



DRAFT

Suo-Motu Petition No. XXXXXXXXXXXXX

In the matter of-

Determination of generic preferential tariff for FY 2016-17 for Biomass based plants under Regulation 8 of the Chhattisgarh State Electricity Regulatory Commission (Terms and conditions for determination of generation tariff and related matters for electricity generated by plants based on renewable energy sources) Regulations, 2012 and subsequent amendment thereof.

**PRESENT : Narayan Singh, Chairman
: Arun Kumar Sharma, Member**

ORDER

(XXXXXXXXXXXXXXXXXX)

The Chhattisgarh State Electricity Regulatory Commission (Terms and conditions for determination of generation tariff and related matters for electricity generated by plants based renewable energy sources) Regulations, 2012, (hereinafter referred to as "the RE Tariff Regulations 2012") and subsequent amendment in the RE Tariff Regulations provides for terms and conditions and the procedure for determination of tariff of the following categories of renewable energy generating stations:

- (a) Wind Power Project;
 - (b) Small Hydro Projects;
 - (c) Non-fossil fuel-based co-generation Plants; and
 - (d) Solar Photo Voltaic (PV) and Solar Thermal Power Projects.
2. The Regulations mandates the Commission to determine the generic tariff on the basis of the suo-motu petition, for the renewable energy technologies (RE technologies) for which norms have been specified in the RE Tariff Regulations 2012 and subsequent amendment.
3. The Commission, in due discharge of the mandate under Regulation 8.1 of the RE Tariff Regulations 2012, had determined the generic tariff of the RE projects, except for the biomass based power plants, achieving COD during the fifth year of control period (i.e. FY

2016-17) through Order dated 29.09.2016 in suo-motu petition no 45 of 2016 (M). Tariff proposals are enclosed herewith.

4. As regard to the fixed and energy charges for the biomass based power plants achieving CoD during FY 2016-17, the Commission in Order dated 29.09.2016 in suo-motu petition no 45 of 2016 (M) has held as follows;

"XXXXXXXX

Upon fixation of biomass fuel price for the year 2016-17 by the Committee thus formed, the Commission will separately determine energy charges and fixed charges for the year 2016-17 as fuel cost shall have impact on it.

XXXXXXXX"

5. Comments /suggestions of the stakeholders on the above proposal are invited by and hearing will be held onPM at the Commission's courtroom.

6. The generic generation tariff for various biomass based plants are discussed below:

- 6.1 **Useful Life:** Regulation 2.1(ii) of the RE Tariff Regulations 2012 defines 'useful life' in relation to a unit of a generating station as per following from the date of commercial operation (COD) of such generation facility:

Renewable Energy Projects	Years
Biomass	20

- 6.2 **Control Period:** Regulation 5 of the RE tariff Regulations 2012 provides that the control period for determination of tariff for renewable energy projects (RE projects) shall be five years. The first year of the control period is from April01, 2012. First Amendment Regulations 2013 stipulates that the tariff determined for the RE projects achieving COD during the control period shall be applicable for the entire duration of the tariff period.

- 6.3 **Tariff Period:** As per First Amendment Regulations 2013, the tariff period in respect of the RE projects shall be considered from the COD of the renewable energy generating stations and shall be considered as 12 years.

- 6.4 **Tariff Structure:** As per Regulation 9.1 of the RE Tariff Regulations 2012, the tariff for RE projects shall be single part tariff consisting of the following fixed cost components:

- (a) Return on equity;
- (b) Interest on loan capital;
- (c) Depreciation;
- (d) Interest on working capital;
- (e) Operation and maintenance expenses;

For renewable energy technologies having fuel cost component, like biomass power projects, single part tariff with two components, fixed cost component and fuel cost component, is to be determined.

6.5 Tariff Design: As per provision in First Amendment Regulations 2013, the generic tariff shall be determined on levellised basis for the Tariff Period from COD and levellisation of tariff is considered for useful life of the project. For renewable energy technologies having tariff with two components, tariff shall be determined considering the year of COD of the project for fixed cost component. For fuel cost component the tariff will be decided for each/every financial year.

