

## **NAME AND ADDRESS OF THE PETITIONER**

Engro Energy (Private) Limited  
7<sup>th</sup> Floor, PNSC Building  
MT Khan Road  
Karachi

## **GROUND AND THE FACTS FORMING THE BASIS OF THE TARIFF PETITION**

Engro Chemical Pakistan Limited (ECPL) submitted a proposal to the Government of Pakistan's Private Power and Infrastructure Board (PPIB), Ministry of Water & Power, on October 18, 2005 to develop an innovative, fast-track project of 150 – 250 MW capacity combined cycle power plant at Daharki based on permeate gas from Qadirpur gas field.

The PPIB issued a letter of interest (LOI) to ECPL on January 6, 2006 for approximately 150 MW Gas-based power generation project.

The project company, Engro Energy (Private) Limited (EEL), was incorporated on February 28, 2006 under the Companies Ordinance, 1984, and 7<sup>th</sup> Floor, PNSC Building, MT Khan Road, Karachi, being its registered office.

Pursuant to the LOI, in January 2006, a detailed feasibility study was awarded to M/s Fichtner of Germany and M/s Hagler Bailly were engaged to conduct the Environmental Impact Assessment (EIA).

A draft feasibility report was submitted to the PPIB in April 2006. Fichtner representatives and Engro team made a presentation to the PPIB/Panel of Experts (POE) on May 5, 2006 explaining the salient features of this unique project based on permeate gas.

The POE communicated their observations/concerns on the draft feasibility on June 9, 2006. These suggestions/comments made by POE were addressed and incorporated in the final draft of the feasibility report which was submitted to the PPIB on August 17, 2006.

The PPIB/POE approved the feasibility study on September 20, 2006 and advised ECPL to file an application with National Electric Power Regulatory Authority (NEPRA) for Tariff determination.

The feasibility study indicates that GE 9E and Alstom GT 11N2 are the viable options for producing 175 to 180 MW power with the 75 MMSCFD allocated quantity of permeate gas. In case an additional quantity of 9-10 MMSCFD higher calorific gas (HCG) is made available to the project along with 75 MMSCFD permeate gas, then Siemens SGT5 –

2000E shall also be the suitable option with higher output (246MW) and better efficiency.

The permeate gas which could not be utilized in the Gas Turbine would need to be flared. In order to ensure that all the allocated quantity of permeate gas shall be utilized, a supplementary firing in HRSG has been proposed to provide additional 50 MWs.

Key components and parameters of the tariff based on GE 9E with supplementary firing are as follows:

Gross Plant Capacity (MW) @ ISO conditions with 75MMSCFD gas	226.52
Gross Plant Capacity (MW) @ Mean Site Conditions	223.80
Net Plant Capacity (MW)	216.80
Notional Plant Load Factor	60 %

## **SCHEDULES OF CHARGES, COSTS, UNITS, PRICE AND OTHER ITEMS COMPRISING THE PROPOSED TARIFF**

### **OPERATIONAL AND FINANCIAL ASSUMPTIONS**

#### **Plant Design and Operational Assumptions**

Gross Plant Capacity @ ISO Conditions	226.52 MW
Gross Plant Capacity @ Reference Conditions	223.80 MW
Auxiliaries Consumption	7.00 MW
Net Plant Capacity @ Reference Conditions	216.80 MW
Gross Thermal Efficiency on permeate gas with supplementary firing	47.00 %
Net Thermal Efficiency on permeate gas with supplementary firing	45.53 %
Heat Rate on permeate gas at full load with supplementary firing	7907 KJ/KWh
Net Plant Capacity @ Reference Conditions on HSD without supplementary firing	155.30 MW
Net Thermal Efficiency on HSD without supplementary firing	45.26 %
Heat Rate on HSD at full load without supplementary firing	7953 KJ/KWh
Capacity Factor	60 % Notional
Degradation/partial loading	As per heat rate/performance curves from the Manufacturer
HHV of permeate gas	565-625 Btu/Scf
Plant Design point HHV	572 Btu/Scf

