	388.24	381.78	375.31	377.28	251.86	230.60	209.34	-	-	4.85	4.85	4.85	12.72	12.72	12.72	21.48	21.48
TOTAL CASH OUTFLOW	824.16	1,962.80	675.14	659.02	652.56	653.76	647.29	640.83	642.80	517.38	496.12	474.86	265.52	265.52	273.33	273.33	273.33	286.02	286.02	286.02	300.15	300.15
NET CASH FLOW on Project	(206.04)	(490.70)	(85.60)	(69.49)	(63.02)	(53.28)	(46.81)	(40.35)	(30.27)	(130.73)	(109.47)	(74.70)	134.64	134.64	141.42	141.42	141.42	144.80	144.80	144.80	148.55	148.55

TABLE 4-9: Summarized total Cash Inflow and Cash outflow

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
WACC	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	824.16	2,786.96	2,681.38	2,470.21	2,261.38	2,059.00	1,866.38	1,680.22	1,500.53	1,334.48	1,130.46	926.44	824.42	824.42	824.42	826.50	828.58	830.65	836.10	841.55	847.00	856.21
- Equity @ DIV	206.04	696.74	696.74	696.74	699.07	707.86	726.40	751.41	782.88	824.42	824.42	824.42	824.42	824.42	824.42	826.50	828.58	830.65	836.10	841.55	847.00	856.21
- Debt	618.12	2,090.22	1,984.64	1,773.47	1,562.31	1,351.14	1,139.98	928.81	717.65	510.05	306.03	102.01	-	-	-	-	-	-	-	-	-	-

TABLE 4-10: WACC generated in each year

4.6 EVA Analysis

After known in the result of financial analysis, in this topic, we will talk about the economic profit getting from the project to see how difference between the financial profit and economic profit are. As mentioned in Chapter 1, under its criterion, the EVA can be measured as Net operating Profit After Taxes (NOPAT) less the money cost of capital as follows:

$$\text{Economic profit} = \text{Net operating profit after tax} - (\text{Capital employed} \times \text{Cost of Capital})$$

By cost of capital which is price a company must pay for using resource, it is the same meaning of WACC that was mentioned and calculated before. It will be used in this formula.

From result, if $EVA > 0$ then we can say a company is successful. This is the only case wealth of shareholders increases because they gain more than what their original investment was. The service to creditors is included there, too. In case of $EVA = 0$ a company produced just as much as it was invested and $EVA < 0$ leads to destroying of wealth of shareholders.

Take all parameters in the formula, the result of economic value added is shown in Table 4-11 below.

4.7 Sensitivity Analysis

For project viability other than base case the project financials have been studied sensibly to a) exchange rate b) deduction income of MSW byproduct sale. The levelized production costs are varied from 7.1850 Baht/ kWh (Exchange rate equals 34 Baht/ US\$) to 7.1767 Baht/ kWh (exclude revenue from MSW by-product sale).

As shown in Table 4-12, it is obvious that the levelized production cost have the most sensitivity with revenue from MSW byproduct. The summary of the sensitivity analysis are shown in Table 4-12.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(104.63)	(353.82)	(15.32)	13.67	42.43	81.51	108.71	135.29	173.30	(28.08)	(36.41)	1.04	15.04	15.04	25.26	25.06	24.86	35.91	35.38	34.86	46.85	45.97
Capital Charge	104.63	353.82	339.33	310.35	281.59	253.45	226.25	199.67	173.71	149.21	121.21	93.21	79.20	79.20	79.20	79.40	79.60	79.80	80.33	80.85	81.37	82.26
WACC	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	824.16	2,786.96	2,681.38	2,470.21	2,261.38	2,059.00	1,866.38	1,680.22	1,500.53	1,334.48	1,130.46	926.44	824.42	824.42	824.42	826.50	828.58	830.65	836.10	841.55	847.00	856.21
- Equity @ DIV	206.04	696.74	696.74	696.74	699.07	707.86	726.40	751.41	782.88	824.42	824.42	824.42	824.42	824.42	824.42	826.50	828.58	830.65	836.10	841.55	847.00	856.21
- Debt	618.12	2,090.22	1,984.64	1,773.47	1,562.31	1,351.14	1,139.98	928.81	717.65	510.05	306.03	102.01	-	-	-	-	-	-	-	-	-	-
Cost of Equity (Ke)	0.20	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-11: EVA ANALYSIS for the Power Plant

