

RAJASTHAN ELECTRICITY REGULATORY COMMISSION, JAIPUR

In the matter of determination of generic tariff for sale of electricity to Distribution Licensee from Biomass, Biogas and Biomass Gasifier based power plants getting commissioned in the State during FY 2016-17 and revised variable charges of the Biomass power plants commissioned during the period 2009-2015 and during FY 2015-16.

Coram:

1. Shri Vishvanath Hiremath, Chairman
2. Shri Vinod Pandya, Member
3. Shri Raghuvendra Singh, Member

Date of Order:

23.08.2016

ORDER

1. The RERC (Terms and Conditions for Determination of Tariff for Renewable Energy Sources – Biomass, Biogas and Biomass Gasifier Energy) Regulations, 2015 (hereinafter called as the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015) provide for terms and conditions for determination of tariff for Biomass, Biogas and Biomass Gasifier based power projects to be commissioned during the control period of FY 2015-16 to FY 2018-19.
2. As per Regulation 7 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the Commission may initiate process for determination of generic tariff for Biomass, Biogas and Biomass Gasifier based power plants on Suo-Motu basis. The Commission, through this order determines the generic tariff for Biomass, Biogas and Biomass Gasifier based power plants getting commissioned during FY 2016-17 on Suo-Motu basis. Further, in terms of Regulation 28 of the said Regulations, the Commission also determines the variable charges applicable to Biomass power plants commissioned during the previous control period 2009-15 and during FY 2015-16.

3. Commission, based on the benchmark Capital Cost and other performance parameters contained in the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, had prepared a draft order in the matter of determination of tariff for the Biomass, Biogas and Biomass Gasifier based power plants getting commissioned during FY 2016-17 and revised variable charges of the Biomass power plants commissioned during the period 2009-15 and during FY 2015-16 in the State for inviting comments/suggestions from the stakeholders.
4. Public notices were issued in the following newspapers on the dates mentioned against each, inviting comments/suggestions from the Stakeholders on the draft tariff order circulated:

Dainik Bhaskar	:	16.06.2016
Rasthradoot	:	16.06.2016
The Times of India (Jaipur Edition)	:	17.06.2016

Public notices alongwith draft tariff order were also placed on the Commission's website.
5. The last date of submission of comments/suggestions by the Stakeholders/Public was 05.07.2016. The Commission has received comments/suggestions from M/s Sathyam Green Power Private Limited only.
6. The Stakeholder has submitted comments/ suggestions relating to normative parameters such as working capital requirement and GCV. However, these are beyond the scope of the present proceedings as tariff determined in this order is based on the Regulations which are in force.
7. In addition to the above, the Stakeholder has also submitted comments/suggestions with respect to fuel cost and feed stock cost. The Stakeholder has submitted that the State Level Committee has

decided the fuel price for FY 2015-16 on lower side, i.e., ₹ 2743/MT against ₹ 2984/MT suggested by the Fuel Study Report. The Commission observes that in terms of Regulation 28 of the RERC RE – Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the Committee has recommended the Biomass Fuel price applicable for FY 2015-16 based on the “Biomass Fuel Supply Study”. Commission has given due consideration to the recommendations of the State Level Committee and considering them reasonable, specified Biomass fuel price as ₹ 2743/MT for FY 2015-16 for Biomass Power Plants in terms of order dated 09.09.2015. Further, in terms of above, Commission has also specified fuel cost of ₹ 2875/MT for FY 2016-17. The Biomass fuel price has been determined as per the provisions of Regulations in respect of biomass fuel price. In view of the above, the suggestion is not accepted in the present proceedings.

8. The present regulatory exercise is limited to determination of generic tariff for Biomass, Biogas and Biomass Gasifier based power plants getting commissioned during FY 2016-17 and revised variable charges of the Biomass power plants commissioned during the period 2009-2015 and during FY 2015-16 based on the parameters contained in the RERC RE Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015. Therefore, Commission proceeds to determine the tariff in terms of the parameters provided in the RERC RE Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 on Suo-Motu basis and duly taking note of the suggestions/comments made by the Stakeholder on the draft order circulated.

Levelling generic tariff for Biomass, Biogas and Biomass Gasifier based power plants getting commissioned during FY 2016-17:

9. The levelling generic tariff for Biomass, Biogas and Biomass Gasifier based power plants getting commissioned during FY 2016-17 has been worked out based on financial principles, operational and

performance parameters as specified under the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015. The parameters adopted in this order have been discussed in the following paras:

Useful Life

10. Regulation 2(24) of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 defines 'useful life' for Biomass, Biogas and Biomass Gasifier power plants as 20 years. Accordingly, useful life has been considered as 20 years for these power plants for determination of their respective generic levelled tariff.

Tariff Period

11. The RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 at Regulation 6 specify that the tariff determined for the Biomass, Biogas and Biomass Gasifier based power plants getting commissioned during the control period shall continue to be applicable for entire duration of the tariff period as stipulated under Regulation 5 of the Regulations, which is 20 years for these power plants.

Tariff Structure, Tariff Design and Levelled Tariff

12. As per regulation 8 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the tariff for Biomass, Biogas and Biomass Gasifier based power plants shall be a two part tariff consisting of fixed cost component and fuel cost component. The fixed cost component shall have the following components:
 - (a) Operation and Maintenance (O&M) Expenses;
 - (b) Depreciation;
 - (c) Interest on loan capital;
 - (d) Interest on Working Capital; and
 - (e) Return on Equity.

13. As per Regulation 9 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the fixed cost component of generic tariff for Biomass, Biogas and Biomass Gasifier based power plants shall be determined on levelled basis for the tariff period. For this purpose the discount factor equivalent to post tax weighted average cost of capital (WACC) is to be considered. Accordingly, the discount factor has been computed as 10.78% and has been considered in tariff determination. The calculations for the discount factor are available at **Annexure - I.**

Capital Cost

Capital Cost of Biomass Power Plants for FY 2016-17

14. Regulation 22 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 provides for normative capital cost for Biomass based power plants with water cooled and air cooled condensers as ₹ 540 Lakh/MW and ₹ 575 Lakh/MW respectively for FY 2015-16. These normative capital costs also included ₹ 15 Lakh/MW towards transmission system and ₹ 2 Lakh/MW as connectivity charges payable to Transmission Licensee or Distribution Licensee as the case may be.
15. The Regulation 22(3) further provides for a capital cost indexation mechanism outlined at Annexure-II of the said Regulations for determining the tariffs for the plants commissioned for each subsequent year during the control period. In accordance with this, the Commission determines normative capital cost of Biomass power plants at ₹ 540.79 Lakh/MW and Rs 575.85 Lakh/MW with water cooled and air cooled condenser respectively for FY 2016-17. Above capital costs are inclusive of cost of transmission system upto the interconnection point, which also includes ₹ 2 Lakh/MW for grid connectivity charges payable to the Transmission Licensee or Distribution Licensee as the case may be. The detailed computations of

the capital cost indexation mechanism and determination of the capital cost for FY 2016-17 thereof, are available at **Annexure-II**.

Capital Cost of Biogas Power Plants for FY 2016-17

16. Regulation 32(2) of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 provides for the normative capital cost for Biogas power plants as ₹ 1183.62 Lakh/MW for the FY 2015-16 and after taking into account the capital subsidy of ₹ 300 Lakh/MW, net capital cost has been specified as ₹ 883.62 Lakh/MW. The said normative capital cost includes ₹ 15 Lakh/MW towards transmission system and ₹ 2 Lakh/MW as connectivity charges payable to the Transmission Licensee or Distribution Licensee as the case may be.

17. The Regulation 32(3) of the said Regulations further provides for capital cost indexation mechanism outlined at Annexure-II of the said Regulations for determining the tariffs for the plants commissioned for each subsequent year during the control period. In accordance with this, the Commission determines normative capital cost of Biogas power plants at ₹ 1185.36 Lakh/MW for FY 2016-17, inclusive of cost of transmission system upto the interconnection point, which also includes ₹ 2 Lakh/MW for grid connectivity charges payable to Transmission Licensee or Distribution Licensee as the case may be . After taking into account the capital subsidy of ₹ 300 Lakh/MW, net capital cost works out to ₹ 885.36 Lakh/MW for FY 2016-17. The detailed computations of the capital cost indexation mechanism and determination of the capital cost for FY 2016-17 thereof, are available at **Annexure-III**.

Capital Cost of Biomass Gasifier based Power Plants for FY 2016-17

18. RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 at Regulation 39(2) provide for the normative capital cost for Biomass Gasifier based power plants as ₹ 607.24 Lakh/MW for the FY 2015-16 and after taking into account capital subsidy of ₹ 150 Lakh/MW, net

capital cost has been specified as ₹ 457.24 Lakh/MW inclusive of ₹ 15 Lakh/MW towards transmission system, which also includes ₹ 2 Lakh/MW as connectivity charges payable to Transmission Licensee or Distribution Licensee as the case may be.

19. The Regulation 22(3) of the said Regulations further provides for capital cost indexation mechanism outlined at Annexure-II of the Regulations for determining the tariffs for the plants commissioned for each subsequent year during the control period. In accordance with this, the Commission determines normative capital cost of Biomass Gasifier based power plants at ₹ 608.13 Lakh/MW for FY 2016-17, inclusive of cost of transmission system upto the interconnection point, which also includes ₹ 2 Lakh/MW for grid connectivity charges payable to Transmission Licensee or Distribution Licensee as the case may be for FY 2016-17. After taking into account the capital subsidy of ₹ 150 Lakh/MW payment by MNRE, the net capital cost works out as ₹ 458.13 Lakh/MW. The detailed computations of the Capital Cost indexation mechanism and determination of the capital cost for FY 2016-17 thereof, are available at **Annexure-IV**.
20. The capital cost specified for second year (i.e., FY 2016-17) of the control period in respect of Biomass, Biogas and Biomass Gasifier based power plants is summarised as under:

Table-1 : Capital Cost for FY 2016-17

S. No.	Particulars	Capital Cost Norm for FY 2016-17 (₹ Lakh/MW)
1.	Biomass Power Plants	
	(a) Water Cooled Condenser	540.79
	(b) Air Cooled Condenser	575.85
2.	Biogas based power plants	885.36
3.	Biomass Gasifier based power plants	458.13

Debt-Equity Ratio

21. The Debt-Equity ratio of 70:30, as specified at Regulation 12 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, has been taken for working out the debt and equity components of normative capital cost for determination of levelised fixed component of the tariff.

Return on Equity

22. Regulation 15 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 provides for a rate of Return on Equity (RoE) as 16% on the equity base of 30% determined in accordance with Regulation 12 of said Regulations. As per Regulation 15 of the said Regulations, Return on Equity has been computed by grossing up the base rate of 16% with tax rate equivalent to Minimum Alternate Tax (MAT) for first 10 years from COD and normal tax rate for remaining years of the project life. In line with the practice followed during the previous control period, the MAT rate of 20.39% (= 18.50% MAT rate+7% surcharge + 3% education cess) has been considered for first year and a MAT rate of 19.06% (= 18.5% MAT rate + 3% education cess) has been considered for remaining 9 years of the first 10 years. For remaining 10 years of useful life of the project, the normal tax rate of 30.90% (= 30% tax rate + 3% education cess) has been applied for grossing up of the base rate of RoE.

