

# **CENTRAL ELECTRICITY REGULATORY COMMISSION**

## **NEW DELHI**

### **Proposed norms for determination of generic tariff for Municipal Solid Waste/Waste to Energy projects and indicative tariff for 2015-16**

#### **Explanatory Memorandum**

##### **1. Introduction**

1.1. A petition under sections 61,62,64 and 86(1)(e) of the Electricity Act, 2003 has been filed by Waste Management Association before the Commission for determination of generic tariff for electricity generation from Rankine Cycle Combustion Based Power Plants utilizing Municipal Solid Waste (MSW) and its derivative, including Refused Derived Fuel (RDF) as fuel. Pursuant to its power under section 61 to determine tariff, this Commission enacted the CERC(Terms and Conditions for tariff determination from Renewable Energy Sources regulations, 2009, which were subsequently replaced by the CERC (Terms and Conditions for tariff determination from Renewable Energy Sources) Regulations, 2012 ( CERC RE Tariff Regulations 2012). As per Section 7 of CERC RE Tariff Regulations, 2012, the Tariff determination for Municipal Solid Based Projects is project specific.

1.2. The Report of the Task Force on Waste to Energy by the Niti Ayog (formerly The Planning Commission) of May 12, 2014 indicates that waste to energy projects are now considered as being integral to the management of municipal solid waste (MSW) in India and provides a critical element in the management, processing and disposal of MSW in India. The said report also highlights the fact that waste to energy projects are not to be treated as simply power projects but must be considered as a critical technology to enable scientific disposal of the ever increasing MSW being generated. The problem of MSW management is also highlighted in Para 2 of the Executive Summary which is as follows

"As per 2011 census, the 377 million people living in 7,935 urban centers (with 4,041 statutory municipal authorities and 3,894 towns with more than 5,000 people of which 75% are male involved in non-agricultural activities), generate 1,70,000 TPD and 62 million tonnes of MSW per year which is based on an average per capital generation of 450gm per person per day. It needs to be noted that 62 million tonnes of waste generation reported, annually, does not include wastes picked up by kabadiwalas from households and from the streets by rag pickers. As per MoUD, 70 million tonnes of waste is generated currently in urban centers".

- 1.3. The Niti Aayog Report also clearly highlights that if normal MSW disposal techniques involving scientific landfill are adopted, the land requirements are staggering as each 1 lakh population requires 15 acres of landfill resulting in an aggregate land requirement for scientific landfills to be 66,000 hectares over the next 20 years.
- 1.4. It may be pertinent to establish the fact that a Waste to Energy (WtE) project requires much less land for managing Municipal Solid Waste (MSW) as opposed to land filling of the MSW. This is because the rejects which need to be landfilled after a waste to energy treatment is a fraction of the incoming MSW.
- 1.5. The country needs an environmentally sound, socially acceptable, and economically feasible solution for its solid waste problems.
- 1.6. The Commission recognizes and is fully cognizant of the fact that the total potential of Waste to Energy in MW terms amounts to a minuscule percentage of the total installed capacity of the community which is approximately 2.7 lac MW. However, given the more socially and environmentally relevant/crucial role that Waste to Energy plants would play in handling solid waste management for Urban India, the Commission feels that a reasonable Tariff has to be given for these projects. In India, primarily two technologies are under operation and implementation for Waste to Energy:
  - a. Combustion or incineration
  - b. Bio-methanation which can be used for smaller capacity and wet garbage handling.

## **2. Determination of Generic Tariff**

2.1. In order to determine the generic tariff for the Rankine Cycle Combustion Based Power Plants utilizing MSW/RDF, the Central Commission will consider the following parameters :

- A. Capital Cost
- B. Fixed Cost Components
  - i. Debt Equity Ratio
  - ii. Depreciation
  - iii. Interest on Loan
  - iv. Interest on Working Capital
  - v. Operation and Maintenance Charges
  - vi. Return on Equity
- C. Energy Charges
  - i. Plant Load Factor
  - ii. Station Heat Rate
  - iii. Auxiliary Consumption
  - iv. Gross Calorific Value
  - v. Fuel Cost

## 2.2. Capital Cost

- 2.2.1 MSW which is the input for WtE plant is highly corrosive, abrasive, containing combustible chloride material and heterogeneous in nature. The equipment has to be designed to burn MSW in specially designed boilers. As the flue gases are corrosive in nature, it is necessary to reduce the speed of the gases in the boiler which necessitates multiple passes (triple) in radiative section of the boiler. Thus, the volume of the boiler has to be much higher and be made of corrosion resistant material. Therefore, world-wide such plants are far more expensive than coal based thermal and biomass based power plants due to the emphasis on sophisticated emission reduction processes.
- 2.2.2 These plants also need additional pollution control equipment such as activated carbon and lime injection for controlling the emission to meet the revised environmental standards specified by CPCB and SPCBs (DPCC). This increases the capital cost substantially in comparison to biomass plant. The CERC fixed the capital cost of a biomass power at Rs 445 lakh per MW for the FY 2012-13 while the capital cost of Biomass Power Plant for the FY 2015-16 is Rs 558.705 lakh/MW for Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser.
- 2.2.3 It is felt that the principle of Reduce, Reuse, Recover, Recycle and Remanufacture (5Rs) should be adopted and after making serious efforts to minimize waste, all components of MSW be utilized in a manner that the full potential of the waste is not only tapped, but rejects are minimised. Appropriate segregation at source/ secondary storages is essential to achieve this object. The waste that can be recycled should be recycled to manufacture new products which will save natural resources. The wet wastes that can produce biogas or compost should be processed and the wastes that are non recyclable and having high calorific value should be used for generating energy.
- 2.2.4 The calorific value of MSW is contributed by biodegradable content of waste such as food waste and non-biodegradable content such as plastics, leather etc. The characteristics and variability of MSW as a fuel, however, has a significant impact on its behavior as a fuel in combustion and other thermal processing systems. In addition to the variability in composition, MSW is notoriously difficult to handle, and to feed in a controlled manner for incineration and for other equipment. This is reflected in the design of MSW handling and feeding systems, and has a significant knock on effect on the difficulties encountered in the control of combustion conditions in conventional incineration plant.
- MSW is also highly slagging and fouling fuel i.e it has a high propensity to form fused ash deposits on the internal surfaces of furnace and high temperature reactor and to form bonded fouling deposits on heat exchanger surplus. Globally, stoke boiler is used. However, due to lesser calorific value of Indian waste, Refuse Derived Fuel (RDF) may also be used