Description	LEVELIZED PRODUCTION COST (Baht/ kWh)	IRR on Project (%)	EVA (Million Baht)	Project NPV (Million Baht)	Payback Period (Years)*
1 BASE CASE @ 34฿/ USD	7.1850	0.14	-313.32	-1,569.53	+ 22 years
2 Sensitivity Analysis					
2.1) Exchange Rate					
32 \$/ USD	7.1818	-0.22	-367.95	-1,635.67	+ 22 years
33 \$/ USD	7.1834	-0.04	-339.89	-1,602.60	+ 22 years
35 \$/ USD	7.1866	0.31	-287.82	-1,536.47	+ 22 years
2.2) MSW (EXCLUDE REVENUE FROM SORTED MSW)	7.1767	-3.51	-791.26	-2,113.57	+ 22 years

*Including 2 years in construction period

TABLE 4-12: SENSITIVITY ANALYSIS of the Power Plant

4.8 Conclusion

It can be concluded following by the result in base case or even in the sensitivity analysis that the project has not feasibility in both of financial and economical term. Along these assumptions, the project can not be arisen if there is still lack of any supporting in its financial structure. Due to high operation cost and high expected return required from both of project shareholders and creditors, it is clear that the project requires an additional option that can respond with those requirements sufficiently.

From the result, there are some factors that the researcher believes that they have high affected to the cash flow of its financial structure. One of them is the O & M cost, it's quite high in the researcher's point of view. If project owner can manage this cost well, the result must be better (reduce expense). Same as the economic result, the operating cost (O & M) takes effect to the EVA result as well; it makes the NOPAT getting low due to the high expense. Including with the expected return from project shareholders and creditors being quite high caused of the project risk, it makes the EVA result getting bad to worse. Judging from the results and receiving data, it shows that the investment that has a very high risk tends to pay out a lot following with the principle of High risk, High expected return.

Another factor, it deals with percent payment of dividend and bonuses set to be paid for shareholders in each year. In assumption, it was defined at 70% for those activities. If this percentage is trimmed down, the Project NPV will be better (reduce expense), but it will affect to the EVA result which will be decreased (shareholders get lower return rate than the differing way). So to adjust this percentage, it is one thing that should be concerned and should not affect to the minimum requirement of shareholders also.

To consider in money support from CDM proceeding is one alternative choice for investor to know whether the project has enough viability in both of financial and economic after apply this activity. All of these will be described in the next chapter.

4.9 The Possibility to adjust data in the model to get the better outcome

There is possibility for investors to adjust some data in the model to change the outcome in both of financial and economical analysis; besides, changing only in the O&M cost and percent payment of dividend and bonuses as mentioned above. By focusing on the proportion between debt and equity in assumption above. From the WACC calculation shown in Table 4-13, it shown that the cost of equity has the proportion being higher than the cost of debt (in each period of time), so if we can adjust the proportion between debt and equity by taking the percentage to the side of debt being higher than the equity, the outcome should be better. But it depends on bank- how much rate they offer to investors and money in hand investors got at that time.