The discount factor considered for this purpose is equal to the Post Tax weighted average cost of the capital on the basis of normative debt: equity ratio (70:30) specified in the RE Tariff Regulations 2012. Considering the normative debt equity ratio and weighted average of the post tax rates for interest and equity component, the discount factor is calculated. Interest Rate considered for the loan component (i.e.70%) of Capital Cost is 12.7% (as explained in subsequent paragraphs). For equity component (i.e. 30%) rate of Return on Equity (ROE) considered at Post Tax ROE of 16% considering the MAT rate of 21.34%. The discount rate derived by this method for all technologies is 10.59%.

7. Parameters for tariff determination

7.1 Capital Cost: Regulation 12 of the RE Tariff Regulations 2012 stipulates that the norms for the capital cost as specified in the technology specific chapter shall be inclusive of all capital works like plant and machinery, civil works, erection and commissioning, financing and interest during construction, and evacuation infrastructure up to inter-connection point. The Commission has specified the normative capital cost, applicable for the first year of control period i.e. FY 2012-13, for biomass based power projects. As per regulation 35.2 of the RE Tariff Regulation 2012, indexed capital cost for biomass power projects by Central Electricity

Regulatory Commission (Central Commission) in accordance with indexation mechanism stipulated under CERC RE Tariff Regulations will be applicable. Central Commission has specified capital cost as Rs.610.8 Lakh/MW for biomass power projects for the year 2016-17.

7.2 Debt-Equity Ratio: Regulation 13.1 of the RE Tariff Regulations 2012 provides that the debt equity ratio of 70:30 is to be considered for determination of generic tariff based on suo-motu petition.

7.3 Return on Equity: Regulation 16.1 of the RE Tariff Regulations 2012 provides that the value base for the equity shall be 30% of the capital cost for generic tariff determination. Regulation 16.2 stipulates the normative return on equity as under:

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

7.4 Loan and Finance Charges: As per regulation 14 of the RE tariff Regulations 2012, for the purpose of determination of tariff, loan tenure of 12 years shall be considered. The normative interest rate shall be considered as average of base rate (lending rate) of State Bank of India prevalent on October 1st of the previous year of the tariff determination year plus 300 basis points.

Base rate (lending rate) of State Bank of India prevalent on October 1st of FY 2015-16 (i.e. previous year of the tariff determination year) is 9.7%. 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 interest rate of 12.7%.

7.5 Depreciation: As specified in regulation 15 of the RE tariff Regulations 2012, 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. 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 on 'Straight Line Method'.

7.6 Interest on Working Capital: As per regulation 17 of the RE tariff Regulations 2012 Working Capital requirement in respect of biomass based power generation projects shall be computed as per following:

- (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

Interest on Working Capital shall be at interest rate equivalent to base rate (lending rate) of State Bank of India prevalent on October 1st of the previous year of the tariff determination year plus 350 basis points accordingly interest rate comes out as 13.2%.

7.7 Operation & Maintenance Expenses:

As per provisions in RE Tariff Regulations 2012, O&M expenses shall be determined for the Tariff Period based on normative O&M expenses specified by the Commission for first year of the Control Period and shall be escalated at the rate of 5.72% per annum over the Tariff Period”

As per regulations 39.1 of the RE Tariff Regulations 2012, normative O & M expenses for the biomass power projects for the year 2012-13 shall be Rs.24 Lakh/MW and for year 2016-17 with escalation rate of 5.72% O & M expenses norms comes out to Rs. 29.98 Lakh/MW.

7.8 Plant Load Factor (PLF): Regulations 36 of the RE Tariff Regulations 2012 specify the plant load factor for biomass projects as 80% and same has been considered for determination of fixed charges.

7.9 Auxiliary Power Consumption: Regulations 37 of the RE Tariff Regulations 2012 stipulate the auxiliary power consumption as 10% which has been considered for determination of tariff of the RE projects.

7.10 Station Heat Rate: The Station Heat Rates (SHR) specified under Regulations 38 of the RE Tariff Regulations 2012 for biomass based generation projects are as under:

RE Projects	SHR, Kcal/kWh
Biomass projects	4000

7.11 Calorific Value: In terms of Regulation 44 of the RE Tariff Regulations 2012 and its subsequent second amendment regulations

2016, calorific value of biomass for determination of tariff 2016-17 is as follows;

"44 Calorific Value

44.1 The average Calorific Value of the biomass fuel(s) used for the purpose of determination of tariff for biomass power projects with MNRE specified fuel mix ratio of 85:15 (biomass:coal) shall be 3300 kcal/kg and for fuel mix ratio of 75:25 (biomass:coal) shall be 3338 kcal/kg (biomass:coal)."

