

***Draft JSERC (Determination of Tariff
for Procurement of Power from
Biomass - Rankine and Gasification
based projects and Non-Fossil fuel
based co-generation projects)
Regulations, 2016***



JHARKHAND STATE ELECTRICITY REGULATORY COMMISSION

JSERC (Biomass and Non-Fossil fuel based Co-Generation Projects) Regulations, 2016

In exercise of the powers conferred by Section 86 (1) (a), (b) and (c) read with (e), Section 61(a to h), and Section 62 (1) of the Electricity Act 2003 and all other powers enabling it in this behalf, the Jharkhand State Electricity Regulatory Commission hereby makes the following Regulations.

A1: SHORT TITLE, COMMENCEMENT AND INTERPRETATION

- 1.1 This Regulation may be called the 'Jharkhand State Electricity Regulatory Commission (Determination of tariff for procurement of power from biomass, biomass gasifier and non-fossil fuel based cogeneration power project) Regulations, 2016'.
- 1.2 These Regulations shall extend to the whole state of Jharkhand.
- 1.3 These Regulations shall come into force on the date of its publication in the Jharkhand Gazette and unless reviewed earlier or extended by the Commission, and shall remain in force up to 31st March, 2020.

A2: DEFINITION

- 2.1 In this Regulation unless the context otherwise requires:
 - (a) “**Act**” means the Electricity Act, 2003 and subsequent amendment thereof;
 - (b) “**Banking of power**” is the process under which a Generating Plant supplies power to the grid not with the intention of selling it to either a third party or to a Licensee, but with the intention of exercising its eligibility to draw back this power from the grid;
 - (c) “**Capital cost**” means the cost inclusive of all capital work including plant and machinery, civil work, land including leasehold land, erection and commissioning, financing and interest during construction, and evacuation infrastructure up-to interconnection point.
 - (d) “**CERC**” means The Central Electricity Regulatory Commission referred to in subsection (1) of section 76;
 - (e) “**Control Period**” means the period during which the norms for determination of tariff specified in these Regulations shall remain valid;
 - (f) “**Day**” means a continuous period starting at 00.00 hours and ending at 24.00 hours;
 - (g) “**Distribution Licensee or Discom**” means a Licensee authorised to operate and maintain a distribution system for supplying electricity to the consumers in his area of supply;

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- (h) **“Extra High Voltage (EHV)”** means the voltage, which exceeds 33,000 volts subject, however, to the percentage variation allowed under the Indian Electricity Rules, 1956;
- (i) **“Grid”** means interconnected network of transmission lines, distribution lines and sub-stations at EHV and HV level;
- (j) **“Grid Code”** shall mean the JSERC (State Grid Code), Regulations, 2008 & its amendment from time to time;
- (k) **“High Voltage (HV)”** means the voltage higher than 650 volts but which does not exceed 33,000 volts 50 cycles under normal conditions subject, however, to the percentage variation allowed under the Indian Electricity Rules, 1956;
- (l) **“Infrastructure cost”** means the cost of auxiliaries, cost of land, site development charges and other civil works, transportation charges, cost of evacuation up to interconnection point;
- (m) **“Inter-connection Point”** means interface point of renewable energy generating facility with the transmission system or distribution system, as the case may be; in relation to Biomass power (Rankine + Gasification) and non-fossil based cogeneration power projects, the inter-connection point shall be line isolator on outgoing feeder on HV side of generator transformer;
- (n) **“JSERC or Commission”** means the Jharkhand State Electricity Regulatory Commission;
- (o) **“Month”** means a continuous period of one month commencing from 00.00 hours on the first day of the month and ending at 24.00 hours on last day of the month;
- (p) **“MNRE”** means the Ministry of New and Renewable Energy of the Government of India;
- (q) **“NLDC”** means National Load Despatch Centre, the Centre established under sub-section (1) of Section 26 of the Act;
- (r) **“Non-firm power”** means the power generated from renewable sources, the hourly variation of which is dependent upon nature’s phenomenon like sun, cloud, wind, etc., that cannot be accurately predicted;
- (s) **“Operation and Maintenance expenses”** or **“O&M expenses”** means the expenditure incurred on operation and maintenance of the project, or part thereof , and includes the expenditure on manpower, repairs, spares, consumables, insurance and overheads;

