

THE HIMACHAL PRADESH ELECTRICITY REGULATORY COMMISSION, SHIMLA

In the matter of adoption of generic levelled tariffs for Waste to Energy Projects based on Municipal Solid Waste (MSW) and Refuse Derived Fuel (RDF) Technology for FY 2015-16 as per Regulation 17 of the Himachal Pradesh Electricity Regulatory Commission (Promotion of Generation from the Renewable Energy Sources and Terms and Conditions for Tariff Determination) Regulations, 2012.

CORAM:
S.K.B.S. Negi
Chairman

ORDER

The Commission has notified the Himachal Pradesh Electricity Regulatory Commission (Promotion of Generation from the Renewable Energy Sources and Terms and Conditions for Tariff Determination) Regulations, 2012 (hereinafter referred to as “RE Tariff Regulations, 2012”), notified by the Commission on 17th December, 2012 in the Rajpatra, Himachal Pradesh.

2. The para-7.9.7 of HPERC MYT Tariff order dated 10th April, 2015 stipulates as:-

“Waste to Energy- The Commission’s policy of 100% clean energy is not only aimed at energy security on sustainable basis, including long term tariff stability, it is also an important measure to arrest climate change and environment protection. Therefore, the Commission proposes to promote generation of energy from the wastes, including municipal waste and decides that entire energy generated from waste in the State shall be purchased by HPSEBL on the tariff determined by the Commission as renewable energy.”

3. The CERC has made 4th amendment in the Central Electricity Regulatory Commission (Terms and Conditions for Tariff Determination for Renewable Energy Sources) Regulations, 2012 (hereinafter referred as “CERC RE Tariff Regulations, 2012”), wherein the norms for generic Tariff for the Rankine Cycle Combustion based power plants utilizing Municipal Solid Waste (MSW)/Refuse Derived Fuel (RDF) have been specified.

4. The para 6.4 (1) (i) of Tariff Policy notified by the Ministry of Power (MoP) published in the Gazette of India on 28th January, 2016 provides that:-

“Distribution Licensee(s) shall compulsorily procure 100% power produced from all the Waste-to-Energy plants in the State, in the ratio of their procurement of power from all sources including their own, at the tariff determined by the Appropriate Commission under Section 62 of the Electricity Act, 2003.”

5. The para 6.4 (2) of the aforesaid Tariff Policy also exempts the renewable energy projects i.e. Waste to Energy plants from competitive bidding process for tariff determination.

6. In order to achieve the objective of the Electricity Act, 2003, National Electricity Policy, 2005 (NEP), Tariff Policy, 2016 and provisions made by the CERC in its

RE Tariff Regulations, 2012 and also keeping in view, the objective of Swachh Bharat Mission of processing 100% solid waste generated in cities/towns of the country by the 2nd October, 2019, the Commission notified the 2nd amendment of its RE Tariff Regulations, 2012 on 11th April, 2016, wherein Waste to Energy (WtE) projects, based on Municipal Solid Waste (MSW) & Refuse Derived Fuel (RDF) based technologies have been included within the scope of RE Tariff Regulations, 2012 and also for adoption of various norms/principles including generic levellised tariffs, determined by the Central Electricity Regulatory Commission from time to time.

7. The relevant provisions of Regulation 17 of RE Tariff Regulations, 2012 are reproduced as under:-

17 (1).....xxxxxxxxxxxx.....

(2) Where the technological specific parameters and other terms and conditions, including the tariff period and useful life of the project, have not been specified, the Commission may, by an order, at any time and at such intervals as it considers appropriate to do so, fix the same.

.....xxxxxxxxxxxx....

Provided further that the Commission may, by order, categorize the renewable energy projects, other than SHPs, under the respective renewable energy technologies specified in sub -regulation (1), based on the capacity of projects, the available subsidy schemes and such other factors as may be considered appropriate by it:

Provided further that the Commission may, in order to promote such technologies for smaller capacities, follow, mutatis mutandis, upto the limits as it may consider necessary separately for each such technology but not exceeding 5 MW for any such technology, the technological specific parameters, including capital cost, and other terms and conditions, as notified, or may be notified, by the Central Commission under the Central Electricity Regulatory Commission (Terms and Conditions for Tariff Determination for Renewable Energy Sources) Regulations, 2012, in respect of the relevant financial years of the control period ending on 31st March, 2017, for the relevant renewable energy technology, as may be considered appropriate by it.”; and

Provided further that the financial norms, except for capital cost, as specified under Chapter-IV of these Regulations shall also be considered as ceiling norms.