Operation & Maintenance (O&M) Expenses

23. Regulations 27(1), 36(1) and 43(1) of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 stipulate normative O&M expenses for FY 2015-16 for Biomass, Biogas and Biomass Gasifier based power plants respectively.

24. The normative O&M Expenses for the FY 2015-16 have been escalated at the rate of 5.85% per annum for determination of the O&M Expenses for FY 2016-17 as under:

Table-2 : O&M Expenses for FY 2016-17

S. No.	Particulars	O&M Expenses (₹ Lakh/MW)
1.	Biomass Power Plants	
	(a) Water Cooled Condenser	37.72
	(b) Air Cooled Condenser	40.223
2.	Biogas based power plants	50.035
3.	Biomass Gasifier based power plants	50.035

25. Further, as per Regulation 17(2) of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the specified O&M expenses arrived at as above for FY 2016-17 for Biomass, Biogas and Biomass Gasifier based power plants have been escalated by 5.85% per annum over their respective tariff period for determination of levelised fixed cost component of generic tariff.

Interest Rate on Long Term Loan and Interest on Working Capital Requirement

26. Regulation 13 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 specifies the interest rate on long term loans for Biomass based power plants as 300 basis points higher than the average SBI base rate prevalent during first six months of the year previous to the relevant year.
27. Accordingly, the average SBI base rate prevalent during first six months of the FY 2014-15 has been considered for computation of applicable interest rate as shown in the table below:

Table-3: Average SBI base rate during first six months of FY 2015-16

Period from	Period to	Base rate	No. of days
01.04.2015	09.04.2015	10.00%	9
10.04.2015	07.06.2015	9.85%	59
08.06.2015	30.09.2015	9.70%	115
Average SBI Base Rate		9.76%	183

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

28. In terms of the above, the interest rate of 12.76% (=9.76%+3.00%) has been used for computation of interest on long term loan in generic tariff computations, treating loan as 70% of the capital cost.
29. Further, the repayment of loan has been taken equal to the depreciation allowed for that year as stipulated at regulation 13(2)(c) of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015.
30. Regulation 16 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, specifies the interest rate on working capital for Biomass based plants as 250 basis points higher than the average SBI base rate prevalent during first six months of previous year, which works out to be 12.26% (=9.76%+2.50%). Accordingly, a rate of 12.26% has been taken as interest rate on working capital requirement.
31. For the purpose of working capital requirement for Biomass, Biogas and Biomass Gasifier based power plants, the composition of working capital has been taken as per Regulation 16 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015. Further, as specified at Regulation 9 of the said Regulations for the purpose of computing interest on working capital requirement component of the fixed cost of the tariff, a fuel price escalation factor of 5% has been considered over their respective useful life.

Depreciation

32. In accordance with Regulation 14 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the rate of depreciation has been considered as 5.83% of the total project cost for the first 12 years and remaining depreciable value has been spread over the balance useful life of the power project.

Plant Load Factor

33. Regulation 23, 33 and 40 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, specify the norms for plant load factor (PLF) for Biomass, Biogas and Biomass Gasifier based power plants respectively as per the details given below and which have been considered for determination of fixed charge component of the tariff.

Table 4 : Plant Load Factor for FY 2016-17

S. No.	Particulars	PLF (%)
1.	Biomass Power Plants	
	(a) During Stabilisation (6 Months)	60%
	(b) During remaining period of first year after stabilisation	70%
	(c) From second year onwards	75%
2.	Biogas based power plants	85%
3.	Biomass Gasifier based power plants	85%

Auxiliary Consumption Factor

34. Regulation 24, 34 and 41 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, provide for the norms of auxiliary consumption factor as under, which have been considered for determination of tariff:

Table-5: Auxiliary Consumption Factor for FY 2016-17

S. No.	Particulars	Auxiliary Consumption Factor (%)
1.	Biomass Power Plants	
	(a) Project using water cooled condenser	(i) During stabilisation (6 Months) : 10.5%
		(ii) After stabilisation : 10.00%
	(b) Project using air cooled condenser	(i) During stabilisation (6 Months) : 12.5%
(ii) After stabilisation : 12.00%		
2.	Biogas based power plants	12%
3.	Biomass Gasifier based power plants	10%

Station Heat Rate for Biomass Power Plants

35. In accordance with Regulation 25 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the Station Heat Rate (SHR) for Biomass based power plants has been taken as under:

Table-6: Station Heat Rate for FY 2016-17

Particulars	Water cooled condenser	Air cooled condenser
Station Heat Rate	4300 kCal/kWh (during stabilisation)	4540 kCal/kWh (during stabilisation)
	4200 kCal/kWh (after stabilisation)	4440 kCal/kWh (after stabilisation)

Gross Calorific Value for Biomass Power Plants

36. As stipulated at Regulation 26 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the Gross Calorific Value has been taken as 3400 kCal/kg for Biomass based power plants.

Specific Fuel Consumption for Biogas and Biomass Gasifier based Power Plants

37. Regulation 35 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 provides for specific fuel consumption of 3 kg of substrate mix per kWh for Biogas based power plants. Accordingly, a specific fuel consumption of 3 kg/kWh has been considered for computation of generic levelled tariff of Biogas power plants.

38. Regulation 42 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 provides for specific fuel consumption of 1.25 kg/kWh for Biomass Gasifier based power plants. Accordingly, a specific fuel consumption of 1.25 kg/kWh has been considered for computation of generic levelled tariff for Biomass Gasifier based power plants.

Fuel Cost and Feed Stock Cost

39. In terms of Regulation 28 of the RERC RE – Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, and in terms of order dated 09.09.2015, the Commission has specified Biomass fuel price as ₹ 2743/MT for FY 2015-16 for Biomass Power Plants. Further, in terms of above, Commission has also specified fuel cost of ₹ 2875/MT for FY 2016-17 based on recommendations of State Level Committee. Alternatively, the provisions of the Regulation 28 of the said Regulations also provide

for a fuel price indexation mechanism outlined at Annexure-III of the said Regulations for adjustment of fuel prices for subsequent years of the control period in case developer wishes to opt for the same. For indexation in fuel price, the data for Pd and WPI, the latest figures for April, 2015 and April, 2014 corresponding to nth and (n-1)th year have been considered. Accordingly, the Biomass fuel price applicable for FY 2016-17 as per indexation works out as ₹ 2613.39/MT. The detailed computations of the fuel price indexation mechanism and determination of Biomass fuel price for FY 2016-17 thereof have been enclosed as **Annexure-V**.

40. The Commission, in terms of Regulation 44 of the RERC RE – Biomass, Biogas and Biomass Gasifier based power plant Regulations, 2015 and in terms of order dated 09.09.2015, has specified biomass fuel price as ₹ 2875 /MT for Biomass Gasifier based power plants for FY 2016-17. Further, alternatively as per fuel price indexation mechanism outlined at Annexure-III of the said Regulations, the Biomass fuel price for such plants for FY 2016-17 works out to be ₹ 2613.39 /MT. The detailed computations are enclosed as **Annexure-V**.
41. In terms of Regulation 37 of the RERC RE – Biomass, Biogas and Biomass Gasifier based power plant Regulations, 2015, the Commission has specified the feed stock price during first year of the control period (i.e. FY 2015-16) as ₹ 1265/MT (net of any cost recovery from digester effluent) and has specified fuel price indexation mechanism for the biogas developer for the subsequent years of the control period. The price of fuel applicable for biogas based power plant for FY 2016-17 shall be ₹ 1209.04 /MT (net of any cost recovery from digester effluent). The detailed computations of the fuel price indexation mechanism and the determination of biogas fuel price for FY 2016-17, thereof, has been enclosed as **Annexure-V** of this order.

Subsidy or Incentive by the Central Government, including Accelerated Depreciation (AD) Benefit

42. The Generation Based Incentive/Tariff Subsidy, if any, allowed by the Central/ State Govt. would be governed by the terms and conditions of such scheme.
43. As regards impact of accelerated depreciation admissible to Biomass and Biogas based power projects, in addition to the allowed 80% depreciation, an additional depreciation of 20% is permitted to the new assets acquired by power generating companies in the initial year vide amendment in Section 32, sub-section(1) clause (iia) of the Income Tax Act, 1961. This has also been taken into account.
44. Accordingly, considering the capital cost of the Biomass and Biogas based projects getting commissioned during FY 2016-17, as capitalized during second half of the year (i.e., put to use for less than 180 days), an additional depreciation of 10% has been taken in the first year and balance 10% additional depreciation has been taken in the subsequent year.
45. In the generic tariff computations of this order in respect of incidence of depreciation, the capitalization has been taken during the second half of the first year and the energy available in the second half of the year has been taken as 50% of annual generation, which is also in consonance with the methodology followed by CERC for working out the benefit of accelerated depreciation.
46. For the purpose of computing accelerated depreciation (AD) benefit, the differential depreciation rates as per the Regulations (i.e., 5.83% for 12 years and 2.50% for the remaining useful life) have been compared with the depreciation rate as per the Income Tax Act (i.e., 80% of the

written down value). The computations have been given at **Annexure-VI, Annexure-VII, Annexure-VIII and Annexure-IX.**

Tariff Period and Levellised Tariff

47. The fixed cost has been levellised for 20 years and applicable tariff has been determined for the useful life of the Biomass, Biogas and Biomass Gasifier based power projects, i.e., for 20 years considering both the situations, viz., if AD benefit is availed and if not availed. Considering the said position, the PPA would also have to be for a period of 20 years.

Biomass Power Plants

48. In light of the above, the levellised generic tariff for Biomass based power plants to be commissioned during for FY 2016-17 is determined as under:

Table-7: Tariff for Biomass based Power Plants to be commissioned during FY 2016-17 and opting Biomass fuel price determined based on recommendations of the State Level Committee:

FY 2016-17	Water cooled condenser		Air cooled condenser	
	Without availing AD Benefit	With AD benefit availed	Without availing AD Benefit	With AD benefit availed
Fixed charges(₹/kWh) (Levellised for 20 years)	2.83	2.66	3.08	2.89
Variable Charges(₹/kWh)	4.00	4.00	4.32	4.32
Applicable Tariff(₹/kWh)	6.83	6.66	7.40	7.21

Table-8: Tariff for Biomass based Power Plants to be commissioned during FY 2016-17 and opting Biomass fuel price based on indexation mechanism:

FY 2016-17	Water cooled condenser		Air cooled condenser	
	Without availing AD Benefit	With AD benefit availed	Without availing AD Benefit	With AD benefit availed
Fixed charges(₹/kWh) (Levellised for 20 years)	2.80	2.63	3.05	2.86
Variable Charges(₹/kWh)	3.71	3.71	4.01	4.01
Applicable Tariff(₹/kWh)	6.51	6.34	7.06	6.87

Biogas Power Plants

49. The levellised generic tariff for Biogas power plants to be commissioned during for FY 2016-17 is determined as under:

Table-9: Tariff for Biogas based power plants to be commissioned during FY 2016-17:

FY 2016-17	Biogas power plants	
	Without availing AD Benefit	With AD benefit availed
Fixed charges (₹/kWh) (Levellised for 20 years)	3.70	3.44
Variable Charges (₹/kWh)	4.12	4.12
Applicable Tariff (₹/kWh)	7.82	7.56

Biomass Gasifier based Power Plants

50. The levellised generic tariff for Biomass Gasifier based power plants to be commissioned during for FY 2016-17 is determined as under:

Table-10: Tariff for Biomass Gasifier based Power Plants to be commissioned during FY 2016-17:

FY 2016-17	Biomass Gasifier based power plants	
	Without availing AD Benefit	With AD benefit availed
Fixed charges (₹/kWh) (Levellised for 20 years)	2.56	2.43
Variable Charges (₹/kWh)	3.63	3.63
Applicable Tariff (₹/kWh)	6.19	6.06

51. The tariffs mentioned in the above tables, i.e., with or without availing AD benefit, are valid tariffs for purchase of power by distribution licensees from the Biomass, Biogas and Biomass Gasifier based power plants covered under this tariff order.