as fuel in MSW based power projects. RDF is a segregated combustible fraction of MSW. The combustible fraction of the waste is transformed into fuel pellets by the compaction of waste or shredded and converted into fluff, enriched in its organic content by the removal of inorganic materials and moisture. Due to reduction in fuel particle size of non - combustible material, RDF fuels are more homogeneous and easier to burn than the gross MSW feedstock. The RDF burning technology includes spreader stoker fired boiler, suspension fired boilers, fluidized bed units, and cyclone furnace units.

Using RDF as a fuel in incinerators is a better option because it is typically formed by augmenting calorific value of combustible wastes with the help of some high calorie - rich industrial wastes or biomass and through application of pressure and/or heat and with help from binders physical shapes of pellets or briquettes are extruded. It is a possible solution for making W to E a success in India because RDF is easy to transport, has adequate shelf life and it can be prepared in small and medium scale de - centralized facilities and conveniently transported to a regional W to E facility in a radius of 100 km catchment zone.

2.2.5 It is understood that eight projects of Waste to Energy are in operation in the country.

The data related to these projects have been sought from the Ministry of New and Renewable Energy, and the Ministry of Urban Development. The data provided by MNRE only pertains to capital cost. The average capital cost of three plants is Rs 19.04 Cr per MW. However, this data on capital cost cannot solely be relied upon as the projects implementation has taken many years, resulting in cost over runs.

Similarly, Ministry of Urban Development (MoUD) has forwarded data which has been provided only by the developers of MSW projects. The capital cost ranges from Rs 8.88 Crore to Rs 26.33 Crore. The average of all data provided by MoUD for Capital Cost per MW is 16.72 Cr per MW.

The Madhya Pradesh Electricity Regulatory Commission (MPERC) has determined a generic Tariff for MSW projects in 2013 and considered Capital Cost at Rs 6 Cr per MW while the stakeholders claimed capital cost in the range of 6 Crs per MW to 12.5 Crs per MW.

The Gujarat Electricity Regulatory Commission (GERC) has determined project specific tariff for RDF based project in 2010 and for MSW based project in 2014. While the capital cost for RDF based project was fixed at Rs 6.90 Cr/MW, the capital cost for MSW based project was fixed at Rs 14 Cr/MW (this includes pre-processing fee). While approving the capital cost (of Rs 14 Cr/MW) GERC has not factored in the incentives provided by Central, State and local Governments for the waste management – e.g., incentives in the form of tipping fee, land arrangements by local municipalities and any kind of subsidy for preprocessing of waste. The capital cost in this case comprised cost of land, plant and machinery, civil works, erection, commissioning, cost of power evacuation and other related expenses.

In the backdrop of the above sets of data, which are diversified in nature only, reference point for determination of capital cost for waste to energy projects poses a challenge. Therefore, the Commission proposes, with due consideration of the comparable nature of technology of biomass and waste to energy plants, that

- the normative capital cost for the Rankine Cycle Combustion Based Power Plants utilizing MSW as input shall be in accordance with Biomass Power plant with additional cost consideration for larger boiler and more sophisticated emission equipments.
- the capital cost of biomass power plant for FY 2015-16 is Rs 558.705 lakhs/MW Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser. Accordingly, the benchmark capital cost for waste to energy plant is proposed as **Rs 900 lakh/MW (Rupees Nine Crore per MW) (FY 2015-16) excluding land cost for RDF based Waste to energy project** and **Rs 1500 lakh/MW ( Rupees Fifteen Crore per MW) (FY 2015-16) excluding land cost for MSW power projects**. As the capital cost for preprocessing comes around 35-40% of entire capital cost, 40% of the capital cost has been considered as capital cost of preprocessing facility for MSW.

### 2.3. Fixed Cost Component

**2.3.1 Debt Equity Ratio:** The normative Debt to Equity Ratio for determining generic tariff for the Rankine Cycle Combustion Based Power Plants utilizing MSW as fuel for determining fixed charge component of Tariff is considered as **70:30**.

**2.3.2 Depreciation:** Regulation 15 of the RE Tariff Regulations provides for computation of depreciation in the following manner:

- "The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission. The Salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the Capital Cost of the asset.*
- Depreciation per annum shall be based on 'Differential Depreciation Approach' over loan period beyond loan tenure over useful life computed on 'Straight Line Method'. The depreciation rate for the first 12 years of the Tariff Period shall be 5.83% per annum and the remaining depreciation shall be spread over the remaining useful life of the project from 13th year onwards.*
- Depreciation shall be chargeable from the first year of commercial operation. Provided that in case of commercial operation of the asset for part of the year, depreciation shall be charged on pro rata basis".*

In accordance with the above, the rate of depreciation for the **first 12 years has been considered as 5.83%** and the rate of depreciation **from the 13th year onwards has been spread over the balance useful life of the MSW project as 2.51%**

**2.3.3 Interest on Loan:** Sub-Regulation (1) of Regulation 14 of the RE Regulations provides that the loan tenure of 12 years is to be considered for the purpose of determination of tariff for RE projects. Sub-Regulation (2) of the said Regulation provides for computation of the rate of interest on loan as under:

- i. *“The loans arrived at in the manner indicated in the Regulation 13 shall be considered as gross normative loan for calculation for interest on loan. The normative loan outstanding as on April 1st of every year shall be worked out by deducting the cumulative repayment up to March 31st of previous year from the gross normative loan.*
- ii. *For the purpose of computation of tariff, the normative interest rate shall be considered as average State Bank of India (SBI) Base rate prevalent during the first six months of the previous year plus 300 basis points.*
- iii. *Notwithstanding any moratorium period availed by the generating company, the repayment of loan shall be considered from the first year of commercial operation of the project and shall be equal to the annual depreciation allowed”.*

The weighted average State Bank of India (SBI) Base rate prevalent during the first six months has been considered for the determination of tariff, as shown in the table below:

Period from	Period to	Base rate
1/4/2014	30/9/2014	10.00%
<b>Average Base rate for first six months of FY 14-15</b>		<b>10.00%</b>

Source: State Bank of India (www.statebankofindia.com)

In terms of the above, the computations of interest on loan carried out for determination of tariff in respect of the RE projects treating the value base of loan as 70% of the capital cost and the weighted average of Base rate prevalent during the first six months of the (i.e. 10.00%) plus 300 basis points (equivalent to **interest rate of 13.00%**).

**2.3.4 Interest on Working Capital :** Regulation 17 of the RE Tariff Regulations provides for the working capital requirements of the RE projects as under:

- i. *“The Working Capital requirement in respect of wind energy projects, Small Hydro Power, Solar PV and Solar thermal power projects shall be computed in accordance with the following:*

*Wind Energy / Small Hydro Power /Solar PV / Solar thermal*

*a) Operation & Maintenance expenses for one month;*

*b) Receivables equivalent to 2 (Two) months of energy charges for sale of electricity calculated on the normative CUF;*

*c) Maintenance spare @ 15% of operation and maintenance expenses*

*ii. The Working Capital requirement in respect of biomass power projects and non-fossil fuel based co-generation projects shall be computed in accordance with the following clause:*

*Biomass (Rankine Cycle Technology), Biomass Gasifier, Biogas Power and Non-fossil fuel Co-generation*

*a) Fuel costs for four months equivalent to normative PLF;*

*b) Operation & Maintenance expense for one month;*

*c) Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF;*

*d) Maintenance spare @ 15% of operation and maintenance expenses*

*iii. Interest on Working Capital shall be at interest rate equivalent to the average State Bank of India Base Rate prevalent during the first six months of the previous year plus 350 basis points”.*

Receivables equivalent to two months of actual fixed cost and variable cost, have been considered. As mentioned above, interest rate is considered as weighted average of State Bank of India Base Rate prevalent during the first six months of the previous year plus 350 basis points (equivalent to **interest rate of 13.50%**).

**2.3.5 Operation and Maintenance Charges:** The Operation and Maintenance Expenses comprise manpower expenses, insurance expenses, spares and repairs, consumables and other expenses (statutory fees etc.).

MPERC has considered 5% of capital cost as the O&M Expenses with 5.72% escalation factor.

GERC has considered 5% of capital cost as the O&M expenses with 5% escalation factor.

O&M expenses for Biomass Power Plants was fixed at Rs 24 lakh per annum with annual escalation of 5.72% per annum for the year 2012-13 in accordance to CERC RE Tariff Regulations 2012.

In view of the above, the normative O&M expenses for the first year of the Control Period (i.e, FY 2015- 16) for the Rankine Cycle Combustion Based Power Plants utilizing MSW as input for determining fixed charge component of Tariff is considered as 5 % of normative capital cost determined and approved, which should be escalated at the rate of 5.72% per annum.

On the proposed normative capital cost of Rs. 9 Crores/MW for RDF based MSW power projects and Rs 15 Crore/MW for MSW power projects, the **proposed normative O&M expenses works out to Rs. 0.45 crores per MW and Rs. 0.75 Crore/MW respectively.**

2.3.6 **Return on Equity** : Sub-Regulation (1) of Regulation 16 of the RE Tariff Regulations provides that the value base for the equity shall be 30% of the capital cost for generic tariff determination. Sub-Regulation (2) of the said Regulation stipulates the normative return on equity (ROE) as under:

- (a) 20% per annum for the first 10 years, and
- (b) 24% per annum from the 11th year

In pursuance to these above mentioned provision, the Commission proposes that the value base for the equity shall be 30% of the capital cost for generic tariff determination and the normative return on equity (ROE) as under:

- (a) 20% per annum for the first 10 years, and
- (b) 24% per annum from the 11th year.

## 2.4. Energy Charges

**2.4.1.1. Plant Load Factor:** MSW is a highly variable and heterogenous, multi component material, which varies both seasonally and geographically. Calorific content of MSW is highly seasonal due to low collection efficiency of Municipalities (most of the waste is collected with lag of 7 -10 days). In monsoon season, most of combustible matter loses its heat content and hence desired quality MSW production shall be insignificant. Normative MSW is corrosive and heterogeneous in nature and thus results in unscheduled shut down and frequent plant maintenance. These fears will be minimized when RDF is used as fuel. A new technology incineration with energy recovery by using reverse reciprocating grate which has been approved by MNRE has significantly reduced challenges of MSW. Therefore the **Commission estimates that the plant can successfully operate at 70% in a normal year. However, during extended stabilization period of 12 months it may operate at 65%.**

**2.4.2. Station Heat Rate:** In biomass power plants , CERC has taken design SHR and provided 10%-12% operating margin. MSW fuel is highly corrosive, abrasive and is having heterogeneous characteristics. It has poor physical and chemical characteristics. It is much a inferior fuel even when compared with Paddy straw. The Boiler has low thermal efficiency and the efficiency of the boiler will further decrease due to corrosion in furnace by the chloride content deposited on furnace, Super heater & Boiler tubes.

MPERC has considered SHR of 4000 kCal/kWh for the purpose of determination of tariff while GERC has considered SHR of 4100 kCal/kWh.