Permeate Gas H <sub>2</sub> S Contents	Less than 320 ppm
Permeate Gas Price @ HHV (Same as Natural gas)	264.90 PKR/MMBtu
HHV - LHV factor	0.9015
Permeate Gas Price @ LHV	293.84 PKR/MMBtu
HSD Price delivered at site	37.70 PKR/Litre
Backup Fuel	HSD
HSD Storage	Seven (7) days
<b>Reference Conditions</b>	
Ambient Temperature	27 C
Relative Humidity	60%
Site Altitude	75 meter above sea level
<b>Financial Assumptions</b>	
EPC Cost	168.00 Million US\$
Project specific EPC Cost	10.00 Million US\$
Project Development Cost	6.70 Million US\$
Services	12.83 Million US\$
Total CAPEX (excl. IDC)	197.53 Million US\$
IDC	17.32 Million US\$
Return on Equity during Construction & Commissioning	9.12 Million US\$
Financing Fee	3.33 Million US\$
Foreign loan registration Stamp Duty	1.67 Million US\$
Total CAPEX	228.97 Million US\$
Term of agreement	25 years
IRR on equity investment	15%
Debt: Equity Ratio	75:25%
Funding	Equity in PKR; Debt in US \$
Interest Rate	LIBOR(5.4%) plus 3.5% on foreign loan & KIBOR plus 2% on local loan for working capital
Tenure of foreign exchange loan	10 years + 2.33 years Grace Period

Number of Principal & Interest payments per year	Two semi annual payments
Discount rate for calculating Levelized tariff	10%
Reference Exchange Rate	1 US\$ = 61 PKR
Working Capital Requirements	HSD Stock of 7 days
	6 Months DSRA (Debt Service Reserve Account) Lender's Requirement
	Spare parts for a period of 3 years
<b>Indexation Assumptions</b>	
Variable O&M – Local	Local WPI
Variable O&M – Foreign	US CPI and USD/PKR indexation
Escalable Component – Local	Local WPI
Escalable Component – Foreign	US CPI and USD/PKR indexation
Debt	Changes in 6 month LIBOR plus USD/PKR indexation
Fuel Component	Change in fuel price plus adjustment for part load operation and for degradation (Recoverable and Non Recoverable)

## GENERAL ASSUMPTIONS

The following has been assumed while calculating the tariff. Any changes to these assumptions will result in a change to the proposed tariff.

- Customs duties on the import of plant, equipment, material and spare parts are considered @ 5%. Any change in the customs duties or any other duty or tax on import of equipment & material will be “pass through” to the Power Purchaser. Similarly, customs duties on spare parts after COD will be “pass through” to the Power Purchaser.
- Only 6% withholding tax on local services assumed. No other taxes on payments to be made to the EPC Contractor assumed. Any additional tax, if levied, will be “pass through” to the Power Purchaser.
- 7.5 % withholding tax on dividend payment assumed. Any change in the aforesaid withholding tax regime will be “pass through” to the Power Purchaser. General sales tax and all other taxes will also be treated as “pass through”.
- Zakat deduction on dividends (currently @ 2.5%), as required to be deducted under Zakat Ordinance, is considered as “pass-through”.
- Debt is assumed in foreign currency (USD) and Equity is assumed in local currency (PKR).
- The Return on Equity for the construction & commissioning period shall be adjusted at the time of COD according to the actual Equity disbursement during such period.
- Power purchaser/NTDC shall be exclusively responsible for the financing, construction, operation and maintenance of the Interconnection and Transmission Facilities.
- Exchange Rate (PKR/USD) is taken @ PKR 61 per USD.
- No cost of utilizing NTDC telecom media is assumed. Any costs incurred with regard thereto will be treated as “pass through”.
- Main Energy meter and electronic recorder for continuous recording of readings will be provided by NTDC at its own cost.
- No cost for main gas metering station is assumed. It is assumed that it shall be provided by gas supplier at its own cost.
- Tolerance band of  $\pm 3$  % in dispatch is assumed.