52. For Biomass, Biogas and Biomass Gasifier based power plants claiming the higher tariff worked out as above for projects not availing AD benefit, Commission considers it appropriate to lay down modalities as under:

(1) The PPA should include an undertaking of the Biomass or Biogas or Biomass Gasifier based power generator that AD benefit would not be availed for the generating plant/unit.

(2) The first bill raised by the Biomass or Biogas or Biomass Gasifier based power generator shall be accompanied by an undertaking

that AD benefit shall not be claimed. Based on this, the applicable tariff would be allowed.

- (3) The claims of energy charges as per applicable tariff may be entertained based on the said undertaking upto the due date of filing of Income Tax Return of the relevant financial year. This would mean 30th September, 2017 for payment for the financial year 2016-17 and for the first six months (upto 30th September) of financial year 2017-18 and so on.
 - (4) After filing of Income Tax Return a certificate from a Chartered Accountant (CA) that AD benefit has not been claimed would have to be submitted or in the alternative a copy of Income Tax Return filed with Income Tax Department wherein AD benefit has not been claimed along with verification of Tax Consultant may be furnished.
 - (5) As Income Tax Return is required to be filed in the next year, the payment of amount corresponding to non-availment of AD benefit in respect of energy supplied in the month of October onwards of the financial year following the financial year of commissioning of the plant would be made only after the said certificate/copy of Income Tax Return is furnished.
 - (6) For the energy supplied in the months of October onwards, the methodology as given in sub-paras (4) & (5) above be followed.
53. The Commission also considers it appropriate that the undertaking of the Biomass, Biogas and Biomass Gasifier based power generator in PPA saying that benefit of AD would not be claimed should also include an undertaking that in case it is found that benefit of AD has been claimed, the distribution licensee shall be entitled to recover the amount wrongly claimed by power generator along with penal charges @ 1.50% per month calculated on daily basis.

54. A Biomass or Biogas or Biomass Gasifier based power generator not availing CDM benefit would need to give an annual undertaking that CDM benefit has not been availed. However, if CDM benefit is availed, it would have to be shared with distribution licensee as envisaged in the applicable Regulations.

Variable Charges for Biomass Power Plants commissioned during FY 2009-15 and FY 2015-16

55. As per the provisions of the Regulation 28 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015, the Biomass fuel price of ₹ 2550/MT (for FY 2015-16) is also applicable in case of Biomass power plants commissioned during the period 2009-15. The variable component of the Tariff has, therefore, been reworked out for FY 2015-16 for such Biomass power plants already commissioned during the year 2009-2015. This fuel price of ₹ 2550/MT shall be subject to revision prospectively and the variable components for such plants would also be revised accordingly.
56. The variable charges for FY 2016-17 of Biomass power projects commissioned earlier during the period, i.e., FY 2009-15 and FY 2015-16, based on the fuel price of ₹ 2875/MT specified by the Commission, shall be ₹ 3.95/kWh and ₹ 4.27/kWh for water cooled and air cooled condensers respectively with fixed charges remaining the same as determined earlier through the respective tariff order(s) for the Biomass based power plants commissioned in the relevant year with other terms and conditions stipulated therein being applicable. For Biomass power plants commissioned during FY 2015-16 and having opted indexation mechanism for Biomass fuel price, the variable charges for FY 2016-17 shall be ₹ 3.66/kWh and ₹ 3.96/kWh for water cooled and air cooled condenser respectively.

57. The above tariff shall be applicable for the Biomass, Biogas and Biomass Gasifier based power plants commissioned on or after

01.04.2016. The variable charges of the Biomass power plants commissioned during previous control period shall be adjusted in terms of charges determined in this order for the intervening period from 01.04.2016 to the date of issuance of this Order. The amount consequential to the adjustment shall be adjusted over three months following the month of issuance of this Order.

58. For supply of energy to distribution licensee under this tariff order, the metering would be at generator premises as provided in the Regulation 49 of the RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015.
59. Commission, in exercise of the powers conferred under Section 62 read with Section 64 of the Electricity Act, 2003 and the RERC RE – Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015 determines tariff for Biomass, Biogas and Biomass Gasifier based power plants as detailed in **Annexure – VI,VII,VIII,IX,X,XI,XII and XIII.**
60. The tariff determined through this Order shall be in force from 1.04.2016 and shall also remain applicable beyond 31.03.2017 as interim for FY 2017-18 till it is replaced by a new Order.
61. Copy of this order may be sent to State Government, Central Electricity Authority (CEA), Rajasthan Renewable Energy Corporation (RREC), Distribution Licensee and Stakeholders whose suggestions/comments have been considered in the present proceedings.
62. The detailed calculations for determination of tariff are annexed as under:

(1)	Computation of Discount Factor considered for FY 2016-17	-	Annexure-I
(2)	Capital Cost Indexation for Biomass based power plants	-	Annexure-II
(3)	Capital Cost Indexation for Biogas based power	-	Annexure-III

	plants		
(4)	Capital Cost Indexation for Biomass Gasifier based power plants	-	Annexure-IV
(5)	Fuel Price Indexation	-	Annexure-V
(6)	Tariff determination of Biomass based power plants with water cooled condenser- fuel price based on State Level Committee	-	Annexure-VI A
(7)	Tariff determination of Biomass based power plants with water cooled condenser- fuel price based on Fuel Price Indexation Mechanism	-	Annexure-VI B
(8)	Tariff determination of Biomass based power plants with air cooled condenser- fuel price based on State Level Committee	-	Annexure-VII A
(9)	Tariff determination of Biomass based power plants with air cooled condenser- fuel price based on Fuel Price Indexation Mechanism	-	Annexure-VII B
(10)	Tariff determination of Biogas based power plants	-	Annexure-VIII
(11)	Tariff determination of Biomass Gasifier based power plants	-	Annexure-IX
(12)	Variable charges for Biomass based power plants with water cooled condenser commissioned during 2009-15 and 2015-16 - fuel price based on State Level Committee	-	Annexure-X
(13)	Variable charges for Biomass based power plants with water cooled condenser commissioned during 2015-16- fuel price based on Fuel Price Indexation Mechanism	-	Annexure-XI
(14)	Variable charges for Biomass based power plants with air cooled condenser commissioned during 2009-15 and 2015-16- fuel price based on State Level Committee	-	Annexure-XII
(15)	Variable charges for Biomass based power plants with air cooled condenser commissioned during 2015-16- fuel price based on Fuel Price Indexation Mechanism	-	Annexure-XIII

(Raghuvendra Singh)
Member

(Vinod Pandya)
Member

(Vishvanath Hiremath)
Chairman

Annexure-I

Computation of Discount Factor for FY 2015-16 as per RERC RE - Biomass, Biogas and Biomass Gasifier Tariff Regulations, 2015:

$$\begin{aligned} \text{DF} &= ((\text{IR} * \text{DC} * (1-\text{IT})) + (\text{ROE} * \text{EC})) \\ &= ((12.76 * 0.70 * (1 - 33.06\%)) + (16 * 0.30)) \\ &= 10.78\% \end{aligned}$$

Where,

DF = Discount Factor,

IR = Interest rate in percentage,

DC = Debt Component,

IT = Income tax rate,

ROE = Return of Equity in percentage,

EC = Equity Component

Capital Cost Indexation for Biomass Power Projects (FY 2016-17)

Indexation Formulation

$$CC_{(n)} = P\&M_{(n)} * [1 + F1 + F2 + F3]$$

$$d_{(n)} = (a * (SI_{(n-1)} / SI_{(0)} - 1) + b * (EI_{(n-1)} / EI_{(0)} - 1)) / (a + b)$$

$$P\&M_{(n)} = P\&M_{(0)} * (1 + d_{(n)})$$

Variable	Description	Value
a	Weightage for Steel Index	0.60
b	Weightage for Electrical Machinery Index	0.40
F1	Factor for land and civil work	0.10
F2	Factor for Erection and Commissioning	0.09
F3	Factor for IDC and Financing	0.14

Month/Year	Electrical Machinery		Steel	
	2015	2011	2015	2011
January	139	137.4	129.4	126.2
February	139	137.8	130.1	126.2
March	138.2	138.4	130.1	126.2
April	137.9	138.4	130.1	135.1
May	137.9	138.6	130.1	129.6
June	138.2	138.6	130.1	130.6
July	138.3	138.8	130.1	130.5
August	138.4	138.4	130.1	130.9
September	138.4	138.6	130.1	130.9
October	138.3	138.7	130.1	130.9
November	138.4	138.7	130.1	130.9
December	138.4	138.6	130.1	128.3
Average	138.37	138.42	130.04	129.69

Parameters	Description	Water Cooled	Air Cooled
CC ₍₀₎ (₹ L/MW)	Capital Cost for the base year	540	575
P&M ₍₀₎ (₹ L/MW)	Plant and Machinery cost for the base year	404.51	430.8271
d _(n)	Capital Cost escalation factor	0.147%	0.147%
P&M _(n) (₹ L/MW)	Plant and Machinery cost for the nth year (FY 2016-17)	405.11	431.46
CC _(n) (₹ L/MW)	Capital Cost for the nth year (FY 2016-17)	540.79	575.85

Source of WPI (Steel and Electrical Machinery): Office of Economic Advisor, Ministry of Commerce and Industry (www.eaindustry.nic.in)

Annexure-III

Capital Cost Indexation for Biogas based Power Projects (FY 2016-17)

Indexation Formulation	
$CC_{(n)}$	$= P\&M_{(n)} * [1 + F1 + F2 + F3]$
$d_{(n)}$	$= (a * (SI_{(n-1)} / SI_{(0)}) - 1) + b * (EI_{(n-1)} / EI_{(0)}) - 1) / (a + b)$
$P\&M_{(n)}$	$= P\&M_{(0)} * (1 + d_{(n)})$

Variable	Description	Value
a	Weightage for Steel Index	0.60
b	Weightage for Electrical Machinery Index	0.40
F1	Factor for land and civil work	0.10
F2	Factor for Erection and Commissioning	0.09
F3	Factor for IDC and Financing	0.14