As per data provided by MoUD, SHR of MSW projects ranges from 3500 Kcal/Kwh to 4200 kcal/Kwh. As the design SHR is not available with the Commission, it is proposed that **SHR of RDF based MSW power projects as well as MSW based power projects shall be 4200 Kcal/kWh.** In other case, the project promoter may provide boiler design SHR and give 10% operating margin.



2.4.2.1. **Auxiliary Consumption:** For biomass projects, auxiliary consumption is fixed at 10% after stabilization. While MPERC has considered 11.5% as auxiliary consumption, GERC has considered 11.5% as auxiliary consumption. This is because unlike any other power station, the Rankine Cycle Combustion Based Power Plants utilizing MSW as input requires to install MSW handling facilities that consume higher electricity. Therefore, the normative Auxiliary Consumption for the Rankine Cycle Combustion Based Power Plants utilizing MSW / RDF as input for determining fixed charge component of tariff is considered at **12.5 %**.

2.4.2.2. **Gross Calorific Value:** Calorific value of MSW varies between 1100 kcal/kg to 1900 kcal/kg. The history of waste to energy plants in India suggests that the major reason of failure of waste to energy plants is variable calorific value of Indian wastes. Indian wastes are low in organic contents therefore its waste has low calorific value.

As per data provided by MoUD, calorific value for RDF of MSW projects ranges from 1650 Kcal/Kg to 2500 kcal/Kg. MPERC has considered calorific value of 2250 kCal/kg for the purpose of determination of tariff and GERC has taken 2250 kCal/kg. **Therefore, the calorific value of MSW /RDF based waste to energy power projects shall be 2500 kcal/kg.**

2.4.2.3. **Fuel Cost:** To preprocess the waste to utilize it in MSW projects like RDF, a cost is involved. Capital cost has not been considered for preprocessing of the waste. Therefore, Commission considers **Rs 1800 Per MT with an escalation at the rate of 5% per annum for fuel of RDF based MSW projects**. This fuel may be RDF or preprocessed MSW. This rate is provided by MoUD through A2Z Company for RDF. MPERC and GERC have taken Rs 1320 per MT for RDF. **No Fuel cost is considered for MSW based projects** as the fuel is supplied for free by the Municipal Corporations

**3. All other elements not specifically covered above would be based on Principles Stipulated for Biomass Power Projects on Rankine Cycle by this Commission in the CERC RE Tariff Regulations.**

3.1 The Commission also proposes that the power plants which are based on MSW or RDF based MSW shall be treated as 'Must-Run and would also have to follow the provisions for scheduling in accordance with the Regulations/Codes issued by the Commission from time to time.

3.2 It is also proposed that these plants need to sign long term PPAs with beneficiaries for the **entire life of the plant for 20 years**. Beneficiaries of the PPAs should release payments for procurement of power from such plants on priority basis in a timely manner.

3.3 The non combustible waste released from these power plants should be handled/disposed by the power project developers , the contracting agencies in accordance with the norms of MoUD/MoEF/MNRE and Appropriate Pollution Control Boards.

**4 Accordingly, proposed Tariff for RDF based MSW Projects and MSW Projects is as below:**

Technology	Levellised Fixed Cost	Variable Cost	Applicable Tariff Rate	Benefit of Accelerated Depreciation	Net Levellised Tariff
		(FY 2015-16)	(FY 2015-16)	(if availed)	(upon adjusting for Accelerated Depreciation benefit) (if availed)
	(Rs/kWh)	(Rs/kWh)	(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
<b>MSW</b>	6.82	0.00	6.82	0.56	6.26
<b>RDF based MSW</b>	4.43	3.46	7.88	0.34	7.54

3.1 The above tariff will be applicable for entire useful life of 20 years for the MSW / RDF based MSW projects commissioned during FY 2015-16 . However, in case of RDF based MSW projects, the variable component of tariff will change each year based on the escalation factor of 5%.

**Municipal Solid Waste Project**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Assumptions
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxillary Consumption during stabilisation	%	12.50%
			Auxillary Consumption after stabilisation	%	12.50%
			PLF(Stablization for 6 months)	%	65%
			PLF(during first year after Stablization)	%	65%
			PLF(second year onwards)	%	70%
			Useful Life	Years	20
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	1,500.000
3	Financial Assumptions	Debt: Equity	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	1050.000
			Total Equity Amout	Rs Lacs	450.000
		Debt Component	Loan Amount	Rs Lacs	1050.00
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	13.00%
		Equity Component	Equity amount	Rs Lacs	450.00
			Return on Equity for first 10 years	% p.a	20.00%
			Return on Equity after 10 years	%	24.00%
			Weighted average of ROE	%	22.00%
			Discount Rate (equiv. to WACC)	%	10.81%
4	Financial Assumptions	Fiscal Assumptions	Income Tax	%	33.990%
		Depreciation	Depreciation Rate(power plant)	%	5.83%
			Depreciation Rate 13th year onwards	%	2.51%
5	Working Capital	For Fixed Charges	O&M Charges	Months	1
			Maintenance Spare	(% of O&M exepenses)	15%
			Receivables for Debtors	Months	2
		For Variable Charges	MSW Stock	Months	4
			Interest On Working Capital	%	13.50%
6	Fuel Related Assumptions	Heat Rate	After Stabilisation period	Kcal/kwh	4200
			During Stablization Period	Kcal/kwh	4200
		MSW	MSW Price	Rs/T	0.00
			GCV	Kcal/kg	2500
			MSW Price Escalation Factor		0.00%
7	Operation & Maintenance	O&M Expenses (2015-16)		Rs. Lacs	75.00
		O & M Expenses Escalation		%	5.72%
		O&M Expenses (2015-16)		Rs. Lacs	75.00

