

DEPARTMENT OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS

SONARGAON UNIVERSITY,DHAKA

DISSERTATION ON

FINANCIAL MODEL OF COMBINED CYCLE POWER PLANT

SUBMITTED TO

Abul Kalam
Dean

Faculty of Business

Sonargaon University, Dhaka

SUBMITTED BY

Mohammad Shakhawat Hossain*

Student ID: EMBA2003021002

21ST Batch

DEPARTMENT OF BUSINESS ADMINISTRATION

Sonargaon University, Dhaka

Transmittal letter

September 7, 2021

Abul Kalam
Dean
Faculty of Business
Sonargaon University, Dhaka

Subject: Transmittal letter

Dear Sir

It is my pleasure to submit the final report on problems and prospects of analysis of the financial model of combined cycle power plant in Bangladesh, which is completed successfully under your prudent supervision.

I would like to have the privilege to convey my gratitude to you, as I found the course material and specially preparation of this report very valuable for my professional life.

Thanking you,

Sincerely yours,



Mohammad Shakhawat Hossain

Student ID: EMBA2003021002

21ST Batch

DEPARTMENT OF BUSINESS ADMINISTRATION

Sonargaon University, Dhaka

Declaration of Student

I am, Md. Shakhawat Hossain, ID: EMBA2003021002, Semester: Summer-2021 Major in Finance, Program: EMBA at Sonargaon University. The Project Report entitled "FINANCIAL MODEL OF COMBINED CYCLE POWER PLANT" as the requirement for the degree of Executive Masters of Business Administration.

I hereby declared that project paper or any part of it has not been submitted to anywhere else for the award to any degree.

Signature of Candidates



.....

Mohammad Shakhawat Hossain

Student ID: EMBA2003021002

21ST Batch

DEPARTMENT OF BUSINESS ADMINISTRATION

Sonargaon University, Dhaka

CERTIFICATION OF SUPERVISOR

This is to certify that the EMBA project entitled **"FINANCIAL MODEL OF COMBINED CYCLE POWER PLANT"** submitted by

Mohammad Shakhawat Hossain

Student ID: EMBA2003021002

21ST Batch

DEPARTMENT OF BUSINESS ADMINISTRATION

Sonargaon University, Dhaka

The thesis represents an independent and original work on the part of the candidate as the requirement for the degree of Executive Masters of Business Administration. He has completed the project report according to my supervision and guidance. tried her best to do this successfully. I think this report will help him in the future to build up his career. I wish his all success and prosperity.

Supervisor

.....

Abul Kalam

DEAN

FACULTY OF BUSINESS

Sonargaon University, Dhaka

Acknowledgement

With great pleasure I express my cordial gratitude to **Abul Kalam**, Dean, Faculty of Business ,Sonargaon University, Dhaka for his kind guidance to conduct this study and preparing the report. I also like to give gratitude to a number of individuals and organizations for their valuable assistance in preparing this the report. I like to take the opportunity to thank a few people without whom my study would have been rather difficult. At first I would like to extend my heartiest thanks to my fellow colleagues. Without their extensive time my study would have been incomplete. It is my pleasure to extend my heartiest gratitude to Mr. **Rubaiat Hossain**, Member of IEEE and Mr. **Nazrul Islam**, Operations Manager, Haripur Power Limited, and in addition to his wholehearted support, has allowed me to carryout the study in parallel with my regular workload. I am very much thankful to **Mr. Sadique Masum**, Plant Manager, Meghnaghat Power Limited and **Mr. Sushanta Kumer Paul**, Operations Manager, Meghnaghat Power Limited.

Glossary of Terms

IPP	–	Independent Power Producer
LD	-	Liquidated Damage
O&M	-	Operation and Maintenance
IA	-	Implementation Agreement
PPA	-	Power Purchase Agreement
GSA	-	Gas Supply Agreement
LLA	-	Land Lease Agreement
EPC	-	Engineering, Procurement and Construction
IEC	-	Installation, Erection and Commissioning
CCPP	-	Combined Cycle Power Plant
MMRA	-	Major Maintenance Reserve Account
ADB	-	Asian Development Bank
GOB	-	Government of Bangladesh
BPDB	-	Bangladesh Power Development Board
CPI	-	Consumer Price Index
CDCG	-	CDC Globeleq (a company of CDC group, UK Govt.) CDC-Colonial Development Corporation
CTMP	-	Combustion Turbine Maintenance Program
EOH	-	Equivalent Operating Hours
GT	-	Gas Turbine
TKH	-	Technical Know How
SC	-	Simple Cycle
CC	-	Combined Cycle
IDCOL	-	Infrastructure Development Company Limited
COD	-	Commercial Operation Date
BAE/BOO	-	Before Anyone Else/ Before Others
IDA GF	-	Individual Development Account Global Fund
CTA	-	Cumulative Translation Adjustment
DSCR	-	Debt-Service Coverage Ratio (1.1 to 2.2)
LLCR	-	Loan Life Coverage Ratio (2.1 to 7.8)
EBITDA	-	Earnings before interest, taxes, depreciation, and amortization
SSF	-	Single Stock Futures /Single Stream Funding
FIIF	-	Foreign Inflation Index Factor
LIIF	-	Local Inflation Index Factor
SPV	-	Special purpose vehicle-subsidiary company
BV	-	Besloten Vennootschop / Business Value of Dutch HOLDCO
MFO	-	Micro Finance Opportunity
ETI	-	Eco-bank Transactional Incorporated
DCM	-	Debit Capital Market

Table of Contents

Description	Page #
Executive Summary	IX
1. Introduction	1
1.1 Justification	1
1.2 Project Description	1
2. Methodology	5
2.1 Data Sources	5
3. Limitation	6
4. Analysis	7
4.1 Contractual Structure	7
4.2 Ownership	9
4.3 Project revenues	9
4.4 Project Operating Costs	17
4.5 Capital Expenditure & Depreciation	26
4.6 Financing Structure Meghnaghat power Limited	33
4.7 Financing Structure Haripur power Limited	39
4.8 Tax	40
4.9 Working Capital	43
4.10 Sponsor Distributions & Returns	45
5. Model Inputs and Assumptions	48
5.1 Technical Assumptions	48
5.2 Date and Timing Assumptions	49
5.3 Economic Assumptions	50
5.4 Financing Assumptions	51
5.5 Tax and Tariff Assumptions	51
5.6 Heat rate Assumptions	52
5.7 Depreciation	53
5.8 Capital Expenditure	54
6. Sensitivity Analysis	55
7. Findings	57
7.1 Financial Model Highlights	57
7.2 Ratio Analysis	60
7.3 Financing the project	61
7.4 Participants in Power Plant Development	62

Description	Page #
7.5 Sources of Finance	62
7.6 Project Contracts	63
7.7 Risk Allocation	63
7.8 Economics	64
8. Recommendation and Conclusion	67
9. Appendix	68
10. References	68
Figures and Tables	
Figure 4.3-1: Estimated Yearly Operating Revenue for Haripur	14
Figure 4.3-2: Estimated Yearly Operating Revenue for Meghnaghat	14
Figure 4.3-3: Revenue Breakdown: Haripur	15
Figure 4.3-4: Revenue Breakdown: Meghnaghat	15
Figure 4.3-5: Meghnaghat Tariff	16
Figure 4.4-1: Fuel Cost as % of Revenue	22
Figure 4.4-2: Technical Know How (TKH) Fee	24
Figure 4.4-3: Average operating costs as a % of Revenue for the life of the project.	25
Figure 4.4-4: Operating Income and Operating Margin	26
Figure 4.6-1: Annual Debt Service Payment Profile	35
Figure 4.6-2: Annual Projected Debt Service vs Free Cash Flow for debt service	36
Figure 4.6-3: Debt Service Reserve	37
Figure 4.6-4: Meghnaghat DSCR	38
Figure 4.7.1: Net Working Capital -HPL	40
Figure 4.7.1: Debt Service Reserve- HPL	40
Figure 4.7.1: Debt Service Coverage Ratio- HPL	41
Figure 4.7.1: Sponsor Distribution	42
Figure 4.8-1: Net Working capital -MPL	45
Figure 4.9-1: Sponsor Distributions -MPL	46
Figure 7.2-1: Typical Power Plant Project Financing Structure	61
Figure 7.3-1: Participants in Power Plant development	62
Figure 7.7-1: Typical Cash Flows	64
Figure 7.7-2: Different Fuel Sources	66
Figure 7.7-3: Greenhouse Gas Emission	66
Table 4.5-1: Construction and Hard Costs of Meghnaghat	27
Table 4.5-2: Statement of Project Costs of Haripur	29
Table 4.6-1: Debt Capital (Meghnaghat)	33
Table 4.6-2: CDC Credit Support Costs for 2004 (Meghnaghat)	39
Table 4.6-3: CDC Credit Support Costs for 2004 (Haripur)	42
Table 5.5-1: Meghnaghat Reference Tariff	51
Table 5.6-1: PPA Heat Rate for Meghnaghat	52
Table 6.0-1: Macro Economic Sensitivities	55
Table 6.0-2: Plant Performance Sensitivities	55
Table 6.0-3: Financial Sensitivities	56
Table 6.0-4: Financial Ratio Sensitivities	56

Executive Summary

A combined-cycle gas turbine power plant consists of one or more gas turbine generators equipped with Heat Recovery Steam Generators to capture heat from the gas turbine exhaust. Steam produced in the heat recovery steam generators powers a steam turbine generator to produce additional electric power. Use of the otherwise wasted heat in the turbine exhaust gas results in high thermal efficiency compared to other combustion based technologies. Combined-cycle plants currently entering service can convert about 50 percent of the chemical energy of natural gas into electricity (HHV basis).

Project development is a complex process involving many parties. Key considerations are financing, contractual arrangements, risks & allocation, technology, economics. It is very important to consider life-cycle cost of plant, not just one-time capital investment to derive cost of electricity

Financial Model of the combined cycle power plant consider all the input assumptions like fuel price, tariff, exchange rate, project life, interest rate for debt and generate the Cash Flows to cover all the expenses including debt maintaining a certain band limit of the DSCR (**Debt-Service Coverage Ratio) =** $\frac{Net\ Oerating\ Income}{Debt\ Service}$ **≥1.2**

In the analysis of the financial model of Haripur and Meghnaghat there is a big difference in debt and equity ratios: for Haripur debt and equity ratio 55.47% and 44.53% respectively but for Meghnaghat those are 74.58% and 25.42% respectively. Economic assumptions like local and foreign inflation rate and exchange rates are same for both the project.

Cost of capital for Haripur was 8.94% but it was 9.009% for Meghnaghat. After acquisition of Haripur and Meghnaghat by Globeleq the project IRR increased to 15.25% for Haripur and 20.19% for Meghnaghat.

Considering sensitivity the financial model is most sensitive to tariff rate in case of Haripur and Meghnaghat. US inflation affect a lot on project IRR: 19.87% at 1.5% inflation and 20.54% at 3.5% inflation compared with the base case IRR 20.2%.

Local inflation does not affect the project IRR significantly but the currency devaluation affects the project IRR.

Considering the plant performance in sensitivity, Plant Availability, Plant factor and O&M expense are the most sensitive input for the financial model.

1. Introduction

1.1 Justification

The main objective of this study is to do analysis of the financial model of combined cycle power plant; find out the assumptions in different input and their sensitivity for the output variables.

1.2 Project Description

A combined-cycle gas turbine power plant consists of one or more gas turbine generators equipped with heat recovery steam generators to capture heat from the gas turbine exhaust. Steam produced in the heat recovery steam generators powers a steam turbine generator to produce additional electric power. Use of the otherwise wasted heat in the turbine exhaust gas results in high thermal efficiency compared to other combustion based technologies. Combined-cycle plants currently entering service can convert about 50 percent of the chemical energy of natural gas into electricity (HHV basis).

Additional efficiency can be gained in combined heat and power (CHP) applications (cogeneration), by bleeding steam from the steam generator, steam turbine or turbine exhaust to serve direct thermal loads.

Haripur Power Limited:

Haripur Power Limited (formerly AES Haripur (Private) Limited) ("Haripur") is a limited liability company formed and registered under the laws of the Peoples' Republic of Bangladesh, established to develop, design, finance, build, own, operate ("BAE"/"BOO") and maintain a 360 MW combined cycle gas-fired power plant at Haripur, 22 km southeast of Dhaka, Bangladesh (the "Project").The Project was built under the aegis of a 22-year IA with the Government of Bangladesh, acting through the Ministry of Energy and Natural Resources. All of the electrical capacity and electricity generated by the Project is sold under a 22-year "take-or-pay" PPA with the BPDB, the largest national electric utility in Bangladesh. The Project is supplied domestic natural gas under a 22-year GSA with Titas, a regional, state-owned company. The following Project Agreements have been entered by the Project: IA, PPA, GSA, LLA, EPC, FA, etc.

The Project consists of the following key elements:

a) One 701F Gas Turbine Generator, manufactured by Mitsubishi Heavy Industries of Japan, nominally rated at 247 MW, is a self-contained, gas turbine unit complete with turbine, generator, and associated auxiliaries
b) b) One Heat Recovery Steam Generator manufactured by Hyundai, designed under a license with Vogt-Nem
c) One KN Series Steam Turbine, manufactured by Fuji Electric Company, nominally rated at 132 MW, is a self-contained, gas turbine unit complete with turbine, generator, and associated auxiliaries
d) Instrumentation and control equipment
e) Balance of plant including Mechanical and electrical equipment
f) Civil works

Meghnaghat Power Limited:

Meghnaghat Power Limited (formerly AES Meghnaghat Limited) ("Meghnaghat") is a limited liability company formed and registered under the laws of the Peoples' Republic of Bangladesh, established to develop, design, finance, build, own, operate ("BOO") and maintain a 450 MW combined cycle gas-fired power plant at Meghnaghat, 35 km southeast of Dhaka, Bangladesh (the "Project").The Project was built under the aegis of a 22-year IA with the Government of Bangladesh, acting through the Ministry of Energy and Natural Resources. All of the electrical capacity and electricity generated by the Project is sold under a 22-year "take-or-pay" PPA with the BPDB, the largest national electric utility in Bangladesh. The Project is supplied domestic natural gas under a 22-year GSA with Titas, a regional, state-owned company. The following Project Agreements have been entered by the Project:IA, PPA, GSA, LLA, EPC, FA, etc.

The Project consists of the following key elements:

a) Two Gas Turbines, Model V.94.2 manufactured by Ansaldo Energia s.p.a. of Italy. Each GTG, nominally rated at 159 MW, is a self-contained, gas turbine unit complete with turbine, generator, and associated auxiliaries
b) Two Heat Recovery Steam Generators ("HRSG") manufactured by Hyundai and designed under a license with Vogt-Nem
c) One Steam Turbine, Fuji KN series. The steam turbine consists of a high-pressure/intermediate-pressure turbine and a low-pressure turbine, nominally rated at

190 MW, is a self-contained, gas turbine unit complete with turbine, generator, and associated auxiliaries

d) Instrumentation and control equipment

e) Balance of plant including mechanical and electrical equipment

f) Civil Works





2 Methodology

2.1 Data Source

Financial models were collected from two combined cycle power plants owned by Pendekar(Private Sector IPP)- Haripur Power Limited (360MW CCPP) and Meghnaghat Power Limited (450MW CCPP). We have analyzed the assumptions but non-probability convenient (Associated Target Agreements and Models) and inputs to followed outputs of those models.

3 Limitation

Different agreements i.e. PPA (Power Purchase Agreements), GSA (Gas Supply Agreements) and terms-conditions are not always same for all the projects. Sometime there would require changing some conditions and financial model also changed accordingly. Input variables and assumptions will be different from project to project, so the financial model will not be same for all power plants.

Financial model of the initial stage of any project need some changes/ modifications during the phase of the commercial operation; in some cases ownership changes by acquisition or sell process. So the actual financial model could not be reached out that is strictly confidential and I have worked with the sample model of Haripur and Meghnaghat since 2000.

4 Analysis

4.1 Contractual Structure

Implementation Agreement -Under the IA the GOB grants the Company a concession to develop, own, finance, construct and operate the Project. The IA includes provisions detailing the **rights** and **obligations** of both the GOB and the Company, including the payment and performance obligations of the GOB, Company and GOB Events of Default, Force Majeure Events and Termination provisions. The IA also includes the obligation of the GOB to guarantee irrevocably the payment obligations of the Lessor, Gas Supplier and the Power Purchaser under the Land Lease Agreement, the Gas Supply Agreement and the Power Purchase Agreements respectively (each as defined below). The IA also includes various provisions governing conversion and transfer of Taka. The IA continues in full force and effect until the termination of the Power Purchase Agreement.

Power Purchase Agreement - Under the PPA, BPDB commits to the payment of Capacity Charges and Energy Charges in return for the Company making available the electrical generating capacity and selling the electrical energy delivered. The PPA term is 22 years from the Commercial Operation Date (1 Dec 2001). Capacity charges are denominated in US Dollars but payable in Bangladeshi Taka ("TK"). Such payments are indexed to movements in the USD / TK exchange rate. The tariff is also indexed to counter increases in US / Bangladesh **CPI** (Consumer Price Index). The Capacity Charge is related to the availability of the Project and is structured to cover all fixed costs of the Project including debt servicing, fixed operating and maintenance costs and equity return. The Energy Charge is denominated in TK and covers the cost of gas under the GSA and variable operating and maintenance costs.

Gas Supply Agreement - Under the GSA, Titas commits to provide to the Company gas in sufficient quantity and quality to allow the Company to meet its obligations under the PPA. The Company is obliged to purchase all fuel from Titas at the price as set by the GOB. The cost of the fuel is fully passed through the PPA, provided that the

Project's heat rates are not worse than those specified in the PPA. The GSA continues in full force and effect until the termination of the PPA.

Land Lease Agreement -Under the LLA, BPDB commits to lease to the Company sufficient land to allow the Company to meet its obligations under the IA, GSA and PPA. The LLA continues in full force and effect until the later of 25th anniversary of the COD and the 3rd anniversary of the expiration or termination of the PPA. In addition the LLA agreement provides an option to extend the lease for another 5 years

Engineering, Procurement and Construction Contract- Hyundai Heavy Industries ("HHI") and Hyundai Engineering and Construction Company ("HEC", together with HHI, "Hyundai"). Both HHI and HEC have entered into a Guarantee and Co-ordination Agreement with the Company whereby each of HEC and HHI has joint and several liabilities for the performance of their contractual obligations. The obligations of Hyundai are supported by irrevocable L/C for 50% of the EPC contract value and performance bond for 10% of the EPC contract value.

Gas Turbine Maintenance Contract-

HPL: On 14 January 2000 the Company entered into four related contracts in respect of the maintenance of the gas turbine with Mitsubishi Heavy Industries ("MHI") and Nichimen Corporation ("Nichimen"). Under these contracts, MHI is to provide resources, spare parts and repairs and Nichimen is to provide technical assistance, know-how and resources to the Company in connection with the operation and maintenance of the Gas Turbines.

MPL: Gas Turbine Maintenance Contract- signed with Ansaldo Energia s.p.a. of Italy on June 30, 2000. Under this Contract, Ansaldo is to provide technical assistance, know-how, resources and spare parts to the Company in connection with the operation and maintenance of the Gas Turbines. The contract has a life of 8 years from COD.

4.2 Ownership

Haripur was owned by the AES Corporation indirectly through AES Victoria Holdings (90%) and AES Victoria Partners (10%), two special purpose vehicles incorporated in the Netherlands to hold this asset. CDCG acquired 100% of the equity of both of these Dutch Holding companies for a dollar each through an SPV (Globeleq Holdings (Haripur) sarl) incorporated in Luxembourg. The Tax treaty between Luxembourg and the Netherlands will allow a tax free dividend distribution in the future. CDCG has also acquired 100% of the shareholder loans due from these companies (US$78,739,025 and US$8,748,780 respectively ex any AES distribution prior to completion) to AES Global Power through a SPV company incorporated in Mauritius. The tax structure is intended to minimize the tax impact of the acquisition including on dividends or capital gains.