Month/Year	Electrical Machinery		Steel	
	2015	2011	2015	2011
January	139	137.4	129.4	126.2
February	139	137.8	130.1	126.2
March	138.2	138.4	130.1	126.2
April	137.9	138.4	130.1	135.1
May	137.9	138.6	130.1	129.6
June	138.2	138.6	130.1	130.6
July	138.3	138.8	130.1	130.5
August	138.4	138.4	130.1	130.9
September	138.4	138.6	130.1	130.9
October	138.3	138.7	130.1	130.9
November	138.4	138.7	130.1	130.9
December	138.4	138.6	130.1	128.3
Average	138.37	138.42	130.04	129.69

Parameters	Description	Value
$CC_{(0)}$ (₹ L/MW)	Capital Cost for the base year	1183.62
$P\&M_{(0)}$ (₹ L/MW)	Plant and Machinery cost for the base year	888.44
$d_{(n)}$	Capital Cost escalation factor	0.147%
$P\&M_{(n)}$ (₹ L/MW)	Plant and Machinery cost for the nth year (FY 2016-17)	889.75
$CC_{(n)}$ (₹ L/MW)	Capital Cost for the nth year (FY 2016-17)	1185.36

Source of WPI (Steel and Electrical Machinery): Office of Economic Advisor, Ministry of Commerce and Industry (www.eaindustry.nic.in)

Annexure-IV

Capital Cost Indexation for Biomass Gasifier Power Projects (FY 2016-17)

Indexation Formulation	
$CC_{(n)}$	$= P\&M_{(n)} * [1 + F1 + F2 + F3]$
$d_{(n)}$	$= (a * (SI_{(n-1)} / SI_{(0)}) - 1) + b * (EI_{(n-1)} / EI_{(0)}) - 1) / (a + b)$
$P\&M_{(n)}$	$= P\&M_{(0)} * (1 + d_{(n)})$

Variable	Description	Value
a	Weightage for Steel Index	0.60
b	Weightage for Electrical Machinery Index	0.40
F1	Factor for land and civil work	0.10
F2	Factor for Erection and Commissioning	0.09
F3	Factor for IDC and Financing	0.14

Month/Year	Electrical Machinery		Steel	
	2015	2011	2015	2011
January	139	137.4	129.4	126.2
February	139	137.8	130.1	126.2
March	138.2	138.4	130.1	126.2
April	137.9	138.4	130.1	135.1
May	137.9	138.6	130.1	129.6
June	138.2	138.6	130.1	130.6
July	138.3	138.8	130.1	130.5
August	138.4	138.4	130.1	130.9
September	138.4	138.6	130.1	130.9
October	138.3	138.7	130.1	130.9
November	138.4	138.7	130.1	130.9
December	138.4	138.6	130.1	128.3
Average	138.37	138.42	130.04	129.69

Parameters	Description	Value
$CC_{(0)}$ (₹ L/MW)	Capital Cost for the base year	607.24
$P\&M_{(0)}$ (₹ L/MW)	Plant and Machinery cost for the base year	455.068
$d_{(n)}$	Capital Cost escalation factor	0.147%
$P\&M_{(n)}$ (₹ L/MW)	Plant and Machinery cost for the nth year (FY 2016-17)	455.74
$CC_{(n)}$ (₹ L/MW)	Capital Cost for the nth year (FY 2016-17)	608.13

Source of WPI (Steel and Electrical Machinery): Office of Economic Advisor, Ministry of Commerce and Industry (www.eaindustry.nic.in)

Annexure-V

Biomass and Biogas Fuel Price for FY 2016-17

As per fuel price index mechanism outlined at Annexure-III under Regulations 28 & 37 and the availability of required information

Fuel Price Indexation for Biomass Power Projects (FY 2016-17)

Indexation Formulation	
$P_{(n)} = P_{(n-1)} * \{a*(WPI_{(n)}/WPI_{(n-1)})+b*(1+IRC_{(n-1)})+c*Pd_{(n)}/Pd_{(n-1)}\}$	
Parameter	Value
$WPI_{(n-1)}$	180.8
$WPI_{(n)}$	176.4
$IRC_{(n-1)}$	-1.894%
$Pd_{(n-1)}$	223.27
$Pd_{(n)}$	188.64
A	0.2
B	0.6
C	0.2

Name of Fuel	Fuel Price (Rs./MT) (2015-16)	Fuel Price (Rs./MT) (2016-17)
Biomass	2743	2613.39
Biogas	1269	1209.04

Note:

1. The calculation of $WPI_{(n)}$ and $WPI_{(n-1)}$ is based on the figures available for April 2015 and April 2014 respectively.
2. The calculation of $Pd_{(n)}$ is based on the weighted average of the WPI (Price of HSD) figures available for the months from April, 2015 to December, 2015.
3. The calculation of $Pd_{(n-1)}$ is based on the weighted average of the WPI (Price of HSD) figures available for the months from April, 2014 to March, 2015.
4. The calculation of $Pd_{(n)}$ and $Pd_{(n-1)}$ are shown as under:

WPI (Price of HSD)

Month	2015-16	2014-15
Apr	195.6	230.1
May	209.6	232.3
Jun	212	235.2
Jul	200.8	238.8
Aug	179.4	240.4
Sep	174	242
Oct	176.5	239.2
Nov	181.7	218.1
Dec	181.7	210.8
Jan	175.1	200.7
Feb		188.4
Mar		203.2
Average	188.64	223.267

Source of WPI and WPI (Price of HSD): Office of Economic Advisor, Ministry of Commerce and Industry (www.eaindustry.nic.in)

From	To	IRC	Days
01.04.2015	30.09.2015	3.83%	183
01.10.2015	31.03.2016	-7.65%	182
Average		1.89%	365

Source of IRC: CERC (www.cercind.gov.in)

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

FY 2016-17

Case Select	Option
-------------	--------

1

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case	
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1	
			Auxiliary Consumption during stabilisation	%	10.50%	
			Auxiliary Consumption after stabilisation	%	10%	
			PLF (Stabilization for 6 months)	%	60%	
			PLF (during first year after Stabilization)	%	70%	
			PLF (Second year onwards)	%	75%	
			Useful Life of Transmission system	Years	35	
			Useful life of Power Plant	Years	20	
2	Project Cost	Capital Cost/MW	including Power plant, Land, Transmission line cost & Connectivity charges	Rs Lakh/MW	540.79	
3	Sources of Fund	Debt: Equity	Debt	%	70%	
			Equity	%	30%	
			Total Debt Amount	Rs Lakh	378.56	
			Total Equity Amount	Rs Lakh	162.24	
		Debt Component	Loan Amount	Rs Lakh	378.56	
			Interest Rate	%	12.76%	
		Equity Component	Equity amount	Rs Lakh	162.24	
			Return on Equity	% p.a	16.00%	
		Discount Rate (Equiv. to WACC)	%	10.78%		
4	Financial Assumptions	Fiscal Assumptions	Income Tax (for yr-11 to yr-20)	%	30.90%	
			MAT Rate (for yr-1))	%	20.39%	
			MAT Rate (for yr-2 to yr-10)	%	19.06%	
			80 IA benefits	Yes/No	Yes	
			Accelerated depreciation benefit (Rs/kWh)	Yes/No	0.17	
			Depreciation			
		Depreciation Rate	%	5.83%		
		Years for 5.83% rate		12		
5	Working Capital	For Fixed Charges	O&M Expenses	Months	1	
			Maintenance Spares	(% of O&M exepenses)	%	20%
			Receivables for Debtors	Months	1.5	
			For Variable Charges			
			Biomass Stock	Months	4	
			Interest On Working Capital	%	12.26%	
6	Fuel Related Assumptions	Heat Rate	After Stabilisation period	kCal/kWh	4200	
			During Stabilization Period	kCal/kWh	4300	
		Biomass	Biomass Price (FY16-17)(Committee)	Rs/MT	2875	
			GCV - Biomass	kCal/kg	3400	
			Biomass Price Escalation Factor for working capital required	%	5%	
7	Operation & Maintenance	power plant	Rs Lakh/MW	Rs Lakh/MW	37.72	
			Esca. in O & M Expense	%	5.85%	
			Total No. of Hours	hrs	8760	

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

For Biomass plants to be commissioned during 2016-17

Cost of Generation

Particulars of Generation	Unit	Years-->	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	6.57	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
Auxiliary Consumption	MU		0.58	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Net Generation	MU		5.11	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91

Variable Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakhs		204.44	245.00	257.25	270.11	283.62	297.80	312.69	328.32	344.74	361.97	380.07	399.08	419.03	439.98	461.98	485.08	509.33	534.80	561.54	589.62
Per unit Variable Cost	Rs/kWh		4.00	4.14	4.35	4.57	4.80	5.04	5.29	5.55	5.83	6.12	6.43	6.75	7.09	7.44	7.81	8.20	8.61	9.04	9.50	9.97

Fixed Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakhs		37.72	39.93	42.27	44.74	47.36	50.13	53.06	56.16	59.45	62.93	66.61	70.51	74.63	79.00	83.62	88.51	93.69	99.17	104.97	111.11
Depreciation	Rs Lakhs		31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	13.52	13.52	13.52	13.52	13.52	13.52	13.52	13.52
Interest on term loan	Rs Lakhs		46.30	42.28	38.25	34.22	30.20	26.17	22.14	18.12	14.09	10.07	6.04	2.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakhs		15.31	17.66	18.42	19.22	20.06	20.95	21.88	22.87	23.91	25.01	26.25	27.47	28.51	29.93	31.42	32.99	34.63	36.37	38.19	40.10
Return on Equity	Rs Lakhs		32.61	32.07	32.07	32.07	32.07	32.07	32.07	32.07	32.07	32.07	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57
Total Fixed Cost	Rs Lakhs		163.49	163.49	162.55	161.80	161.23	160.86	160.70	160.77	161.07	161.62	168.01	169.10	154.23	160.01	166.12	172.58	179.41	186.62	194.24	202.30
Per unit Fixed Cost	Rs/kWh		3.20	2.76	2.75	2.74	2.73	2.72	2.72	2.72	2.73	2.84	2.86	2.61	2.71	2.81	2.92	3.03	3.16	3.29	3.42	
Per unit Fixed Cost considering accelerated	Rs/kWh		3.02	2.59	2.57	2.56	2.55	2.55	2.54	2.54	2.55	2.56	2.67	2.69	2.43	2.53	2.63	2.74	2.86	2.98	3.11	3.25

Levelised per unit fixed charges (Rs/kWh) **2.83**
(Without Availing AD Benefit)

Levelised per unit fixed charges (Rs/kWh) **2.66**
(With Availing AD Benefit)

Applicable Tariff for plants to be commissioned during FY 2016-17

Variable Cost (FY 2016-17)	4.00	Rs/kWh
Levelised Fixed Cost	2.83	Rs/kWh
Applicable Tariff (FY 2016-17)	6.83	Rs/kWh
Accelerated Depreciation	0.17	Rs/kWh
Net Tariff (FY 2016-17)	6.66	Rs/kWh

Applicable Tariff for plants commissioned during FY 2009-2015 & 2015-16

Variable Cost (FY 2009-15)	3.95	Rs/kWh
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TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

Determination of Accelerated Depreciation Benefit for Biomass Power Projects

Annex-VIA Contd..