Determination of Tariff for MSW Projects																							
Units Generation		Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Installed Capacity	MW			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross Generation	MU			5.69	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13
Auxiliary Consumption	MU			0.71	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Net Generation	MU			4.98	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
Fixed Cost		Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakh			75.00	79.29	83.83	88.62	93.69	99.05	104.71	110.70	117.04	123.73	130.81	138.29	146.20	154.56	163.40	172.75	182.63	193.08	204.12	215.80
Depreciation	Rs Lakh			87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58
Interest on term loan	Rs Lakh			130.81	119.44	108.06	96.69	85.31	73.94	62.56	51.19	39.81	28.44	17.06	5.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capita	Rs Lakh			11.24	11.21	11.20	11.21	11.22	11.26	11.31	11.38	11.47	11.57	12.12	12.27	11.43	11.89	12.38	12.89	13.44	14.02	14.63	15.27
Return on Equity	Rs Lakh			90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>			<b>394.50</b>	<b>387.39</b>	<b>380.54</b>	<b>373.96</b>	<b>367.68</b>	<b>361.69</b>	<b>356.04</b>	<b>350.72</b>	<b>345.76</b>	<b>341.19</b>	<b>335.44</b>	<b>331.70</b>	<b>303.20</b>	<b>312.03</b>	<b>321.36</b>	<b>331.22</b>	<b>341.65</b>	<b>352.67</b>	<b>364.32</b>	<b>376.65</b>
Levillised tariff corresponding to Useful life																							
Per Unit Cost of Generation		Unit	Levillised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Variable COG	Rs/kWh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O&M expn	Rs/kWh		2.09	1.51	1.48	1.56	1.65	1.75	1.85	1.95	2.06	2.18	2.31	2.44	2.58	2.72	2.88	3.05	3.22	3.40	3.60	3.80	4.02
Depreciation	Rs/kWh		1.47	1.76	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Int. on term loan	Rs/kWh		1.26	2.63	2.23	2.01	1.80	1.59	1.38	1.17	0.95	0.74	0.53	0.32	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capita	Rs/kWh		0.22	0.23	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.23	0.23	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28
RoE	Rs/kWh		1.78	1.81	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
<b>Total COG</b>	<b>Rs/kWh</b>		<b>6.82</b>	<b>7.92</b>	<b>7.22</b>	<b>7.09</b>	<b>6.97</b>	<b>6.85</b>	<b>6.74</b>	<b>6.64</b>	<b>6.54</b>	<b>6.44</b>	<b>6.36</b>	<b>6.22</b>	<b>6.55</b>	<b>5.65</b>	<b>5.82</b>	<b>5.99</b>	<b>6.17</b>	<b>6.37</b>	<b>6.57</b>	<b>6.79</b>	<b>7.02</b>
Levillised Tariff		Unit	Year -->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Discount Factor				1	0.902	0.814	0.735	0.663	0.599	0.540	0.488	0.440	0.397	0.358	0.323	0.292	0.263	0.238	0.215	0.194	0.175	0.158	0.142
Variable Cost (FY2015-16)		0.00	Rs/kwh																				
Levillised Tariff (Fixed)		6.82	Rs/kwh																				
<b>Applicable Tariff (FY2015-16)</b>		<b>6.82</b>	<b>Rs/kwh</b>																				

Determination of Accelerated Depreciation for MSW Projects																						
Depreciation amount		90%																				
Book Depreciation rate		5.28%																				
Tax Depreciation rate		80%																				
Additional Depreciation		20.00%																				
Income Tax (Normal Rates)		33.990%																				
Capital Cost Rs. Lakh		1500.000																				
Years	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Book Depreciation	%	2.64%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	2.88%	0.00%	0.00%	
Book Depreciation	Rs Lakh	39.60	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	79.20	43.20	0.00	0.00
Accelerated Depreciation																						
Opening	%	100.00%	50.00%	5.00%	1.00%	0.20%	0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Allowed during the year	%	50%	45.00%	4.00%	0.80%	0.16%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Closing	%	50%	5%	1.00%	0.20%	0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Accelerated Deprn.	Rs Lakh	750.00	675.00	60.00	12.00	2.40	0.48	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Net Depreciation Benefit	Rs Lakh	710.40	595.80	-19.20	-67.20	-76.80	-78.72	-79.10	-79.18	-79.20	-79.20	-79.20	-79.20	-79.20	-79.20	-79.20	-79.20	-79.20	-43.20	0.00	0.00	
Tax Benefit	Rs Lakh	241.46	202.51	-6.53	-22.84	-26.10	-26.76	-26.89	-26.91	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-14.68	0.00	0.00	
Net Energy generation	MU	2.49	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	
Per unit benefit	Rs/Unit	9.69	3.77	-0.12	-0.43	-0.49	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.27	0.00	0.00	
Discounting Factor		1.00	0.95	0.86	0.77	0.70	0.63	0.57	0.51	0.46	0.42	0.38	0.34	0.31	0.28	0.25	0.23	0.20	0.18	0.17	0.15	















**Long-Term Debt Schedule**

<b>Particular</b>	<b>Unit</b>	<b>Year--&gt;</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
Opening Balance	Rs Lakh		1050	963	875	788	700	613	525	438	350	263	175
Repayment	Rs Lakh		87.50	87.50	87.50	87.50	87.50	87.50	87.50	87.50	87.50	87.50	87.50
Closing Balance	Rs Lakh		963	875	788	700	613	525	438	350	263	175.0	88
<b>Interest</b>	<b>Rs Lakh</b>		<b>130.81</b>	<b>119.44</b>	<b>108.06</b>	<b>96.69</b>	<b>85.31</b>	<b>73.94</b>	<b>62.56</b>	<b>51.19</b>	<b>39.81</b>	<b>28.44</b>	<b>17.06</b>