(3) The Commission may, after having fixed the norms/parameters and other related terms and conditions as per sub-regulation (2), determine, by order generic levellised tariff(s) for any or all categories of such renewable energy technology(ies).

Provided that the Commission may, by order, fix, on annual basis, the ceiling rates and associated terms and conditions to be used by the licensee for reverse bidding for procurement of power from the projects based on such technologies.

(3A) Notwithstanding anything contained in sub-regulations (2) and (3) of this regulation, the Commission may, in case of Municipal Solid Waste (MSW) based power projects and Refuse Derived Fuel (RDF) based power projects, adopt the various norms/principles including Useful Life, tariff period, technology specific norms, financial norms/principles, applicability of tariff as well as generic levellised tariffs (with and without accelerated depreciation), adjustments on account of grant-in-aid, subsidy and CDM benefits, if any, and other associated terms and conditions as laid down by Central Commission, from time to time, for such projects.

(4)xxxxxxxxxxxxxxxx..... .

(5)xxxxxxxxxxxxxxxx..... .

8. The Sub-regulation (3A) of Regulation 17 of the Himachal Pradesh Electricity Regulatory Commission (Promotion of Generation from the Renewable Energy Sources and Terms and Conditions for Tariff Determination) Regulations, 2012 provides that Commission may, in case of Municipal Solid Waste (MSW) based power projects and Refuse Derived Fuel (RDF) based power projects, adopt the various norms/principles including Useful Life, tariff period, technology specific norms, financial norms/principles, applicability of tariff as well as generic levellised tariffs (with and without accelerated depreciation), adjustments on account of grant-in-aid, subsidy and CDM benefits, if any, and other associated terms and conditions as laid down by Central Electricity Regulatory Commission, from time to time, for such projects.
9. The CERC has determined the indicative generic levellised tariff for Waste to Energy Projects vide its order dated 7th October, 2015.
10. The CERC in RE Tariff Regulations, 2012 and order dated 7th October, 2015 have laid down the financial and technology specific parameters for MSW/RDF projects which are briefly given in the Table-I & II.

Table-I

FINANCIAL AND TECHNOLOGICAL PARAMETERS FOR RDF WASTE PROJECTS			
Sr.No.	Particulars	Units	Values in figure
1.	Capital Cost	Rs. Lakhs per/MW	900.00
2.	Debt: Equity Debt Equity	% %	70.00% 30.00%
3.	a). Return on Equity for first 10 years. b). Return on Equity after 10 years.	% per annum. -do-	20.00% 24.00%
4.	Debt Component: Moratorium Period. Repayment Period (including Moratorium)	Years Years	0.0 12.00
5.	Interest Rate on Debt Component:	%	13.00%
6.	Financial Assumption: Income Tax Depreciation Rate (power plant) Depreciation Rate 13 th year onwards Recovery of Depreciation	% % % %	33.990% 5.83% 2.51% 90.00%
7.	Working Capital: a). <u>For fixed charges:</u> O&M charges Maintenance spares Receivables for Debtors b). <u>For Variable Charges:</u> RDF Stock Interest on working capital	Months % of O&M Months Months %	1 15% 2% 4 13.50%
8.	Useful Life	Years	20
9.	Auxiliary Consumption: Auxiliary consumption during stabilization. Auxiliary consumption after stabilization. PLF (Stabilization for 6 months). PLF (During first year after Stabilization). PLF (second year onwards).	% % % % %	15.00% 15.00% 65.00% 65.00% 80.00%
10.	Operation & Maintenance O&M Expenses (2015-16) O&M Expenses Escalation	Rs. Lakhs %	54.00 5.72%
11.	Discounted Factor	%	10.81%
12.	Fuel Related Parameters: Heat rate after stabilization period Heat rate during stabilization period RDF Price Gross Calorific Value RDF Price Escalation Factor	Kcal/kwh Kcal/kwh Rs./Ton Kcal/kg	4200 4200 1800.00 2500 5.00%
13.	Accelerated Depreciation : Depreciation Amount Book Depreciation Rate Accelerated Depreciation Additional Depreciation	% % % %	90.00% 5.28% 80.00% 20.00%