Meghnaghat was owned by the AES Corporation indirectly through AES Great Falls (90%) and AES Rock Springs (10%), two special purpose vehicles incorporated in the Netherlands to hold this asset. AES to CDCG {31 December,2003) to Pendekar (31 December,2007) has acquired 100% of the equity of both of these Dutch Holding companies for US$1 each through an SPV (Globeleq Holdings (Meghnaghat) Sarl), incorporated in Luxembourg. The Tax treaty between Luxembourg and the Netherlands will allow a tax free dividend distribution in the future. CDCG has also acquired 100% of the shareholder loans due from these companies (US$77,606,203 and US$8,622,912 respectively) to AES Global Power through a SPV company incorporated in Mauritius. The tax structure is intended to minimize the tax impact of the acquisition including on dividends or capital gains.

4.3 Project Revenues

100% of the net electrical output of the plant is sold to the Bangladesh Power Development Board. The BPDB is the largest electricity utility in Bangladesh with the responsibility for the planning, construction and operation of generation facilities in Bangladesh and the distribution of approximately 50% of the total electricity generated in Bangladesh. It was established in 1972 and is wholly owned by the GOB, through the Ministry of Minerals, Energy and Natural Resources. BPDB is also the contracting

agency/off-taker for the independent power projects ("IPPs") being developed by the private sector in Bangladesh.

The tariff charged by the project has two basic components: a Capacity Payment and an Energy Payment which are payable to the Company for available capacity and net energy output.

- **Capacity Payment**- covers all fixed costs including debt services, fixed O&M and equity returns and is set by reference of available dependable capacity. Dependable Capacity is measured on a yearly basis and set at the level of such measure for the operating year. This is different than that at HPL where as long as the measure of the Dependable Capacity is not below 95% of the Initial Dependable Capacity (360MW) the Dependable Capacity for purposes of the tariff payments is set at the level of the Initial Dependable Capacity.

1) Non Escalable Component ("NEC"): Fixed price tariff calculated in USD/kW Month covering debt service and equity returns. The table below shows the estimated capacity payment for the operating year 2004, a 5 year rolling average and the project's life average. The non escalable component shows a declining payment per KW in each successor operating year from the beginning of the PPA (US$ 4.48), equity returns and are slightly loaded to the front end of the project's life.

HPL	Yearly		
US$ 000	**Operating Year Dec 03-04**	**Dec 2003-Dec 2008 Avg**	**Project Life Avg**
Assumed Dep Cap	360	360	360
NEC Tariff ($/kw/m)	4.300	4.165	3.070
NEC Payment	**$18,576**	**$17,991**	**$13,263**

MPL	Yearly		
US$ 000	**Operating Year Dec 03-04**	**Dec 2003-Dec 2008 Avg**	**Project Life Avg**
Assumed Dep Cap	450	450	450
NEC Tariff ($/kw/m)	6.970	7.463	7.388
NEC Payment	**$37,742**	**$40,346**	**$39,925**

2) **Escalable Component:** consisting of a reference foreign escalable capacity price (calculated in USD/kW Month) and a reference local escalable capacity price (calculated in Taka/kW Month) which together cover the fixed O&M costs of the Plant. Each component is adjusted by the US and Bangladesh CPI on a monthly basis. The table below shows the estimated capacity payment for operating year 2004, a 5 year rolling average and the project's life average.

Haripur, US$ 000	Oper Year Dec 03-04	Dec 2003-Dec 2008 Avg	Proj Life Avg
Assumed Dep Cap	360	360	360
Foreign Esc Com Tariff (USD/kw/m)	1.300	1.300	1.300
Foreign Esc Com Payment	$6,592	$6,930	$8,234
Local Esc Com Tariff (Taka/kw/m)	7.413	7.413	7.413
Local Esc Com Payment (Taka converted to USD)	$774	$814	$967
Total Escalable Com Payment	**$7,366**	**$7,744**	**$9,201**

Meghnaghat, US$ 000	Oper Year Dec 03-04	Dec 2003-Dec 2008 Avg	Proj Life Avg
Assumed Dep Cap	450	450	450
Foreign Esc Com Tariff (USD/kw/m)	0.447	0.469	0.572
Foreign Esc Com Payment	$2,418	$2,538	$3,090
Local Esc Com Tariff (Taka/kw/m)	10.377	11.700	19.317
Local Esc Com Payment (Taka converted to USD)	$935	$981	$1,194
Total Escalable Com Payment	**$3,353**	**$3,519**	**$4,284**

3) **Availability Incentive/Penalty Payment:**

HPL: The PPA provides for penalty payments if availability falls below 90% in any year except every 3rd year when the threshold for penalty payment is 86% But No incentive payments.

MPL: The PPA provides for payment of an incentive from BPDB to the Project or a penalty from the Project to BPDB depending on the plant availability for each contract year. Minimum plant availability is set at 876 hours (90% of available time in a year) for every year except every three years where the project is allowed 1376 hours (84.29% of available time in a year) of downtime. Incentive payments are paid for any availability above the 90% threshold in years where this threshold applies and 85.6% availability in the other years. In addition the project has the option at its sole discretion to elect to apply its allowance of 1376 hours every 3 years to the Contract

year immediately preceding or immediately following such Contract Year. This allows the project to choose an optimal incentive/penalty schedule which does not have to follow exactly the major maintenance outages schedules. The following table sets the assumptions in the model for availability in minor and major maintenance years.

Availability Assumptions only MPL	**Minor Maint**		**Major Maint**
Total Years in PPA	17		5
Contracted Availability for the year	90.00%		84.29%
Assumed Availability for the year	95.00%		90.00%
Average Project Life Plant Availability		93.86%	

MPL **US$ 000**	Yearly		
	Oper Year Dec 03-04	**Nov 2003-Dec 2008 Avg**	**Proj Life Avg**
Incentive/Penalty Payment	$2,050	$2,506	$2,288

- **Energy Payment**- covers fuel costs and variable costs. The Reference Energy payment is made up of two components the energy payment and the variable O&M costs payment

1) **Fuel Payment**- Is composed of the product of the Net Electrical Output produced multiplied by the reference gas price (denominated in Taka / kWh) based on a reference net heat rate which varies according to the plant load factor. The reference price is set by the GoB from time to time and published on the country's official gazette. The model assumes fuel price is increased in US real terms annually (please refer to table below). The fuel cost is intended to be a passed through under the PPA, but this could deviate to a slight profit or loss depending on the actual heat rate efficiency of the plant.

Haripur, US$ 000	Oper Year Dec 03-04	Dec 2003-Dec 2008 Avg	Project Life Avg
Thermal Consumption of Energy (GJ)	18,516,460	18,035,716.61	18,119,799
Yearly Gas Price Escalation (in nom terms)	4.50%	4.50%	4.50%
Avg Gas Price ($/Mscf@950 BTU HHV/SCF)	1.24	1.35	1.88
Total Fuel Payment to Project	**$22,879**	**$24,373**	**$33,934**

Meghnaghat, US$ 000	Oper Year Dec 03-04	Dec 2003-Dec 2008 Avg	Project Life Avg
Thermal Consumption of Energy (GJ)	25,703,188	25,391,231	25,345,499
Yearly Gas Price Escalation (in nom terms)	4.50%	4.50%	4.50%
Avg Gas Price ($/Mscf@950 BTU HHV/SCF)	1.22	1.34	1.93
Total Fuel Payment to Project	**$31,465**	**$34,012**	**$49,034**

2) **Variable Reference Energy Payment**- consisting of a reference foreign escalable energy price (calculated in USD/kW Month) to cover the variable O&M costs of the Plant. The foreign escalable component is adjusted by the US CPI on a monthly basis. The reference price is multiplied by the plant's net electrical output to determine the local and foreign Energy Payments. The table below shows the estimated Variable Reference Energy Payment for the operating year 2004, the 5 year rolling average and the project's life average.

HPL: US$ 000	Oper Year Dec 03-04	Dec 2003-Dec 2008 Avg	Project Life Avg
Foreign Esc Com Tariff (US/kw/m)	0.799	0.799	0.799
Total Escalable Com Payment	**$3,150**	**$3,224**	**$3,849**

MPL: US$ 000	Oper Year Dec 03-04	Dec 2003-Dec 2008 Avg	Project Life Avg
Foreign Esc Com Tariff (US/kw/m)	0.103	0.108	0.131
Total Escalable Com Payment	$3,235	$3,359	$4,083

- **Total revenues**- The following graphs show the project's operating revenue for each contract year and the breakdown in revenue as a percentage of total revenue as per the income categorization described above.

Figure 4.3-1: Estimated Yearly Operating Revenue for Haripur - US$'000

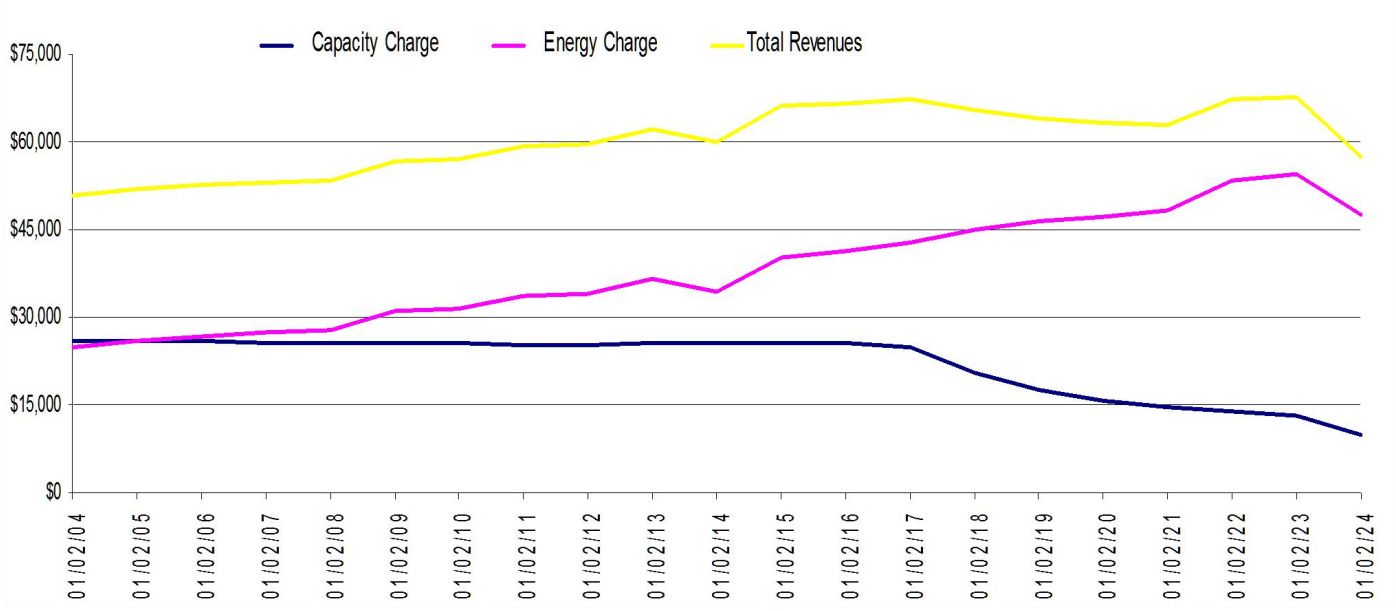


Figure 4.3-2: Estimated Yearly Operating Revenue for Meghnaghat - US$'000

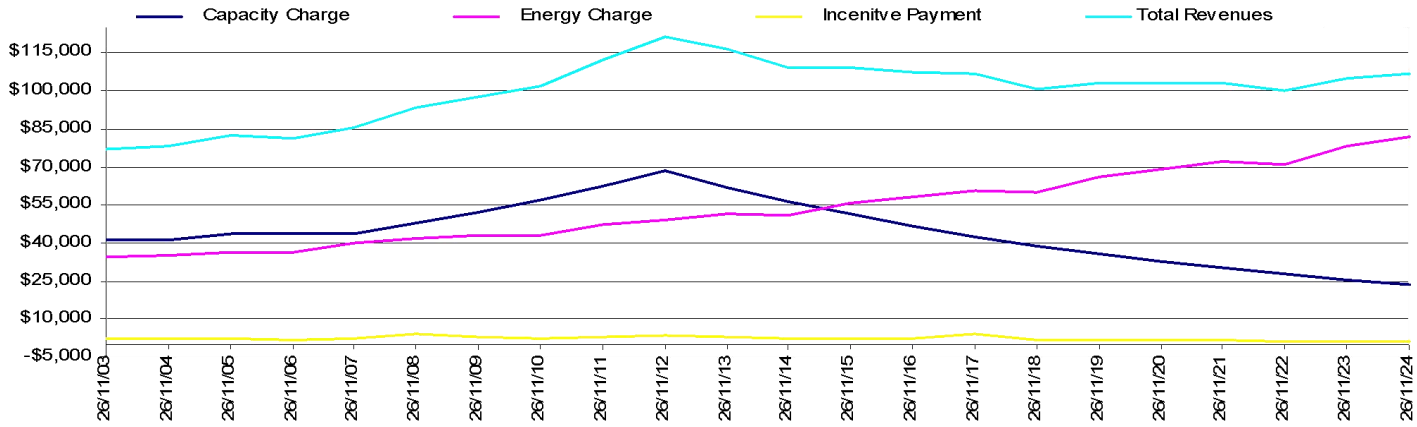


Figure 4.3-3: Revenue Breakdown: Haripur

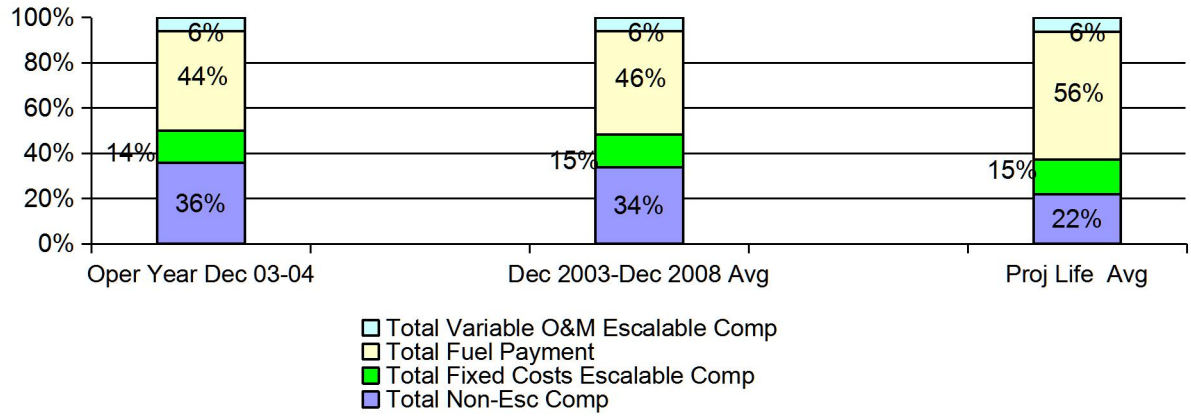


Figure 4.3-4: Revenue Breakdown: Meghnaghat

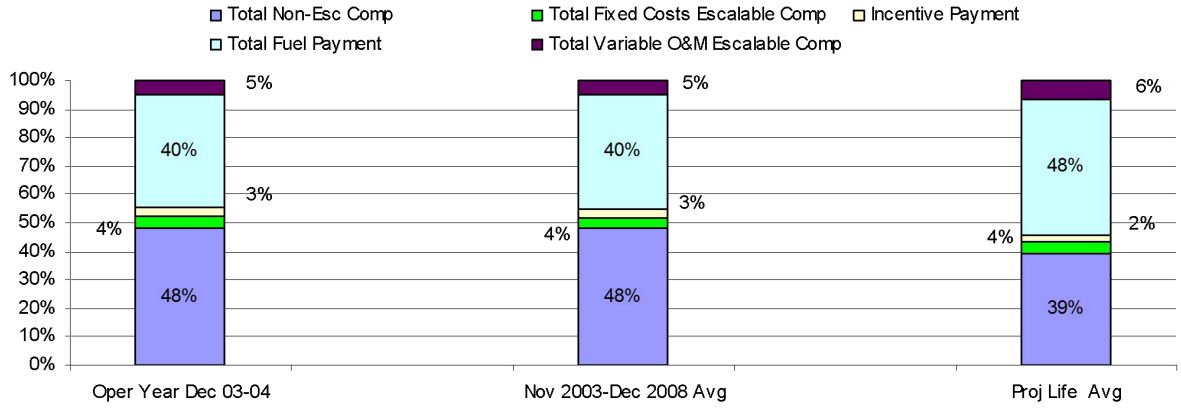
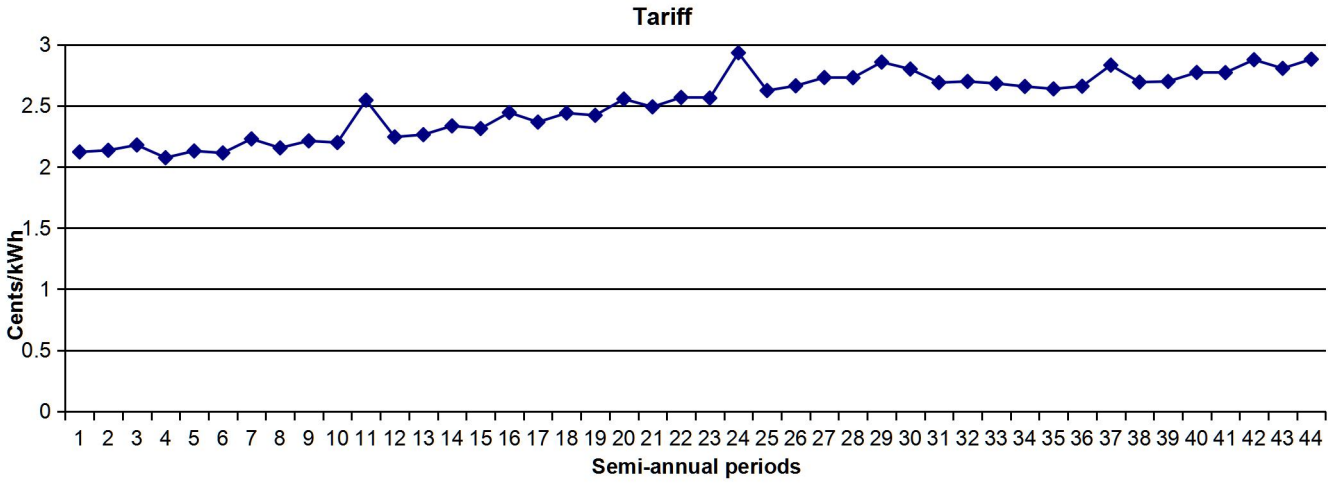
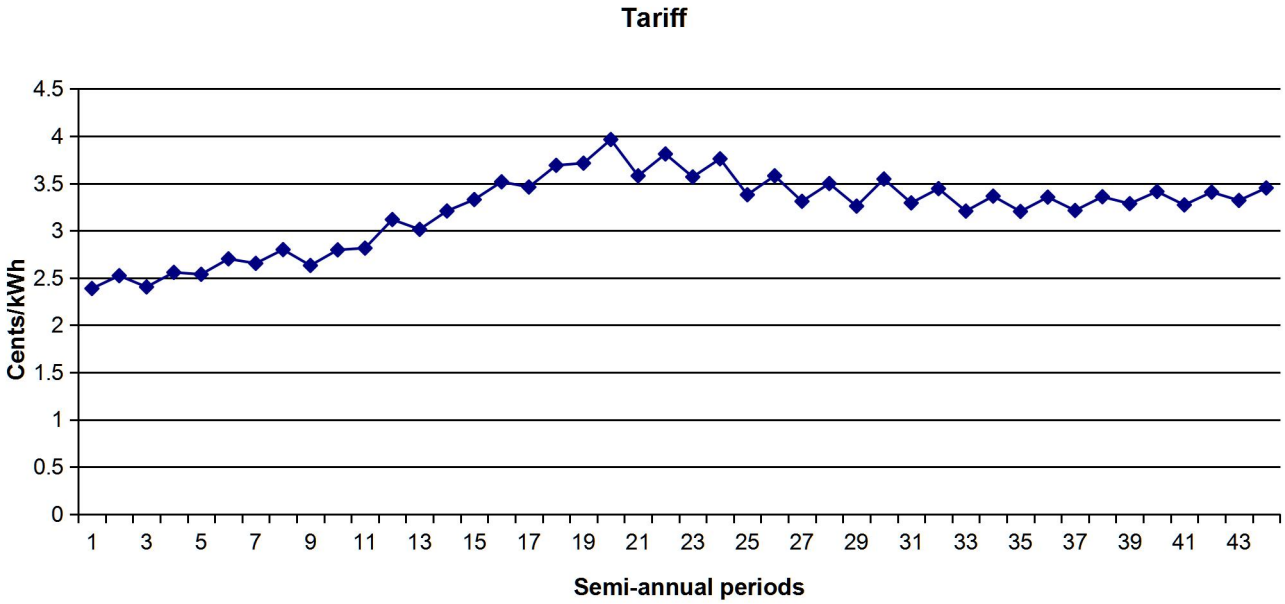


Figure 4.3-5: Tariff

HPL Tariff:



MPL Tariff:



4.4 Project Operating Costs

4.4.1 Fixed Costs- The Projects fixed costs have been broken down into the following subcategories: plant personnel (expat and local), rent, plant admin and service expenses, professional contracts, Insurance Payment, TKH Supervisory Agreement Costs, CDC security documents transfer costs.