Accordingly, the Commission has specified energy charges for plants having fuel mix ratio of 85:15 (biomass:coal) based on 3300 kcal/kg and for plants having fuel fuel mix ratio of 75:25 based on 3338 kcal/kg.

7.12 Fuel Cost: The Commission in its second amendment of RE Regulation 2016, has specified that biomass fuel price shall be determined through independent study by a six member State level Committee. Relevant para of the regulations is reproduced below;

"45.1 Biomass fuel price shall be 2476 Rs/MT during first year of the control period (i.e., FY 2012-13) and there after shall be linked to indexation mechanism as specified under Regulation 45.2 and 45.3

However biomass fuel price for the year fifth year of the control period (i.e. FY 2016-17) shall be determined through independent study would be carried out by a six member State level Committee consisting following members nominated by the Commission;

- a. Representative of State Govt - Chairman*
- b. Representative of CG State Co-operative Marketing Federation Ltd -Member*
- c. Representative of State Nodal Agency (CREDA) - Member-Convener*
- d. Representative of State Distribution Company (CSPDCL) - Member*
- e. Representative of biomass power producers association - Member*
- f. Consumer representative – Member*

After study, the Committee will arrive at biomass fuel price and will submit applicable biomass fuel price within two months".

- 8.** The Commission vide order no. 04-04/CSEB/07/04/02/1612 dtd. 12.09.2016 constituted the committee to determine biomass fuel price for fifth year of the control period i.e. FY 2016-17. As per the directive, the committee while specifying the biomass fuel price

should consider the supply and demand of biomass based on the cropping pattern and to determine the biomass fuel price through independent study. The CREDA head office was secretariat support to the committee. Representative of CREDA was made Member-Convener of the committee and CREDA head office mandated to provide secretariat support to the committee.

9. The committee submitted its report vide letter no. 21433/CREDA/SMD/2016-17 dated 22.11.2016 regarding applicable biomass fuel price for the year 2016-17. The biomass fuel price recommended by the committee was Rs. 3210/- per MT. The details submitted by the Committee are as under:-

Sr.	Parameters	Committee recommendations
1.	Average rate of biomass (rice husk) as per CG Marketing Federation	Rs. 2113.00 per ton
2.	Effective rate after deducting 10% loss on account of moisture & decay	Rs. 2347.77 per ton
3.	Effective rate after deducting 10% losses in transportation & ingress of mud	Rs. 2608.63 per ton
4.	Add additional transportation charges	Rs. 600.00 per ton
		Rs. 3208.63 per ton
	Say	Rs. 3210 per ton

While submitting the Committee report, member convener of the committee submitted that one member of the committee representing distribution licensee did not agree to the rest of the committee members on the issue of methodology to determine biomass price and therefore he did not sign the committee's report. It is to note that disagreeing member of the committee separately submitted his comments to the Commission vide letter 4311 dated 05.12.2017. He mentioned that he agrees to the base price of biomass i.e. Rs. 2113 per MT but didn't agree to the 10% loss on account of moisture & decay, 10% losses in transportation & ingress of mud and adding additional transportation charges.

This comment of member was referred to the committee for further examination however as earlier other members of committee after examination, has adhered to their initial stand. The Committee quoted the report of the committee constituted by the Hon'ble Central Commission on October 11, 2012 to undertake a detailed study on

"Performance/viability of biomass based plants operating in the country including the prevailing biomass prices".

The Commission, however, noted that the price of rice husk as per CERC formula of price indexation mechanism for the year 2016-17 works out to Rs. 3003.01. The Commission after going through the report of the Committee is not convinced on certain techno-legal point and therefore decided to obtain legal opinion from the Advocate. As per the conclusion of legal opinion, the final report submitted by the Committee has no merit as it is not prepared based on the justified ground to accept by the Commission. Further, as per the opinion of the Advocate, the Commission may proceed to determine the rates of Rice husk as per the available documents on record by adopting legal process as per rules. Copy all the reports and legal opinions as stated above is available in the Commission's office.