Table-II

FINANCIAL AND TECHNOLOGICAL PARAMETERS FOR MUNICIPAL SOLID WASTE PROJECTS			
Sr.No.	Particulars	Units	Values in figure
1.	Capital Cost	Rs. Lakhs per/MW	1500.00
2.	Debt: Equity Debt Equity	% %	70.00% 30.00%
3.	a). Return on Equity for first 10 years. b). Return on Equity after 10 years.	% per annum. -do-	20.00% 24.00%
4.	Debt Component: Moratorium Period. Repayment Period (including Moratorium)	Years Years	0.0 12.00
5.	Interest Rate on Debt Component:	%	13.00%
6.	Financial Assumption: Income Tax Depreciation Rate (power plant) Depreciation Rate 13 th year onwards Recovery of Depreciation	% % % %	33.990% 5.83% 2.51% 90.00%
7.	Working Capital: a) <u>For fixed charges:</u> O&M charges Maintenance spares Receivables for Debtors b) <u>For Variable Charges:</u> MSW Stock Interest on working capital	Months % of O&M Months Months %	1 15% 2% 4 13.50%
8.	Useful Life	Years	20
9.	Auxiliary Consumption: Auxiliary consumption during stabilization. Auxiliary consumption after stabilization. PLF (Stabilization for 6 months). PLF (During first year after Stabilization). PLF (second year onwards).	% % % % %	15.00% 15.00% 65.00% 65.00% 75.00%
10.	Operation & Maintenance O&M Expenses (2015-16) O&M Expenses Escalation	Rs. Lakhs %	90.00 5.72%
11.	Discounted Factor	%	10.81%
12.	Fuel Related Parameters: Heat rate after stabilization period Heat rate during stabilization period MSW Price	Kcal/kwh Kcal/kwh Rs./Ton	4200 4200 0.00
13.	Accelerated Depreciation : Depreciation Amount Book Depreciation Rate Accelerated Depreciation Additional Depreciation	% % % %	90.00% 5.28% 80.00% 20.00%

11. Based on the above, CERC have determined the generic levelled tariff and associated terms and conditions for MSW/RDF based Waste to Energy projects as given the Table-III.

Table-III

Technology	Levelled Fixed Cost	Variable Cost	Applicable Tariff Rate	Benefit of Accelerated Depreciation	Net Levelled Tariff
		(FY 2016-17)	(FY 2016-17)	(If availed)	(Upon adjusting for Accelerated Depreciation Benefit) (If availed)
	(Rs/kWh)	(Rs/kWh)	(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
MSW	7.04	0.00	7.04	0.54	6.50
RDF based MSW	4.34	3.56	7.90	0.31	7.59

The CERC in their order dated 7th October, 2015 has also mentioned that in case of RDF based Waste to Energy Projects, the variable component of tariff will change each year based on the escalation factor of 5%.

Based on above the year wise total tariff for RDF projects shall work out as given in the Table-IV below:-

Table-IV

RDF Projects			
Years	Variable Cost of Generation for RDF (Rs. per unit)	Levelled Fixed Cost (Rs. per unit)	Total Tariff
1	3.56	4.34	7.90
2	3.74	4.34	8.08
3	3.92	4.34	8.26
4	4.12	4.34	8.46
5	4.33	4.34	8.67
6	4.54	4.34	8.88
7	4.77	4.34	9.11
8	5.01	4.34	9.35
9	5.26	4.34	9.60
10	5.52	4.34	9.86
11	5.80	4.34	10.14
12	6.09	4.34	10.43
13	6.39	4.34	10.73
14	6.71	4.34	11.05
15	7.05	4.34	11.39
16	7.40	4.34	11.74
17	7.77	4.34	12.11
18	8.16	4.34	12.50
19	8.57	4.34	12.91
20	9.00	4.34	13.34

Note: Year 1 in the above Table-IV refers to a period of 365 days from the first unit of the project and so on.

The detailed computation for generic levellised tariffs, determined by the CERC vide order dated 07.10.2015, in respect of MSW/RDF based power projects for FY 2015-16 as well as illustrations thereof is attached at Annexures-“A” & B” of this order.

12. The Central Commission in its Renewable Energy Tariff Order dated 29th April, 2016, mentioned the following in para-5 of the said Order:-

“The Commission, also notified the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) (Fourth Amendment) Regulations, 2015, on 07.10.2015 wherein, various technical norms of Waste to Energy viz Municipal Solid Waste (MSW) & Refuse Derived Fuel (RDF) were specified. The Commission is of the opinion that not much time has lapsed since the notification of the regulations, therefore it is prudent to fix the capital cost and tariff of such projects once more data is available with the Commission. Therefore, the Commission has decided to issue the Tariff Order for MSW/RDF projects separately, till such time it is proposed that the Tariff as per order dated 07.10.2015 shall continue to be in force.”