Depreciation amount	90%	
Depreciation rate	5.83%	
Tax Depreciation rate	80%	
Additional depreciation rate	20%	
Income Tax	33.06%	30.90% (yr-2 onwards)
Capital Cost	540.79	Rs Lakh/MW

Year(s)-->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Depreciation	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Depreciation	Rs Lacs	15.77	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	13.52	13.52	13.52	13.52	13.52	13.52	13.52	13.52
Higher Depreciation Benefit																					
Opening balance	%	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	%	50.00%	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	%	50.00%	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%	0.00%
Higher depreciation	Rs Lacs	270.40	243.36	21.63	4.33	0.87	0.17	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
Net depreciation benefit	Rs Lacs	254.62	211.81	(9.91)	(27.22)	(30.68)	(31.37)	(31.51)	(31.54)	(31.54)	(31.55)	(31.55)	(31.55)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)
Tax Benefit	Rs Lacs	84.19	65.45	(3.06)	(8.41)	(9.48)	(9.69)	(9.74)	(9.75)	(9.75)	(9.75)	(9.75)	(9.75)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)
Discounted Tax Benefit	Rs Lacs	84.19	62.27	(2.63)	(6.52)	(6.63)	(6.12)	(5.55)	(5.02)	(4.53)	(4.09)	(3.69)	(3.33)	(1.29)	(1.16)	(1.05)	(0.95)	(0.86)	(0.77)	(0.70)	(0.63)
Levelised tax benefit	Rs Lacs	9.70																			
Energy Generation	MU	2.56	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91
Discounted Generation	MU	2.56	5.63	5.08	4.58	4.14	3.74	3.37	3.04	2.75	2.48	2.24	2.02	1.82	1.65	1.49	1.34	1.21	1.09	0.99	0.89
Levelised generation	MU	5.56																			
Per Unit Benefit	Rs/kWh	3.29	1.11	(0.05)	(0.14)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Discount Factor		1.00	0.90	0.81	0.74	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.22	0.19	0.18	0.16	0.14
Applicable Discount Factor		1.00	0.95	0.86	0.78	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
Levelised ITAX benefit	Rs/kWh	0.17																			

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 50.00%(= 50% of (80%+20%)) and generation for the first year has been considered as 50% of the normative generation as per CERC
2. For working out Tax benefit, income tax rate for the first year has been considered as 33.06% and a tax rate of 30.90% for subsequent years.
3. Figures may not tally exactly on account of rounding of .

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

Annex-VI B

FY 2016-17

Case Select	Option
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1

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxiliary Consumption during stabilisation	%	10.50%
			Auxiliary Consumption after stabilisation	%	10%
			PLF (Stabilization for 6 months)	%	60%
			PLF (during first year after Stabilization)	%	70%
			PLF (Second year onwards)	%	75%
			Useful Life of Transmission system	Years	35
			Useful life of Power Plant	Years	20
2	Project Cost	Capital Cost/MW	including Power plant, Land, Transmission line cost & Connectivity charges	Rs Lakh/MW	540.79
3	Sources of Fund	Debt: Equity	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lakh	378.56
			Total Equity Amount	Rs Lakh	162.24
		Debt Component	Loan Amount	Rs Lakh	378.56
			Interest Rate	%	12.76%
		Equity Component	Equity amount	Rs Lakh	162.24
			Return on Equity	% p.a	16.00%
		Discount Rate (Equiv. to WACC)	%	10.78%	
4	Financial Assumptions	Fiscal Assumptions	Income Tax (for yr-11 to yr-20)	%	30.90%
			MAT Rate (for yr-11)	%	20.39%
			MAT Rate (for yr-2 to yr-10)	%	19.06%
			80 IA benefits	Yes/No	Yes
			Accelerated depreciation benefit (Rs/kWh)	Yes/No	0.17
		Depreciation	Depreciation Rate	%	5.83%
			Years for 5.83% rate		12
5	Working Capital	For Fixed Charges	O&M Expenses	Months	1
			Maintenance Spares (% of O&M expenses)	%	20%
		Receivables for Debtors		Months	1.5
		For Variable Charges	Biomass Stock	Months	4
			Interest On Working Capital	%	12.26%
6	Fuel Related Assumptions	Heat Rate	After Stabilisation period	kCal/kWh	4200
			During Stabilization Period	kCal/kWh	4300
		Biomass	Biomass Price (FY 16-17) (Indexation)	Rs/MT	2613
			GCV - Biomass	kCal/kg	3400
			Biomass Price Escalation Factor for working capital requirement	%	5%
			Handling and storage losses	%	2%
7	Operation & Maintenance	power plant	Rs Lakh/MW	Rs Lakh/MW	37.72
		Esca. in O & M Expense	%	%	5.85%
		Total No. of Hours	hrs	hrs	8760

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

For Biomass plants to be commissioned during 2016-17

Cost of Generation

Particulars of Generation	Unit	Years-->	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	6.57	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
Auxiliary Consumption	MU		0.58	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Net Generation	MU		5.11	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91

Variable Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakhs		189.56	227.16	238.52	250.44	262.96	276.11	289.92	304.41	319.64	335.62	352.40	370.02	388.52	407.94	428.34	449.76	472.25	495.86	520.65	546.68
Per unit Variable Cost	Rs/kWh		3.71	3.84	4.03	4.24	4.45	4.67	4.90	5.15	5.41	5.68	5.96	6.26	6.57	6.90	7.24	7.61	7.99	8.39	8.81	9.25

Fixed Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakhs		37.72	39.93	42.27	44.74	47.36	50.13	53.06	56.16	59.45	62.93	66.61	70.51	74.63	79.00	83.62	88.51	93.69	99.17	104.97	111.11
Depreciation	Rs Lakhs		31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	13.52	13.52	13.52	13.52	13.52	13.52	13.52	13.52
Interest on term loan	Rs Lakhs		46.30	42.28	38.25	34.22	30.20	26.17	22.14	18.12	14.09	10.07	6.04	2.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakhs		14.46	16.65	17.35	18.09	18.88	19.71	20.58	21.50	22.48	23.50	24.67	25.81	26.77	28.10	29.50	30.97	32.52	34.14	35.85	37.65
Return on Equity	Rs Lakhs		32.61	32.07	32.07	32.07	32.07	32.07	32.07	32.07	32.07	32.07	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57	37.57
Total Fixed Cost	Rs Lakhs		162.64	162.47	161.48	160.67	160.05	159.62	159.40	159.40	159.64	160.11	166.43	167.45	152.48	158.18	164.20	170.56	177.29	184.40	191.91	199.85
Per unit Fixed Cost	Rs/kWh		3.18	2.75	2.73	2.72	2.71	2.70	2.70	2.70	2.70	2.71	2.81	2.83	2.58	2.68	2.78	2.88	3.00	3.12	3.25	3.38
Per unit Fixed Cost considering accelerated	Rs/kWh		3.01	2.57	2.56	2.54	2.53	2.52	2.52	2.52	2.53	2.53	2.64	2.66	2.40	2.50	2.60	2.71	2.82	2.94	3.07	3.21

Levelised per unit fixed charges (Rs/kWh) **2.80**
(Without Availing AD Benefit)

Levelised per unit fixed charges (Rs/kWh) **2.63**
(With Availing AD Benefit)

Applicable Tariff for plants to be commissioned during FY 2016-17

Variable Cost (FY 2016-17)	3.71	Rs/kWh
Levelised Fixed Cost	2.80	Rs/kWh
Applicable Tariff (FY 2016-17)	6.51	Rs/kWh
Accelerated Depreciation	0.17	Rs/kWh
Net Tariff (FY 2016-17)	6.34	Rs/kWh

Applicable Tariff for plants commissioned during FY 2015-16

Variable Cost (FY 2009-15)	3.66	Rs/kWh
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TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

Determination of Accelerated Depreciation Benefit for Biomass Power Projects

Annex-VI B Contd..

Depreciation amount	90%	
Depreciation rate	5.83%	
Tax Depreciation rate	80%	
Additional depreciation rate	20%	
Income Tax	33.06%	30.90% (yr-2 onwards)
Capital Cost	540.79	Rs Lakh/MW

Year(s)-->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Depreciation	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Depreciation	Rs Lacs	15.77	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	31.55	13.52	13.52	13.52	13.52	13.52	13.52	13.52	13.52
Higher Depreciation Benefit																					
Opening balance	%	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	%	50.00%	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	%	50.00%	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%	0.00%
Higher depreciation	Rs Lacs	270.40	243.36	21.63	4.33	0.87	0.17	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
Net depreciation benefit	Rs Lacs	254.62	211.81	(9.91)	(27.22)	(30.68)	(31.37)	(31.51)	(31.54)	(31.54)	(31.55)	(31.55)	(31.55)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)	(13.52)
Tax Benefit	Rs Lacs	84.19	65.45	(3.06)	(8.41)	(9.48)	(9.69)	(9.74)	(9.75)	(9.75)	(9.75)	(9.75)	(9.75)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)	(4.18)
Discounted Tax Benefit	Rs Lacs	84.19	62.27	(2.63)	(6.52)	(6.63)	(6.12)	(5.55)	(5.02)	(4.53)	(4.09)	(3.69)	(3.33)	(1.29)	(1.16)	(1.05)	(0.95)	(0.86)	(0.77)	(0.70)	(0.63)
Levelised tax benefit	Rs Lacs	9.70																			
Energy Generation	MU	2.56	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91	5.91
Discounted Generation	MU	2.56	5.63	5.08	4.58	4.14	3.74	3.37	3.04	2.75	2.48	2.24	2.02	1.82	1.65	1.49	1.34	1.21	1.09	0.99	0.89
Levelised generation	MU	5.56																			
Per Unit Benefit	Rs/kWh	3.29	1.11	(0.05)	(0.14)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Discount Factor		1.00	0.90	0.81	0.74	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.22	0.19	0.18	0.16	0.14
Applicable Discount Factor		1.00	0.95	0.86	0.78	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
Levelised ITAX benefit	Rs/kWh	0.17																			

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 50.00%(= 50% of (80%+20%)) and generation for the first year has been considered as 50% of the normative generation as per CERC
2. For working out Tax benefit, income tax rate for the first year has been considered as 33.06% and a tax rate of 30.90% for subsequent years.
3. Figures may not tally exactly on account of rounding of .