- 10.** The Commission has noted that Hon'ble Central Commission has amended (first amendment in 2014) its Central Electricity Regulatory Commission (Terms and conditions for tariff determination from renewable energy sources) Regulations, 2012 and various operating parameters such as calorific value of the biomass, station hear rate etc. has been modified in line with the study report. However the Commission was not inclined to amend its parameters as specified in the RE Tariff Regulations 2012.
- 11.** From the above analysis, it is clear that the Committee so constituted to study and recommend biomass fuel price has recommended the rates of biomass for the FY 2016-17 as Rs. 3210.00 per ton. In this context, it would not be inappropriate to ignore the opinion of one of the member of the Committee who has not signed the report and forwarded his opinion to this Commission, wherein, it is indicated that the detailed report of the Committee recommending losses on account moisture and decay, transportation and ingress of mud and additional transportation @ Rs. 600/- per ton is not supported with any valid reason.
- 12.** Therefore, we are left with no other option to consider another alternative in **line with the Hon'ble CERC order dated 30.03.2016** in the matter of **"Determination of levellised generic tariff** for FY 2016-17 under **regulation 8 of the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012.**

Hon'ble CERC in its order dated 30.03.2016 at clause 59 (determination of fuel cost) has described as under:-

"59. The Commission, in terms of Regulation 44 of the RE Tariff Regulations, has specified the biomass fuel price applicable during the period 2012-13 and has specified fuel price indexation mechanism, in case developer wishes to opt, for the remaining years of the control period. The data for Pd and WPI, as per regulations, latest figures for April, 2015 and April, 2014 corresponding to nth and (n-1)th year has been considered while calculating the fuel price indexation for biomass and also non-fossil fuel based co-generation power projects. The detailed computations of the fuel price indexation mechanism and the determination of the biomass fuel prices for FY 2016-17 thereof, has been enclosed as Appendix-7 to this order. Accordingly, the biomass fuel price applicable for FY 2016-17 is as under:

State	Biomass price (Rs./tonne)
Andhra Pradesh	2807.74
Haryana	3195.86
Maharashtra	3268.62
Punjab	3342.60
Rajasthan	2789.54
Tamil Nadu	2761.64
Uttar Pradesh	2856.25
Other States	3003.01

The biomass fuel price for the last 4 years i.e. FY 2012-13 to FY 2015-16 has been determined by this Commission as per clauses 45.1 and 45.2 of the CSERC (Terms and conditions for determination of generation tariff and related matters for electricity generated by plants based on renewable energy sources) Regulations, 2012, which are as under:-

"45. Fuel Cost

45.1 Biomass fuel price shall be 2476 Rs/MT during first year of the control period (i.e., FY 2012-13) and thereafter shall be linked to indexation mechanism as specified under Regulation 45.2 and 45.3.

45.2 In case of (existing and new) biomass power projects, the indexing mechanism specified in this Regulation for adjustment of fuel prices for each year of operation, will be applicable for determination of applicable variable charge component of tariff:"

Accordingly, the biomass fuel prices as determined are as under:-

Sr.	Year	Biomass fuel price (in Rs. /ton)
1.	2012-13	2476.00
2.	2013-14	2653.07
3.	2014-15	2942.54
4.	2015-16	3144.00

The Hon'ble CERC has determined the rate of biomass fuel price for the year 2016-17 as Rs. 3003.01/- per MT for Chhattisgarh State.

13. In the light of the discussion made in the preceding paragraphs and keeping in view the delay in determining biomass fuel price for FY 2016-17, the generic levellised tariffs of the biomass based power projects achieving COD during the financial year 2016-17 have been determined as under.

RE Projects	Levelling Total Tariff, Rs/kWh
Biomass projects (85:15) - Fixed Cost	2.70
Biomass projects (85:15) - Variable Cost for FY 2016-17	4.04
Biomass projects (75:25) or any other- Variable Cost for FY 2016-17	4.00

The detailed computations for the generic tariff for biomass based plants have been enclosed to this Order as per the details given hereunder;

RE Projects	Annexure
Biomass projects (85:15) -	Annexure: 1A
Biomass projects (75:25) or any other-	Annexure: 1B

Above generic levellised tariff has been determined for the biomass based projects (considering entire useful life and levellisation of tariff for the entire useful life), which are achieving COD during the FY 2016-17 having long term PPA for useful life with distribution companies in the State. Tariff period of 12 years shall be considered from the COD of the renewable energy generating stations.