13. Since this Commission presently does not have its own experience in relation to norms for Municipal Solid Waste and Refuse Derived Fuel based power projects, so in exercise to powers conferred under Regulation 17 of RE Tariff Regulations, 2012, the Commission vide its proposal/draft order dated 30.04.2016 proposed for adoption of Financial and Technological Parameters and generic levellised tariffs for Municipal Solid Waste and Refuse Derived Fuel based power projects and indicative generic levellised tariffs determined by the CERC vide Order dated 07.10.2015. These norms and tariffs have been further extended by the CERC in preceding para-12.

The Commission invited public objections and suggestions by way of insertions in two News papers i.e. “The Hindustan Times” and “Divya Himachal” and also by way of making the draft order/proposal dated 30.04.2016 available on the Commission’s website:www.hperc.org.

The Commission, vide letter dated 02.05.2016, requested the major stakeholders, including Industries Associations, State Government, Directorate of Energy, Distribution Licensee, Municipal Corporation, Shimla, Directorate of Urban Development and HIMURJA to make their objections/suggestions as per the aforesaid public notice.

The following stakeholders have filed their comments/suggestions, on the proposal/draft Order dated 30.04.2016:-

- I. M/s Elephant Energy Private Limited, A-1/36, Third Floor, Safdarjung Enclave, New Delhi- 110029.
- II. Himachal Pradesh State Electricity Board Limited, Vidyut Bhawan, Shimla- 171004.

14. **Suggestion/objections of M/s Elephant Energy Private Limited:**

M/s Elephant Energy Private Limited (EEPL) have made the following comments/suggestions on the aforesaid proposal as under:-

- (i) The CERC in its tariff determination order of MSW/RDF dated 7th October, 2015, pointed out in the para-4.3, page-8 that “*the selection of technology [for RDF based power projects] is left to the discretion of the developer*”. Importantly EEPL are not an incineration to electricity (or Rankine Cycle) technology application, which can have significant negative environmental effects. These environmental impacts became particularly apparent in the closing of the Okhla Plant in 2015 due to dangerous dioxin and furan emissions coming from the plant, some 30 times over the standard levels recommended.
- (ii) M/s Elephant Energy Private Limited (EEPL) utilises hybrid gasification technology. Hybrid gasification utilises indirect and controlled heat to break down all carbon based waste streams in RDF into gases, which can then be reformed to make a syngas to run a generator, and a non-toxic char. This technology is significant as it can be utilised in a decentralized environment that enables waste to be collected, converted and utilised for electricity close to the source with very low emissions. With respect to testing for dioxins and furans, the EEPL system recorded readings of 1/15,000 less than the standard levels recommended.
- (iii) (a) Their proposal to Municipal Corporation, Shimla which had issued a public notice for up-gradation of 100 tonnes per day waste processing facility at Bhariyal. After submission of their proposal, Municipal Corporation, Shimla issued a public notice inviting the challenge to their offer.
(b) Given the challenge involved in running waste to energy plants as per environmental norms, M/s Elephant Energy Private Limited had requested in September, 2015 for a tariff of INR 8.0 indexed to annual inflation in their proposal. During the negotiation, M/s Elephant Energy Private Limited accepted CERC determined rate (order dated 7th October, 2015) of 7.90 and with annual escalation of variable cost @ of 5% upto 20 years from COD.
(c) As per M/s Elephant Energy Private Limited submissions, the plant operations were not commercially viable at rates below this price. EEPL requests that RDF-based power project, are awarded the rates as explained above. These rates are consistent to rates clearly identified in CERC Tariff Order date 7th October, 2015 para-7, page-26 as INR 7.9 for the year 2015-16 escalating on the variable component (INR 3.56) by 5% per annum for the duration of the agreement – 20 years.

(d) M/s Elephant Energy Private Limited also submits that previously they agreed with Municipal Corporation, Shimla to consider 2016-17 as the base year with INR 7.90 as the tariff for 2016-17 with annual escalation on the variable component (INR 3.56) by 5% per annum for the duration of the agreement.