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR

FY 2016-17
2

Case Select Option

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case	
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1	
			Auxiliary Consumption during stabilisation	%	12.50%	
			Auxiliary Consumption after stabilisation	%	12%	
			PLF (Stabilization for 6 months)	%	60%	
			PLF (during first year after Stabilization)	%	70%	
			PLF (Second year onwards)	%	75%	
			Useful Life of Transmission system	Years	35	
			Useful life of Power Plant	Years	20	
			2	Project Cost	Capital Cost/MW	including Power plant, Land, Transmission line cost & Connectivity charges
3	Sources of Fund	Debt: Equity	Debt	%	70%	
			Equity	%	30%	
			Total Debt Amount	Rs Lakh	403.09	
			Total Equity Amount	Rs Lakh	172.75	
			Debt Component	Loan Amount	Rs Lakh	403.09
				Interest Rate	%	12.76%
			Equity Component	Equity amount	Rs Lakh	172.75
				Return on Equity	% p.a	16.00%
Discount Rate (Equiv. to WACC)	%	10.78%				
4	Financial Assumptions	Fiscal Assumptions	Income Tax (for yr-11 to yr-20)	%	30.90%	
			MAT Rate (for yr-1))	%	20.39%	
			MAT Rate (for yr-2 to yr-10)	%	19.06%	
			80 IA benefits	Yes/No	Yes	
			Accelerated depreciation benefit (Rs/kWh)	Yes/No	0.19	
			Depreciation	Depreciation Rate	%	5.83%
				Years for 5.83% rate		12
			5	Working Capital	For Fixed Charges	O&M Expenses
Maintenance Spares	(% of O&M expenses)	%				20%
Receivables for Debtors	Months	1.5				
For Variable Charges	Biomass Stock	Months				4
	Interest On Working Capital	%				12.26%
6	Fuel Related Assumptions	Heat Rate	After Stabilisation period	kCal/kWh	4440	
			During Stabilization Period	kCal/kWh	4540	
			Biomass	Biomass Price (FY 16-17) (Committee)	Rs/MT	2875
				GCV - Biomass	kCal/kg	3400
				Biomass Price Escalation Factor for working capital required		5%
7	Operation & Maintenance	power plant	Rs Lakh/MW	Rs Lakh/MW	40.22	
			Esca. in O & M Expense	%	5.85%	
			Total No. of Hours	hrs	8760	

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR

For Biomass plants to be commissioned during 2016-17

Cost of Generation

Particulars of Generation	Unit	Years-->	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	6.57	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
Auxiliary Consumption	MU		0.70	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Net Generation	MU		5.00	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78

Variable Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakhs		216.00	259.00	271.95	285.55	299.82	314.81	330.55	347.08	364.44	382.66	401.79	421.88	442.97	465.12	488.38	512.80	538.44	565.36	593.63	623.31
Per unit Variable Cost	Rs/kWh		4.32	4.48	4.70	4.94	5.19	5.45	5.72	6.00	6.30	6.62	6.95	7.30	7.66	8.04	8.45	8.87	9.31	9.78	10.27	10.78

Fixed Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakhs		40.22	42.58	45.07	47.70	50.49	53.45	56.57	59.88	63.39	67.10	71.02	75.18	79.57	84.23	89.16	94.37	99.89	105.74	111.92	118.47
Depreciation	Rs Lakhs		33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40
Interest on term loan	Rs Lakhs		49.30	45.02	40.73	36.44	32.15	27.87	23.58	19.29	15.01	10.72	6.43	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakhs		16.21	18.70	19.50	20.35	21.24	22.18	23.17	24.21	25.31	26.48	27.79	29.08	30.18	31.68	33.26	34.92	36.66	38.50	40.42	42.45
Return on Equity	Rs Lakhs		34.72	34.15	34.15	34.15	34.15	34.15	34.15	34.15	34.15	34.15	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
Total Fixed Cost	Rs Lakhs		174.04	174.03	173.04	172.23	171.62	171.23	171.06	171.13	171.44	172.03	178.84	179.99	164.15	170.30	176.81	183.68	190.95	198.63	206.74	215.32
Per unit Fixed Cost	Rs/kWh		3.48	3.01	2.99	2.98	2.97	2.96	2.96	2.96	2.97	2.98	3.09	3.11	2.84	2.95	3.06	3.18	3.30	3.44	3.58	3.72
Per unit Fixed Cost considering accelerated	Rs/kWh		3.29	2.82	2.80	2.79	2.78	2.77	2.77	2.77	2.78	2.79	2.90	2.92	2.65	2.76	2.87	2.99	3.11	3.25	3.39	3.53

Levelised per unit fixed charges (Rs/kWh) **3.08**
(Without Availing AD Benefit)

Levelised per unit fixed charges (Rs/kWh) **2.89**
(With Availing AD Benefit)

Applicable Tariff for plants to be commissioned during FY 2016-17

Variable Cost (FY 2016-17)	4.32	Rs/kWh
Levelised Fixed Cost	3.08	Rs/kWh
Applicable Tariff (FY 2016-17)	7.40	Rs/kWh
Accelerated Depreciation	0.19	Rs/kWh
Net Tariff (FY 2016-17)	7.21	Rs/kWh

Applicable Tariff for plants commissioned during FY 2009-2015 & 2015-16

Variable Cost (FY 2009-15)	4.27	Rs/kWh
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TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR

Determination of Accelerated Depreciation Benefit for Biomass Power Projects

Annex-VII-A Contd..

Depreciation amount	90%	
Depreciation rate	5.83%	
Tax Depreciation rate	80%	
Additional depreciation rate	20%	
Income Tax	33.06%	30.90% (yr-2 onwards)
Capital Cost	575.85	Rs Lakh/MW

Year(s)-->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Depreciation	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Depreciation	Rs Lacs	16.80	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40
Higher Depreciation Benefit																					
Opening balance	%	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	%	50.00%	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	%	50.00%	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%	0.00%
Higher depreciation	Rs Lacs	287.92	259.13	23.03	4.61	0.92	0.18	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
Net depreciation benefit	Rs Lacs	271.13	225.54	(10.56)	(28.98)	(32.67)	(33.41)	(33.55)	(33.58)	(33.59)	(33.59)	(33.59)	(33.59)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)
Tax Benefit	Rs Lacs	89.64	69.69	(3.26)	(8.96)	(10.09)	(10.32)	(10.37)	(10.38)	(10.38)	(10.38)	(10.38)	(10.38)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)
Discounted Tax Benefit	Rs Lacs	89.64	66.30	(2.80)	(6.94)	(7.06)	(6.52)	(5.91)	(5.34)	(4.82)	(4.35)	(3.93)	(3.55)	(1.37)	(1.24)	(1.12)	(1.01)	(0.91)	(0.82)	(0.74)	(0.67)
Levelised tax benefit	Rs Lacs	10.32																			
Energy Generation	MU	2.50	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Discounted Generation	MU	2.50	5.50	4.97	4.48	4.05	3.65	3.30	2.98	2.69	2.42	2.19	1.98	1.78	1.61	1.45	1.31	1.18	1.07	0.96	0.87
Levelised generation	MU	5.43																			
Per Unit Benefit	Rs/kWh	3.59	1.21	(0.06)	(0.15)	(0.17)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Discount Factor		1.00	0.90	0.81	0.74	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.22	0.19	0.18	0.16	0.14
Applicable Discount Factor		1.00	0.95	0.86	0.78	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
Levelised ITAX benefit	Rs/kWh	0.19																			

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 50.00%(= 50% of (80%+20%)) and generation for the first year has been considered as 50% of the normative generation as per CERC
2. For working out Tax benefit, income tax rate for the first year has been considered as 33.06% and a tax rate of 30.90% for subsequent years.
3. Figures may not tally exactly on account of rounding of .

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR

FY 2016-17

Case Select	Option
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2

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxiliary Consumption during stabilisation	%	12.50%
			Auxiliary Consumption after stabilisation	%	12%
			PLF (Stabilization for 6 months)	%	60%
			PLF (during first year after Stabilization)	%	70%
			PLF (Second year onwards)	%	75%
			Useful Life of Transmission system	Years	35
			Useful life of Power Plant	Years	20
2	Project Cost	Capital Cost/MW	including Power plant, Land, Transmission line cost & Connectivity charges	Rs Lakh/MW	575.85
3	Sources of Fund	Debt: Equity	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lakh	403.09
			Total Equity Amount	Rs Lakh	172.75
		Debt Component	Loan Amount	Rs Lakh	403.09
			Interest Rate	%	12.76%
		Equity Component	Equity amount	Rs Lakh	172.75
			Return on Equity	% p.a	16.00%
		Discount Rate (Equiv. to WACC)	%	10.78%	
4	Financial Assumptions	Fiscal Assumptions	Income Tax (for yr-11 to yr-20)	%	30.90%
			MAT Rate (for yr-11)	%	20.39%
			MAT Rate (for yr-2 to yr-10)	%	19.06%
			80 IA benefits	Yes/No	Yes
			Accelerated depreciation benefit (Rs/kWh)	Yes/No	0.19
			Depreciation		
		Depreciation Rate	%	5.83%	
		Years for 5.83% rate		12	
5	Working Capital	For Fixed Charges	O&M Expenses	Months	1
			Maintenance Spares (% of O&M expenses)	%	20%
		Receivables for Debtors		Months	1.5
		For Variable Charges	Biomass Stock	Months	4
			Interest On Working Capital	%	12.26%
6	Fuel Related Assumptions	Heat Rate	After Stabilisation period	kCal/kWh	4440
			During Stabilization Period	kCal/kWh	4540
		Biomass	Biomass Price (FY 16-17) (Indexation)	Rs/MT	2613
			GCV - Biomass	kCal/kg	3400
			Biomass Price Escalation Factor for working capital requirement	%	5%
			Handling and storage losses	%	2%
7	Operation & Maintenance	power plant	Rs Lakh/MW	Rs Lakh/MW	40.22
		Esca. in O & M Expense	%	%	5.85%
		Total No. of Hours	hrs	hrs	8760

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR

For Biomass plants to be commissioned during 2016-17

Cost of Generation

Particulars of Generation	Unit	Years-->	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	6.57	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
Auxiliary Consumption	MU		0.70	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Net Generation	MU		5.00	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78

Variable Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakhs		200.27	240.14	252.15	264.75	277.99	291.89	306.49	321.81	337.90	354.80	372.53	391.16	410.72	431.26	452.82	475.46	499.23	524.19	550.40	577.92
Per unit Variable Cost	Rs/kWh		4.01	4.15	4.36	4.58	4.81	5.05	5.30	5.57	5.84	6.14	6.44	6.77	7.10	7.46	7.83	8.22	8.63	9.07	9.52	10.00

Fixed Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakhs		40.22	42.58	45.07	47.70	50.49	53.45	56.57	59.88	63.39	67.10	71.02	75.18	79.57	84.23	89.16	94.37	99.89	105.74	111.92	118.47
Depreciation	Rs Lakhs		33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40
Interest on term loan	Rs Lakhs		49.30	45.02	40.73	36.44	32.15	27.87	23.58	19.29	15.01	10.72	6.43	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakhs		15.31	17.63	18.37	19.16	19.99	20.87	21.79	22.77	23.80	24.89	26.12	27.33	28.34	29.75	31.23	32.79	34.42	36.15	37.96	39.86
Return on Equity	Rs Lakhs		34.72	34.15	34.15	34.15	34.15	34.15	34.15	34.15	34.15	34.15	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
Total Fixed Cost	Rs Lakhs		173.14	172.96	171.91	171.04	170.38	169.92	169.69	169.68	169.93	170.44	177.17	178.24	162.31	168.37	174.78	181.55	188.71	196.28	204.27	212.72
Per unit Fixed Cost	Rs/kWh		3.46	2.99	2.97	2.96	2.95	2.94	2.93	2.93	2.94	2.95	3.06	3.08	2.81	2.91	3.02	3.14	3.26	3.39	3.53	3.68
Per unit Fixed Cost considering accelerated	Rs/kWh		3.27	2.80	2.78	2.77	2.76	2.75	2.74	2.74	2.75	2.76	2.87	2.89	2.62	2.72	2.83	2.95	3.07	3.20	3.34	3.49

Levelised per unit fixed charges (Rs/kWh) **3.05**
(Without Availing AD Benefit)

Levelised per unit fixed charges (Rs/kWh) **2.86**
(With Availing AD Benefit)

Applicable Tariff for plants to be commissioned during FY 2016-17

Variable Cost (FY 2016-17)	4.01	Rs/kWh
Levelised Fixed Cost	3.05	Rs/kWh
Applicable Tariff (FY 2016-17)	7.06	Rs/kWh
Accelerated Depreciation	0.19	Rs/kWh
Net Tariff (FY 2016-17)	6.87	Rs/kWh

Applicable Tariff for plants commissioned during FY 2015-16

Variable Cost (FY 2009-15)	3.96	Rs/kWh
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TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR
Determination of Accelerated Depreciation Benefit for Biomass Power Projects
Annex-VII B Contd..