14. We order accordingly.

(Arun Kumar Sharma)
MEMBER

(Narayan Singh)
CHAIRMAN

Parameters for determination of tariff for Biomass plants					
S No	Assumption Head	Sub-head	Sub-head 2	Unit	Values
1	Power generation	Capacity	Installed Capacity	MW	1
			Capacity Utilisation Factor	%	80%
			Auxiliary consumption	%	10%
			Useful Life	Years	20
			Gross Generation	MU	7.008
			Auxiliary consumption	MU	0.7008
			Net generation	MU	6.3072
2	Project cost	Capital cost/MW		Rs Cr/MW	6.108
		Power Plant Cost		Rs. Cr	6.108
3	Financial parameters	Debt/equity	Tariff period	Year	5
			Debt	%	70%
			Equity	%	30%
			Total debt amount	Rs Cr.	4.2756
			Total equity amount	Rs Cr.	1.8324
		Debt component	Loan amount	Rs Cr	4.2756
			Repayment Period	Year	12
			Interest rate	%	12.70%
		Equity component	Equity Amount	Rs Cr	1.8324
			RoE for first 10 years	%	20.00%
			RoE Period	Year	10
			Post Tax RoE for first 10 years	%	16%
			RoE for 11th year onwards	%	24.00%
			Discount Rate	%	10.59%
		Fiscal assumptions	Income Tax	%	33.99%
MAT Rate (first 10 years)	%		21.34%		
Depreciation	Depreciation rate for first 12 years	%	5.83%		
	Depreciation rate 13 year onwards	%	2.51%		
	Years for 5.83% rate	Year	12		
4	Operation and maintenance	O & M expenses	O & M expenses	Rs Cr/MW	0.2998
			Escalation factor	%	5.72%
5	Working Capital		O & M expenses	Month	1
			Maintenance Spare @ % of O & M expenses	%	15%
			Biomass Stock	Months	4
			Receivable	Months	2
			Interest on WC	%	13.20%
6	Fuel related assumptions	Fuel Mix: 85:15	Heat rate	KCal/kWh	4000
			Calorific value of biomass	KCal/kg	3300
			Base price of biomass	Rs/MT	3003.01
			Biomass price escalation factor	%	5%

Determination of tariff for Biomass plants

Particulars	Year	1	2	3	4	5	6	7	8	9	10
Installed Capacity	MW	1	1	1	1	1	1	1	1	1	1
Net Power Generation	MU	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31
Variable Cost	Rs Lakh	255.09	267.85	281.24	295.30	310.07	325.57	341.85	358.94	376.89	395.73
Fixed Cost	Year	1	2	3	4	5	6	7	8	9	10
O & M expenses	Rs Lakh	29.98	31.69	33.51	35.42	37.45	39.59	41.86	44.25	46.78	49.46
Depreciation	Rs Lakh	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61
Interest on term loan	Rs Lakh	52.04	47.51	42.99	38.46	33.94	29.41	24.89	20.36	15.84	11.31
Interest on Working Capital	Rs Lakh	21.57	22.41	23.31	24.26	25.26	26.31	27.43	28.61	29.85	31.16
Return on Equity	Rs Lakh	36.65	36.65	36.65	36.65	36.65	36.65	36.65	36.65	36.65	36.65
Total Fixed Cost	Rs Lakh	175.84	173.88	172.06	170.40	168.90	167.58	166.43	165.48	164.73	164.19
Tariff	Rs/kWh	2.79	2.76	2.73	2.70	2.68	2.66	2.64	2.62	2.61	2.60

O & M expenses	Rs/kWh	0.48	0.50	0.53	0.56	0.59	0.63	0.66	0.70	0.74	0.78
Depreciation	Rs/kWh	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Interest on term loan	Rs/kWh	0.83	0.75	0.68	0.61	0.54	0.47	0.39	0.32	0.25	0.18
Interest on Working Capital	Rs/kWh	0.34	0.36	0.37	0.38	0.40	0.42	0.43	0.45	0.47	0.49
Return on Equity	Rs/kWh	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Total Fixed Cost	Rs/kWh	2.79	2.76	2.73	2.70	2.68	2.66	2.64	2.62	2.61	2.60
Variable COG	Rs/kWh	4.04	4.25	4.46	4.68	4.92	5.16	5.42	5.69	5.98	6.27
Discount Factor		1	0.904	0.818	0.739	0.669	0.605	0.547	0.494	0.447	0.404
Levelled Tariff	Rs/kWh	2.70									