Analysis & Commission's View:-

As per the provisions of the HPERC RE Tariff Regulations, 2012 & CERC RE Tariff Regulations, 2012, the norms specified for tariff determination for Waste to Energy Projects which use Municipal Solid Waste (MSW) and Refuse Derived Fuel (RDF) and are based on Rankine Cycle Technology Application. In the CERC Order dated 7th October, 2015, on the suggestion of a stakeholder i.e. apart from the technologies specified by the CERC, Pyrolysis and High End Gasifier technologies could be used with same tariff norms as the same is also recommended in the "Report of the Task Force on Waste to Energy" by the Planning Commission in May 2014. So alternatively, norms could be technology free based on fuel selection as of RDF/MSW. The CERC expressed following view point at para-4.3 of order dated 7th October, 2015:-

“4.3 Analysis & Commission's View:-

The Commission opines that the selection of technology is left to the discretion of the developer so as to arrive at a reasonable tariff. Therefore, Pyrolysis and High End Gasifier can also be selected by the developer in addition to Combustion or incineration, Bio-methanation (which can be used for smaller capacity and wet garbage handling)”

The Commission agrees with the view point expressed by the CERC that selection of technology is left to the discretion of the renewable energy generator provided that the processes in the power plant are environmental friendly and fulfil the emissions norms as well as other standards laid down by the respective authority. As such the Commission allows such deviation of technologies selection as compared to the norms specified in the RE Tariff Regulations, 2012. As regard the applicability of the tariff as suggested, the Commission has vide Regulation 3(A) of RE Tariff Regulations, 2012 already made provision for the adoption of the CERC generic levelled tariffs for RDF projects also.

15. Suggestion/objections of HPSEBL:

The HPSEB Limited have submits the following comments/suggestions on the aforesaid proposal as:-

- (i) HPSEB Limited submitted that 20% additional depreciation available under the clause (ii a) of sub-section (1) of section 32 of the Income Tax has not been considered for the cost of Plant & Machinery which on normative basis is to be considered on 70% of the project cost .

This aspect is missing in Sr. No. 11 of proposal dated 30.04.2016 in which only accelerated depreciation has been considered.

- (ii) Govt subsidy for MSW/RDF plants to be established under the proposal dated 30.04.2016 have not been considered, as the higher tariff for MSW/RDF will impact the general tariff applicable to the consumers of the State and they will be additionally burdened with this higher tariff. The HPSEBL is procuring power @ Rs 2.66 per kWh, (average pooled cost), whereas, under the referred proposal, the HPSEBL has to compulsorily purchase the power from Waste to Energy power plants @ Rs10/kWh (approximately). As such, this costly power may be compensated by way of subsidy to the balance cost of Rs 7.34 per unit (i.e. Rs10.00- Rs 2.66 per unit) from the GoHP.
- (iii) The proceeds of carbon credit from approved Clean Development Mechanism (CDM) project shall be shared between Generating Company and Distribution Licensee from the Date of Commercial Operation of the Generating Plant.

Analysis & Commission's View:-

The Commission in its proposal/draft Order dated 30.04.2016, proposed for adoption of various norms/principles including useful life, tariff period, technologies specific norms, financial norms/principles, applicability of tariff as well as generic levelled tariffs (with and without accelerated depreciation) as determined by the CERC vide Order dated 7th October, 2015. The generic levelled accelerated depreciations benefit, with 80% tax benefit rate and 20% additional depreciations, are also provided in the proposal.

As regard the per unit subsidy from the Govt. of Himachal Pradesh for procurement of power from such projects, the Commission advises the HPSEBL to take up the matter expeditiously with State Government.

As far as, sharing of CDM from the commercial operation date of Waste to Energy generating plant, the Commission is of the view that the provisions made in the proposal shall be retained as the same are based on the CERC RE Tariff Regulations, 2012.

16. In light of the discussions made in the preceding paragraphs, the Commission hereby adopts the technological and financial parameters as given in the Tables-I & II under para-10 as well as the generic levelled tariffs given in the Tables-III & IV under para- 11. These tariffs shall be further subject to the following associated terms and conditions :-

- A. These tariffs shall be applicable where distribution licensee agree to sell/purchase the energy generated from the renewable energy projects based on such technologies at the interconnection point to be mentioned in the Power Purchase Agreement.