In table 4-14, it shows the different outcomes for each adjustment.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Asset (Capital employed)	824.16	2,786.96	2,681.38	2,470.21	2,261.38	2,059.00	1,866.38	1,680.22	1,500.53	1,334.48	1,130.46	926.44	824.42	824.42	824.42	826.50	828.58	830.65	836.10	841.55	847.00	856.21
- Equity @ DIV	206.04	696.74	696.74	696.74	699.07	707.86	726.40	751.41	782.88	824.42	824.42	824.42	824.42	824.42	824.42	826.50	828.58	830.65	836.10	841.55	847.00	856.21
- Debt	618.12	2,090.22	1,984.64	1,773.47	1,562.31	1,351.14	1,139.98	928.81	717.65	510.05	306.03	102.01	-	-	-	-	-	-	-	-	-	-
Cost of Equity (Ke)	0.20	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-13: Cost of equity and Cost of Debt generated in each year (BASE CASE)

Proportion of Equity and Debt	Project NPV (Million Baht)	EVA (Million Baht)
1). 10 : 90*	-2,036.21	-198.80
2). 20 : 80*	-1,713.80	-272.19
3). 40 : 60*	-1,232.85	-735.49
4). 50 : 50*	-1,171.47	-1,335.32
5). 60 : 40*	-1,178.95	-1,924.07
6). 80 : 20*	-1,317.55	-3,054.14
7). 90 : 10*	-1,377.37	-3,596.25

* Condition in BASE CASE

TABLE 4-14: Outcome from adjustment

From results, it shown that the modification can make the result of EVA getting better clearly because the rate of return a firm has to offer shareholders to compensate for their returns have more than the creditors want. In adjustment by taking a side of debt more than equity, it is obvious that NOPAT will be deducted by the cost of capital less than the opposite way- “the higher debt, the better EVA outcome”. All adjustments are shown in table 4-15 to 4-20 below.

During the Project NPV, the results are in the opposite way. That comes from the responsibility that investor has to take by more of debt; more of loan interest and financial fees that project investor has to pay.

However, in making a decision, if the project NPV is still be negative outcome, EVA can look across in making a decision and should not be concerned anymore because the negative result of project NPV shows that the investment is not financially feasible: that is, the company over time needs to generate average returns that are higher than its capital costs. If a company is not able to show long-term returns which are higher than its capital costs will be in jeopardy. While, in case the project NPV, it generates a positive outcome, the EVA should be adjusted to be a positive result as well. To guarantee that the company can offer enough return rate to shareholders to compensate for theirs investment.

Caution: Even though you may use a high proportion of debt to finance current investments, using this debt now will reduce your business’s ability to use credit in the financing of the future investments.

From the all reasons, they can be concluded that changing in only one factor cannot make the outcome getting better or best. So in the study of project viability, first thing that should be concerned, project developers must decide the model based on available data; and bring the result from the initial analysis to adjust and find the best solution for the project investment, and take that solution to be an operation plan or company policy used in actual work so on.