Plant Personnel Costs- are split between expat and local salaries and indexed to the respective CPIs. The model assumes that the number of expats will be reduced after 2005, to be replaced by local employees who would have received proper mentoring by the expats and will have developed to assume such positions. Expat costs are split between Meghnaghat and Haripur. The following tables sets out the number of employees that is estimated the project will have in each particular year, average salary and total estimated annual costs.

Personnel Assumptions for Haripur Power Ltd,	**2003**	**2004**	**2005**	**Steady State**
No. of Expats($180/person)	3	3	2	1
No. of Local Employees(Tk.1000/person)	33	30	30	27
No. Plant Personnel	**36**	**33**	**32**	**28**
Salary Payment	$1,143	$1,117	$951	$1,193

Personnel Assumptions for Meghnaghat PowerLtd.	**2003**	**2004**	**2005**	**Steady State**
No. of Expats($180/person)	3	3	2.5	1.5
No. of Local Employees(Tk.950/person)	32	32	30.5	31.5
No. Plant Personnel	35	35	33	33
Salary Payment	$1,122	$1,155	$1,050	$1,112

Lease Payments- The Project company has signed with BPDB a 25 year land lease agreement starting at COD with an option to extend the lease for an additional 5 years. Rent is payable semi annually in Taka and is adjusted annually by the US CPI with no yearly increase being above 4%.The rent payment for 2004 will be approximately US$58k

General Administration Expenses- Consist of the following Subcategories: Recruiting/Relocation, Medical, Education Support, Housing related exp, Safety, Security, Plant, Functions, Community Expenses, Training & Development, Social Responsibility, Permit Fees, Advertisements, Printing and Stationary, Environmental expenses, Freight & Forwarding, Telephone, Information Technology, Communication, Expenses, Maintenance - Office Equipment , Maintenance – Vehicles, Building Maintenance, Professional Organizations, Travel – General, Conferences, Business Meals & Entertainment, Custom Clearance Handling, Site Housing, Refreshment, Painting, Ground Maintenance, Motorcar Lease, Office Supplies, Postage and Courier, Temporary Staff, Cleaning and Gardening. General, Admin Expenses are escalated semi annualy by the US$ CPI. The following table shows the G&AE for 2004 the 5 year rolling yearly average and the project life yearly average.

US$ 000	Oper Year 2004	5 Year Yearly Avg	Proj Life Avg
General Admin Expenses; HPL	$500	$547	$654
General Admin Expenses; MPL	$580	$601	$734

Professional & Contract Costs- Consist of the following Subcategories: Engineering Services, Legal Service – Local, Legal Service – Foreign, Audit + Accounting + Tax, Insurance Advisor, Other Financing exp, 3rd Party Analysis (Ambient air), Reimbursement to lenders. Professional & Contract Costs are escalated semi annually by the US$ CPI. The following table shows the P&CC for 2004 the 5 year rolling yearly average and the project life yearly average.

US$ 000	Oper Year 2004	5 Year Yearly Avg	Proj Life Avg
Professional & Contract Expenses; HPL	$258	$282	$337
Professional & Contract Expenses; MPL	$141	$146	$189

Insurance Costs -

HPL: relate to premiums paid for the All Risk insurance policy, Public Liability and Sabotage & Terrorism cover. The All Risk insurance cover the full $132m replacement value of the facility and 18 months' business interruption. The Products and Public liability insurance covers up to $25m and the Sabotage & Terrorism cover is for an amount of $105m (as per the waiver obtained from the lenders for the period up to Dec 2004). Insurance premiums are paid semi

annually and increased annually by a growth factor as shown on the table below. The increase in Sabotage and Terrorism Cover for 2004 is a result of insuring the project for the full year vs only 4 months in 2003

Insurance Cost Annual Growth Factor		2.50%		
Haripur Power Ltd,	Yearly			
Insurance Payments	Oper Year 2003	Oper Year 2004	5 Year Avg	Proj Life Avg
All Risk Cover	$911	$781	$872	$1,064
Public and Products Liability Insurance	$75	$85	$95	$116
S&T	$245	$298	$333	$406
Total Insurance Cost	**$1,360**	**$1,163**	**$1,300**	**$1,585**

MPL: relate to premiums paid for the All Risk insurance policy, Public Liability and Sabotage & Terrorism cover. The All Risk insurance cover the full $179m replacement value of the facility and 18 months' business interruption $44m. The Products and Public liability insurance covers up to $25m and the Sabotage & Terrorism cover is for an amount of $160m (as per the waiver obtained from the lenders for the period up to Dec 2004). Insurance premiums are paid semi annually and increased annually by a growth factor as shown on the table below. The increase in Sabotage and Terrorism Cover for 2004 is a result of insuring the project for the full year vs only 4 months in 2003

Insurance Cost Annual Growth Factor		2.50%		
Haripur Power Ltd,	Yearly			
Insurance Payments	Oper Year 2003	Oper Year 2004	5 Year Avg	Proj Life Avg
All Risk Cover	$1,123	$1,067	$1,191	$1,456
Public and Products Liability Insurance	$127	$130	$145	$177
S&T	$111	$468	$523	$639
Total Insurance Cost	**$1,360**	**$1,665**	**$1,859**	**$2,272**

GT Maintenance Contract

HPL: The following Agreements are in place to ensure uninterrupted operation of the MHI 701F Gas turbine.

Gas Turbine Maintenance Agreement - This has been executed between MHI and the Project Company for ensuring essential parts availability, roll in roll out and shop repair activities.There is an associated block payment schedule (based upon EOH) which is followed by the parties, which also covers warranty for the relevant parts.

CTMP (Combustion Turbine Maintenance Program) Management Services Contract- This has been executed between MHI and the Project Company to ensure proper Management of the GT maintenance program. This details the scope of Management activities for the GT maintenance program and each party's obligations. Payment is made through a block payment schedule (based upon EOH).

Technical Know How Contract- This has been executed between Nichimen Corporation and the Project Company to ensure proper supervision of outages. Technical Field Assistance (TFA) is provided to the Project Company through this contract. It details the provision of each maintenance/outage activity and the associated scopes for Nichimen. Payment is based upon travel/per Diem expenses of supervisors.

Guarantee and Coordination Agreement- This is a legal instrument signed by Project company, MHI and Nichimen wherein MHI and Nichimen acts as guarantors of the above three contracts.

	2004	Average
Total GT Contract Costs ('000 $)	2,829	3,571

MPL: **Ansaldo Overhaul & Supervision Maintenance Contract**- The project has signed (with Ansaldo the GT manufacturer) an Overhaul and Supervision/Expertise Contract. The term of the contract is 8 years which covers two full maintenance cycles, considering that Minor Inspections are to be made once every year and the Hot Gas Path/GT Major inspections and Generator Major Inspections are made once every 4 years. It is contemplated that the Ansaldo supervision will be renewed at the end of the contract and these services will continue to be provided for the life of the project. The contract provides for a 2% yearly escalation in price and a further adjustment every 4 years if the relative movement of the Euro vs. the US dollar exceeds 2%. The table below shows the fees charged by Ansaldo to the project for each of the services provided.

Meghnaghat PowerLtd.	
Ansaldo Overhaul Inspection & Supervision Contract	Cost per Outage
Minor Inspection Cost	68.4
GT Major Inspection/Hot Gas Path Inspection	1,256.9
Generator Major Overhaul	434.2
Increase in Price for new contract	2.0%

Ansaldo Spare Parts Supply Contracts- The project has signed 6 different agreements with Ansaldo for the Supply of spare parts prior to Completion. These agreements cover the supply of minor inspection/overhaul spare parts, GT major overhaul spare parts, GT emergency spare parts, GT generator emergency spare parts, GT generator major overhaul spare parts and GT spare blades and associated equipment. The value of the contract was for $8.527m. Each contract provides for new orders for a 2% yearly escalation in price and a further adjustment every 4 years if the relative movement of the Euro vs. the US dollar exceed 2%. The table below shows the future expected payment for spare parts as established by the project company and lenders technical advisor on the financing of the project which has been set as the Major Maintenance Reserve Requirement and is released every 4 years for the payment of new spare parts for the new maintenance cycle. These level of costs for new spare parts is considered conservative, particularly as the project company has used excess cash from project cost savings to buy additional spares for a value of $14.5m.

Spare parts after	Cost
1st Major Maintenance Period	$13,411.46
2nd Major Maintenance Period	$16,385.50
3rd Major Maintenance Period	$16,215.56
4th Major Maintenance Period	$19,811.43
5th Major Maintenance Period	$19,605.96

4.4.2 Variable Costs- The Projects variable costs are modelled on $/MW/H basis and have been broken down into the following subcategories: fuel costs, consumables, oil lubricants and chemicals, operation and maintenance spares, maintenance labour, utility charges and Technical Know How Fee.

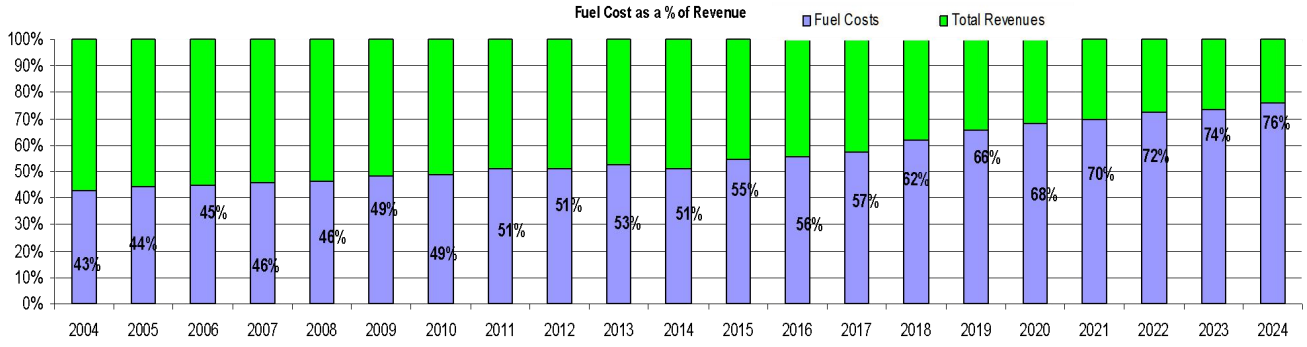
Fuel Expense- The single largest cost item for the project is the payment for gas. This payable is paid to Titas based on the amount of mscf of gas consumed per month and the reference price established on the GoB official Gazette for the amount of Gas consumed during such month. The reference price is set in $/mscf at 950 BTU's HHV. The gas payable is further adjusted throughout the life's project by an assumed growth rate in the fuel price as well as by a reduction in efficiency modelled through recoverable (after a major maintenance is performed) and non recoverable degradation factors applied throughout the life of the project as shown in the table below.

Gas Price at COD (US$/Mscf@950 BTU HHV/SCF)	1.198
Assumed yearly fuel price increase	4.5%
Rec Degr of Heat Rate after MM (as a % of Net Cap Out)	1.0%
Non Rec Deg of Heat Rate over the PPA (as a % of Net Cap Output)	1.0%

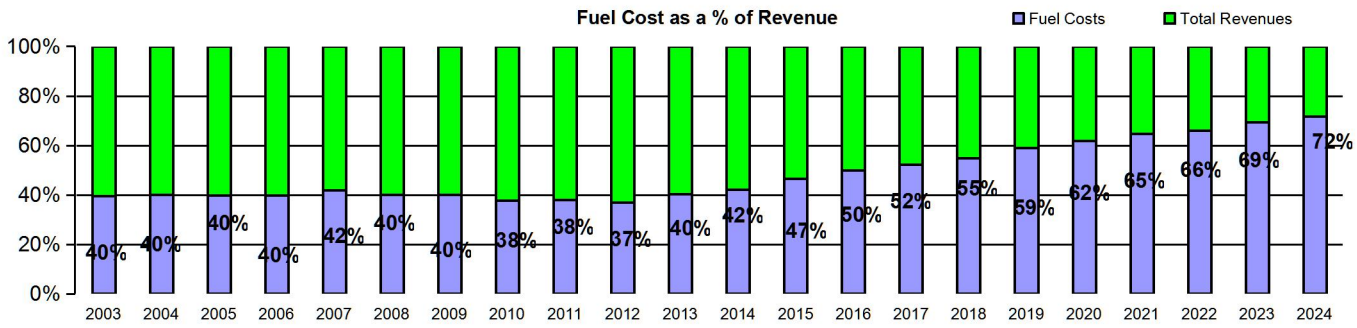
The following graph shows the payment for fuel relative to the revenues generated by the project in each Contract Year. As the debt is repaid and the capacity tariff adjusted downward the costs of fuel supply increases as a proportion of revenues.

Figure 4.4-1: Fuel Cost as % of Revenue

HPL:



MPL:



O&M Variable Expenses- Are dependent on the Net Electrical Output of the plant and are categorized into consumables, oil lubricants and chemicals, operation and maintenance spares, maintenance labour, utility charges. Variable expenses are budgeted on an annual basis by the plant's team leaders. The following table shows the O&M Variable Costs per category for 2003, 2004 and 2005, the estimated Net Electrical Output and costs on US cents/kwh. Variable O&M Costs for 2005 are taken as a base and inflated by US CPI for the life of the project.

HPL:

	US Thousands		
	2003	**2,004**	**2005**
Consumables	235	46	146
Spares	503	594	623
Oil, lub and chem	162	129	180
Labour	128	21	80
Utilities	96	60	78
Other	-	86	84
Total	**1,124**	**936**	**1,190**

	US$ cents/kwh		
	2,003	**2,004**	**2005**
Consumables	0.099	0.019	0.061
Spares	0.211	0.249	0.261
Oil, lub and chem	0.068	0.054	0.075
Labour	0.054	0.009	0.033
Utilities	0.040	0.025	0.033
Other	-	0.036	0.035
Total	**0.47093**	**0.39220**	**0.49856**

Estimated Net Electrical Output		
Net Electrical Output Estimated of MWH (model output)	2003	2,387,059
	2004	2,449,267
	2005	2,387,059

MPL:

Estimated Net Electrical Output		
Net Electrical Output Estimated of MWH (model output)	2003	2,387,059
	2004	2,449,267
	2005	2,387,059

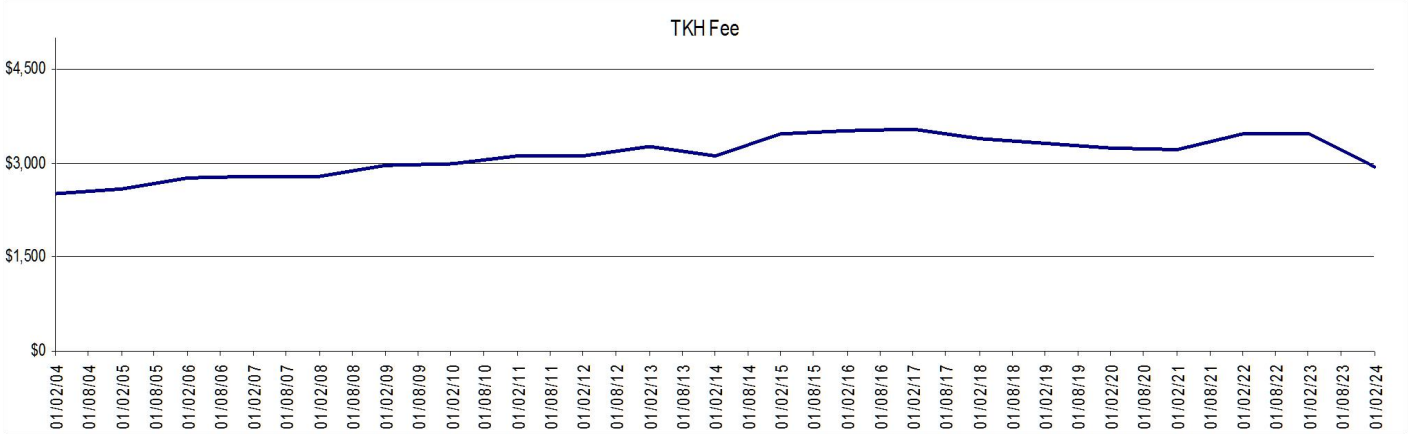
	US Thousands		
	2003	2,004	2005
Consumables	95	51	73
Spares	1,087	512	799
Oil, lub and chem	140	82	111
Labour	46	13	29
Utilities	90	-	45
Other	133	140	137
Total	1,592	797	1,195

	US$ cents/kwh		
	2,003	2,004	2005
Consumables	0.03033	0.01621	0.02329
Spares	0.34552	0.16234	0.25415
Oil, lub and chem	0.04456	0.02584	0.03524
Labour	0.01458	0.00398	0.00929
Utilities	0.02861	-	0.01431
Other	0.04240	0.04445	0.04348
Total	0.50600	0.25282	0.37976

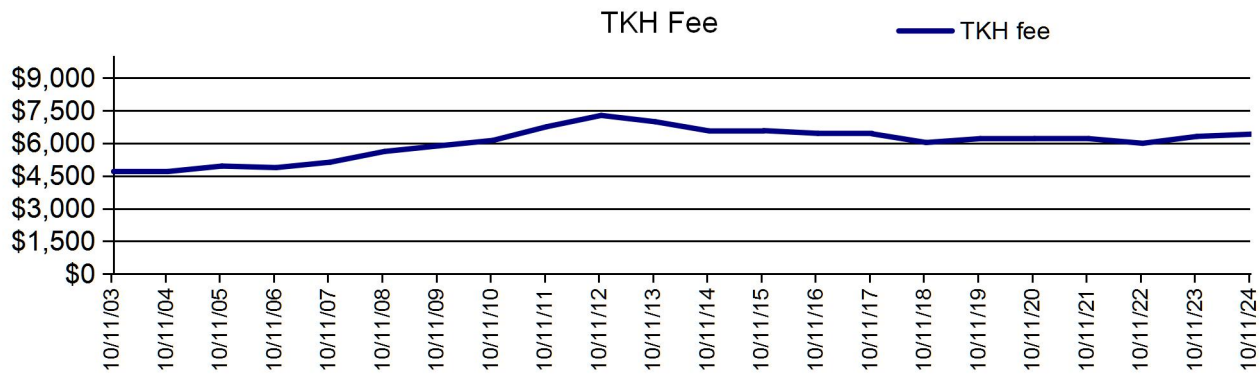
Technical Know How Fee- The technical know how fee is 6%pa of the project revenues, less expat salaries plus a 45% overhead associated with the expat salaries. The fee is paid to Globeleq Services Limited annually, subject to BOI review of the annual audited accounts to which the fee payment relates. This fee is the subordinated to senior debt service payments and is not subject to withholding tax.