- B. These tariffs shall be applicable w.e.f. the date of issuance of this order and shall remain applicable till such time CERC revises such tariffs in accordance with para-12 or upto 31.03.2017 whichever is earlier . The Commission may determine tariff/norms from such projects afresh in case CERC comes out with a fresh order as per para-12.
- C. These tariffs shall be applicable for such MSW/RDF projects which achieve commercial operation for at least one unit in the time frame, for which these tariffs continue to be valid in accordance with clause B, above.
- D. The tariff applicable at the time of commercial operation of the project shall continue to be applicable for the entire useful life of the project. However, in case of RDF based waste to energy projects, the variable component of tariff will change each year based on the escalation factor of 5% in accordance with the computations in Table-IV under para-11 above.
- E. In case, a MSW/RDF based power project is entitled to any incentive and/or subsidy and/or grant available, subsidy/budgetary support/grant/Generation Based Incentive (GBI)/Viability Gap Funding (VGF), under the schemes of the Central or State Government or their agencies, it is proposed that the same shall be adjusted by the Distribution Licensee.
- F. The proceeds of carbon credit from approved Clean Development Mechanism (CDM) project shall be shared between Generating Company and Distribution Licensee in the following manner, namely:-
- i) 100% of the gross proceeds on account of CDM benefit to be retained by the Project Developer in the first year after the date of commercial operation of the generating station;
 - ii) In the second year, the share of the beneficiaries shall be 10% which shall be progressively increased by 10% every year till it reaches 50%, where after the proceeds shall be shared in equal proportion, by the Generating Company and the Distribution Licensee.
- G. Other terms and conditions are subjected to the CERC (Terms and Conditions for Tariff Determination for Renewable Energy Sources) Regulations, 2012 and HPERC (Promotion of Generation from the Renewable Energy Sources and Terms and Conditions for Tariff Determination) Regulations, 2012.

Sd/-

Shimla:
Date: 07th May, 2016.

(S.K.B.S Negi)
Chairman

Annexure-“A”

FINANCIAL AND TECHNOLOGICAL PARAMETERS FOR RDF WASTE PROJECTS			
Sr.No.	Particulars	Units	Values in figure
1.	Capital Cost	Rs. Lakhs per/MW	900.00
2.	<u>Debt: Equity</u> Debt Equity	% %	70.00% 30.00%
3.	a). Return on Equity for first 10 years. b). Return on Equity after 10 years.	% per annum. -do-	20.00% 24.00%
4.	<u>Debt Component:</u> Moratorium Period. Repayment Period (including Moratorium)	Years Years	0.0 12.00
5.	Interest Rate on Debt Component:	%	13.00%
6.	<u>Financial Assumption:</u> Income Tax Depreciation Rate (power plant) Depreciation Rate 13 th year onwards Recovery of Depreciation	% % % %	33.990% 5.83% 2.51% 90.00%
7.	<u>Working Capital:</u> a). <u>For fixed charges:</u> O&M charges Maintenance spares Receivables for Debtors b). <u>For Variable Charges:</u> RDF Stock Interest on working capital	Months % of O&M Months Months %	1 15% 2% 4 13.50%
8.	Useful Life	Years	20
9.	<u>Auxiliary Consumption:</u> Auxiliary consumption during stabilization. Auxiliary consumption after stabilization. PLF (Stabilization for 6 months). PLF (During first year after Stabilization). PLF (second year onwards).	% % % % %	15.00% 15.00% 65.00% 65.00% 80.00%
10.	<u>Operation & Maintenance</u> O&M Expenses (2015-16) O&M Expenses Escalation	Rs. Lakhs %	54.00 5.72%
11.	Discounted Factor	%	10.81%
12.	<u>Fuel Related Parameters:</u> Heat rate after stabilization period Heat rate during stabilization period RDF Price Gross Calorific Value RDF Price Escalation Factor	Kcal/kwh Kcal/kwh Rs./Ton Kcal/kg	4200 4200 1800.00 2500 5.00%
13.	<u>Accelerated Depreciation :</u> Depreciation Amount Book Depreciation Rate Accelerated Depreciation Additional Depreciation	% % % %	90.00% 5.28% 80.00% 20.00%