- Thirty days per year Schedule Outage for Washing and Combustion Inspection; forty-five days for Washing and Hot Gas Path Inspection and sixty days for Washing and Major Overhaul have been assumed. Five hundred hours per year for Forced Outage are assumed. During these periods, full capacity payments shall be paid by the Power Purchaser.
- Cost of seven (7) days HSD storage (100% load @ reduced Contract Capacity of 155 MW) is assumed in the working capital.
- Working capital for bridge financing to cover the lag between payments to be made to the Gas Supplier and payments to be received from the Power Purchaser/NTDC is not considered as per assurance of Power purchaser that Power Purchaser shall pay the Seventy percent (70%) of Capacity payments in advance every month from COD. In case it is not given then the working capital of 15 days Fuel (Gas) cost shall be considered & financial cost shall be passed to Power Purchaser.
- Fuel cost component for energy delivered before COD and all the testing after COD shall be paid by the Power Purchaser to the Company. Capacity Payments and Energy Payments shall be made during Annual Testing.
- No O&M Reserve, Maintenance Reserve Account, Contingency Reserve Account or any other Reserve account (except DSRA for 6 months) has been considered in the Tariff model. In case Company is required to do so, the financial impact would be “pass through”.
- The fuel component and Capacity will be adjusted for aging (permanent degradation), fouling (recoverable degradation) and ambient degradation factors in order to compensate the effect of performance deterioration by these factors as per Manufacturer’s curves.
- The fuel component will be adjusted for changes in calorific value of the permeate gas as per Manufacturer’s curve.
- In case of 100 % HSD use, degradation will be different and HSD based tariff shall be applicable.
- Partial loading shall be compensated as per performance curves.
- Required gas pressure (32 bars) shall be maintained by Gas Supplier at gas inlet stop valve of gas turbine. Therefore, gas booster compressors and auxiliaries are to be installed & maintained by gas supplier as per decision of PPIB with OGDCL & SNGPL (Copy attached)
- Additional cost for gas turbine start-up, shut down and part load operation with HSD or HSD admixture to gas shall be compensated by factors as per gas turbine Manufacturer recommendation.

- No open cycle operation prior to COD assumed.
- The Complex will operate in open cycle below 50% load.
- The Complex will operate on HSD upto 50% load. Conversion from HSD to gas will take place from 50% to 60% load.
- During the Term, if there is any gas supply interruption (temporary interruption or annual turn around of supplier), and plant is required to dispatch on HSD, the Power purchaser will pay HSD based tariff.
- Number of Cold, Warm and Hot start-ups will be as per Manufacturer's recommendations. Cost of start-ups shall be "pass through".
- For operation and maintenance requirement of plant on permeate gas and HSD, equivalent operating hours at different loads, fuel, shut down/start-up and trips shall be considered as per Manufacturer recommendations.
- The Power Purchaser shall supply power to the plant during off load period at fuel component rate.
- In case of open cycle mode operation, heat rate / efficiency will be different and energy component will be adjusted accordingly.
- GSA shall be equivalent to the PPA term.
- 24 months prior to gas reservoir depletion or in case of sudden/catastrophic failure of reservoir, Company to get capacity payments from Power Purchaser until GOP shall allow one of the following:
  - New Gas Allocation;
  - HSD based tariff throughout the year for the remainder of the PPA Term as per GOP's Fuel policy;
  - If the plant is required to convert on LSFO then all costs pertaining to O&M, alternate fuel heat rate, modification cost and alternate fuel storage tanks cost shall be "passed through" to the Power Purchaser in the form of a supplemental tariff. Furthermore, the Power Purchaser shall make the Capacity Payments to the Project Company during the Conversion Period.
  - Termination of the IA and recovery by the Project Company of items "a", "b" and "f" under Schedule 2 to the IA.
- In case of operation on HSD, the Power Purchaser shall make Energy Payments on weekly basis to avoid the requirement for the additional working capital.
- No post-COD LC in favour of the Power Purchaser assumed.

- HSD tariff shall be determined now and agreed to avoid any operational delays.