Figure 4.4-2: Technical Know How (TKH) Fee

HPL:



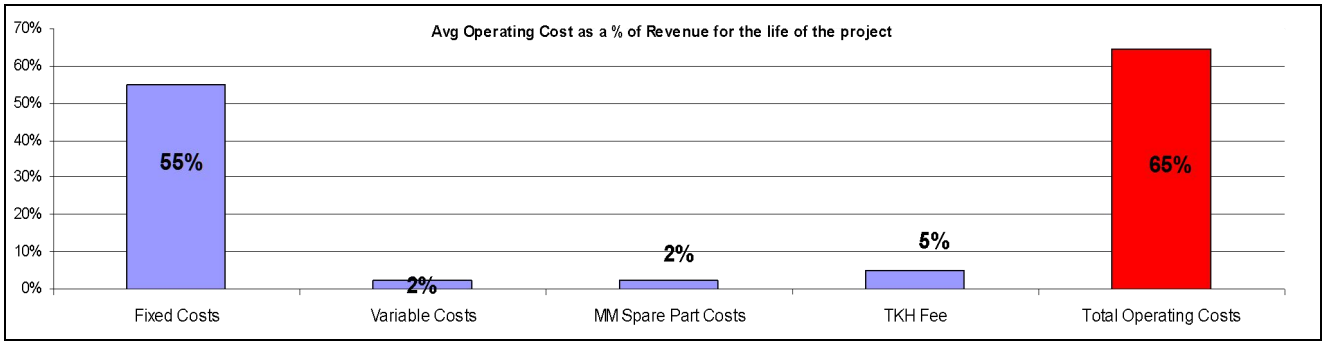
MPL:



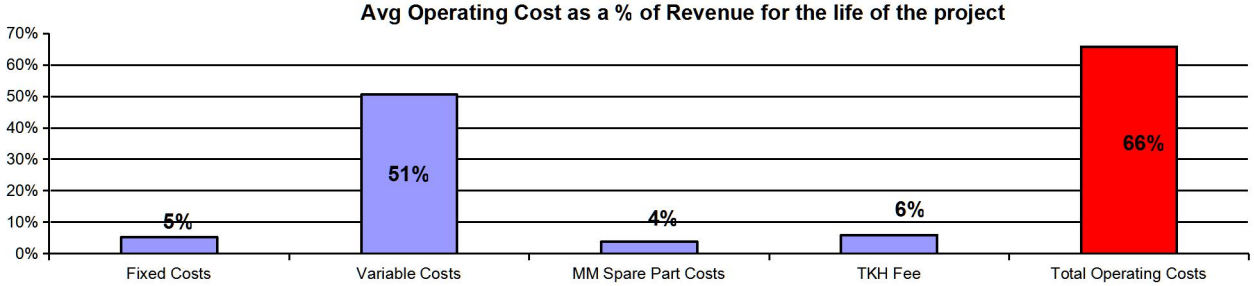
The following table shows the breakdown of Fixed Costs, Variable Costs, Major Maintenance Spare Costs and TKH fees paid as a percentage of revenue

Figure 4.4-3: Average operating costs as a % of Revenue for the life of the project.

HPL:



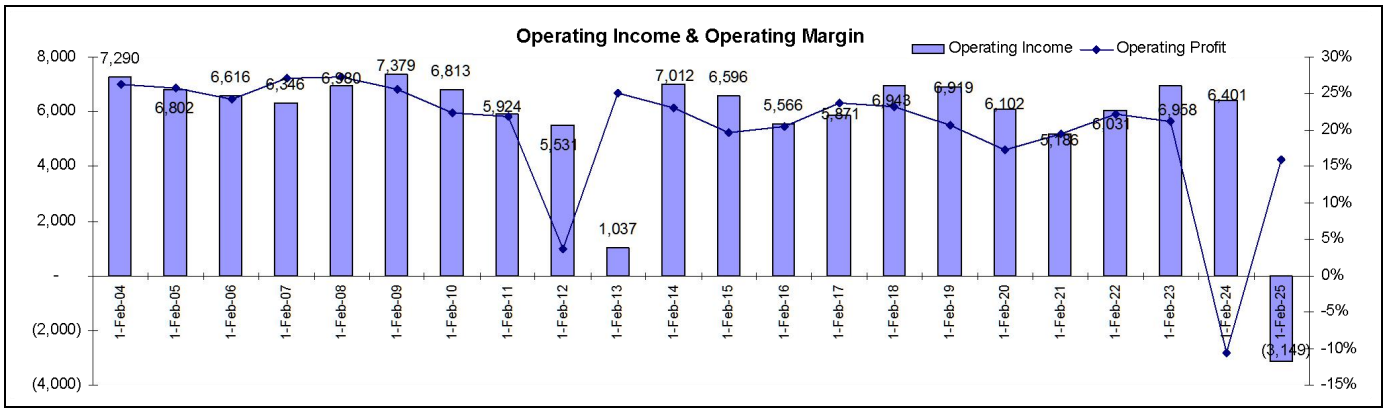
MPL:



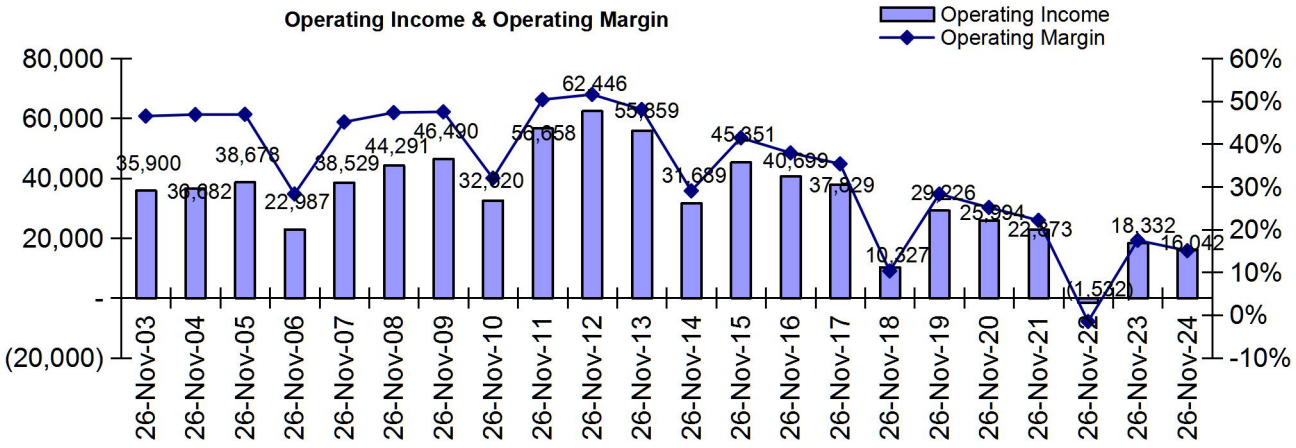
Operating Profit and Operating Profit Margin- is shown on the table below for each Contract year . The reduction in these two financial parameters every 4 years is due to the expense charge related to the acquisition of Spare parts for Major Maintenance years. It is assumed that this cost is expensed as incurred. The cash funding of such costs comes from a release of cash from the build up of the Major Maintenance Reserve Account.

Figure 4.4-4: Operating Income and Operating Margin

HPL:



MPL:



4.5 Capital Expenditure & Depreciation

Meghnaghat Project Costs- The original project cost budget was US$300m. The project however came under budget and final total costs were $290m. As per the finance documents, if there were any savings from the original budget the initial $5m

would be allocated to the project company as additional cash for working capital and any savings above this level would be reimbursed to the equity provider. The final total financing to the project therefore, was $295m of which $220m was financed by debt and $75m through equity. The following table shows the breakdown of total project costs.

Table 4.5-1: Construction and Hard Costs of Meghnaghat

Meghnaghat Power Limited **Construction and Hard Costs**	**Total Final Project Cost**
EPC Contract Payments	184,893
EPC Bonus Amount	1,534
Construction Insurance	2,324
Development Expenses	6,633
Construction Management	2,750
Testing, Start up and Pre-Operating Costs	5,328
Fuel & Electricity during Start Up	363
Spare Parts/Maintenance Equipment	14,500
Site Colony	2,000
Working Capital	2,200
Social Responsibility	1,000
LC Cost @	203
Guarantee Fee Reserve	1,456
Free Electricity Reserve	34,751
Remaining Site Remedial Cost (LD'spaid by BPDB)	(1,623)
EPC Contingency	905
Total Construction and Hard Costs	**259,217**
Financing Costs	
Upfront Fees	3,200
Other Financing costs	14,385
Senior Debt Reserve Pre-funding	10,446
Subordinated Debt Reserve Pre-funding	2,752
Total Financing Costs	**30,783**
Total Use of Funds	**290,000**
Cost Savings as per CTA (funds allocated for Certified Internal Audit additional working capital-w/c)	**5,000**
Total Project Cost	**295,000**

INPUT SUMMARY	
US Inflation Rate	2.50%
Bangladesh Inflation Rate	6.00%
Avg Yearly Currency Devaluation Rate	3.34%
Plant Load Factor	84.00%
Heat Rate Degradation	1.00%
Initial PPA Fuel Price (US$)	1.2
PPA Fuel Price Escalation	4.50%

Initial GSA Fuel Price (US$)	1.2
GSA Fuel Price Escalation	4.50%
Cash Interest Rates	2.00%
Min DSCR check for Restricted Payment	1.20
EQUITY SUMMARY	
Acquisition Date	10-Dec-03
Equity Acquisition Price	86,229
Equity Book Value	75,002
IRR (semi-annual) includes transaction cost	20.19%
IRR (semi-annual) - Trans costs and corp. overhead allocation	#REF!
Investment Payback Period	6.0
Av yearly cflo to Globeleq (yrs 1-5)	10,789
Av yearly cflo to Globeleq (maturity)	17,847
Av yearly Globeleq NI (yrs 1-5)	7,917
Av yearly Globeleq NI (maturity)	13,498
Average Annual Div Yield (Includes TKH fee)	19.5%
Terminal Value	0
Firm Value at completion	303,180
Equity Acquisition Price/Book Value	1.15
Equity Cost/MW (US$ k)	192
Firm Value /MW (US$ k)	674
DEBT FINANCING SUMMARY	
Total Sr debt	160,000
Total Subordinated debt	60,000
Total debt financing	220,000
Total capital funding	295,002
Equity Ratio	0.25
Debt Ratio	0.75
Average DSCR	2.28
Min DSCR	0.84
Average LLCR	2.10
Min LLCR	1.89

CONSTRUCTION/FINANCING	
Construction start	24-Jan-01
Construction Period, month	23
Commercial Operations Date	26-Nov-02
Cost of LD's for Free Electricity not provided	34,751
EPC	186,427
Total Capex	**259,217**
Debt service reserve funding	13,198
Financing cost	17,585
Project Costs	290,000
Total Project Cost (incl $5m wc)	**295,000**
Equity at COD	**75,002**

OPERATING ASSUMPTIONS	
Plant Availability Minor Maint Years	95.00%
Plant Availability Major Maint Years	90.00%
Average Project Life Plant Availibility	93.86%
Avg Life Plant Load Factor	84.00%
Project Life Effective Generation time	78.85%
Avg EPC Heat Rate (CC)	8,097
Dependable Capacity	450
Non Recoverable Degradation	1.0%
Recoverable Degradation	1.0%
TARIFF SUMMARY	
Average Fuel Component	1.58
Average O&M	0.15
Average Capital Recovery Charge	1.50
Average Tariff Project Life (cents/kwr)	**3.22**

Table 4.5-2: Construction and Hard Costs of Haripur

Haripur Power Limited **Construction and Hard Costs**	**Total Final Project Cost**
EPC Contract Payments:	**125,161,152**
Supply contract	113,461,646
IEC contract	11,699,506
IEC Net	10,955,712
IT & VAT deducted from IEC payments	730,199
Hydrogen plant	603,529
EPC Bonus	-
Site Lease	219,864
Pre-Development Expenses	-
Construction Insurance	1,745,709
Development and Financing Expenses	15,405,223
Construction Management	3,421,924
Testing, Start up and Pre-Operating Costs	1,778,267
Fuel & Electricity during Start Up	243,319
Spare Parts/Maintenance Equipment	14,345,416
Working Capital (2mths O&M)	1,000,000
Social Responsibility	500,000
LC Cost	174,693
Contingency	-
Total Construction and Hard Costs	**164,599,096**
Financing Cost	
Upfront Fees	1,065,750
IDC	4,481,265
IDA & GOB Fees	691,412

Commitment Fees	376,583
Debt Reserve Pre-funding	5,284,017
Total Financing Cost	**11,899,026**
Total Project Cost	**176,498,123**

PROJECT CAPITAL COSTS	At COD
Equity Invested	36,203
Total Sr debt	97,900
Total Subordinated debt (shareholder loan)	37,550
Total debt financing	135,450
Simple cycle revenue	4,896
Total capital funding	176,549
ACQUISITION SUMMARY	
Acquisition Date	10-Dec-03
Equity Acquisition Price	58,081
IRR (semi-annual) includes transaction cost	15.3%
IRR (semi-annual) - Trans costs and corp overhead allocation	#REF!
Terminal Value	-
Firm Value at completion	182,234
Equity Acquisition Price/Book Value	102%
Equity Cost/MW (US$ k)	161
Firm Value /MW (US$ k)	506
Av yearly cflo to Globeleq (yrs 03-08)	7,094
Av yearly cflo to Globeleq (maturity)	9,318
Av yearly Globeleq NI (yrs 03-08)	2,260
Av yearly Globeleq NI (maturity)	2,156
CAPITAL AND DEBT RATIOS	
Initial Equity/Debt Ratio	27%
Initial Debt/Cap Ratio	77%
Average DSCR	3.81
Min DSCR	1.46
Average LLCR	7.01
Min LLCR	2.52
TARIFF SUMMARY	
Average Fuel Component	1.42
Average O&M	0.55
Average Capital Recovery Charge	0.56
Average Tariff Project Life	**2.52**

CONSTRUCTION	
Construction Start	1-Dec-99
Simple Cycle COD	1-May-01

Commercial Operations Date	1-Dec-01
EPC Contract Cost	125,161
Total Project Costs	176,549
INPUT SUMMARY	
US Inflation Rate	2.5%
Bangladesh Inflation Rate	6.0%
Avg Yearly Currency Devaluation Rate	3.4%
Plant Load Factor	80.0%
Heat Rate (KJ/KWhr)	7,530
Initial PPA Fuel Price (US$)	1.198
PPA Yearly Fuel Price Escalation	4.5%
Initial GSA Fuel Price (US$)	1.198
GSA Yearly Fuel Price Escalation	4.5%
Yearly Interest Rate Earned on Cash Balances	2.0%
Min DSCR check for Restricted Payment	1.2
OPERATING ASSUMPTIONS	
Outage Days HGPI	16
Outage Days CI	7
Outage Days MM	44
Average Project Life Plant Availibility	95%
Avg Life Plant Load Factor	80%
Project Life Effective Generation time	76%
Dependable Capacity	360
Assumed Avg EPC Heat Rate (CC)	7,549
Heat Rate Degradation (one time)	0.0%

4.5.1 Operation phase Projected Capital Expenditure - Expected CAPEX has been broken down into the following 3 different categories. The table below shows the projected capital expenditure for the plant for each year of operation.

- Meghnaghat has outstanding payment commitments to BPDB to be paid during the first years of operation. These commitments relate to development (rights and licenses obtained) and project site transfer payments which will be paid in 5 equal installments on each anniversary of the commercial operations date. These fixed contracted costs are set on the table below in column 2 and 3 from left to right
- Costs associated to the Concessions provided to the Government of Bangladesh ("GoB") under the Supplemental Agreement ("SA"). These concessions include the reallocation of the Demised Corridor, the handing

over of the Switchyard and the cancellation of the priority letter provided by the GoB to the project. The table below shows the estimated date when the reallocation is expected to take place and projected costs to be incurred inside the project promises for such reallocation. All costs associated to outside work is expected to be borne by the GoB as per the SA. No costs to the project have been budgeted for the handing over of the switchyard nor any income proceeds ($12.6m - depreciation) as per the terms of the SA agreement.

				Cost	Year
Demised Corridor Costs				1,000,000	2005

- An annual general capital expenditure to maintain the facility in proper conditions. The projected Capex for 2004 has been assumed to be $100,000 and this amount is inflated by 5% annually

Capital Expenditure (US$)	Annual Dev Payment	BPDB Site Transfer-B	New CAPEX	Total
2003	369,472	600,000	100,000	1,069,472
2004	360,876	600,000	100,000	1,060,876
2005	348,928	600,000	1,105,000	2,053,928
2006	337,407	600,000	110,250	1,047,657
2007	326,266	600,000	115,763	1,042,029
2008			121,551	121,551
2009			127,628	127,628
2010			134,010	134,010
2011			140,710	140,710
2012			147,746	147,746
2013			155,133	155,133
2014			162,889	162,889
2015			171,034	171,034
2016			179,586	179,586
2017			188,565	188,565
2018			197,993	197,993
2019			207,893	207,893

Capital Expenditure (US$)	Annual Dev Payment	BPDB Site Transfer-B	New CAPEX	Total
2020			218,287	218,287
2021			229,202	229,202
2022			240,662	240,662
2023			252,695	252,695
2024			265,330	265,330
Total				**9,414,874**

4.5.2 Depreciation & Amortization (HPL & MPL) - Electric and Steam facility as per the Bangladesh GAAP is allowed to be depreciated on a straight line method over 40 years. As per the due diligence performed by PWC a 40 year depreciation basis is probably not appropriate under IAS and/or US GAAP, the reason being the term of the PPA is only 22 years. The land lease agreement however, allows the project to renew the lease up to a maximum tenor of 30 years, therefore PWC has suggested that the prudent accounting policy would be to depreciate PP&E over a 30 year basis instead of 40 years.

The base case scenario assumes PP&E is depreciated over a 30 year basis. The following table shows the assumed accounting and tax depreciation rates for each type of asset."

	Years	
Depreciation/Amortization	**Book**	**Tax**
Electric & Steam facility	**30**	**5**
Free Elect/Intan/Develop/SiteTransfer/New Capex	**22**	**5**

4.6 Financing Structure Meghnaghat power Limited

4.6.1 Equity Capital

Total project costs were $295,000,000 of which $75,000,0000 was financed by equity and $220,000,000 by debt. The total debt to capital ratio is 25%, there are no outstanding equity obligations related to project construction. The only sponsor equity obligation is a contingent obligation which is triggered by an event where the facility

has to be restored. This contingent obligation is for $17.9m and reduced to $8.9m in 2008 and $13.4m in 2013. In case of a restoration event the sponsor would be compensated with a return of 18%pa for the additional equity committed to the project.