12	13
88	0
87.50	0.00
0	0
5.69	0.00

**Working Captial Requirement**

Particular	Unit	Year--->	1	2	3	4	5	6	7	8	9
O&M expense for power plant	Rs Lakh		6.25	6.61	6.99	7.39	7.81	8.25	8.73	9.23	9.75
Receivables	Rs Lakh										
Fixed Charges	Rs Lakh		65.75	64.57	63.42	62.33	61.28	60.28	59.34	58.45	57.63
Variable Charges	Rs Lakh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance Spare	Rs Lakh		11.25	11.89	12.57	13.29	14.05	14.86	15.71	16.61	17.56
Fuel Stock	Rs Lakh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Working Capital</b>	<b>Rs Lakh</b>		<b>83.25</b>	<b>83.07</b>	<b>82.98</b>	<b>83.01</b>	<b>83.14</b>	<b>83.39</b>	<b>83.77</b>	<b>84.28</b>	<b>84.94</b>
Interest Rate	%	13.50%									
<b>Interest on Working Capital</b>	<b>Rs Lakh</b>		<b>11.24</b>	<b>11.21</b>	<b>11.20</b>	<b>11.21</b>	<b>11.22</b>	<b>11.26</b>	<b>11.31</b>	<b>11.38</b>	<b>11.47</b>

10	11	12	13	14	15	16	17	18	19	20
10.31	10.90	11.52	12.18	12.88	13.62	14.40	15.22	16.09	17.01	17.98
56.87	59.24	58.62	50.53	52.00	53.56	55.20	56.94	58.78	60.72	62.77
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.56	19.62	20.74	21.93	23.18	24.51	25.91	27.39	28.96	30.62	32.37
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>85.74</b>	<b>89.76</b>	<b>90.88</b>	<b>84.65</b>	<b>88.07</b>	<b>91.69</b>	<b>95.51</b>	<b>99.56</b>	<b>103.83</b>	<b>108.35</b>	<b>113.13</b>
<b>11.57</b>	<b>12.12</b>	<b>12.27</b>	<b>11.43</b>	<b>11.89</b>	<b>12.38</b>	<b>12.89</b>	<b>13.44</b>	<b>14.02</b>	<b>14.63</b>	<b>15.27</b>

**Operation and Maintenance Expenses**

<b>Particular</b>	<b>Unit</b>	<b>Year---&gt;</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
O&M expense for power plant	Rs Lakh		75.00	79.29	83.83	88.62	93.69	99.05	104.71	110.70	117.04
<b>Total O&amp;M expense</b>	<b>Rs Lakh</b>		<b>75.00</b>	<b>79.29</b>	<b>83.83</b>	<b>88.62</b>	<b>93.69</b>	<b>99.05</b>	<b>104.71</b>	<b>110.70</b>	<b>117.04</b>



10	11	12	13	14	15	16	17	18	19	20
123.73	130.81	138.29	146.20	154.56	163.40	172.75	182.63	193.08	204.12	215.80
<b>123.73</b>	<b>130.81</b>	<b>138.29</b>	<b>146.20</b>	<b>154.56</b>	<b>163.40</b>	<b>172.75</b>	<b>182.63</b>	<b>193.08</b>	<b>204.12</b>	<b>215.80</b>

**RDF Waste Project**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Assumptions
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxillary Consumption during stabilisation	%	12.50%
			Auxillary Consumption after stabilisation	%	12.50%
			PLF(Stabilization for 6 months)	%	65%
			PLF(during first year after Stabilization)	%	65%
			PLF(second year onwards)	%	70%
			Useful Life	Years	20
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	900.000
3	Financial Assumptions	Debt: Equity	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	630.000
			Total Equity Amount	Rs Lacs	270.000
		Debt Component	Loan Amount	Rs Lacs	630.00
			Moratorium Period	years	0
			Repayment Period(incl. Moratorium)	years	12
			Interest Rate	%	13.00%
		Equity Component	Equity amount	Rs Lacs	270.00
			Return on Equity for first 10 years	% p.a	20.00%
			Return on Equity after 10 years	%	24.00%
			Weighted average of ROE	%	22.00%
	Discount Rate (equiv. to WACC)	%	10.81%		
4	Financial Assumptions	Fiscal Assumptions	Income Tax	%	33.990%
		Depreciation	Depreciation Rate(power plant)	%	5.83%
			Depreciation Rate 13th year onwards	%	2.51%
5	Working Capital	For Fixed Charges	O&M Charges	Months	1
			Maintenance Spare	(% of O&M exepenses)	15%
			Receivables for Debtors	Months	2
			For Variable Charges		
			RDF Stock	Months	4
			Interest On Working Capital	%	13.50%
6	Fuel Related Assumptions	Heat Rate	After Stabilisation period	Kcal/kwh	4200
			During Stabilization Period	Kcal/kwh	4200
		RDF			

		RDF Price	Rs/T	1800.00
		GCV	Kcal/kg	2500
		RDF Price Escalation Factor		5.00%
	<b>Operation &amp; Maintenance</b>			
7		O&M Expenses (2015-16)	Rs. Lacs	45.00
		<u>O &amp; M Expenses Escalation</u>	%	5.72%
		O&M Expenses (2015-16)	Rs. Lacs	45.0