## REFERENCE PROJECT COST

<b>Power plant EPC Cost</b>	<b>168.00 Million US\$</b>
<b>Project Specific EPC</b>	
<i>Gas pipeline</i>	2.5 Million US \$
<i>Residential Colony</i>	4.1 Million US \$
<i>Water &amp; waste water pipelines</i>	2.3 Million US \$
<i>Access Road</i>	0.3 Million US \$
<i>Evaporation Ponds</i>	0.8 Million US \$
<b>Total Project specific EPC Cost</b>	<b>10.00 Million US \$</b>
<b>Total EPC Cost</b>	<b>178.00 Million US\$</b>
<b>Project Development Cost</b>	
<i>Permits, Feasibility, ITB, Bid Evaluation etc.</i>	0.73 Million US \$
<i>Consultancy Financial (Lenders)</i>	0.70 Million US \$
<i>Consultancy (Legal &amp; Commercial)</i>	0.27 Million US\$
<i>Company Overhead during Development</i>	2.34 Million US \$
<i>Bank Charges for Performance Guarantee,</i>	1.50 Million US \$
<i>Land acquisition incl. fees</i>	1.16 Million US \$
<b>Total Project Development Cost</b>	<b>6.70 Million US\$</b>
<b>Services Cost</b>	
Administrative costs of project company	1.94 Million US \$
Construction Management	6.49 Million US \$
Insurance during construction	2.80 Million US \$
Utilities during construction	0.50 Million US\$
Fuel cost during testing	0.60 Million US \$
First Fill of lubes & chemicals	0.50 Million US \$
<b>Total Cost of Services</b>	<b>12.83 Million US\$</b>
<b>Financing Cost</b>	
Financing Fee	3.33 Million US\$
Foreign loan registration Stamp Duty	1.67 Million US\$
Interest during Construction	17.32 Million US\$
Return on Equity during Construction	9.12 Million US\$
<b>Total Cost of Financing</b>	<b>31.44 Million US\$</b>
<b>Total Project Cost</b>	<b>228.97 Million US\$</b>



## **KEY FACTORS UNDERLYING THE CALCULATIONS OF THE TARIFF**

### **FUEL COMPONENT**

The gas supplier will charge the gas cost based on HHV. A conversion factor of 1.1093 has been used to convert Gross calorific value to Net Calorific value.

The Gross thermal efficiency of 47 % has been assumed. This efficiency number is relatively on the lower side due to supplementary firing in HRSG. The supplementary firing option has been incorporated to ensure utilization of all the allocated quantity of permeate gas (75MMSCFD) and producing more power instead of flaring the balance quantity of gas thus averting loss of precious and scarce national resource.

The Net thermal efficiency of CCPP based on permeate gas would be 45.53 %.

The proposed thermal efficiency with permeate gas is for 100% loading on a brand new machine. The following factors are assumed to be applicable to the Fuel component:

- Heat rate degradation factor (Recoverable and Non-recoverable) as per Manufacturer's data to compensate for the effects of efficiency degradation due to aging and fouling.
- Partial load Heat rate adjustment as per Manufacturer's data to compensate for the lower efficiency while operating on partial load.
- Part load operation with HSD or HSD admixture to the permeate gas shall be compensated by factors based on the data from the Manufacturer.

The Gross thermal efficiency while operating on HSD without supplementary firing in HRSG will be 46.8%. This efficiency number is also relatively on the lower side due to part load operation of steam turbine @ 50 MW vs. name plate capacity of 127 MW.

The Net thermal efficiency on HSD would be 45.26 %.

The start-up cost shall be charged on the condition of the plant (Hot, Warm and Cold) prior to start-up.

The fuel component would be indexed with any change in the price of gas.

## **VARIABLE O&M COMPONENT**

Variable O&M cost component will be part of Energy charge and will be allocated to local and foreign components.

### **Local Component**

This component mainly consists of lubricants, chemicals for water treatment, small consumable parts and other supplies which will be procured locally. This component shall be escalated with local inflation rate (WPI).