4.6.2 Debt Capital

The $220,000,000 financing for the project was structured through a combination of lending facilities provided by multilateral organizations (Asian Development Bank and IDCOL, a limited liability company incorporated under the laws of Bangladesh wholly owned by the GOB that acts as an investment manager for the Private Sector Infrastructure Development Fund ("PSIDF") of the International Development Association ("IDA") of the World Bank part of the World Bank) and a syndicate of commercial lenders. The following table presents the initial debt commitments of each of the financial institutions involved in the project and a summary of the terms of each of the facilities

Table 4.6-1: Debt Capital (Meghnaghat)

Financial Institution (US$)	Commit
GE Capital	20,000,000
Asian Development Bank	50,000,000
ANZ	20,000,000
Credit Industriel	5,000,000
Credit Lyonnais	10,000,000
Fortis	10,000,000
HVB	15,000,000
Standard Chartered	10,000,000
IDCOL Sr	20,000,000
IDCOL Subordinated debt	60,000,000
Total	**220,000,000**

Facility (US$m)	ADB-Principal	ADB-Comp	ADB "PRG"-A	ADB "PRG"-B	IDCOL-SNR	IDCOL-SUB	Total Debt Capped
Pro-rata coef	**22.73%**	**9.09%**	**9.09%**	**22.73%**	**9.09%**	**27.27%**	**100.00%**
Amount (USD Mil)	**50.00**	**20.00**	**20.00**	**50.00**	**20.00**	**60.00**	**220.00**
Number of Repayments	**27**	**15**	**25**	**10**	**27**	**31**	

Grace (from COD) (rounded)	**9 Mths**	**9 Mths**	**1.0 years**	**8.0 years**	**9 Mths**	**6.0 years**	
Commitment Fees	**50 b.p.**	**100 b.p.**	**65 b.p.**	**65 b.p.**	**75 b.p.**	**75 b.p.**	
Fixed Swap Rate	**622 b.p.**	**568 b.p.**	**613 b.p.**	**633 b.p.**	**530 b.p.**	**557 b.p.**	
PreCOD-Spread	**380 b.p.**	**350 b.p.**	**200 b.p.**	**225 b.p.**	**350 b.p.**	**350 b.p.**	
PostCOD-Spread	**355 b.p.**	**350 b.p.**	**200 b.p.**	**225 b.p.**	**350 b.p.**	**350 b.p.**	
PreCOD-All in Rate	**10.02%**	**9.18%**	**8.13%**	**8.58%**	**8.80%**	**9.07%**	
PostCOD-All in Rate	**9.77%**	**9.18%**	**8.13%**	**8.58%**	**8.80%**	**9.07%**	**9.02%**

4.6.3 Debt Service Profile

The interest rates in all facilities have been swapped from floating to fixed rate for the tenor of the facilities. The weighted average cost of debt is 9.02% and the weighted average maturity of the debt is 10.25 years. Both the ADB PRG A and the ADB PRG B facilities have been structured to have political risk protection which is provided by the ADB. The PRI guarantee provided by ADB covers the GoB obligations under the IA and the GoB direct guarantee with respect to the obligations of the BPDB under the PPA, the Land Lease Agreement and Titas under the Gas Supply Agreement. The following table show the debt repayment profile of each of the debt facilities

Figure 4.6-1: Annual Debt Service Payment Profile

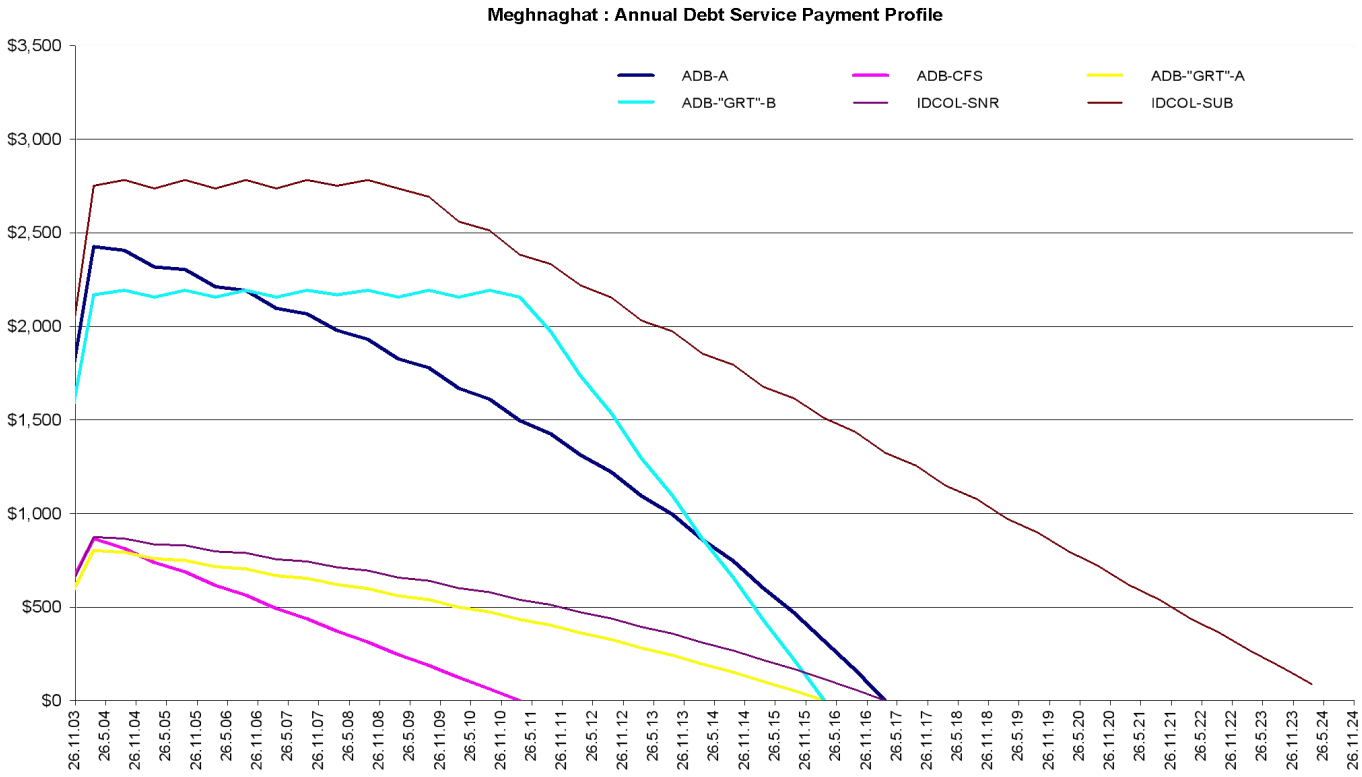
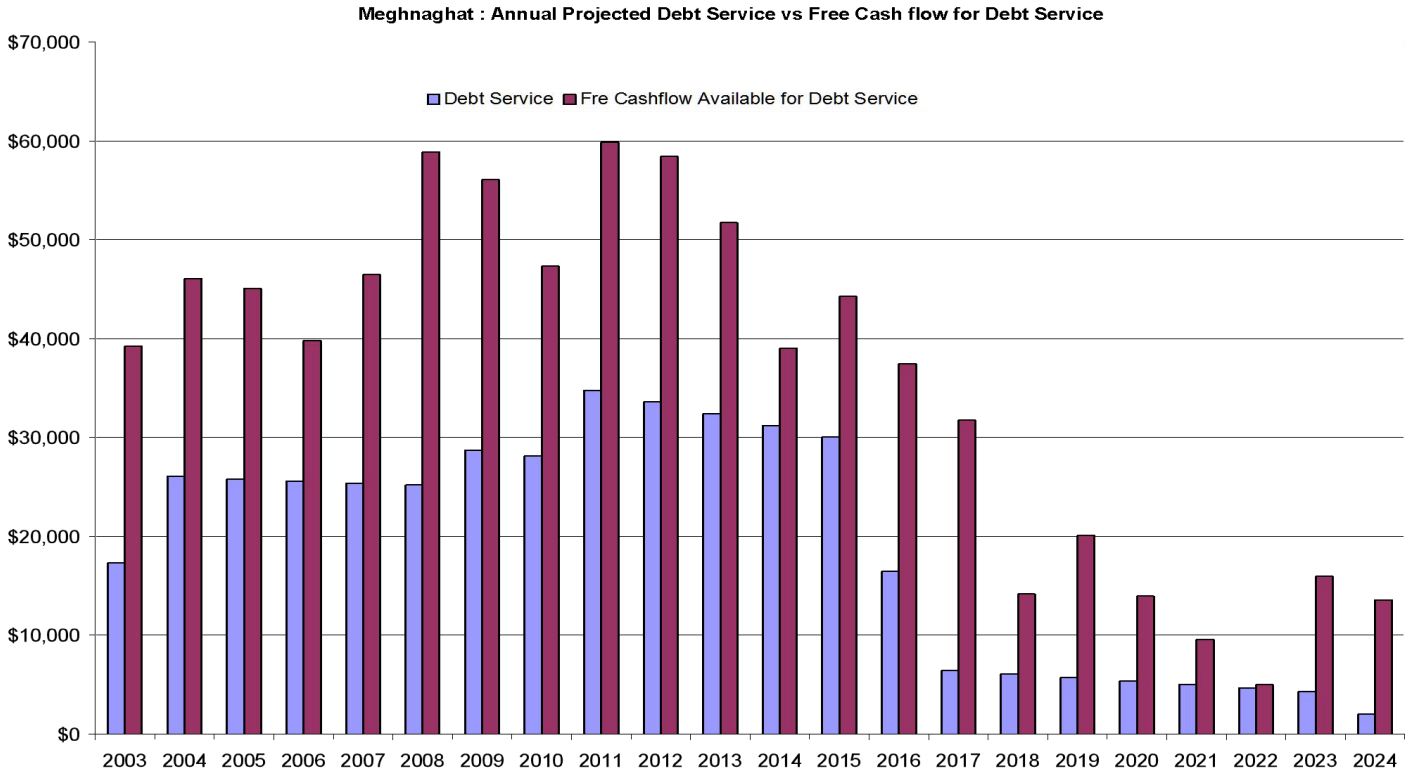


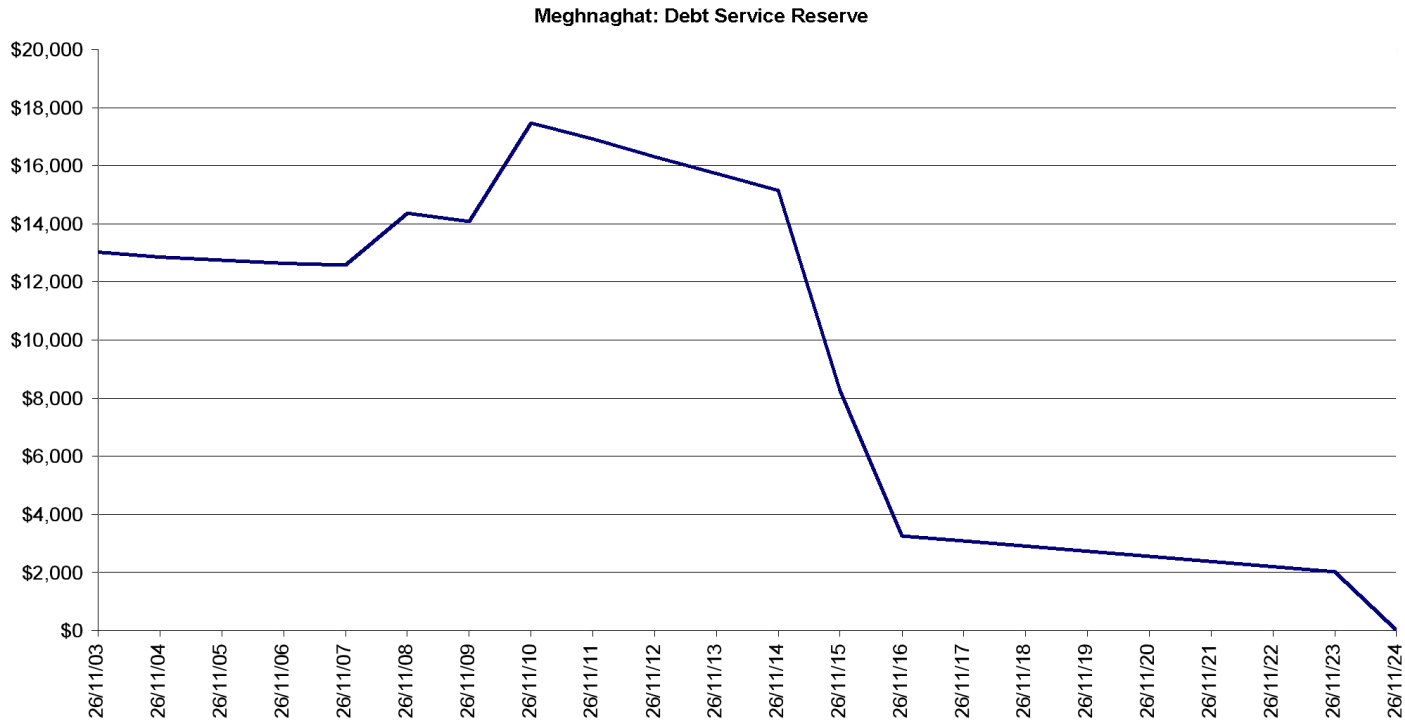
Figure 4.6-2: Annual Projected Debt Service vs Free Cash Flow for debt service.



4.6.4 Debt Service Reserve

A debt service reserve equivalent to the first principal repayment and six months scheduled interest payment obligations in respect to the Credit Facilities, was financed as part of the Project Costs. The project is also obligated to maintain the debt service reserve balance equivalent to six months of debt service on an ongoing basis. AES Meghnaghat may withdraw part of the funds from this reserve only upon posting a Letter of Credit ("L/C") from a bank or banks acceptable to the Lenders, with a face value equivalent to the amounts withdrawn. The debt service reserve requirement peaks on 2010 when the subordinated debt principal repayment commences.

Figure 4.6-3: Debt Service Reserve



	26-Nov-03	26-Nov-04	26-Nov-05	26-Nov-06	26-Nov-07	26-Nov-08	26-Nov-09	26-Nov-10	26-Nov-11	26-Nov-12	26-Nov-13	26-Nov-14	26-Nov-15	26-Nov-16	26-Nov-17	26-Nov-18	26-Nov-19	26-Nov-20	26-Nov-21	26-Nov-22	26-Nov-23	26-Nov-24
Debt Reserve	13,024	12,858	12,747	12,640	12,579	14,362	14,081	17,470	16,918	16,303	15,724	15,147	8,256	3,260	3,083	2,907	2,734	2,553	2,377	2,200	2,024	-

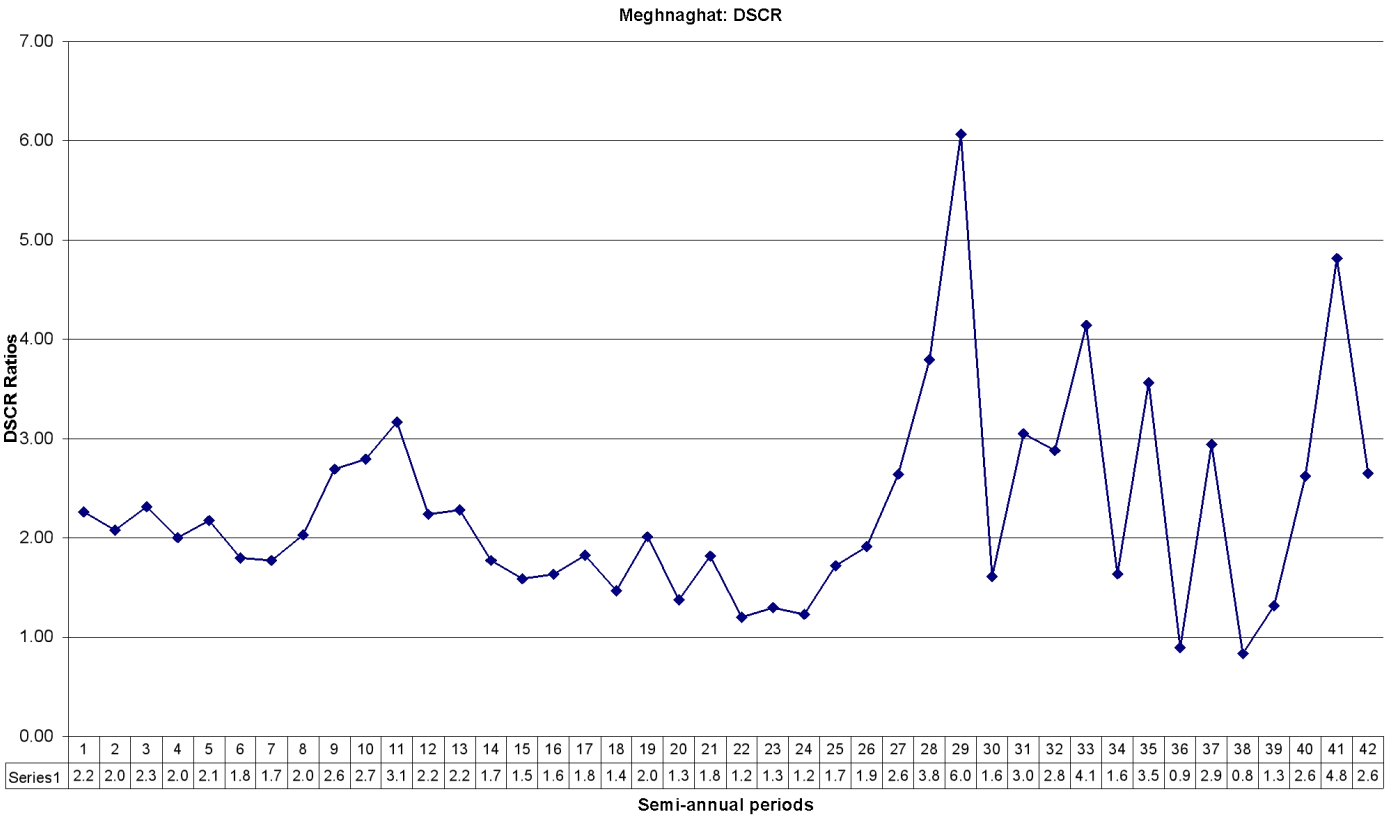
4.6.5 Key Coverage Ratio Tests

The following minimum financial parameters have been set by the lenders as hurdle rates for distribution of restricted payments and or to call an event of default on the project. These ratios are calculated on a semi annual basis.

Minimum Coverage Ratios for Distribution	
Minimum DSCR:	1.20:1 and
Projected DSCR:	1.20:1
(next semi-annual period)	
Event of Default Ratios	
For two Consecutive Semi-annual periods DSCR Below	1.05:1
For Any Semi-annual Period LLCR Below	1.15:1

The project shows strong variance in the DSCR, particularly in the last years of the PPA. The strong variances in the DSCR are a result more of the timing on which certain cash inflows and cashflows are expected to occur rather that the lack of profitability of the project. In particular, the combination of the availability incentive payments being paid on January of each year and the totality of the TKH fees of the previous year being paid on a different semi annual period and being categorized as senior to debt service results on low coverage ratios at the end of the PPA.

Figure 4.6-4: Meghnaghat DSCR [DEBT SERVICE COVERAGE RATIO=$\frac{\text{NET OPERATING INCOME}}{\text{TOTAL DEBT SERVICE}}$ ≥].2



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Series1	2.2	2.0	2.3	2.0	2.1	1.8	1.7	2.0	2.6	2.7	3.1	2.2	2.2	1.7	1.5	1.6	1.8	1.4	2.0	1.3	1.8	1.2	1.3	1.2	1.7	1.9	2.6	3.8	6.0	1.6	3.0	2.8	4.1	1.6	3.5	0.9	2.9	0.8	1.3	2.6	4.8	2.6

4.6.6 Cost of CDC Credit Support

Meghnaghat Power Limited:

CDC will provide credit support to CDCG for the following obligations:

i) Restoration Support Obligation under the Share Retention and Project Funds Agreement for $17m

ii) Operational Security guarantee for two months of capacity payments in favour of BPDB for $6.8m and

iii) Guarantee Fee Reserve L/C to cover the payments of the ADB political risk guarantee for $1.32m.

In exchange for this credit support CDC will charge the following fees to CDCG as long as these obligations remain outstanding

Table 4.6-2: CDC Credit Support Costs for 2004 (Meghnaghat)

Restoration Obligation	
Supply Contract	162,280,000
Installation Erection & Construction	16,961,000
Meghnaghat	**179,241,000**
Total Restoration Obligation (10% of Cont Costs)	**17,924,100**
Factor applied by CDC treasury	10
Annual Fee Charged to CDCG (%)	2.5%
Total	**44,810**
Operational Security	
Meghnaghat	6,830,000
Annual Fee Charged to CDCG (%)	2.5%
Total	**170,750**
Guarantee Fee L/C	
Meghnaghat	1,320,000
Annual Fee Charged to CDCG (%)	2.5%
Total	**33,000**
Grand Total of Annual Fees to be paid by CDCG to CDC	**248,560**

4.7 Financing Structure Haripur power Limited

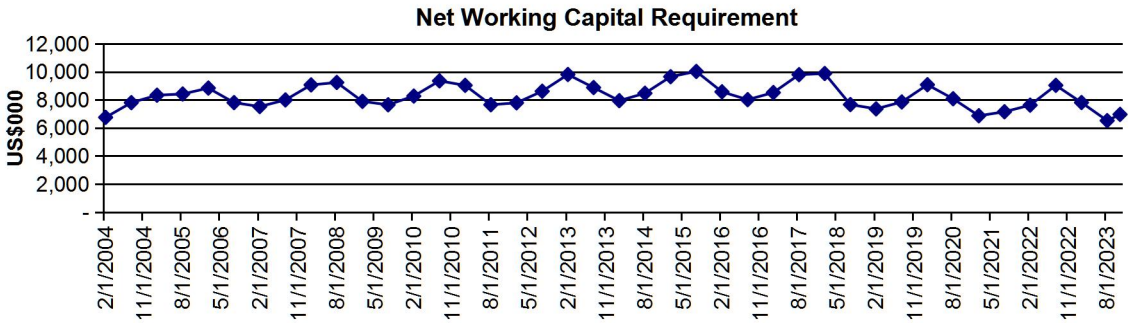
4.7.1: Working Capital HPL:

The working capital of the project is primarily composed of electricity receivables from the BPDB and payables to Titas the gas supply company. Both the PPA and GSA provide for the payment to be made 25 days after the invoice is submitted. Invoices are submitted 7 days after end of the month of the relevant invoice. Inventory is composed of chemicals, lubricants and maintenance spares used for the day to day operation and maintenance of the facility. The initial $10.4m of inventory acquired as

initial inventory for the first minor and major maintenance cycle was capitalized as part of the property plant & equipment. Future acquisition of spares for the next major maintenance cycle are assumed to be fully expensed on the year these spares are bought (as per PWC's suggested accounting policy). Working capital requirement are funded by operating cash flow. The following table shows the assumptions used for the working capital and the net working capital requirement for the life of the project.