Determination of tariff for Biomass plants

Particulars	Year	11	12	13	14	15	16	17	18	19	20
Installed Capacity	MW	1	1	1	1	1	1	1	1	1	1
Net Power Generation	MMU	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31
Variable Cost	Rs Lakh	415.52	436.29	458.11	481.01	505.06	530.32	556.83	584.68	613.91	644.60
Fixed Cost	Year	11	12	13	14	15	16	17	18	19	20
O & M expenses	Rs Lakh	52.29	55.28	58.44	61.78	65.32	69.05	73.00	77.18	81.59	86.26
Depreciation	Rs Lakh	35.61	35.61	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30
Interest on term loan	Rs Lakh	6.79	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on Working Capital	Rs Lakh	32.70	34.16	35.29	37.01	38.82	40.72	42.71	44.81	47.02	49.33
Return on Equity	Rs Lakh	43.98	43.98	43.98	43.98	43.98	43.98	43.98	43.98	43.98	43.98
Total Fixed Cost	Rs Lakh	171.37	171.29	153.01	158.07	163.41	169.05	175.00	181.27	187.89	194.87
Tariff	Rs/kWh	2.72	2.72	2.43	2.51	2.59	2.68	2.77	2.87	2.98	3.09
O & M expenses	Rs/kWh	0.83	0.88	0.93	0.98	1.04	1.09	1.16	1.22	1.29	1.37
Depreciation	Rs/kWh	0.56	0.56	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Interest on term loan	Rs/kWh	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on Working Capital	Rs/kWh	0.52	0.54	0.56	0.59	0.62	0.65	0.68	0.71	0.75	0.78
Return on Equity	Rs/kWh	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Total Fixed Cost	Rs/kWh	2.72	2.72	2.43	2.51	2.59	2.68	2.77	2.87	2.98	3.09
Variable COG	Rs/kWh	6.59	6.92	7.26	7.63	8.01	8.41	8.83	9.27	9.73	10.22
Discount Factor		0.366	0.331	0.299	0.270	0.244	0.221	0.200	0.181	0.163	0.148
Levelling Tariff	Rs/kWh										

Parameters for determination of tariff for Biomass plants					
S No	Assumption Head	Sub-head	Sub-head 2	Unit	Values
1	Power generation	Capacity	Installed Capacity	MW	1
			Capacity Utilisation Factor	%	80%
			Auxiliary consumption	%	10%
			Useful Life	Years	20
			Gross Generation	MU	7.008
			Auxiliary consumption	MU	0.7008
			Net generation	MU	6.3072
2	Project cost	Capital cost/MW		Rs Cr/MW	6.108
		Power Plant Cost		Rs. Cr	6.108
3	Financial parameters	Debt/equity	Tariff period	Year	5
			Debt	%	70%
			Equity	%	30%
			Total debt amount	Rs Cr.	4.2756
			Total equity amount	Rs Cr.	1.8324
		Debt component	Loan amount	Rs Cr	4.2756
			Repayment Period	Year	12
			Interest rate	%	12.70%
		Equity component	Equity Amount	Rs Cr	1.8324
			RoE for first 10 years	%	20.00%
			RoE Period	Year	10
			Post Tax RoE for first 10 years	%	16%
			RoE for 11th year onwards	%	24.00%
			Discount Rate	%	10.59%
		Fiscal assumptions	Income Tax	%	33.99%
			MAT Rate (first 10 years)	%	21.34%
Depreciation	Depreciation rate for first 12 years	%	5.83%		
	Depreciation rate 13 year onwards	%	2.51%		
	Years for 5.83% rate	Year	12		
4	Operation and maintenance	O & M expenses	O & M expenses	Rs Cr/MW	0.2998
			Escalation factor	%	5.72%
5	Working Capital		O & M expenses	Month	1
			Maintenance Spare @ % of O & M expenses	%	15%
			Biomass Stock	Months	4
			Receivable	Months	2
			Interest on WC	%	13.20%
6	Fuel related assumptions	Fuel Mix: 75:25	Heat rate	KCal/kWh	4000
			Calorific value of biomass	KCal/kg	3338
			Base price of biomass	Rs/MT	3003.01
			Biomass price escalation factor	%	5%