### **Foreign Component**

It consists of (i) replacement cost of imported spare parts on completion of their service life (ii) replacement cost of spare parts in case of premature failure (unscheduled maintenance), (iii) technical services obtained from foreign experts during maintenance. This component shall be indexed with US CPI and US\$/PKR exchange rate.

## **FIXED O&M COST**

### **Local fixed O&M cost**

It includes insurance, O&M staff cost, Administrative cost of the Project Company including remuneration to employees and Chief Executive Officer, rents, utilities and local taxes. It also includes costs such as NEPRA annual fee, bank charges for SNGPL bank guarantee, audit fees, legal and consultancy fees etc. This component shall be indexed to local WPI.

### **Foreign fixed O&M cost**

This component mainly consists of Major overhauling cost which shall be undertaken as per Manufacturer's recommendation. It is subject to both US CPI and US\$/PKR indexation.

## **RETURN ON EQUITY**

Equity rate of return is based on 15 % IRR net of 7.5% withholding tax. Equity portion is 25 % of project cost at COD. Equity is based on local currency and shall be indexed to WPI.

## **NON ESCALABLE COMPONENT**

This component represents repayment of debt. The debt is assumed to be in foreign currency bearing an interest rate of LIBOR + 3.5 %. The term of the loan will be 10 years after COD. Principal repayment and interest payment shall be on semi annual basis.

## **FACTORS INFLUENCING EPC COST & TARIFF**

### **Permeate Gas:**

Permeate gas is a low Btu Gas with high Sulphur contents. Due to low Btu nature of the gas, only few turbines were found to be suitable for operation on this gas. Also, due to high sulphur contents (320ppm), the exhaust gas temperature of HRSG has to be kept on the higher side to avoid corrosion due to acid gas condensation resulting in lower steam generation in HRSG thus causing lower efficiency. High sulphur contents have also necessitated use of special material in HRSG to accommodate supplementary firing.

### **Supplementary Firing:**

75 MMCFD of permeate gas has been allocated to Engro IPP. In order to avoid flaring of balance permeate gas which could not be consumed in gas turbine, supplementary firing is incorporated into the design of HRSG. This has resulted in increased capacity of the power plant by 50 MW. However, it has relatively lowered the efficiency of the cycle slightly as compared to a conventional Combined Cycle plant based on pipeline quality natural gas.

### **Black Start Facility, 4 MW Capacity:**

The power plant will be capable of black start. This is accomplished by installing two MV generators of 2 MW each. Moreover, control and switchgear for the generators will also be installed.

### **Two extra 220kV Lines (incoming from Fauji IPP lines):**

Transmission line between Fauji and Rohri will be looped in and out of the power plant. This was identified in Load Flow Study conducted by NTDC. Therefore, Engro IPP has to install four lines as compared to two lines. This has increased the scope and size of HV switchgear, protection system and ratings of the fault interrupting devices.

### **Remote Water off-Take Facility:**

Water off-take will be from Ghotki feeder canal which is seven KM away from the proposed Power Plant. This requires pumping station, water pipeline, right of way, overhead transmission line complete with poles, conductors, MV switchgear and transformers.

### **Reverse Osmosis (RO) Plant:**

Well water arrangement has been designed as a back-up when Ghotki canal is closed for maintenance. A RO plant will be installed at the proposed site to treat the well water and make it suitable for steam generation.

### **Construction of Residential Colony:**

Since EEL's power plant will be at a remote location, there is a need to construct an appropriate residential colony for the staff in order to attract and retain good quality human resource.

### **Security:**

On account of remote location of the proposed Power Plant, in addition to construction of a suitable residential facility for the O&M staff, provision of security for the power plant and the Company's staff has been budgeted.

### **Access Road:**

Plant is located away from the main road. An access road of approximately 1 KM shall be built for the proposed Power Plant. This necessitated additional civil work and right of way.

### **RELIEF OR DETERMINATION SOUGHT;**

The Petitioner requests the learned Authority to kindly approve generation tariff based on (a) permeate gas and, in the case of non-availability thereof, (b) high speed diesel, as submitted herein.