Working Capital Assumptions		
Receivables	2.1	months
Inventory	8	months
Other current assets	2.5%	Assets
Gas Payables	2	months
O&M expenses are payable in	1	month

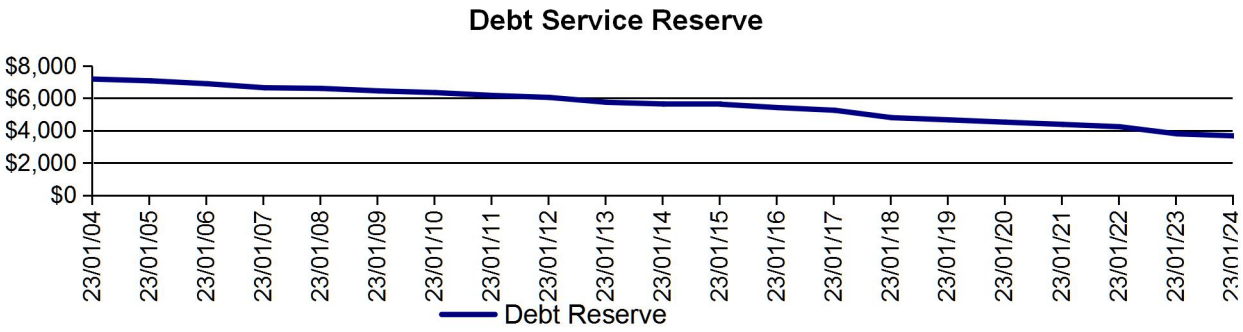
Figure 4.7.1: Haripur Net Working Capital Requirements:



4.7.2: Debt Service Reserve HPL:

A debt service reserve equivalent to the first principal repayment and six months scheduled interest payment obligations in respect to the Credit Facilities, was financed as part of the Project Costs. The project is also obligated to maintain the debt service reserve balance equivalent to six months of debt service on an ongoing basis.

Figure 4.7.2: Haripur Debt Service Reserve

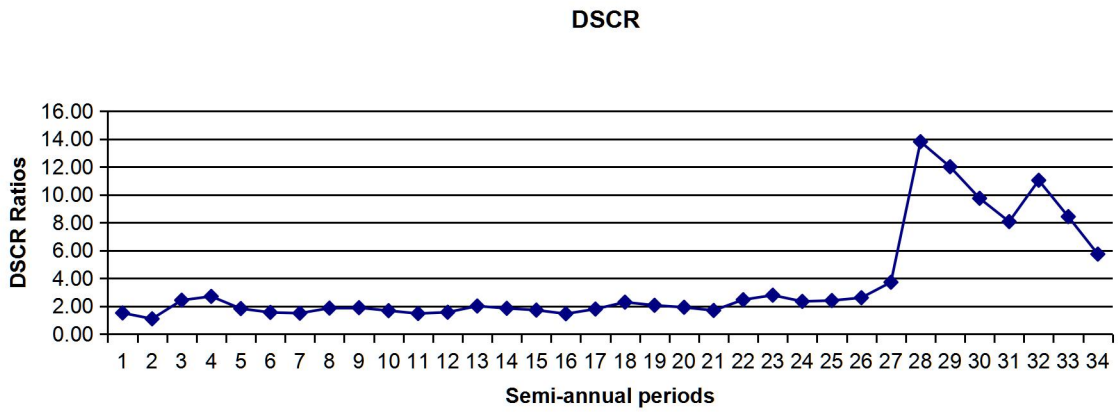


4.7.3: Haripur Key Coverage Ratio Tests-

The following minimum financial parameters have been set by the lenders as hurdle rates for distribution of restricted payments and or to call an event of default on the project. These ratios are calculated on a semi annual basis.

Minimum Coverage Ratios for Distribution	
Minimum DSCR:	1.20:1 and
Projected DSCR:	1.20:1
(next semi-annual period)	
Event of Default Ratios	
DSCR below	1.00:1
or (two consecutive periods)	1.05:1
LLCR below	1.15:1

Figure 4.7.3: Haripur Debt Service Coverage Ratio



4.7.4: Cost of CDC Credit Support

Haripur Power Limited:

CDC will provide credit support to CDCG for the following obligations:

I) Restoration Support Obligation under the Share Retention and Project Funds Agreement for $13m

II) Operational Security guarantee for two months of capacity payments in favour of BPDB for $4.3m.

In exchange for this credit support CDC will charge the following fees to the CDCG as long as these obligations remain outstanding

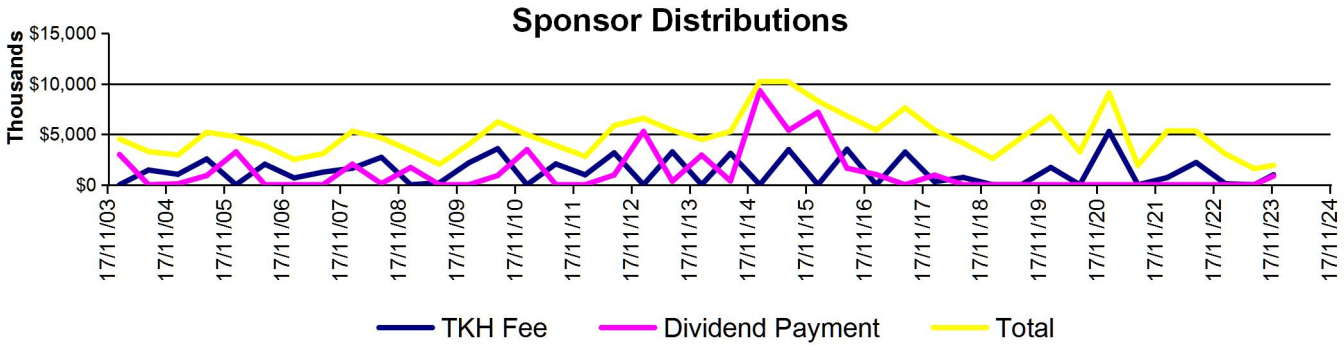
Table 4.7-3: CDC Credit Support Costs for 2004 (Haripur)

Restoration Obligation		
	Supply Contract	117,000,000
	Installation Erection & Construction	13,000,000
	Haripur	**130,000,000**
	Total Restoration Obligation (10% of Cont Costs)	**13,000,000**
	Factor applied by CDC treasury	10
	Annual Fee Charged to CDCG (%)	2.5%
	Total	**32,500**
Operational Security		
	Haripur	4,300,000
	Annual Fee Charged to CDCG (%)	2.5%
	Total	**107,500**
Grand Total of Annual Fees to be paid by CDCG to CDC		**140,000**

4.7.5: Haripur Sponsor Distributions & Returns

Sponsor distributions- are made through the payment of a technical know how fees (6% of revenues pa, less expat salaries plus 45% of overheads associated with expat salaries) and through direct dividend distributions. Dividend distributions are allowed to be made as per the finance documents every February 1 and August 1 along with the debt service payments. TKH fees are paid on an annual basis once the Board of Investment has received the company's annual audited accounts and has verified the amount of TKH fees requested to be paid out of the project.

Figure: 4.7.4: **Haripur Sponsor Distributions**



Sponsor Returns- The following table shows the expected returns for the project and main acquisition assumptions: timing of acquisition, price paid for the asset, acquisition costs and corporate overheads allocation

Acquisition Assumptions	
% of Equity Acquired	100%
Acquisition Date	10-Dec-03
Acquisition Price paid to AES	58,081
Acquisition Task Cost	2,200
Annual corporate overhead allocation	#REF!
Return	
IRR to CDCG	15.28%
IRR to CDCG (after Corp Overhead Costs)	#REF!

4.8 Taxes

4.8.1 Acquisition taxes

The transaction has been structured as to minimize tax impact on the transaction and future distributions. It was decided therefore, to acquire 100% of the shares of AES Victoria Holdings and AES Victoria Partners, 2 Dutch BVs which hold 100% of AES Haripur (Private) Limited instead of the project company itself. This will allow CDC Globeleq to take advantage of the tax treaty between the Netherlands and Bangladesh and minimize the dividend withholding tax at 10% vs a normal wht of 15%.

CDCG has created 2 SPVs to upstream distributions from the Dutch BV's to CDCG . Globeleq Haripur Holdings sarl (Luxembourg) has acquired the shares of the Dutch BVs for $1 each and Globeleq Holdings Mauritius has acquired the shareholder loans that were outstanding from the Dutch BVs to AES Jackson Holdings. No withholding tax is payable on dividends paid by the Dutch company to the Luxembourg company nor on interest from the Dutch BVs to the Mauritius SPV. The Luxembourg company is a subsidiary of the Mauritius SPV and as there is WHT on dividends from Luxembourg to Mauritius it is expected that once the debt is repaid from the Dutch BV's and there are dividend distributions to the Luxembourg company a further restructure will take place at the Luxembourg level to avoid paying WHT when up streaming dividends to Mauritius.

4.8.2 Project level taxes

Taxation of the company-The IA provides the following tax concessions to the Company: I) from Commercial Operations Date and continuing until the fifteenth (15th) anniversary of the Commercial Operations Date is exempt from taxation or withholding tax in Bangladesh (or withholding of tax by BPDB, the Gas Supplier, the Lessor, or GOB) on its income. ii) the Company and the Contractors are exempt from the payment of any Taxes, including Custom Duties and VAT, on spare parts or repaired or refurbished parts imported during until the twelfth anniversary of the COD, provided, that the imported spare parts or repaired or refurbished parts exempted from Taxes do not exceed a cost of ten percent (10%) of the total equipment cost.

iii) the Company is also exempt from any stamp duty and fees on the registration of the Financing Documents and deeds recorded in connection with acquisition of the Site in Bangladesh. iv) any direct foreign collaborators, companies and experts of the Company involved in the Project are exempt from tax and withholding tax on income as is paid to it by the Company as "royalties" or as "technical know how fees". This last concession is of particular relevance as part of the returns of the project are realized through a TKH fee charge of 6% of revenues

Taxation of Lenders- The foreign Lenders have been granted a tax or withholding tax exemption by the GOB in respect of their income from interest and fees arising from loans extended to the Company during the term of the Power Purchase Agreement

Taxes on Sales of Electricity- As per the IA the project is exempted from any imposition of tax on the sale of electricity to BPDB

The following table shows the tax assumption used on the model

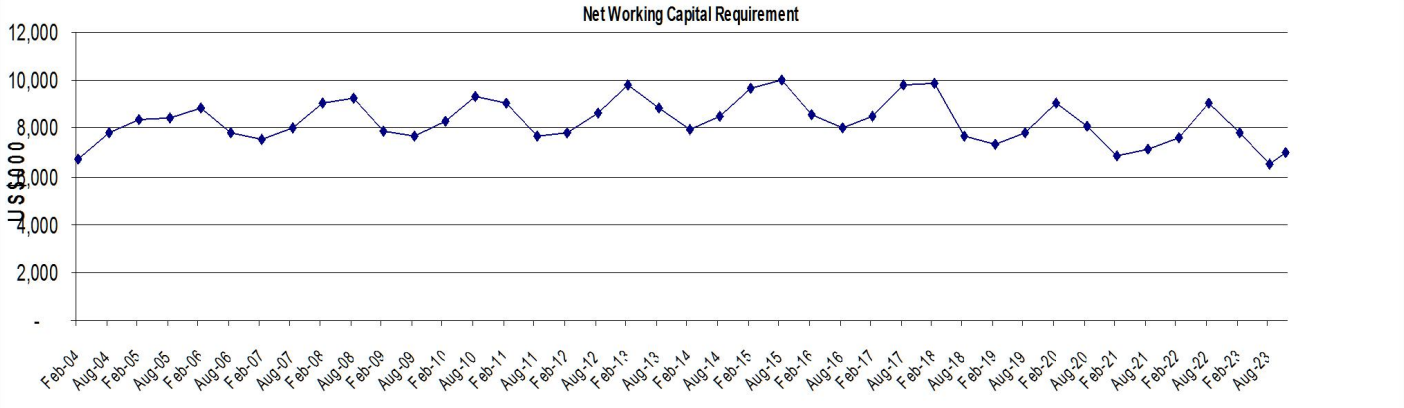
Corporate Taxes	Rate	Holiday
Bangladesh Income Tax	35%	15 years
Tax On Spare Parts	20%	12 years
Bang Div WHT Taxes (Netherlands)	10%	
Taxes on TKH Fees	0%	
Bangladesh Interest Withholding Tax	0%	
Capital Gain Tax	0%	
Taxes on Electricity	0%	

4.9 Working Capital

The working capital of the project is primarily composed of electricity receivables from the BPDB and payables to Titas the gas supply company. Both the PPA and GSA provide for the payment to be made 25 days after the invoice is submitted. Invoices are submitted 7 days after end of the month of the relevant invoice. Inventory is composed of chemicals, lubricants and maintenance spares used for the day to day operation and maintenance of the facility. The initial $10.4m of inventory acquired as initial inventory for the first minor and major maintenance cycle was capitalized as part of the property plant & equipment. Future acquisition of spares for the next major maintenance cycle are assumed to be fully expensed on the year these spares are bought (as per PWC's suggested accounting policy). Working capital requirements are funded by operating cash flow. The following table shows the assumptions used for the working capital and the net working capital requirement for the life of the project.

Working Capital Assumptions		
Receivables	2.1	months
Inventory	8	months
Other current assets	2.5%	Assets
Gas Payables	2	months
O&M expenses are payable in	1	month

Figure 4.8-1: Net Working capital for Haripur

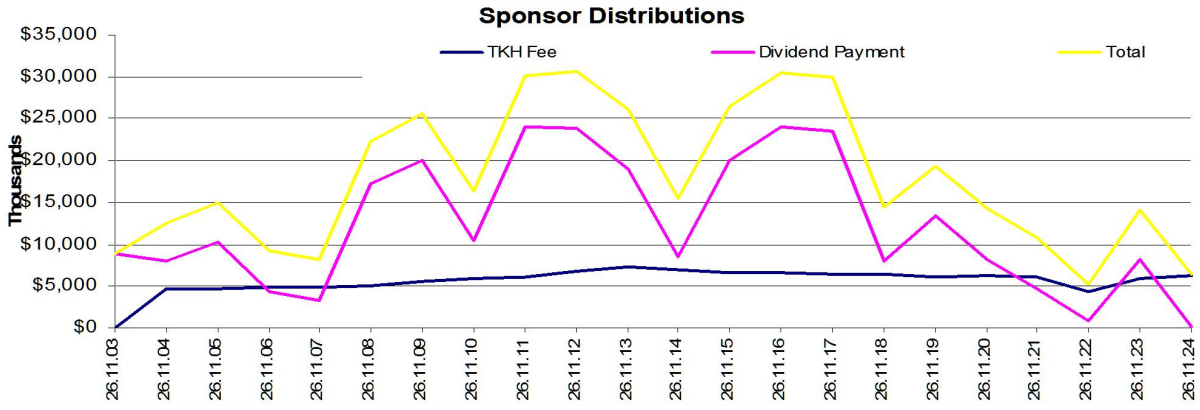


4.10: Meghnaghat Sponsor Distributions & Returns

Sponsor distributions - are made through the payment of a technical know how fees (6% of revenues) and through direct dividend distributions. Dividend distributions are allowed to be made as per the finance documents every March 15 and September 15 along with the debt service payments. TKH fees are paid on an annual basis once the Board of Investment has received the company's annual audited accounts and has verified the amount of TKH fees requested to be paid out of the project.

Distribution Profile			
Year	**TKH**	**Div**	**Total**
2003	-	8,845	**8,845**
2004	4,651	7,928	**12,579**
2005	4,696	10,283	**14,980**
2006	4,945	4,360	**9,305**
2007	4,876	3,360	**8,236**
2008	5,123	17,231	**22,355**
2009	5,615	20,046	**25,661**
2010	5,872	10,438	**16,310**
2011	6,121	10,438	**16,559**
2012	6,751	23,852	**30,604**
2013	7,267	23,852	**31,119**
2014	6,977	18,940	**25,916**
2015	6,553	8,509	**15,062**
2016	6,570	19,974	**26,544**
2017	6,444	23,971	**30,414**
2018	6,424	23,565	**29,989**
2019	6,025	7,974	**13,999**
2020	6,203	8,156	**14,359**
2021	6,096	4,678	**10,774**
2022	4,380	926	**5,306**
2023	5,990	8,143	**14,133**
2024	6,304	170	**6,474**
Total	**123,885**	**265,639**	**389,524**

Figure 4.9-1: Sponsor Distributions=MPL



Sponsor Returns - The following table shows the expected returns for the project and main acquisition assumptions: timing of acquisition, price paid for the asset, acquisition costs and corporate overhead allocation

Acquisition Assumptions	
% of Equity Acquired	100%
Acquisition Date	10-Dec-03
Acquisition Price paid to AES	86,229
Acquisition Task Cost	2,250
Return	
IRR to CDCG	20.19%
Investment Payback	**Years**
Investment Payback Period	6.0

5 Model Inputs and Assumptions

5.1 Technical Assumptions:

Operating Assumptions for Meghnaghat	
Contracted Capacity (MW)	**450**
Dependable Capacity (MW)	450
Recoverable Degradation of Heat Rate over the PPA Period (as a % of Net Capacity Output)	**2.00%**
Non Recoverable Degradation Of Heat Rate (as a % of Net Capacity Output)	**2.00%**
Actual Availability (on normal year)	**94.00%**
Actual Availability (on Major maintenance year)	**90.00%**
Contracted Availability (on normal year)	**90.00%**
Allowed Outages Multiplier (1) (third C.Yr and every third C.Yr thereafter)	**1376**
Allowed Outages Multiplier (2) (for other C.Yrs other than (1))	**876**
Threshold Outages Multiplier (1) (third C.Yr and every third C.Yr thereafter)	**1236**
Threshold Outages Multiplier (2) (for other C.Yrs other than (1))	**876**
Capacity Factor Amount	**1.37**
Plant Factor	**85.00%**
Total Energy (MWh) at Plant Factor 100%	**3,942,000**

Plant Declared Capacity Availability factor, capacity factor and Outage period are most important technical assumption for financial model. If availability factor is not achieved by the project company then offtaker will have option to get LD.