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	
Gross Generation	MU		5.69	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	
Auxiliary Consumption	MU		0.85	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	
Net Generation	MU		4.84	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	
RDF Cost	Rs Lakh		172.19	222.52	233.64	245.33	257.59	270.47	284.00	298.20	313.11	328.76	345.20	362.46	380.58	399.61	419.59	440.57	462.60	485.73	510.02	535.52
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		54.00	57.09	60.35	63.81	67.46	71.31	75.39	79.71	84.27	89.09	94.18	99.57	105.26	111.29	117.65	124.38	131.49	139.02	146.97	155.37
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		76.49	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		19.13	22.62	23.41	24.25	25.14	26.09	27.09	28.15	29.28	30.47	31.98	33.31	34.11	35.75	37.48	39.30	41.22	43.23	45.35	47.57
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	64.80	64.80	64.80	64.80	64.80	64.80	64.80	64.80	64.80
Total Fixed Cost	Rs Lakh		258.09	257.84	255.07	252.54	250.26	248.24	246.49	245.04	243.90	243.09	253.66	253.56	226.72	234.38	242.48	251.03	260.06	269.59	279.66	290.29
Levelling tariff corresponding to Useful life																						
Per Unit Cost of Generation	Unit	Levelling	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Variable COG	Rs/kWh	5.01	3.56	3.74	3.92	4.12	4.32	4.54	4.77	5.01	5.26	5.52	5.80	6.08	6.39	6.71	7.04	7.40	7.77	8.15	8.56	8.99
O&M expn	Rs/kWh	1.37	1.12	0.96	1.01	1.07	1.13	1.20	1.27	1.34	1.41	1.50	1.58	1.67	1.77	1.87	1.98	2.09	2.21	2.33	2.47	2.61
Depreciation	Rs/kWh	0.81	1.08	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Int. on term loan	Rs/kWh	0.70	1.62	1.20	1.09	0.97	0.86	0.74	0.63	0.52	0.40	0.29	0.17	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capita	Rs/kWh	0.48	0.40	0.38	0.39	0.41	0.42	0.44	0.45	0.47	0.49	0.51	0.54	0.56	0.57	0.60	0.63	0.66	0.69	0.73	0.76	0.80
RoE	Rs/kWh	0.98	1.12	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Total COG	Rs/kWh	9.35	8.89	8.06	8.20	8.36	8.53	8.71	8.91	9.12	9.35	9.60	10.05	10.34	10.20	10.64	11.11	11.61	12.13	12.68	13.26	13.86
Levelling 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)	3.56	Rs/kWh																				
Levelling Tariff (Fixed)	4.34	Rs/kWh																				
Applicable Tariff (FY2015-16)	7.90	Rs/kWh																				

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	2.42	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96	5.96
Per unit benefit	Rs/Unit	5.99	2.04	-0.07	-0.23	-0.26	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.15	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

Annexure-“B”

FINANCIAL AND TECHNOLGOCIAL PARAMETERS FOR MUNICIPAL SOLID WASTE PROJECTS			
Sr.No.	Particulars	Units	Values in figure
1.	Capital Cost	Rs. Lakhs per/MW	1500.00
2.	Debt: Equity Debt Equity	% %	70.00% 30.00%
3.	a). Return on Equity for first 10 years. b). Return on Equity after 10 years.	% per annum. -do-	20.00% 24.00%
4.	Debt Component: Moratorium Period. Repayment Period (including Moratorium)	Years Years	0.0 12.00
5.	Interest Rate on Debt Component:	%	13.00%
6.	Financial Assumption: Income Tax Depreciation Rate (power plant) Depreciation Rate 13 th year onwards Recovery of Depreciation	% % % %	33.990% 5.83% 2.51% 90.00%
7.	Working Capital: a) <u>For fixed charges:</u> O&M charges Maintenance spares Receivables for Debtors b) <u>For Variable Charges:</u> MSW Stock Interest on working capital	Months % of O&M Months Months %	1 15% 2% 4 13.50%
8.	Useful Life	Years	20
9.	Auxiliary Consumption: Auxiliary consumption during stabilization. Auxiliary consumption after stabilization. PLF (Stabilization for 6 months). PLF (During first year after Stabilization). PLF (second year onwards).	% % % % %	15.00% 15.00% 65.00% 65.00% 75.00%
10.	Operation & Maintenance O&M Expenses (2015-16) O&M Expenses Escalation	Rs. Lakhs %	90.00 5.72%
11.	Discounted Factor	%	10.81%
12.	Fuel Related Parameters: Heat rate after stabilization period Heat rate during stabilization period MSW Price	Kcal/kwh Kcal/kwh Rs./Ton	4200 4200 0.00
13.	Accelerated Depreciation : Depreciation Amount Book Depreciation Rate Accelerated Depreciation Additional Depreciation	% % % %	90.00% 5.28% 80.00% 20.00%