### **EVIDENCE IN SUPPORT OF THE PETITION.**

- Minutes of Meeting of PPIB dated July 22, 2006
- Letter of Interest dated January 6, 2006
- Performance Guarantee
- Feasibility Study approval letter dated September 20, 2006
- 75 MMCFD Gas Allocation letter for IPP
- PPIB letter to SNGPL for GSA negotiation with ENGRO
- Authority Permission to CPPA to procure power from Engro

The Summarized tariff table on Permeate Gas is as follows.

US Cents/KWh												
	Energy Purchase Price (EPP)				Capacity Purchase Price (CPP)							Total
	Fuel	Variable O&M		Total	ROE	Fixed O&M		Interest on WC	Total Escalable	Non Escalable	Total	
		Local	Foreign			Local	Foreign					
Average (Year 1-10)	3.610	0.048	0.214	3.872	0.869	0.423	0.029	0.117	1.438	2.307	3.745	7.617
Average (Year 11-25)	3.610	0.048	0.214	3.872	0.869	0.423	0.029	0.038	1.359	0.000	1.359	5.231
Average (Year 1-25)	3.610	0.048	0.214	3.872	0.869	0.423	0.029	0.070	1.391	0.923	2.314	6.186
<b>Levelized</b>	3.610	0.048	0.214	3.872	0.869	0.423	0.029	0.096	1.417	1.562	2.979	<b>6.851</b>

Rs/KWh												
	Energy Purchase Price (EPP)				Capacity Purchase Price (CPP)							Total
	Fuel	Variable O&M		Total	ROE	Fixed O&M		Interest on WC	Total Escalable	Non Escalable	Total	
		Local	Foreign			Local	Foreign					
Average (Year 1-10)	2.202	0.029	0.131	2.362	0.530	0.258	0.018	0.071	0.877	1.407	2.284	4.646
Average (Year 11-25)	2.202	0.029	0.131	2.362	0.530	0.258	0.018	0.023	0.829	0.000	0.829	3.191
Average (Year 1-25)	2.202	0.029	0.131	2.362	0.530	0.258	0.018	0.043	0.849	0.563	1.412	3.774
<b>Levelized</b>	2.202	0.029	0.131	2.362	0.530	0.258	0.018	0.059	0.865	0.953	1.818	<b>4.179</b>

The Summarized tariff table on High Speed Diesel (HSD) is as follows.

US Cents/KWh												
	Energy Purchase Price (EPP)				Capacity Purchase Price (CPP)							Total
	Fuel	Variable O&M		Total	ROE	Fixed O&M		Interest on WC	Total Escalable	Non Escalable	Total	
		Local	Foreign			Local	Foreign					
Average (Year 1-10)	13.516	0.052	0.387	13.955	1.213	0.591	0.041	0.163	2.008	3.220	5.228	19.183
Average (Year 11-25)	13.516	0.052	0.387	13.955	1.213	0.591	0.041	0.053	1.898	0.000	1.898	15.853
Average (Year 1-25)	13.516	0.052	0.387	13.955	1.213	0.591	0.041	0.097	1.942	1.288	3.230	17.185
<b>Levelized</b>	13.516	0.052	0.387	13.955	1.213	0.591	0.041	0.135	1.980	2.180	4.160	<b>18.115</b>

Rs/KWh												
	Energy Purchase Price (EPP)				Capacity Purchase Price (CPP)							Total
	Fuel	Variable O&M		Total	ROE	Fixed O&M		Interest on WC	Total Escalable	Non Escalable	Total	
		Local	Foreign			Local	Foreign					
Average (Year 1-10)	8.245	0.032	0.236	8.513	0.740	0.361	0.025	0.099	1.225	1.964	3.189	11.702
Average (Year 11-25)	8.245	0.032	0.236	8.513	0.740	0.361	0.025	0.032	1.158	0.000	1.158	9.671
Average (Year 1-25)	8.245	0.032	0.236	8.513	0.740	0.361	0.025	0.059	1.185	0.786	1.971	10.484
<b>Levelized</b>	8.245	0.032	0.236	8.513	0.740	0.361	0.025	0.082	1.208	1.330	2.538	<b>11.050</b>