5.2 Date and Timing Assumptions:

Meghnaghat power limited

	Number of Months	Date
Peg Date		15-Jan-98
EPC FNTP	**37**	15-Feb-01
Construction Period	**21.5**	30-Nov-02
Delay	**0**	Months
Take over date Date		26-Nov-02
Free Electricity Period	**0**	Months
Financing period	**21.5**	Months
Commercial Operations Date		26-Nov-02
CostOverun	**0**	
First Repayment Date		15-Sep-03
Months in year	**12**	
Semi in year	**2**	
Days in Cal Yr.	**365**	
Days in Bank Yr.	**360**	
Hours in a day	**24**	
Hours in a Cal Yr	**8760**	

Haripur Power Limited

Construction Start	**1-Dec-99**
Month 0	30-Nov-99
Construction Period Combined Cycle	**23 mths**
Construction Period Simple Cycle	**17 mths**
Construction Period End Combined Cycle	30-Nov-01
Commercial Operations Combined Cycle	1-Dec-01
Commercial Operations Simple Cycle	1-May-01
Financial Close	**30-Apr-01**

5.3 Economic Assumptions:

Meghnaghat Power Limited

Bid Date	**1-Jun-97**	
Exchange Rate at	**1-Jan-98**	**47.00**
Current Exchange Rate at	**1-Jun-01**	**57.90**
US Inflation		**2.50%**
Bangladesh Inflation		**6.00%**
US CPI as at Bid Date	**28-Jun-97**	**100.00**
US CPI as at	**1-Jan-98**	**101.27**
Current US CPI as at	**1-Jun-01**	**110.19**
Bangladesh CPI at Bid Date	**28-Jun-97**	**100.00**
Bangladesh CPI at	**1-Jan-98**	**103.03**
Current Bangladesh CPI at	**6-Jun-01**	**125.83**
Currency devaluation at FC	**0.00%**	

Haripur Power Limited:

Bangladesh Inflation p.a.	**5.00%**	From 1999 to 2025
US Inflation p.a.	**2.50%**	From 1999 to 2003
Base ExchRate, Taka/USD	**50.00**	**1-Nov-98**
USCPI1	**160.40**	**1-Jun-97**
USCPI2	**164.50**	**1-Jan-99**
BangCPI1	**100.00**	**1-Jun-97**
BangCPI2	108.05	**1-Jan-99**

5.4 Financing Assumptions:

Haripur Power Limited

	$M	%
AES Equity	**78.60**	44.53%
Total Debt	**97.90**	55.47%
Project Cost	**176.50**	100.00%

Meghnaghat Power Limited

Floating LIBOR Base Rate	**5.00%**	
Base Equity Contribution (%)	**26.67%**	
Base Equity Contribution (Cap)	**80**	
Base Equity Contribution (USD Mil)	**80**	
% of Equity Before draw down	**69.82%**	
Maximum Contingent Equity (USD Mil)	**15**	
Working Capital (USD Mil)	**2.2**	
Revenues are received in	**1.5**	months
Natural Gas payments are payable in	**1.5**	months
O&M expenses are payable in	**1**	month
Maximum Debt Availability	**220**	

5.5 Tax and Tariff Assumptions:

	Rate	Holiday	Applicable From
Bangladesh Income Tax	35%	15 years	15-Jan-18
Bangladesh Dividend Withholding Taxes	10%		
Bangladesh Interest Withholding Tax	0%		

Tariff:

Tariff has the following components:

- Reference Capacity Payment

- Non-Escalable Component- Foreign (US$/KW/Mo)
- Escalable Component - Foreign(US$/KW/Mo) and Local (TK./KW/Mo)

- Reference Energy Payment
  - Variable O&M Cost
    - Foreign (USc/KWh)
    - Local (TK./KWh)

Tariff schedule for Meghnaghat Power limited is shown below:

Table 5.5-1: Meghnaghat Reference Tariff

Agreement Years	Reference Capacity Price				Reference Energy Price	
	Non-Escalable Component (US$/kW/Mo)		Escalable Component		Variable O&M Cost	
		Foreign	Foreign (US$/kW/Mo)	Local (Tk./kW/Mo)	Foreign (USc/kWh)	Local (Tk. /kWh)
	1	2	3	4	5	6
		RNECP	RECP(US)	RECP(Tk.)	RVOMP(US)	RVOMP(Tk.)
1		6.9701	0.4011	7.744	0.0921	0.0061
2		6.9701	0.4011	7.744	0.0921	0.0061
3		7.4578	0.4011	7.744	0.0921	0.0061
4		7.3833	0.4011	7.744	0.0921	0.0061
5		7.3833	0.4011	7.744	0.0921	0.0061
6		8.1216	0.4011	7.744	0.0921	0.0061
7		8.9337	0.4011	7.744	0.0921	0.0061
8		9.8272	0.4011	7.744	0.0921	0.0061
9		10.8098	0.4011	7.744	0.0921	0.0061
10		11.8910	0.4011	7.744	0.0921	0.0061
11		10.7017	0.4011	7.744	0.0921	0.0061
12		9.6315	0.4011	7.744	0.0921	0.0061
13		8.6686	0.4011	7.744	0.0921	0.0061
14		7.8016	0.4011	7.744	0.0921	0.0061
15		7.0215	0.4011	7.744	0.0921	0.0061
16		6.3193	0.4011	7.744	0.0921	0.0061
17		5.6873	0.4011	7.744	0.0921	0.0061
18		5.1186	0.4011	7.744	0.0921	0.0061
19		4.6069	0.4011	7.744	0.0921	0.0061
20		4.1461	0.4011	7.744	0.0921	0.0061
21		3.7314	0.4011	7.744	0.0921	0.0061
22		3.3584	0.4011	7.744	0.0921	0.0061

5.6 Heat Rate Assumption:

Heat rate (kJ/kWh) represents the thermal efficiency of the plant; i.e. how much kJ energy is required to produce per kWh. Heat rate varies on plant load factor, it is lowest at 100% load (7845kJ/kWh) and highest at 25% load (9340kJ/kWh).

Table 5.6-1: PPA Heat Rate for Meghnaghat

Plant Factor (PF)	Reference Heat Rate (kJ/kWh)			% of Operating	Generation
% of Dependable Capacity	Facility as One Simple Cycle Unit	Facility as Two Simple Cycle Unit	Facility as Combined Cycle Unit	Time	Curve
100.00%	11,800	11,775	7,845	64.00%	80.5%
95.00%	12,150	12,125	7,900	0.00%	0.0%
90.00%	12,500	12,475	7,968	0.00%	0.0%
85.00%	12,762	12,762	8,036	0.00%	0.0%
80.00%	13,014	13,014	8,104	5.00%	5.0%
75.00%	13,320	13,320	8,172	0.00%	0.0%
70.00%	13,677	13,677	8,240	0.00%	0.0%
65.00%	14,079	14,079	8,370	0.00%	0.0%
60.00%	14,549	14,549	8,565	5.00%	3.8%
55.00%	14,950	14,925	8,805	0.00%	0.0%
50.00%	15,400	15,375	7,950	5.00%	3.1%
45.00%	16,075	16,075	8,060	0.00%	0.0%
40.00%	16,858	16,858	8,168	15.00%	7.5%
35.00%	17,919	17,919	8,450	0.00%	0.0%
30.00%	19,309	19,309	8,835	0.00%	0.0%
25.00%	21,000	20,975	9,340	0.00%	0.0%
Average Plant Factor				80%	100.0%
Average PPA Heat Rate (Combined Cycle)				**7,913**	**kJ/kWh**

5.7 Depreciation:

Meghnaghat Power Limited

Depreciable life	**40**

Book Depreciation (St. Line)

Plant	2.5%
Deffered Financing costs & Free electricity buyout	4.5%
Site Development & BPDB Development	2.5%

Haripur Power Limited

Depreciation of fixed asset, Years	**25**

	% of Capital Expenditure	Depreciation rate
Plant & Machinery	87.00%	4.00%
Building (General)	9.00%	4.00%
Factory Building	3.00%	4.00%
Furniture & Fittings	1.00%	4.00%
Subtotal	100.00%	

5.8 Capital Expenditure

Breakdown	% of Capital Expenditure
Plant & Machinery	**87%**
Building (General)	**9%**
Factory Building	**3%**
Furniture & Fittings	**1%**
Subtotal	100.00%

6 Sensitivity Analysis

Meghnaghat model sensitivities are as follows:

Table 6.0-1: MACRO ECONOMIC SENSITIVITIES

		Economic - US Inflation			Economic - US Inflation		
		1.5%	1.5%	2.5%	4.0%	6.0%	8.0%
IRR (includes task acq costs)	20.2%	19.87%	19.87%	20.19%	20.2%	20.2%	20.2%
Av cflo to Globeleq (yrs 1-5)	10,789	10,680	10,680	10,789	10,775	10,789	10,803
Av cflo to Globeleq (maturity)	17,847	17,346	17,346	17,847	17,812	17,847	17,878
Av Globeleq NI (yrs 1-5)	7,917	7,820	7,820	7,917	7,901	7,917	7,932
Av Globeleq NI (maturity)	13,498	13,285	13,285	13,498	13,462	13,498	13,529
Average DSCR	2.3	2.26	2.26	2.28	2.28	2.28	2.29
Minimum DSCR	0.8	0.84	0.84	0.84	0.84	0.84	0.84

		Economic - Fuel Escalation			Economic - Currency Devaluation		
		3.5%	4.5%	5.5%	10.0%	20.0%	30.0%
IRR (includes task acq costs)	20.2%	20.2%	20.2%	20.2%	20.1%	20.1%	20.0%
Av cflo to Globeleq (yrs 1-5)	10,789	10,799	10,789	10,779	10,752	10,720	10,694
Av cflo to Globeleq (maturity)	17,847	17,837	17,847	17,863	17,785	17,736	17,691
Av Globeleq NI (yrs 1-5)	7,917	7,946	7,917	7,886	7,880	7,848	7,822
Av Globeleq NI (maturity)	13,498	13,755	13,498	13,211	13,441	13,397	13,357
Average DSCR	2.3	2.30	2.28	2.28	2.3	2.3	2.3
Minimum DSCR	0.8	0.84	0.84	0.84	0.84	0.84	0.84

Table 6.0-2: PLANT PERFORMANCE SENSITIVITIES

		Plant Availability Minor Year			Plant Availability Major Year		
		90.0%	90.0%	93.0%	80.0%	86.0%	88.0%
IRR (semi-annual) - equity	20.2%	18.2%	18.2%	19.4%	19.3%	19.8%	20.0%
Av cflo to Globeleq (yrs 1-5)	10,789	9,154	9,154	10,135	10,043	10,438	10,614
Av cflo to Globeleq (maturity)	17,847	16,214	16,214	17,192	17,032	17,481	17,663
Av Globeleq NI (yrs 1-5)	7,917	6,254	6,254	7,252	7,197	7,575	7,746
Av Globeleq NI (maturity)	13,498	11,953	11,953	12,883	12,775	13,156	13,326
Average DSCR	2.3	2.2	2.2	2.3	2.2	2.3	2.3
Minimum DSCR	0.8	0.84	0.84	0.84	0.84	0.84	0.84

		Plant Factor			Increase In Heat Rate		
		86.0%	80.0%	70.0%	1.0%	2.0%	3.0%
IRR (semi-annual) - equity	20.2%	20.3%	20.0%	19.5%	20.2%	20.2%	20.2%
Av cflo to Globeleq (yrs 1-5)	10,789	10,856	10,654	10,318	10,789	10,789	10,789
Av cflo to Globeleq (maturity)	17,847	17,938	17,666	17,204	17,847	17,847	17,847
Av Globeleq NI (yrs 1-5)	7,917	7,956	7,839	7,644	7,917	7,917	7,917
Av Globeleq NI (maturity)	13,498	13,527	13,442	13,303	13,498	13,498	13,498
Average DSCR	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Minimum DSCR	0.8	0.84	0.84	0.84	0.84	0.84	0.84

		Increase O&M			Tariff Reduction (Year 3)		
		95.0%	100.0%	105.0%	100.0%	90.0%	80.0%
IRR (semi-annual) - equity	20.2%	20.5%	20.2%	19.9%	20.2%	16.1%	11.6%
Av cflo to Globeleq (yrs 1-5)	10,789	11,101	10,789	10,478	10,789	8,909	7,700
Av cflo to Globeleq (maturity)	17,847	18,290	17,849	17,410	17,847	14,418	10,886
Av Globeleq NI (yrs 1-5)	7,917	8,279	7,917	7,554	7,917	5,457	2,990
Av Globeleq NI (maturity)	13,498	13,979	13,499	13,025	13,498	10,030	6,555
Average DSCR	2.3	2.3	2.3	2.4	2.3	2.1	1.9
Minimum DSCR	0.8	0.81	0.84	0.86	0.84	0.84	0.84

Table 6.0-3: FINANCIAL SENSITIVITIES:

		Depreciation			Insurance		
		22	22	30	$2,210	$2,660	$2,920
IRR (semi-annual) - equity	20.2%	20.2%	20.2%	20.2%	20.2%	20.2%	20.2%
Av cflo to Globeleq (yrs 1-5)	10,789	10,789	10,789	10,789	10,789	10,789	10,789
Av cflo to Globeleq (maturity)	17,847	17,847	17,847	17,847	17,847	17,847	17,847
Av Globeleq NI (yrs 1-5)	7,917	7,917	7,917	7,917	7,917	7,917	7,917
Av Globeleq NI (maturity)	13,498	13,498	13,498	13,498	13,498	13,498	13,498
Average DSCR	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Minimum DSCR	0.8	0.84	0.84	0.84	0.84	0.84	0.84

Table 6.0-3: FINANCIAL RATIO SENSITIVITIES:

Average DSCR **3.81**
Min DSCR **1.46**

Average LLCR **7.03**
Min LLCR **2.52**

7 Findings

7.1 Financial Model Highlights

Haripur Power Limited

PROJECT CAPITAL COSTS	At COD
Equity Invested	36,203
Total Sr debt	97,900
Total Subordinated debt (shareholder loan)	37,550
Total debt financing	135,450
Simple cycle revenue	4,896
Total capital funding	**176,549**

CONSTRUCTION	
Construction Start	1-Dec-99
Simple Cycle COD	1-May-01
Commercial Operations Date	1-Dec-01
EPC Contract Cost	125,161
Total Project Costs	**176,549**

INPUT SUMMARY	
US Inflation Rate	2.5%
Bangladesh Inflation Rate	6.0%
Avg Yearly Currency Devaluation Rate	3.4%
Plant Load Factor	80.0%
Heat Rate (KJ/KWhr)	7,530
Initial PPA Fuel Price (US$)	1.198
PPA Yearly Fuel Price Escalation	4.5%
Initial GSA Fuel Price (US$)	1.198
GSA Yearly Fuel Price Escalation	4.5%
Yearly Interest Rate Earned on Cash Balances	2.0%
Min DSCR check for Restricted Payment	1.2

ACQUISITION SUMMARY	
Acquisition Date	10-Dec-03
Equity Acquisition Price	58,081
IRR (semi-annual) includes transaction cost	15.2%
Firm Value at completion	182,234
Equity Acquisition Price/Book Value	102%
Equity Cost/MW (US$ k)	161
Firm Value /MW (US$ k)	506
Av yearly cflo to Globeleq (yrs 03-08)	7,094
Av yearly cflo to Globeleq (maturity)	9,288
Av yearly Globeleq NI (yrs 03-08)	2,260
Av yearly Globeleq NI (maturity)	2,117

CAPITAL AND DEBT RATIOS	
Initial Equity/Debt Ratio	27%
Initial Debt/Cap Ratio	77%
Average DSCR	3.77

Min DSCR	1.46
Average LLCR	6.98
Min LLCR	2.51

OPERATING ASSUMPTIONS	
Outage Days HGPI	16
Outage Days CI	7
Outage Days MM	44
Average Project Life Plant Availibility	95%
Avg Life Plant Load Factor	80%
Project Life Effective Generation time	76%
Dependable Capacity	360
Assumed Avg EPC Heat Rate (CC)	7,549
Heat Rate Degradation (one time)	0.0%

TARIFF SUMMARY	
Average Fuel Component	1.42
Average O&M	0.55
Average Capital Recovery Charge	0.56
Average Tariff Project Life	**2.52**

Meghnaghat Power Limited

CONSTRUCTION/FINANCING	
Construction start	24-Jan-01
Construction Period, month	23
Commercial Operations Date	26-Nov-02
Cost of LD's for Free Electricity not provided	34,751
EPC	186,427
Total Capex	**259,217**
Debt service reserve funding	13,198
Financing cost	17,585
Project Costs	290,000
Total Project Cost (incl $5m wc)	**295,000**
Equity at COD	**75,002**

INPUT SUMMARY	
US Inflation Rate	2.50%
Bangladesh Inflation Rate	6.00%
Avg Yearly Currency Devaluation Rate	3.34%
Plant Load Factor	84.00%
Heat Rate Degradation	1.00%
Initial PPA Fuel Price (US$)	1.2
PPA Fuel Price Escalation	4.50%
Initial GSA Fuel Price (US$)	1.2
GSA Fuel Price Escalation	4.50%
Cash Interest Rates	2.00%
Min DSCR check for Restricted Payment	1.20

EQUITY SUMMARY	
Acquisition Date	10-Dec-03
Equity Acquisition Price	86,229

Equity Book Value	75,002
IRR (semi-annual) includes transaction cost	20.19%
Investment Payback Period	6.0
Av yearly cflo to Globeleq (yrs 1-5)	10,789
Av yearly cflo to Globeleq (maturity)	17,847
Av yearly Globeleq NI (yrs 1-5)	7,917
Av yearly Globeleq NI (maturity)	13,498
Average Annual Div Yield (Includes TKH fee)	19.5%
Terminal Value	0
Firm Value at completion	303,180
Equity Acquisition Price/Book Value	1.15
Equity Cost/MW (US$ k)	192
Firm Value /MW (US$ k)	674

OPERATING ASSUMPTIONS	
Plant Availability Minor Maint Years	95.00%
Plant Availability Major Maint Years	90.00%
Average Project Life Plant Availibility	93.86%
Avg Life Plant Load Factor	84.00%
Project Life Effective Generation time	78.85%
Avg EPC Heat Rate (CC)	8,097
Dependable Capacity	450
Non Recoverable Degradation	1.0%
Recoverable Degradation	1.0%

DEBT FINANCING SUMMARY	
Total Sr debt	160,000
Total Subordinated debt	60,000
Total debt financing	220,000
Total capital funding	295,002
Equity Ratio	0.25
Debt Ratio	0.75
Average DSCR	2.28
Min DSCR	0.84
Average LLCR	2.10
Min LLCR	1.89

TARIFF SUMMARY	
Average Fuel Component	1.58
Average O&M	0.15
Average Capital Recovery Charge	1.50
Average Tariff Project Life	**3.22**

7.2 Ratio's Analysis:

7.2.1 Asset based or Stored Liquidity Ratios:

1) Cash position indicators $= \frac{\text{Cash + Deposits}}{\text{Total Assets}} = \frac{(75+179.241)m}{248.56m} = 1.023$

2) Liquid Securities Indicators $= \frac{\text{Govt. Securities}}{\text{Total Securities}} = \frac{33000}{170750} = 0.193$

3) Risk less Assets Position $= \frac{\text{Cash+ Deposits+ Govt. Securities}}{\text{Total Assets}} = \frac{(75+179.241+3.3)m}{248.56m} = 1.036$

4) Net Treasury Funds Position $= \frac{\text{Balance of Reserves with Central Bank}}{\text{Total Assets}} = \frac{1.32m}{248.56m} = 0.0053$

5) Liquidity Assets Ratio $= \frac{\text{Cash+ Reserves+ Govt. Securities}}{\text{Total Assets}} = \frac{(75+1.32+3.3)m}{248.56m} = 0.3203$

6) Capacity Ratio $= \frac{\text{Net Loan + Lease or Rent}}{\text{Total Assets}} = \frac{(220+.22)m}{248.56m} = 0.886$

7) Pledged Securities Ratio $= \frac{\text{Pledged Securities}}{\text{Total Securities Holdings}} = \frac{6.8m}{17.075} = 0.3982$

7.2.2 Liability based or Purchased Liquidity Ratios:

1) Hot Money deposit $= \frac{\text{Withdraw able Hot Money Deposits}}{\text{Total Hot Money Deposits}} = — =$

2) Short- term Deposit to Assets$= \frac{\text{Short}- \text{ term Deposits}}{\text{Total Assets}} = — =$

3) Short- time Investments to Sensitive Liabilities $= \frac{\text{Short}- \text{ time Investments}}{\text{Sensitive Liabilities}} = — =$

4) Deposits Brokerage Index $= \frac{\text{Brokerage deposits}}{\text{Total Assets}} = — =$

5) Core Deposits Ratio $= \frac{\text{Core Deposits}}{\text{Total Assets}} = — =$

6) Deposits Composition Ratio $= \frac{\text{Current Deposits}}{\text{Term Deposits}} = — =$

7) Transaction Deposits Ratio $= \frac{\text{Transaction Deposits}}{\text{Non}- \text{ transaction able Deposits}} = — =$

7.3 Financing the project

A funding structure that relies on the future cash flows from a project as the primary source of repayment, with that project's assets as collateral security.