Caution: In adjustment, project developers have to realize whether the data which are adjusted has the possibility to be acted in the actual execution.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(111.75)	(377.21)	(35.55)	(0.26)	35.04	81.28	115.72	149.40	194.37	(0.18)	(2.20)	41.56	58.72	58.72	68.94	68.79	68.63	79.72	79.25	78.77	90.81	89.97
Capital Charge	111.75	377.21	359.96	324.27	288.98	253.68	219.24	185.56	152.64	121.31	87.00	52.68	35.53	35.53	35.53	35.68	35.83	35.99	36.46	36.94	37.42	38.25
WACC	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	839.42	2,833.34	2,704.76	2,447.62	2,190.48	1,933.34	1,685.05	1,444.67	1,212.20	994.80	744.80	494.80	369.80	369.80	369.80	371.39	372.98	374.57	379.54	384.50	389.46	398.18
- Equity @ DIV	83.94	283.33	283.33	283.33	283.33	283.33	292.20	308.96	333.62	369.80	369.80	369.80	369.80	369.80	369.80	371.39	372.98	374.57	379.54	384.50	389.46	398.18
- Debt	755.48	2,550.00	2,421.43	2,164.29	1,907.14	1,650.00	1,392.96	1,135.72	878.57	625.00	375.00	125.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost of Equity (Ke)	0.39	0.39	0.38	0.35	0.32	0.29	0.25	0.22	0.18	0.15	0.13	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-15: Capital employed occurred in proportion of equity and debt (10: 90)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(106.98)	(361.53)	(21.99)	9.08	40.14	81.66	111.25	140.17	180.47	(18.66)	(24.91)	14.62	29.66	29.66	39.88	39.70	39.52	50.57	50.07	49.56	61.57	60.70
Capital Charge	106.98	361.53	346.00	314.94	283.87	253.30	223.72	194.79	166.54	139.79	109.71	79.62	64.58	64.58	64.77	64.95	65.13	65.64	66.15	66.66	67.53	67.53
WACC	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	829.19	2,802.24	2,689.08	2,462.76	2,236.44	2,015.24	1,804.27	1,600.24	1,403.14	1,220.17	1,000.99	781.81	672.22	672.22	672.22	674.14	676.05	677.97	683.26	688.55	693.83	702.88
- Equity @ DIV	165.84	560.45	560.45	560.45	560.45	565.58	580.93	603.22	632.44	672.22	672.22	672.22	672.22	672.22	672.22	674.14	676.05	677.97	683.26	688.55	693.83	702.88
- Debt	663.35	2,241.79	2,128.63	1,902.31	1,675.99	1,449.67	1,223.34	997.02	770.70	547.95	328.77	109.59	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cost of Equity (Ke)	0.23	0.23	0.22	0.21	0.19	0.18	0.17	0.15	0.14	0.12	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-16: Capital employed occurred in proportion of equity and debt (20: 80)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(97.76)	(331.19)	4.26	26.23	47.72	79.66	99.86	119.57	150.83	(57.15)	(71.60)	(40.25)	(29.30)	(29.30)	(19.08)	(19.32)	(19.57)	(8.57)	(9.14)	(9.71)	2.24	1.31
Capital Charge	97.76	331.19	319.75	297.78	276.30	255.30	235.10	215.40	196.18	178.28	156.39	134.49	123.55	123.55	123.55	123.79	124.03	124.28	124.85	125.42	125.99	126.92
WACC	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	809.41	2,742.12	2,658.79	2,501.52	2,349.33	2,202.21	2,063.45	1,929.76	1,801.14	1,684.78	1,525.25	1,365.73	1,285.96	1,285.96	1,285.96	1,288.51	1,291.06	1,293.61	1,299.53	1,305.45	1,311.37	1,321.04
- Equity @ DIV	323.76	1,096.85	1,096.85	1,106.25	1,120.73	1,140.28	1,168.19	1,201.17	1,239.22	1,285.96	1,285.96	1,285.96	1,285.96	1,285.96	1,285.96	1,288.51	1,291.06	1,293.61	1,299.53	1,305.45	1,311.37	1,321.04
- Debt	485.65	1,645.27	1,561.94	1,395.27	1,228.60	1,061.93	895.26	728.59	561.92	398.82	239.29	79.76	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cost of Equity (Ke)	0.15	0.15	0.14	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-17: Capital employed occurred in proportion of equity and debt (40: 60)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(93.31)	(316.51)	16.96	34.13	50.89	78.20	93.85	109.10	135.99	(76.28)	(94.69)	(67.30)	(58.33)	(58.33)	(48.11)	(48.39)	(48.66)	(37.69)	(38.29)	(38.89)	(26.97)	(27.93)	