Determination of Tariff for RDF Projects																						
Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross Generation	MU		5.69	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13
Auxiliary Consumption	MU		0.71	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Net Generation	MU		4.98	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
RDF Cost	Rs Lakh		172.19	194.70	204.44	214.66	225.39	236.66	248.50	260.92	273.97	287.67	302.05	317.15	333.01	349.66	367.14	385.50	404.77	425.01	446.26	468.58
<b>Fixed Cost</b>	<b>Unit</b>	<b>Year--&gt;</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
O&M Expenses	Rs Lakh		45.00	47.57	50.30	53.17	56.21	59.43	62.83	66.42	70.22	74.24	78.48	82.97	87.72	92.74	98.04	103.65	109.58	115.85	122.47	129.48
Depreciation	Rs Lakh		52.47	52.47	52.47	52.47	52.47	52.47	52.47	52.47	52.47	52.47	52.47	52.47	22.55	22.55	22.55	22.55	22.55	22.55	22.55	22.55
Interest on term loan	Rs Lakh		78.49	71.66	64.84	58.01	51.19	44.36	37.54	30.71	23.89	17.06	10.24	3.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capita	Rs Lakh		18.63	20.17	20.84	21.55	22.30	23.10	23.95	24.84	25.80	26.81	27.83	28.26	29.85	31.28	32.78	34.36	36.02	37.76	39.59	41.52
Return on Equity	Rs Lakh		54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	64.80	64.80	64.80	64.80	64.80	64.80	64.80	64.80
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>248.59</b>	<b>245.88</b>	<b>242.44</b>	<b>239.20</b>	<b>236.17</b>	<b>233.36</b>	<b>230.78</b>	<b>228.45</b>	<b>226.38</b>	<b>224.58</b>	<b>234.12</b>	<b>232.92</b>	<b>204.92</b>	<b>211.36</b>	<b>218.17</b>	<b>225.35</b>	<b>232.94</b>	<b>240.95</b>	<b>249.41</b>	<b>258.34</b>
Levillised tariff corresponding to Useful life																						
<b>Per Unit Cost of Generation</b>	<b>Unit</b>	<b>Levillised</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
Variable COG	Rs/kWh	4.86	3.46	3.63	3.81	4.00	4.20	4.41	4.63	4.86	5.11	5.36	5.63	5.91	6.21	6.52	6.84	7.18	7.54	7.92	8.32	8.73
O&M expn	Rs/kWh	1.25	0.90	0.89	0.94	0.99	1.05	1.11	1.17	1.24	1.31	1.38	1.46	1.55	1.63	1.73	1.83	1.93	2.04	2.16	2.28	2.41
Depreciation	Rs/kWh	0.88	1.05	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Int. on term loan	Rs/kWh	0.76	1.58	1.34	1.21	1.08	0.95	0.83	0.70	0.57	0.45	0.32	0.19	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capita	Rs/kWh	0.47	0.37	0.38	0.39	0.40	0.42	0.43	0.45	0.46	0.48	0.50	0.52	0.55	0.56	0.58	0.61	0.64	0.67	0.70	0.74	0.77
RoE	Rs/kWh	1.07	1.08	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21
<b>Total COG</b>	<b>Rs/kWh</b>	<b>9.29</b>	<b>8.45</b>	<b>8.21</b>	<b>8.33</b>	<b>8.46</b>	<b>8.60</b>	<b>8.76</b>	<b>8.93</b>	<b>9.12</b>	<b>9.33</b>	<b>9.55</b>	<b>9.99</b>	<b>10.25</b>	<b>10.03</b>	<b>10.46</b>	<b>10.91</b>	<b>11.38</b>	<b>11.89</b>	<b>12.41</b>	<b>12.97</b>	<b>13.55</b>
<b>Levillised Tariff</b>	<b>Unit</b>	<b>Year --&gt;</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
Discount Factor			1	0.902	0.814	0.735	0.663	0.599	0.540	0.488	0.440	0.397	0.358	0.323	0.292	0.263	0.238	0.215	0.194	0.175	0.158	0.142
Variable Cost (FY2015-16)	3.46	Rs/kWh																				
Levillised Tariff (Fixed)	4.43	Rs/kWh																				
<b>Applicable Tariff (FY2015-16)</b>	<b>7.88</b>	<b>Rs/kWh</b>																				

Determination of Accelerated Depreciation for RDF based MSW Projects																					
Depreciation amount		90%																			
Book Depreciation rate		5.28%																			
Tax Depreciation rate		80%																			
Additional Depreciation		20.00%																			
Income Tax (Normal Rates)		33.990%																			
Capital Cost Rs. Lakh		900.000																			
Years	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Book Depreciation	%	2.64%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	2.88%	0.00%	0.00%
Book Depreciation	Rs Lakh	23.76	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	47.52	25.92	0.00	0.00
Accelerated Depreciation																					
Opening	%	100.00%	50.00%	5.00%	1.00%	0.20%	0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Allowed during the year	%	50%	45.00%	4.00%	0.80%	0.16%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	50%	5%	1.00%	0.20%	0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Accelerated Deprn.	Rs Lakh	450.00	405.00	36.00	7.20	1.44	0.29	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Depreciation Benefit	Rs Lakh	426.24	357.48	-11.52	-40.32	-46.08	-47.23	-47.46	-47.51	-47.52	-47.52	-47.52	-47.52	-47.52	-47.52	-47.52	-47.52	-47.52	-25.92	0.00	0.00
Tax Benefit	Rs Lakh	144.88	121.51	-3.92	-13.70	-15.66	-16.05	-16.13	-16.15	-16.15	-16.15	-16.15	-16.15	-16.15	-16.15	-16.15	-16.15	-16.15	-8.81	0.00	0.00
Net Energy generation	MU	2.49	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
Per unit benefit	Rs/Unit	5.82	2.26	-0.07	-0.26	-0.29	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.16	0.00	0.00
Discounting Factor		1.00	0.95	0.86	0.77	0.70	0.63	0.57	0.51	0.46	0.42	0.38	0.34	0.31	0.28	0.25	0.23	0.20	0.18	0.17	0.15

**Variable Cost**

S. No.	Particulars	Unit	Stabilisation Period (First 6 Month)	Remain. 6 month	1	2	3	4	5	6	7
1	Installed Capacity	MW	1	1	1	1	1	1	1	1	1
2	Plant load factor	%	65%	65%		70%	70%	70%	70%	70%	70%
3	Gross energy generation	MU	2.85	2.85	5.69	6.13	6.13	6.13	6.13	6.13	6.13
4	Auxiliary Consumption	%	12.5%	12.5%		12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
5	Auxiliary Consumption	MU	0.36	0.36	0.71	0.77	0.77	0.77	0.77	0.77	0.77
6	Net Energy generation	MU	2.49	2.49	4.98	5.37	5.37	5.37	5.37	5.37	5.37
7	Station Heat Rate	Kcal/kWh	4200	4200		4200	4200	4200	4200	4200	4200
8	Energy Input required	Million Kcal	11957.4	11957.4	0.0	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4
9	Calorific Value	Kcal/kg	2500	2500		2500	2500	2500	2500	2500	2500
10	RDF Required	Million Kg	4.783	4.783	9.57	10.302	10.302	10.302	10.302	10.302	10.302
11	RDF Price	Rs/ MT			1800	1890	1985	2084	2188	2297	2412
12	RDF Cost	Rs Lakh			172.2	194.7	204.4	214.7	225.4	236.7	248.5
<b>13</b>	<b>Cost of Generation</b>	<b>Rs/kWh</b>			<b>3.46</b>	<b>3.63</b>	<b>3.81</b>	<b>4.00</b>	<b>4.20</b>	<b>4.41</b>	<b>4.63</b>