Determination of tariff for Biomass plants

Particulars	Year	1	2	3	4	5	6	7	8	9	10	
Installed Capacity	MW	1	1	1	1	1	1	1	1	1	1	
Net Power Generation	MU	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	
Variable Cost	Rs Lakh	252.19	264.80	278.04	291.94	306.54	321.86	337.96	354.85	372.60	391.23	
Fixed Cost	Year	1	2	3	4	5	6	7	8	9	10	
O & M expenses	Rs Lakh	29.98	31.69	33.51	35.42	37.45	39.59	41.86	44.25	46.78	49.46	
Depreciation	Rs Lakh	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	35.61	
Interest on term loan	Rs Lakh	52.04	47.51	42.99	38.46	33.94	29.41	24.89	20.36	15.84	11.31	
Interest on Working Capital	Rs Lakh	21.37	22.21	23.10	24.03	25.02	26.07	27.17	28.33	29.56	30.86	
Return on Equity	Rs Lakh	36.65	36.65	36.65	36.65	36.65	36.65	36.65	36.65	36.65	36.65	
Total Fixed Cost	Rs Lakh	175.65	173.67	171.85	170.18	168.67	167.33	166.17	165.20	164.44	163.88	
Tariff	Rs/kWh	2.78	2.75	2.72	2.70	2.67	2.65	2.63	2.62	2.61	2.60	
O & M expenses	Rs/kWh	0.48	0.50	0.53	0.56	0.59	0.63	0.66	0.70	0.74	0.78	
Depreciation	Rs/kWh	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	
Interest on term loan	Rs/kWh	0.83	0.75	0.68	0.61	0.54	0.47	0.39	0.32	0.25	0.18	
Interest on Working Capital	Rs/kWh	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.45	0.47	0.49	
Return on Equity	Rs/kWh	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	
Total Fixed Cost	Rs/kWh	2.78	2.75	2.72	2.70	2.67	2.65	2.63	2.62	2.61	2.60	
Variable COG	Rs/kWh	4.00	4.20	4.41	4.63	4.86	5.10	5.36	5.63	5.91	6.20	
Discount Factor		1	0.904	0.818	0.739	0.669	0.605	0.547	0.494	0.447	0.404	
Levelling Tariff	Rs/kWh	2.69										

Determination of tariff for Biomass plants

Particulars	Year	11	12	13	14	15	16	17	18	19	20
Installed Capacity	MW	1	1	1	1	1	1	1	1	1	1
Net Power Generation	MU	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31
Variable Cost	Rs Lakh	410.79	431.33	452.89	475.54	499.32	524.28	550.49	578.02	606.92	637.27
Fixed Cost	Year	11	12	13	14	15	16	17	18	19	20
O & M expenses	Rs Lakh	52.29	55.28	58.44	61.78	65.32	69.05	73.00	77.18	81.59	86.26
Depreciation	Rs Lakh	35.61	35.61	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30
Interest on term loan	Rs Lakh	6.79	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on Working Capital	Rs Lakh	32.39	33.83	34.94	36.64	38.43	40.31	42.29	44.36	46.55	48.84
Return on Equity	Rs Lakh	43.98	43.98	43.98	43.98	43.98	43.98	43.98	43.98	43.98	43.98
Total Fixed Cost	Rs Lakh	171.05	170.96	152.66	157.70	163.03	168.64	174.57	180.82	187.42	194.38
Tariff	Rs/kWh	2.71	2.71	2.42	2.50	2.58	2.67	2.77	2.87	2.97	3.08

O & M expenses	Rs/kWh	0.83	0.88	0.93	0.98	1.04	1.09	1.16	1.22	1.29	1.37
Depreciation	Rs/kWh	0.56	0.56	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Interest on term loan	Rs/kWh	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on Working Capital	Rs/kWh	0.51	0.54	0.55	0.58	0.61	0.64	0.67	0.70	0.74	0.77
Return on Equity	Rs/kWh	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Total Fixed Cost	Rs/kWh	2.71	2.71	2.42	2.50	2.58	2.67	2.77	2.87	2.97	3.08
Variable COG	Rs/kWh	6.51	6.84	7.18	7.54	7.92	8.31	8.73	9.16	9.62	10.10
Discount Factor		0.366	0.331	0.299	0.270	0.244	0.221	0.200	0.181	0.163	0.148
Levelled Tariff	Rs/kWh										