Depreciation amount	90%	
Depreciation rate	5.83%	
Tax Depreciation rate	80%	
Additional depreciation rate	20%	
Income Tax	33.06%	30.90% (yr-2 onwards)
Capital Cost	575.85	Rs Lakh/MW

Year(s)-->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Depreciation	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Depreciation	Rs Lacs	16.80	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	33.59	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40
Higher Depreciation Benefit																					
Opening balance	%	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	%	50.00%	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	%	50.00%	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%	0.00%
Higher depreciation	Rs Lacs	287.92	259.13	23.03	4.61	0.92	0.18	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
Net depreciation benefit	Rs Lacs	271.13	225.54	(10.56)	(28.98)	(32.67)	(33.41)	(33.55)	(33.58)	(33.59)	(33.59)	(33.59)	(33.59)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)	(14.40)
Tax Benefit	Rs Lacs	89.64	69.69	(3.26)	(8.96)	(10.09)	(10.32)	(10.37)	(10.38)	(10.38)	(10.38)	(10.38)	(10.38)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)	(4.45)
Discounted Tax Benefit	Rs Lacs	89.64	66.30	(2.80)	(6.94)	(7.06)	(6.52)	(5.91)	(5.34)	(4.82)	(4.35)	(3.93)	(3.55)	(1.37)	(1.24)	(1.12)	(1.01)	(0.91)	(0.82)	(0.74)	(0.67)
Levelised tax benefit	Rs Lacs	10.32																			
Energy Generation	MU	2.50	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Discounted Generation	MU	2.50	5.50	4.97	4.48	4.05	3.65	3.30	2.98	2.69	2.42	2.19	1.98	1.78	1.61	1.45	1.31	1.18	1.07	0.96	0.87
Levelised generation	MU	5.43																			
Per Unit Benefit	Rs/kWh	3.59	1.21	(0.06)	(0.15)	(0.17)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Discount Factor		1.00	0.90	0.81	0.74	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.22	0.19	0.18	0.16	0.14
Applicable Discount Factor		1.00	0.95	0.86	0.78	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
Levelised ITAX benefit	Rs/kWh	0.19																			

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 50.00%(= 50% of (80%+20%)) and generation for the first year has been considered as 50% of the normative generation as per CERC
2. For working out Tax benefit, income tax rate for the first year has been considered as 33.06% and a tax rate of 30.90% for subsequent years.
3. Figures may not tally exactly on account of rounding of .

TARIFF DETERMINATION FOR BIOGAS POWER PROJECTS GETTING COMMISSIONED DURING FY 2016-17

FY 2016-17

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxiliary Consumption	%	12.00%
			Plant Load Factor (PLF)	%	85%
			Useful life of Power Plant	Years	20
2	Project Cost	Capital Cost/MW	Power plant cost (before subsidy)	Rs Lakh/MW	1185.36
			Power plant cost (after subsidy)	Rs Lakh/MW	885.36
		Connectivity Charges		Rs Lakh/MW	2
3	Sources of Fund	Debt: Equity	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lakh	619.75
			Total Equity Amount	Rs Lakh	265.61
		Debt Component	Loan Amount	Rs Lakh	619.75
			Moratorium Period	years	0
			Interest Rate	%	12.76%
		Equity Component	Equity amount	Rs Lakh	265.61
			Return on Equity	% p.a	16.00%
	Discount Rate (eq. WACC)	%	10.78%		
4	Financial Assumptions	Fiscal Assumptions	Income Tax (for yr-11 to yr-20)	%	30.90%
			MAT Rate (for first year)		20.39%
			MAT Rate (for yr-2 to yr-10)	%	19.06%
			80 IA benefits	Yes/No	Yes
			Accelerated depreciation benefit	Yes/No	Yes
			Accelerated depreciation benefit	Rs/kWh	0.26
			Depreciation		
			Depreciation Rate	%	5.83%
	Years for 5.83% rate	Years	12		
5	Working Capital	For Fixed Charges	O&M Expenses	Months	1
			Maintenance Spares (% of O&M exepenses)		20%
			Receivables for Debtors	Months	1.5
			For Variable Charges		
			Biogas Stock	Months	4
			Interest rate on Working Capital	%	12.26%
6	Fuel Related Assumptions	Biogas	Fuel Price	Rs/MT	1209
			Specific Fuel Consumption	kg/kWh	3
7	Operation & Maintenance	O&M Expenses (2016-17)	Esc. In O & M	%	5%
			Esc. In O & M	%	5.85%
			Total No. of Hours	hrs	8760

TARIFF DETERMINATION FOR BIOGAS POWER PROJECTS GETTING COMMISSIONED DURING FY 2016-17

For Biogas power projects to be commissioned during FY 2016-17

Cost of Generation

Particulars of Generation	Unit	Years-->	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		7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45
Auxiliary Consumption	MU		0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Net Generation	MU		6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55

Variable Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biogas Cost	Rs Lakhs		270.07	283.58	297.76	312.65	328.28	344.69	361.93	380.02	399.02	418.97	439.92	461.92	485.02	509.27	534.73	561.47	589.54	619.02	649.97	682.47
Per unit Variable Cost	Rs/kWh		4.12	4.33	4.54	4.77	5.01	5.26	5.52	5.80	6.09	6.39	6.71	7.05	7.40	7.77	8.16	8.57	9.00	9.45	9.92	10.42

Fixed Cost	Unit	Years-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakhs		50.04	52.96	56.06	59.34	62.81	66.49	70.38	74.49	78.85	83.46	88.35	93.51	98.98	104.78	110.90	117.39	124.26	131.53	139.22	147.37
Depreciation	Rs Lakhs		51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	22.13	22.13	22.13	22.13	22.13	22.13	22.13	22.13
Interest on term loan	Rs Lakhs		75.80	69.21	62.62	56.03	49.44	42.85	36.25	29.66	23.07	16.48	9.89	3.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakhs		20.78	21.58	22.44	23.36	24.32	25.34	26.42	27.56	28.77	30.04	31.52	32.94	34.02	35.70	37.46	39.32	41.27	43.32	45.48	47.75
Return on Equity	Rs Lakhs		53.38	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	61.50	61.50	61.50	61.50	61.50	61.50	61.50	61.50	61.50	61.50
Total Fixed Cost	Rs Lakhs		251.64	247.90	245.27	242.87	240.72	238.82	237.20	235.87	234.84	234.13	242.90	242.89	216.64	224.11	232.00	240.35	249.17	258.49	268.34	278.76
Per unit Fixed Cost	Rs/kWh		3.84	3.78	3.74	3.71	3.67	3.64	3.62	3.60	3.58	3.57	3.71	3.71	3.31	3.42	3.54	3.67	3.80	3.94	4.10	4.25
Per unit Fixed Cost considering accelerated	Rs/kWh		3.58	3.53	3.49	3.45	3.42	3.39	3.36	3.34	3.33	3.32	3.45	3.45	3.05	3.16	3.28	3.41	3.55	3.69	3.84	4.00

Levelised per unit fixed charges (Rs/kV) 3.70

(Without Availing AD Benefit)

Levelised per unit fixed charges (Rs/kV) 3.44

(With Availing AD Benefit)

Applicable Tariff for FY 2016-17

Variable Cost (FY 2016-17)	4.12	Rs/kWh
Levelised Fixed Cost	3.70	Rs/kWh
Applicable Tariff (FY 2016-17)	7.82	Rs/kWh
Accelerated Depreciation	0.26	Rs/kWh
Net Tariff (FY 2016-17)	7.56	Rs/kWh

TARIFF DETERMINATION FOR BIOGAS POWER PROJECTS GETTING COMMISSIONED DURING FY 2016-17

Annex VIII contd..

Determination of Accelerated Depreciation Benefit for Biogas based Power Projects FY 2016-17

Depreciation amount	90%	
Book Depreciation rate	5.83%	
Tax Depreciation rate	80%	
Additional depreciation rate	20%	
Income Tax	33.06%	30.90% (yr-2 onwards)
Capital Cost	885.36	Rs Lakh/MW

Year(s)-->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Book Depreciation	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Book Depreciation	Rs Lakh	25.82	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	51.65	22.13	22.13	22.13	22.13	22.13	22.13	22.13	22.13
Higher Depreciation Benefit																					
Opening balance	%	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	%	50.00%	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	%	50.00%	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%	0.00%
Higher depreciation	Rs Lakh	442.68	398.41	35.41	7.08	1.42	0.28	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	416.86	346.77	(16.23)	(44.56)	(50.23)	(51.36)	(51.59)	(51.63)	(51.64)	(51.65)	(51.65)	(51.65)	(22.13)	(22.13)	(22.13)	(22.13)	(22.13)	(22.13)	(22.13)	(22.13)
Tax Benefit	Rs Lakh	137.83	107.15	(5.02)	(13.77)	(15.52)	(15.87)	(15.94)	(15.96)	(15.96)	(15.96)	(15.96)	(15.96)	(6.84)	(6.84)	(6.84)	(6.84)	(6.84)	(6.84)	(6.84)	(6.84)
Discounted Tax Benefit	Rs Lakh	137.83	101.94	(4.31)	(10.67)	(10.86)	(10.03)	(9.09)	(8.21)	(7.41)	(6.69)	(6.04)	(5.45)	(2.11)	(1.90)	(1.72)	(1.55)	(1.40)	(1.26)	(1.14)	(1.03)
Levelised tax benefit	Rs Lakh	15.87																			
Energy Generation	MU	3.28	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55
Discounted Generation	MU	3.28	6.23	5.63	5.08	4.59	4.14	3.74	3.37	3.04	2.75	2.48	2.24	2.02	1.82	1.65	1.49	1.34	1.21	1.09	0.99
Levelised generation	MU	6.20																			
Per Unit Benefit	Rs/kWh	4.21	1.64	(0.08)	(0.21)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Discount Factor		1.00	0.90	0.81	0.74	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.22	0.19	0.18	0.16	0.14
Applicable Discount Factor		1.00	0.95	0.86	0.78	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
Levelised ITAX benefit	Rs/kWh	0.26																			

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 50.00% (= 50% of (80%+20%)) and generation for the first year has been considered as 50% of the normative generation as per CERC
2. For working out Tax benefit, income tax rate for the first year has been considered as 33.06% and a tax rate of 30.90% for subsequent years.
3. Figures may not tally exactly on account of rounding off.