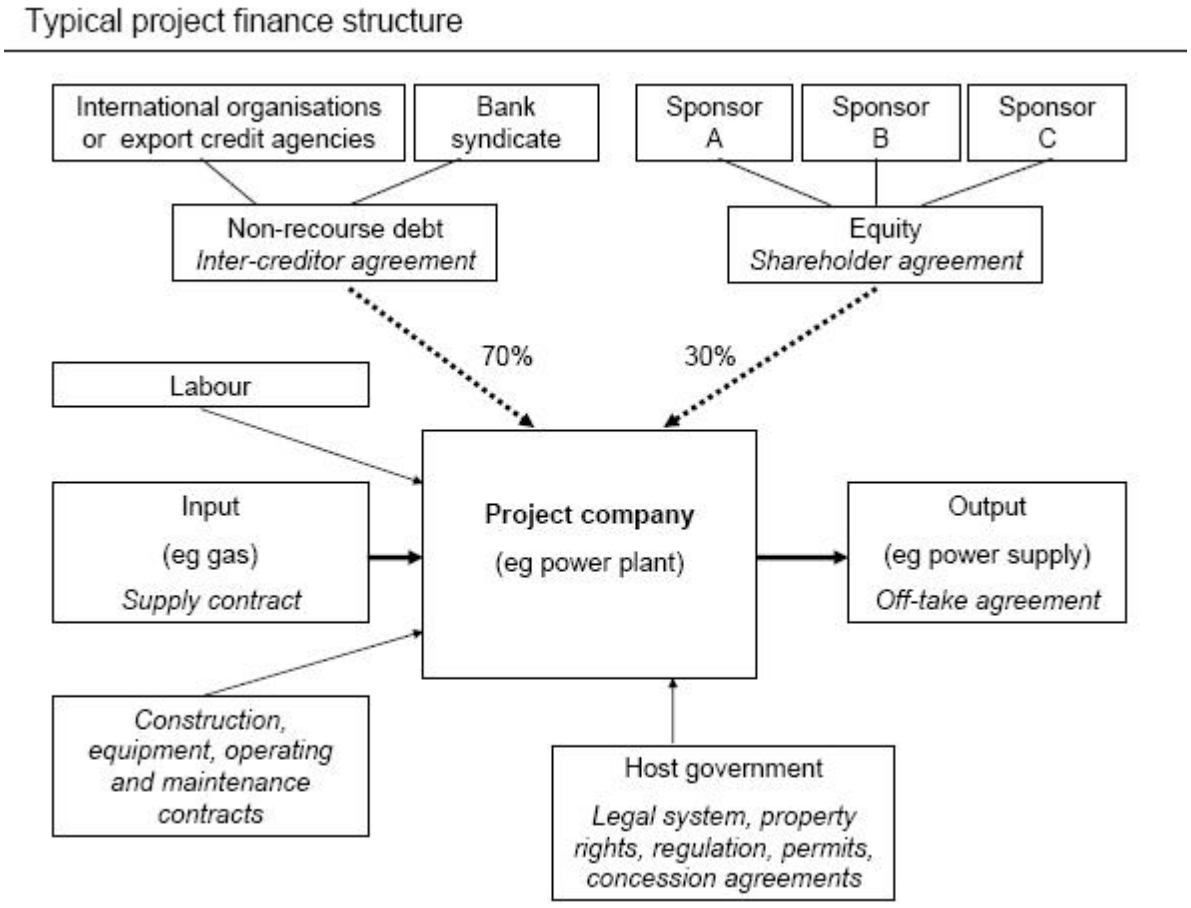
There are three steps in financing process and they are as follows:

First, funding the construction project

Second, project completion and qualification

Third, project's cash flows are used for debt service & equity return

Figure 7.2-1: Typical Power Plant Project Financing Structure

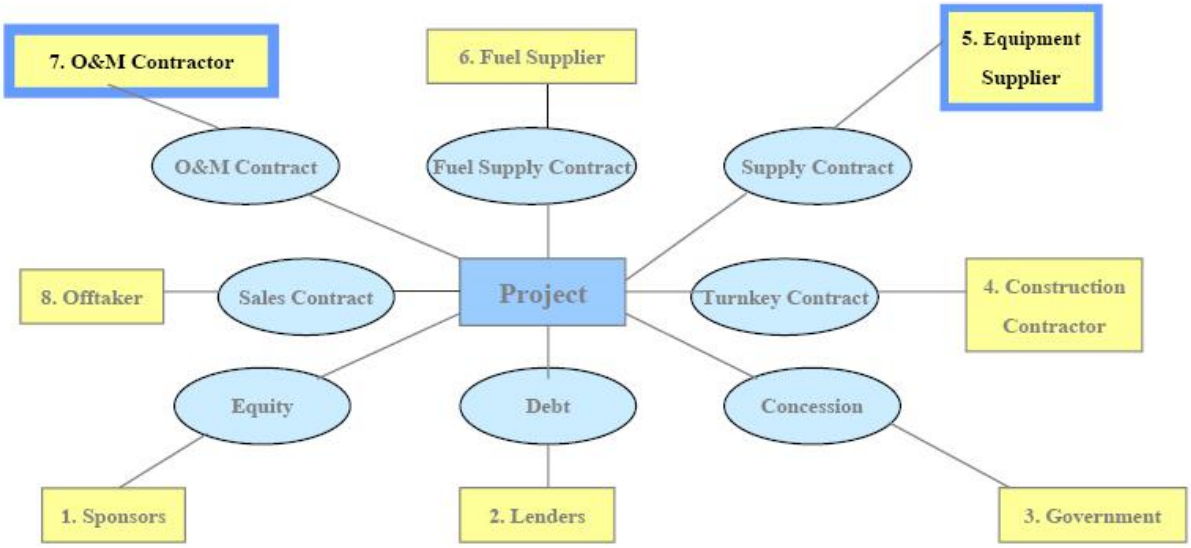


7.4 Participants in Power Plant Development

Power plant development is a vast process and many parties involved in deferent phases from construction to commercial operation.

Participants in the power plant development can be shown as follows:

Figure 7.3-1: Participants in Power Plant development



7.5 Sources of finance

Sources of finance may very from project to project. Followings are a list of sources of finance:

- Equity
- Commercial Bank
- Loan from Multilateral Agencies
- Export Credit
- Capital markets

Haripur Equity and debt ratios were: 44.53% and 55.47%

Meghnaghat Equity and debt ratios were: 25.42% and 74.58%

7.6 Project Contracts

Project contracts establish the development, commissioning, and operation of the project. These are the most critical documentations and it requires experienced and expert people to compile those contracts. Those contracts are considered as the directives and required to be checked by the legal representatives.

Key contracts generally are:

- Engineering, Procurement, and Construction (EPC)
- Fuel Supply Agreement (e.g. GSA)
- Offtake Agreement (e.g. PPA)
- Land Lease Agreement (LLA)
- Gas Turbine Maintenance Contract
- Implementation Agreement

7.7 Risk Allocation

There are a number of risks involved in project development:

- Completion
    - EPC contractor may make delay in the project development that may cause to make LD payment to the offtaker by the project company.
- Fuel Supply
    - A number of risk involved in the Fuel supply like Off-spec fuel supply, Interruption in fuel supply, delay in completion of the fuel supply system's construction.
- Market
    - Market demand may fall and if there is no scope for capacity payment then there will be big uncertainty in electricity selling
- Force Majeure

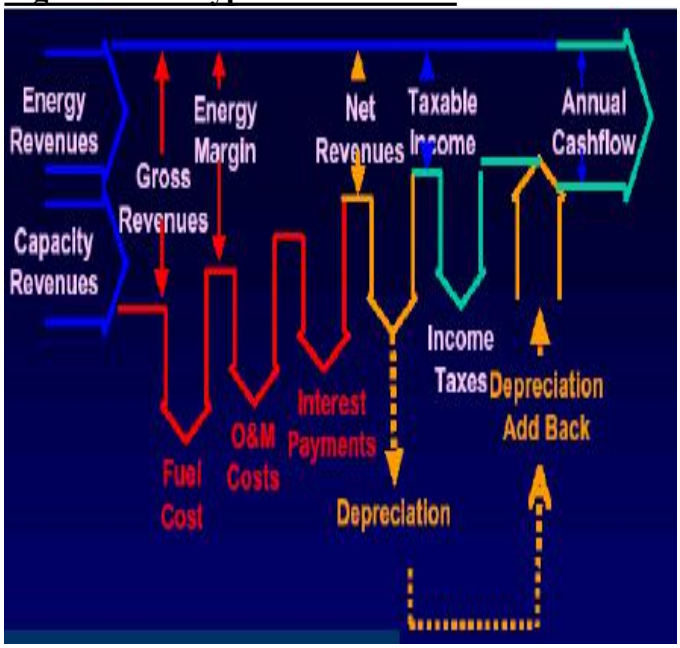
- If any of the key equipments fail then there will be unscheduled outage which may cause plant shutdown for long time.

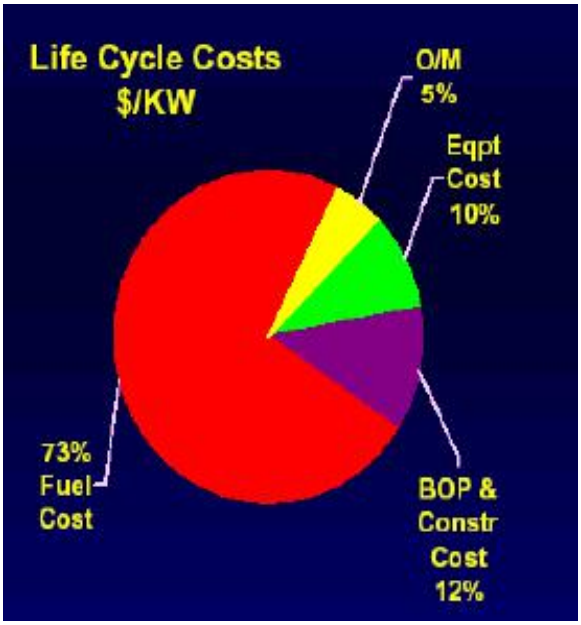
- Environmental
  - Power plant has to comply with local environmental regulations for emission and waste discharge to the atmosphere.
- Financial: Interest rate/ Foreign Exchange
  - Interest rate and Foreign exchange play an important role in the Cash flows.
- Document/ Legal
  - Legal requirements are the most important parts for the project company because they have to implement those.

7.8 Economics:

Cash Flows: Components of cash flows are capacity payment and energy payment. Typical cash flow can be shown as flows:

Figure 7.7-1: Typical Cash Flows





LIFE CYCLE COSTS

Cost of ownership is the sum of First Cost and Annual Operation Expenses. Operating expenses include Fuel, O/M, and Consumables.

Fuel expense is dominant factor in base load plant. Technology is another important cost factor that enhances the efficiency.

Cost of Electricity

Cost of electricity is the sum of all the operating expenses for each year of operation

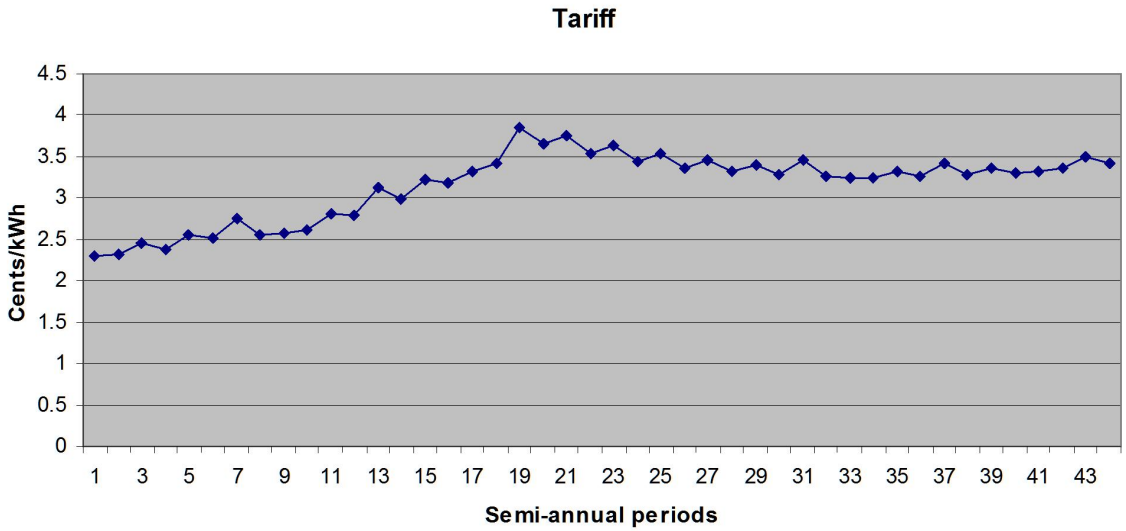
- Fuel, Operation and Maintenance Cost, Consumables, etc.

Add the carrying cost of capital

- Total Capacity x Fixed Charges Rate

Divide by KWH's produced in the year yield the cost of electricity.

Meghnaghat Tariff schedule:



Divers and Cost Effective Energy Choices:

Comparative data for different fuel sources are as follows:

Figure 7.7-2: Different Fuel Sources

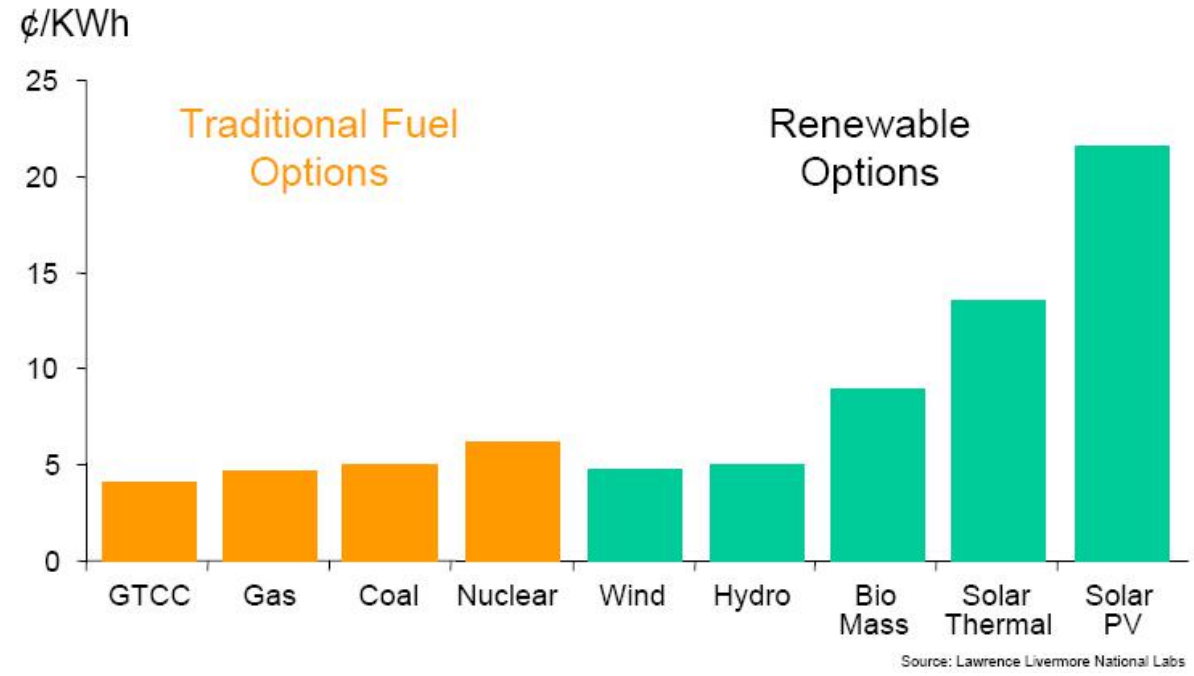
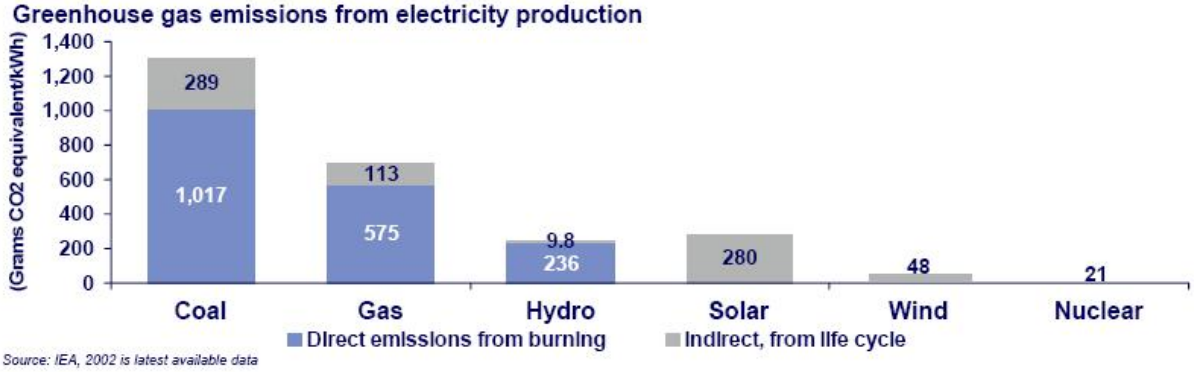


Figure 7.7-3: Greenhouse Gas Emission



There are different sources for fuel like coal, liquid fuel, gas and other renewable sources. Coal is very cheap but difficult to handle and also categorized as a major source for environmental pollution. Gas is the most appropriate fuel for combined cycle power plant with comparing cost and environmental consideration.

8.0 Recommendations and Conclusion

Project development is a complex process involving many parties. Key considerations: financing, contractual arrangements, risks & allocation, technology, economics.

It is very important to consider life-cycle cost of plant, not just one-time capital investment to derive cost of electricity. Combined cycle technology with gas turbine and steam turbine is among the most efficient today, which can reduce life-cycle cost and achieve overall lower electricity tariff for the country.

Economic assumptions are very important in the financial model of power plant. Among the economic assumptions: local inflation rate, foreign inflation rate, exchange rate etc should be covered in the tariff calculation to recover fluctuation in the future.

Fuel cost and O&M expenses are the most important consideration for cash flows. Though the fuel cost will depend on plant load factor and will not very too much, but choosing a high efficiency Gas Turbine will keep fuel cost low and also will put add profit in fuel payment by the heat rate.

For combine cycle power plant, Maintenance expense plays an important role for cash flows; because the Gas Turbine and Steam Turbine require major maintenance in a certain interval (normally in every five year) and it requires couples of million dollars. This huge expense is covered by maintaining a special account named MMRA (Major Maintenance Reserve Account).

9 Appendix

9.1 Haripur Financial Model

- Attached

9.2 Meghnaghat Financial Model

- Attached

10. References of Financial Model

a) https://en.wikipedia.org/wiki/Project_finance_model
b) https://www.youtube.com/watch?v=xDlQPJaFtCw
c) https://www.wallstreetprep.com/knowledge/project-finance-model-structure/
d) https://www.investopedia.com/articles/financial-theory/11/corporate-project-valuation-methods.asp
e) https://www.financialdirector.co.uk/2019/11/06/what-are-the-different-financial-models/
f) https://www.wallstreetmojo.com/financial-modeling/
g) https://www.googleadservices.com/pagead/aclk?
h) https://www.coursera.org/specializations/wharton-business-financial-modeling
i) https://corporatefinanceinstitute.com/resources/knowledge/modeling/types-of-financial-models/
j) https://www.techfunnel.com/fintech/6-most-common-types-of-financial-modeling-techniques/
k) https://www.proschoolonline.com/blog/top-6-types-financial-models
l) https://www.wallstreetmojo.com/financial-modeling-tools/
m) https://finmark.com/financial-modeling-tools/
n) https://blog.imarticus.org/what-is-the-best-way-to-learn-to-do-financial-modeling-financial-modeling-blog/
o) https://www.quora.com/Which-is-the-best-institution-for-financial-modelling-course