Capital Charge	93.31	316.51	307.05	289.89	273.12	256.76	241.11	225.87	211.02	197.41	179.48	161.55	152.58	152.58	152.58	152.85	153.13	153.40	154.00	154.60	155.20	155.80	156.16
WACC	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	799.85	2,713.05	2,644.16	2,524.55	2,409.11	2,297.85	2,194.04	2,094.40	1,998.93	1,914.82	1,784.17	1,653.51	1,588.19	1,588.19	1,588.19	1,588.19	1,591.04	1,593.89	1,596.75	1,602.97	1,609.20	1,615.42	1,625.40
- Equity @ DIV	399.93	1,356.53	1,356.53	1,374.72	1,397.08	1,423.61	1,457.59	1,495.75	1,538.08	1,588.19	1,588.19	1,588.19	1,588.19	1,588.19	1,588.19	1,588.19	1,591.04	1,593.89	1,596.75	1,602.97	1,609.20	1,615.42	1,625.40
- Debt	399.93	1,356.53	1,267.63	1,149.83	1,012.04	874.24	736.45	598.65	460.86	326.63	195.98	65.33	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cost of Equity (Ke)	0.13	0.13	0.13	0.12	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-18: Capital employed occurred in proportion of equity and debt (50: 50)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(88.97)	(302.14)	29.39	41.85	54.00	76.77	87.97	98.85	121.46	(95.01)	(117.29)	(93.79)	(86.76)	(86.77)	(76.56)	(76.86)	(77.16)	(66.22)	(66.85)	(67.48)	(55.58)	(56.57)
Capital Charge	88.97	302.14	294.62	282.16	270.02	258.19	246.99	236.11	225.55	216.14	202.09	188.03	181.01	181.02	181.02	181.33	181.63	181.93	182.56	183.19	183.81	184.80
WACC	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	790.50	2,684.61	2,629.85	2,547.11	2,467.66	2,391.50	2,321.91	2,255.60	2,192.59	2,140.04	2,037.66	1,935.27	1,884.08	1,884.16	1,884.25	1,887.40	1,890.55	1,893.70	1,900.23	1,906.75	1,913.28	1,923.56
- Equity @ DIV	474.30	1,610.77	1,610.77	1,637.56	1,667.64	1,701.00	1,740.94	1,784.16	1,830.67	1,884.08	1,884.08	1,884.08	1,884.08	1,884.16	1,884.25	1,887.40	1,890.55	1,893.70	1,900.23	1,906.75	1,913.28	1,923.56
- Debt	316.20	1,073.85	1,019.08	909.55	800.03	690.50	580.97	471.44	361.92	255.96	153.58	51.19	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cost of Equity (Ke)	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-19: Capital employed occurred in proportion of equity and debt (60: 40)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
EVA	(76.51)	(260.78)	65.17	64.08	62.92	72.65	71.03	69.34	79.63	(148.91)	(182.37)	(170.03)	(168.66)	(168.75)	(158.62)	(159.01)	(159.39)	(148.54)	(149.25)	(149.96)	(138.15)	(139.22)
Capital Charge	76.51	260.78	258.85	259.93	261.09	262.32	263.93	265.62	267.38	270.05	267.16	264.27	262.91	263.00	263.09	263.48	263.86	264.25	264.96	265.66	266.37	267.44
WACC	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Asset (Capital employed)	763.65	2,602.87	2,588.79	2,612.16	2,636.28	2,661.14	2,690.02	2,719.65	2,750.03	2,788.33	2,767.30	2,746.27	2,736.58	2,737.53	2,738.47	2,742.48	2,746.49	2,750.50	2,757.88	2,765.26	2,772.65	2,783.79
- Equity @ DIV	687.29	2,342.59	2,342.59	2,394.13	2,446.42	2,499.45	2,556.51	2,614.31	2,672.85	2,735.76	2,735.76	2,735.76	2,736.58	2,737.53	2,738.47	2,742.48	2,746.49	2,750.50	2,757.88	2,765.26	2,772.65	2,783.79
- Debt	76.37	260.29	246.20	218.03	189.86	161.69	133.52	105.34	77.17	52.57	31.54	10.51	-	-	-	-	-	-	-	-	-	-
Cost of Equity (Ke)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cost of Debt (Kd)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

TABLE 4-20: Capital employed occurred in proportion of equity and debt (90: 10)