TARIFF DETERMINATION FOR BIOMASS GASIFIER POWER PROJECTS GETTING COMMISSIONED DURING FY 2016-17

FY 2016-17

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxiliary Consumption	%	10.00%
			PLF	%	85%
			Useful life of Power Plant	Years	20
2	Project Cost	Capital Cost/MW	Power plant cost (before subsidy)	Rs Lakh/MW	608.13
			Net Power plant cost (after subsidy)	Rs Lakh/MW	458.132568
		Connectivity Charges	Rs Lakh/MW	Rs Lakh/MW	2
3	Sources of Fund	Debt: Equity	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lakh	320.69
			Total Equity Amount	Rs Lakh	137.44
		Debt Component	Loan Amount	Rs Lakh	320.69
			Moratorium Period	years	0
			Interest Rate	%	12.76%
		Equity Component	Equity amount	Rs Lakh	137.43977
			Return on Equity	% p.a	16.00%
Discount Rate (eq. WACC)	%		10.78%		
4	Financial Assumptions	Fiscal Assumptions	Income Tax (for yr-11 to yr-20)	%	30.90%
			MAT Rate (for first year)		20.39%
			MAT Rate (for yr-2 to yr-10)	%	19.06%
			80 IA benefits	Yes/No	Yes
			Accelerated depreciation benefit	Yes/No	Yes
			Accelerated depreciation benefit	Rs/kWh	0.13
		Depreciation	Depreciation Rate	%	5.83%
	Years for 5.83% rate	Years	12		
5	Working Capital	For Fixed Charges	O&M Expenses	Months	1
			Maintenance Spares (% of O&M expences)		20%
		For Variable Charges	Receivables for Debtors	Months	1.5
			Biogas Stock	Months	4
		Interest rate on Working Capital	%	12.26%	
		6	Fuel Related Assumptions	Biomass	Fuel Price
Specific Fuel Consumption	kg/kWh				1.25
Substrate Price Escalation Factor for working capital	%				5%
7	Operation & Maintenance	O&M Expenses (2016-17)	Rs Lakhs/MW	Rs Lakhs	50.04
			Esc. in O & M Expenses	%	5.85%
			Total No. of Hours	hrs	8760

TARIFF DETERMINATION FOR BIOMASS GASIFIER POWER PROJECTS GETTING COMMISSIONED DURING FY 2016-17

For Biomass Gasifier power projects to be commissioned during FY 2016-17.

Cost of Generation

Particulars of Generation	Unit	Years--->	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		7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45	7.45
Auxiliary Consumption	MU		0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Net Generation	MU		6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70

Variable Cost	Unit	Years--->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakhs		243.24	255.40	268.17	281.58	295.66	310.44	325.97	342.26	359.38	377.35	396.21	416.03	436.83	458.67	481.60	505.68	530.97	557.51	585.39	614.66
Per unit Variable Cost	Rs/kWh		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	7.19	7.55	7.92	8.32	8.74	9.17

Fixed Cost	Unit	Years--->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakhs		50.04	52.96	56.06	59.34	62.81	66.49	70.38	74.49	78.85	83.46	88.35	93.51	98.98	104.78	110.90	117.39	124.26	131.53	139.22	147.37
Depreciation	Rs Lakhs		26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72
Interest on term loan	Rs Lakhs		39.22	35.81	32.40	28.99	25.58	22.17	18.76	15.35	11.94	8.53	5.12	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakhs		17.89	18.67	19.50	20.38	21.31	22.29	23.32	24.40	25.55	26.76	28.10	29.44	30.64	32.18	33.80	35.51	37.30	39.19	41.17	43.25
Return on Equity	Rs Lakhs		27.62	27.17	27.17	27.17	27.17	27.17	27.17	27.17	27.17	27.17	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82
Total Fixed Cost	Rs Lakhs		161.49	161.34	161.86	162.60	163.59	164.83	166.34	168.14	170.23	172.64	180.11	183.21	172.90	180.24	187.99	196.18	204.84	213.99	223.67	233.90
Per unit Fixed Cost	Rs/kWh		2.41	2.41	2.42	2.43	2.44	2.46	2.48	2.51	2.54	2.58	2.69	2.73	2.58	2.69	2.81	2.93	3.06	3.19	3.34	3.49
Per unit Fixed Cost considering accelerated	Rs/kWh		2.28	2.28	2.29	2.30	2.31	2.33	2.35	2.38	2.41	2.45	2.56	2.60	2.45	2.56	2.68	2.80	2.93	3.06	3.21	3.36

Levelised per unit fixed charges (Rs/kWh) **2.56**
(Without Availing AD Benefit)

Levelised per unit fixed charges (Rs/kWh) **2.43**
(With Availing AD Benefit)

Applicable Tariff for FY 2016-17

Variable Cost (FY 2016-17)	3.63	Rs/kWh
Levelised Fixed Cost	2.56	Rs/kWh
Applicable Tariff (FY 2016-17)	6.19	Rs/kWh
Accelerated Depreciation	0.13	Rs/kWh
Net Tariff (FY 2016-17)	6.06	Rs/kWh

TARIFF DETERMINATION FOR BIOMASS GASIFIER POWER PROJECTS GETTING COMMISSIONED DURING FY 2016-17

Annex-IX contd..

Determination of Accelerated Depreciation Benefit for Biomass Gasifier based Power Projects FY 2016-17.

Depreciation amount	90%	
Book Depreciation rate	5.83%	
Tax Depreciation rate	80%	
Additional depreciation rate	20%	
Income Tax	33.06%	30.90% (yr-2 onwards)
Capital Cost	458.13	Rs Lakh/MW

Year(s)---->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Book Depreciation	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Book Depreciation	Rs Lakh	13.36	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	26.72	11.45	11.45	11.45	11.45	11.45	11.45	11.45	11.45
Higher Depreciation Benefit																					
Opening balance	%	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	%	50.00%	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	%	50.00%	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%	0.00%
Higher depreciation	Rs Lakh	229.07	206.16	18.33	3.67	0.73	0.15	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
Net depreciation benefit	Rs Lakh	215.70	179.44	(8.40)	(23.06)	(25.99)	(26.58)	(26.70)	(26.72)	(26.72)	(26.72)	(26.72)	(26.72)	(11.45)	(11.45)	(11.45)	(11.45)	(11.45)	(11.45)	(11.45)	(11.45)
Tax Benefit	Rs Lakh	71.32	55.45	(2.60)	(7.13)	(8.03)	(8.21)	(8.25)	(8.26)	(8.26)	(8.26)	(8.26)	(8.26)	(3.54)	(3.54)	(3.54)	(3.54)	(3.54)	(3.54)	(3.54)	(3.54)
Discounted Tax Benefit	Rs Lakh	71.32	52.75	(2.23)	(5.52)	(5.62)	(5.19)	(4.70)	(4.25)	(3.84)	(3.46)	(3.13)	(2.82)	(1.09)	(0.99)	(0.89)	(0.80)	(0.72)	(0.65)	(0.59)	(0.53)
Levelised tax benefit	Rs Lakh	8.21																			
Energy Generation	MU	3.35	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70
Discounted Generation	MU	3.35	6.38	5.75	5.19	4.69	4.23	3.82	3.45	3.11	2.81	2.54	2.29	2.07	1.87	1.68	1.52	1.37	1.24	1.12	1.01
Levelised generation	MU	6.34																			
Per Unit Benefit	Rs/kWh	2.13	0.83	(0.04)	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Discount Factor		1.00	0.90	0.81	0.74	0.66	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.22	0.19	0.18	0.16	0.14
Applicable Discount Factor		1.00	0.95	0.86	0.78	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
Levelised ITAX benefit	Rs/kWh	0.13																			

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 50.00%(= 50% of (80%+20%)) and generation for the first year has been considered as 50% of the normative generation as per CERC
2. For working out Tax benefit, income tax rate for the first year has been considered as 33.06% and a tax rate of 30.90% for subsequent years.
3. Figures may not tally exactly on account of rounding off.

Annexure-X

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR

Variable Cost 2009-15 & FY 2015-16 opting biomass fuel price based on State Level Committee report

S. No.	Particulars	Unit	Variable Charges
1	Installed Capacity	MW	1
2	Plant load factor	%	75%
3	Gross energy generation	MU	6.57
4	Auxiliary Consumption	%	10.0%
5	Auxiliary Consumption	MU	0.66
6	Net Energy generation	MU	5.91
7	Station Heat Rate	kCal/kWh	4200
8	Energy Input required	Million Kcal	27594.0
9	Calorific Value	kCal/kg	3400
10	Biomass Required	Million Kg	8.116
11	Biomass Price	Rs/MT	2875
12	Biomass Cost	Rs Lakh	233.3
13	Variable Cost	Rs/kWh	3.95

Annexure-XI

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH WATER COOLED CONDENSOR
Variable Cost 2015-16 opting biomass fuel price based on fuel price indexation

S. No.	Particulars	Unit	Variable Charges
1	Installed Capacity	MW	1
2	Plant load factor	%	75%
3	Gross energy generation	MU	6.57
4	Auxiliary Consumption	%	10.0%
5	Auxiliary Consumption	MU	0.66
6	Net Energy generation	MU	5.91
7	Station Heat Rate	kCal/kWh	4200
8	Energy Input required	Million Kcal	27594.0
9	Calorific Value	kCal/kg	3400
10	Biomass Required	Million Kg	8.278
11	Biomass Price	Rs/MT	2613
12	Biomass Cost	Rs Lakh	216.3
13	Variable Cost	Rs/kWh	3.66

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR**Variable Cost 2009-15 & FY 2015-16 opting biomass fuel price based on State Level Committee report**

S. No.	Particulars	Unit	Variable Charges
1	Installed Capacity	MW	1
2	Plant load factor	%	75%
3	Gross energy generation	MU	6.57
4	Auxiliary Consumption	%	12.0%
5	Auxiliary Consumption	MU	0.79
6	Net Energy generation	MU	5.78
7	Station Heat Rate	kCal/kWh	4440
8	Energy Input required	Million Kcal	29170.8
9	Calorific Value	kCal/kg	3400
10	Biomass Required	Million Kg	8.580
11	Biomass Price	Rs/MT	2875
12	Biomass Cost	Rs Lakh	246.7
13	Variable Cost	Rs/kWh	4.27

Annexure-XIII

TARIFF DETERMINATION FOR BIOMASS POWER PLANT WITH AIR COOLED CONDENSOR
Variable Cost 2015-16 opting biomass fuel price based on fuel price indexation

S. No.	Particulars	Unit	Variable Charges
1	Installed Capacity	MW	1
2	Plant load factor	%	75%
3	Gross energy generation	MU	6.57
4	Auxiliary Consumption	%	12.0%
5	Auxiliary Consumption	MU	0.79
6	Net Energy generation	MU	5.78
7	Station Heat Rate	kCal/kWh	4440
8	Energy Input required	Million Kcal	29170.8
9	Calorific Value	kCal/kg	3400
10	Biomass Required	Million Kg	8.751
11	Biomass Price	Rs/MT	2613
12	Biomass Cost	Rs Lakh	228.7
13	Variable Cost	Rs/kWh	3.96