# PROPOSED REFERENCE TARIFF TABLE (US Cents/KWh)

## On Permeate Gas

ENERGY CHARGE					CAPACITY CHARGE							
US Cents per kWh					US Cents per kWh							
YEARS	FUEL	Variable O&M		TOTAL	ESCALABLE COMPONENT					Non	TOTAL	TOTAL
		Local	Foreign	ENERGY CHARGE	ROE	Fixed O&M		Interest on WC	TOTAL	Escalable LOANS	CAPACITY CHARGE	TARIFF Cents/kWh
						Local	Foreign					
1	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.1663	1.4879	2.3071	3.7950	7.6665
2	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.1663	1.4879	2.3071	3.7950	7.6665
3	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.1663	1.4879	2.3071	3.7950	7.6665
4	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
5	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
6	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
7	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
8	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
9	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
10	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0956	1.4172	2.3071	3.7242	7.5958
11	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
12	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
13	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
14	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
15	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
16	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
17	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
18	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
19	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
20	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
21	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
22	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
23	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
24	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
25	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
<b>YEARS</b>					<b>AVERAGE TARIFF US Cents/kWh</b>							
1-10	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.1168	1.4384	2.3071	3.7455	7.6170
11-25	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0381	1.3597	0.0000	1.3597	5.2312
1 -25	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0696	1.3912	0.9228	2.3140	6.1855
LEVEL.												
TARIFF	3.6097	0.0477	0.2141	3.8715	0.8690	0.4235	0.0292	0.0964	1.4180	1.5617	2.9797	6.8512

# PROPOSED REFERENCE TARIFF TABLE (Rs/KWh)

## On Permeate Gas

ENERGY CHARGE					CAPACITY CHARGE								
Rupees per kWh					Rupees per kWh								
YEARS	FUEL	Variable O&M		TOTAL	ESCALABLE COMPONENT				Non	TOTAL	TOTAL		
		Local	Foreign	ENERGY CHARGE	ROE	Fixed O&M		Interest on WC	TOTAL	Escalable LOANS	CAPACITY CHARGE	TARIFF (Rs/kWh)	
						Local	Foreign						
1	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.1014	0.9076	1.4073	2.3149	4.6766	
2	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.1014	0.9076	1.4073	2.3149	4.6766	
3	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.1014	0.9076	1.4073	2.3149	4.6766	
4	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
5	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
6	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
7	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
8	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
9	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
10	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0583	0.8644	1.4073	2.2718	4.6334	
11	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
12	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
13	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
14	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
15	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
16	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
17	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
18	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
19	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
20	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
21	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
22	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
23	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
24	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
25	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1911	
<b>YEARS</b>					<b>AVERAGE TARIFF</b>								
					<b>Rs/kWh</b>								
1-10	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0712	0.8774	1.4073	2.2847	4.6464	
11-25	2.2020	0.0291	0.1306	2.3617	0.5300	0.2583	0.0178	0.0232	0.8294	0.0000	0.8294	3.1910	
1-25	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0424	0.8486	0.5629	1.4115	3.7732	
LEVEL.													
TARIFF	2.2019	0.0291	0.1306	2.3616	0.5300	0.2583	0.0178	0.0588	0.8649	0.9527	1.8176	4.1792	