8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	1	1	1	1	1	1	1	1	1	1	1
70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13
12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4	25754.4
2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
10.302	10.302	10.302	10.302	10.302	10.302	10.302	10.302	10.302	10.302	10.302	10.302	10.302
2533	2659	2792	2932	3079	3233	3394	3564	3742	3929	4126	4332	4549
260.9	274.0	287.7	302.0	317.2	333.0	349.7	367.1	385.5	404.8	425.0	446.3	468.6
<b>4.86</b>	<b>5.11</b>	<b>5.36</b>	<b>5.63</b>	<b>5.91</b>	<b>6.21</b>	<b>6.52</b>	<b>6.84</b>	<b>7.18</b>	<b>7.54</b>	<b>7.92</b>	<b>8.32</b>	<b>8.73</b>











**Long-Term Debt Schedule**

<b>Particular</b>	<b>Unit</b>	<b>Year--&gt;</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
Opening Balance	Rs Lakh		630	578	525	473	420	368	315	263	210	158	105
Repayment	Rs Lakh		52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50
Closing Balance	Rs Lakh		578	525	473	420	368	315	263	210	158	105.0	53
<b>Interest</b>	<b>Rs Lakh</b>		<b>78.49</b>	<b>71.66</b>	<b>64.84</b>	<b>58.01</b>	<b>51.19</b>	<b>44.36</b>	<b>37.54</b>	<b>30.71</b>	<b>23.89</b>	<b>17.06</b>	<b>10.24</b>

12	13
53	0
52.50	0.00
0	0
<b>3.41</b>	<b>0.00</b>

**Working Captial Requirement**

Particular	Unit	Year-->	1	2	3	4	5	6	7	8	9
O&M expense for power plant	Rs Lakh		3.75	3.96	4.19	4.43	4.68	4.95	5.24	5.54	5.85
Receivables	Rs Lakh										
Fixed Charges	Rs Lakh		41.43	40.98	40.41	39.87	39.36	38.89	38.46	38.07	37.73
Variable Charges	Rs Lakh		28.70	32.45	34.07	35.78	37.57	39.44	41.42	43.49	45.66
Maintenance Spare	Rs Lakh		6.75	7.14	7.54	7.98	8.43	8.91	9.42	9.96	10.53
Fuel Stock	Rs Lakh		57.40	64.90	68.15	71.55	75.13	78.89	82.83	86.97	91.32
<b>Total Working Capital</b>	<b>Rs Lakh</b>		<b>138.03</b>	<b>149.43</b>	<b>154.36</b>	<b>159.60</b>	<b>165.17</b>	<b>171.09</b>	<b>177.37</b>	<b>184.03</b>	<b>191.10</b>
Interest Rate	%	13.50%									
<b>Interest on Working Capital</b>	<b>Rs Lakh</b>		<b>18.63</b>	<b>20.17</b>	<b>20.84</b>	<b>21.55</b>	<b>22.30</b>	<b>23.10</b>	<b>23.95</b>	<b>24.84</b>	<b>25.80</b>

10	11	12	13	14	15	16	17	18	19	20
6.19	6.54	6.91	7.31	7.73	8.17	8.64	9.13	9.65	10.21	10.79
37.43	39.02	38.82	34.15	35.23	36.36	37.56	38.82	40.16	41.57	43.06
47.94	50.34	52.86	55.50	58.28	61.19	64.25	67.46	70.84	74.38	78.10
11.14	11.77	12.45	13.16	13.91	14.71	15.55	16.44	17.38	18.37	19.42
95.89	100.68	105.72	111.00	116.55	122.38	128.50	134.92	141.67	148.75	156.19
<b>198.58</b>	<b>208.36</b>	<b>216.76</b>	<b>221.13</b>	<b>231.70</b>	<b>242.81</b>	<b>254.49</b>	<b>266.78</b>	<b>279.70</b>	<b>293.28</b>	<b>307.56</b>
<b>26.81</b>	<b>28.13</b>	<b>29.26</b>	<b>29.85</b>	<b>31.28</b>	<b>32.78</b>	<b>34.36</b>	<b>36.02</b>	<b>37.76</b>	<b>39.59</b>	<b>41.52</b>

**Operation and Maintenance Expenses**

Particular	Unit	Year-->	1	2	3	4	5	6	7	8	9
O&M expense for power plant	Rs Lakh		45.00	47.57	50.30	53.17	56.21	59.43	62.83	66.42	70.22
<b>Total O&amp;M expense</b>	<b>Rs Lakh</b>		<b>45.00</b>	<b>47.57</b>	<b>50.30</b>	<b>53.17</b>	<b>56.21</b>	<b>59.43</b>	<b>62.83</b>	<b>66.42</b>	<b>70.22</b>



10	11	12	13	14	15	16	17	18	19	20
74.24	78.48	82.97	87.72	92.74	98.04	103.65	109.58	115.85	122.47	129.48
<b>74.24</b>	<b>78.48</b>	<b>82.97</b>	<b>87.72</b>	<b>92.74</b>	<b>98.04</b>	<b>103.65</b>	<b>109.58</b>	<b>115.85</b>	<b>122.47</b>	<b>129.48</b>