		Determination of Tariff for MSW Plant																				
Unit 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	KW		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Gross generation	MU		5.694	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
Auxillary Consumption	MU		0.85	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Net Generation	MU		4.840	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58
Fixed Cost		year																				
O&M Expences	₹lacs		90.00	95.15	100.59	106.34	112.43	118.86	125.66	132.84	140.44	148.48	156.97	165.95	175.44	185.48	196.08	207.30	219.16	231.69	244.95	258.96
Depriciation	₹lacs		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	₹lacs		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 Capital	₹lacs		12.07	12.09	12.13	12.18	12.26	12.35	12.47	12.60	12.76	12.94	13.56	13.80	13.04	13.60	14.18	14.80	15.46	16.15	16.88	17.66
Return on Equity	₹lacs		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
Total fixed Cost	₹lacs		410.33	404.13	398.23	392.67	387.45	382.60	378.14	374.08	370.46	367.31	383.04	380.88	334.06	344.65	355.84	367.68	380.19	393.42	407.40	422.19
Levellised CoG																						
Per unit CoG	Unit	levellised																				
O&M Expences	₹/kWh	2.42	1.86	1.70	1.80	1.90	2.01	2.13	2.25	2.38	2.51	2.66	2.81	2.97	3.14	3.32	3.51	3.71	3.92	4.15	4.39	4.64
Depriciation	₹/kWh	1.43	1.81	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Interest on Term Loan	₹/kWh	1.23	2.70	2.14	1.94	1.73	1.53	1.32	1.12	0.92	0.71	0.51	0.31	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on Working Capital	₹/kWh	0.23	0.25	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.24	0.25	0.23	0.24	0.25	0.27	0.28	0.29	0.30	0.32
Return on Equity	₹/kWh	1.72	1.86	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Total CoG	₹/kWh	7.04	8.48	7.2366	7.13	7.03	6.94	6.85	6.77	6.70	6.63	6.58	6.86	6.82	5.98	6.17	6.37	6.58	6.81	7.04	7.30	7.56
Discounted factor	%		1	0.90	0.81	0.73	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.21	0.19	0.17	0.16	0.14
levellised Tariff	₹/kWh	7.04	8.48	6.5306	5.81	5.17	4.60	4.10	3.66	3.27	2.92	2.61	2.46	2.21	1.75	1.63	1.51	1.41	1.32	1.23	1.15	1.08

Determination of Accelerated Depreciation Benefit for MSW Power Projects																					
Depreciation Amount	90%																				
Book Depreciation Rate	5.28%																				
Tax Depreciation Rate	80%																				
Additional Depreciation	20%																				
Income Tax (Normal rate)	33.99%																				
Capital cost (In Lacs)	1,500.00																				
Years	Units	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	₹ Lacs	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	43.20	0.00	0.00
Accelerated Depreciation																					
opening	%	100	50	5.00	1.00	0.20	0.04	0.01	0.00												
Allowed during the Year	%	50	45	4	0.8	0.16	0.03	0.01													
Closing	%	50	5	1	0.2	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 Depreciation	₹ Lacs	750.00	675.00	60.00	12.00	2.40	0.45	0.15	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
Net Depreciation Benefit	₹ Lacs	710.40	595.80	-19.20	-67.20	-76.80	-78.75	-79.05	-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
Tax Benefit	₹ Lacs	241.46	202.51	-6.53	-22.84	-26.10	-26.77	-26.87	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-26.92	-14.68	0.00	0.00
Energy Generation	MU	2.420	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585	5.585
Discounting factor		1	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
Per Unit Energy Generation Benefit		9.98	3.63	-0.12	-0.41	-0.47	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.48	-0.26	0.00	0.00
Discounted Net Depreciation Benefit	₹ Lacs	710.40	566.74	-16.48	-52.06	-53.69	-49.68	-45.01	-40.69	-36.72	-33.14	-29.91	-26.99	-24.36	-21.98	-19.84	-17.90	-16.16	-7.95	0.00	0.00
Discounted Tax Benefit	₹ Lacs	241.46	192.63	-5.60	-17.69	-18.25	-16.89	-15.30	-13.83	-12.48	-11.26	-10.17	-9.17	-8.28	-7.47	-6.74	-6.08	-5.49	-2.70	0.00	0.00
Discounted Energy Generation	MU	2.420	5.312	4.794	4.326	3.904	3.523	3.180	2.869	2.589	2.337	2.109	1.903	1.718	1.550	1.399	1.262	1.139	1.028	0.928	0.837
Discounted Per Unit Energy Generation Benefit		9.98	3.45	-0.10	-0.32	-0.33	-0.30	-0.27	-0.25	-0.22	-0.20	-0.18	-0.16	-0.15	-0.13	-0.12	-0.11	-0.10	-0.05	0.00	0.00

Levillised Benefit
Levillised Tax benefit 28.47923
Levillised Energy Generation in MU 5.246545

Levillised Benefit Rs/kWh 0.54