**PROPOSED REFERENCE TARIFF TABLE (US Cents/KWh)**  
**On High Speed Diesel (HSD)**

ENERGY CHARGE					CAPACITY CHARGE							
US Cents per kWh					US Cents per kWh							
YEARS	FUEL	Variable O&M		TOTAL	ESCALABLE COMPONENT					Non	TOTAL	TOTAL
		Local	Foreign	ENERGY CHARGE	ROE	Fixed O&M		Interest on WC	TOTAL	Escalable LOANS	CAPACITY CHARGE	TARIFF Cents/kWh
						Local	Foreign					
1	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.2321	2.0769	3.2204	5.2973	19.2530
2	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.2321	2.0769	3.2204	5.2973	19.2530
3	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.2321	2.0769	3.2204	5.2973	19.2530
4	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
5	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
6	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
7	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
8	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
9	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
10	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1334	1.9782	3.2204	5.1986	19.1543
11	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
12	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
13	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
14	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
15	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
16	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
17	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
18	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
19	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
20	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
21	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
22	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
23	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
24	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
25	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
<b>YEARS</b>					<b>AVERAGE TARIFF US Cents/kWh</b>							
1-10	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1630	2.0078	3.2204	5.2282	19.1839
11-25	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0532	1.8980	0.0000	1.8980	15.8537
1 -25	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.0971	1.9419	1.2881	3.2301	17.1858
LEVEL.												
TARIFF	13.5164	0.0518	0.3874	13.9557	1.2130	0.5911	0.0407	0.1345	1.9793	2.1800	4.1593	18.1150

# PROPOSED REFERENCE TARIFF TABLE (Rs/KWh)

## On High Speed Diesel (HSD)

ENERGY CHARGE					CAPACITY CHARGE							
Rupees per kWh					Rupees per kWh							
YEARS	FUEL	Variable O&M		TOTAL	ESCALABLE COMPONENT				Non	TOTAL	TOTAL	
		Local	Foreign	ENERGY CHARGE	ROE	Fixed O&M		Interest on WC	TOTAL	Escalable LOANS	CAPACITY CHARGE	TARIFF (Rs/kWh)
						Local	Foreign					
1	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.1416	1.2669	1.9644	3.2314	11.7443
2	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.1416	1.2669	1.9644	3.2314	11.7443
3	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.1416	1.2669	1.9644	3.2314	11.7443
4	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
5	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
6	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
7	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
8	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
9	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
10	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0814	1.2067	1.9644	3.1711	11.6841
11	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
12	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
13	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
14	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
15	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
16	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
17	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
18	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
19	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
20	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
21	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
22	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
23	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
24	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
25	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
YEARS	<b>AVERAGE TARIFF Rs/kWh</b>											
1-10	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0994	1.2248	1.9644	3.1892	11.7022
11-25	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0324	1.1578	0.0000	1.1578	9.6708
1 -25	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0592	1.1846	0.7858	1.9703	10.4833
LEVEL.												
TARIFF	8.2450	0.0316	0.2363	8.5130	0.7399	0.3606	0.0248	0.0821	1.2074	1.3298	2.5372	11.0502

## DEBT REPAYMENT PROFILE (ANNUITY BASED)

<b>Period</b>	<b>Principal</b>	<b>Principal Repayment</b>	<b>Interest</b>	<b>Balance</b>	<b>Debt Service</b>
	Million \$	Million \$	Million \$	Million \$	Million \$
1	171.730	5.503	7.642	166.227	13.145
2	166.227	5.748	7.397	160.479	13.145
3	160.479	6.003	7.141	154.476	13.145
4	154.476	6.271	6.874	148.205	13.145
5	148.205	6.550	6.595	141.655	13.145
6	141.655	6.841	6.304	134.814	13.145
7	134.814	7.146	5.999	127.669	13.145
8	127.669	7.464	5.681	120.205	13.145
9	120.205	7.796	5.349	112.410	13.145
10	112.410	8.143	5.002	104.267	13.145
11	104.267	8.505	4.640	95.762	13.145
12	95.762	8.883	4.261	86.879	13.145
13	86.879	9.279	3.866	77.600	13.145
14	77.600	9.692	3.453	67.909	13.145
15	67.909	10.123	3.022	57.786	13.145
16	57.786	10.573	2.571	47.212	13.145
17	47.212	11.044	2.101	36.169	13.145
18	36.169	11.535	1.610	24.633	13.145
19	24.633	12.049	1.096	12.585	13.145
20	12.585	12.585	0.560	0.000	13.145