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- (t) **“Project”** means a generating station or the evacuation system up to interconnection point, as the case may be;
- (u) **“Regional Load Despatch Centre (RLDC)”** means the Centre established under sub-section (1) of Section 27 of the Act;
- (v) **“Regional Power Committee (RPC)”** means a Committee established by resolution by the Central Government for a specific region for facilitating the integrated operation of the power systems in that region;
- (w) **“RPC Secretariat”** means the Secretariat of the RPC;
- (x) **“Schedule”** denote the injection schedule in MW (in case of generator) or drawl schedule in MW (in case of consumer) provided by generator/consumer to the SLDC (in case of connected to transmission network) or to the Distribution Licensee (in case of connected to distribution network) in a manner as specified in this code;
- (y) **“SERCs”** means State Electricity Regulatory Commissions;
- (z) **“State Load Despatch Centre (SLDC)”** means the Centre established under subsection (1) of Section 31 of the Act;
- (aa) **“State”** means the State of Jharkhand;
- (bb) **“State Transmission Utility (STU)”** means the Board or the Government Company specified as such by the State Government under sub-section (1) of Section 39 of the Act;
- (cc) **“Tariff period”** means the period for which tariff is to be determined by the Commission on the basis of norms specified under these Regulations;
- (dd) **“Useful Life”** in relation to a unit of a generating station including evacuation system shall mean the duration from the date of commercial operation (COD) of such generation facility and shall be considered as provided in the Regulation 4.23.
- (ee) **“Year”** means a financial year.

2.2 All other expressions used herein although not specifically defined herein, but defined in the Act, shall have the meaning assigned to them in the Act. The other expressions used herein but not specifically defined in this Regulation or in the Act but defined under any law passed by the Parliament applicable to electricity industry in the State shall have the meaning assigned to them in such law.

A3: APPLICABILITY OF THE ORDER

3.1 These regulations shall be applicable in case of following grid connected power generation projects:

- (a) **Biomass power project based on Rankine cycle technology** – Biomass power projects using new plant and machinery based on Rankine cycle technology and using biomass fuel sources, provided use of fossil fuel is restricted only up to 15% of total fuel consumption on annual basis.
- (b) **Biomass Gasifier based Power plant** – The project shall qualify to be termed as a biomass gasifier based power project, if it is using new plant and machinery and having a Grid connected system that uses 100% producer gas engine, coupled with gasifier technologies approved by MNRE.
- (c) **Non-fossil fuel based co-generation project** – The project shall qualify to be termed as a non-fossil fuel based co-generation project, if it is using new plant and machinery and is in accordance with the definition and also meets the qualifying requirements outlined below:

Topping cycle mode of co-generation – Any facility that uses non-fossil fuel input for the power generation and also utilizes the thermal energy generated for useful heat applications in other industrial activities simultaneously.

Provided that for the co-generation facility to qualify under topping cycle mode, the sum of useful power output be greater than 45% of the facility's energy consumption, during season.

For the purposes of this clause,

(i) 'Useful power output' is the gross electrical output from the generator. There will be an auxiliary consumption in the cogeneration plant itself (e.g. the boiler feed pump and the FD/ID fans). In order to compute the net power output it would be necessary to subtract the auxiliary consumption from the gross output. For simplicity of calculation, the useful power output is defined as the gross electricity (kWh) output from the generator.

(ii) 'Useful Thermal Output' is the useful heat (steam) that is provided to the process by the cogeneration facility.

(iii) 'Energy Consumption' of the facility is the useful energy input that is supplied by the fuel (normally bagasse or other such biomass fuel).

(iv) 'Topping cycle' means a cogeneration process in which thermal energy produces electricity followed by useful heat application in industrial activities.

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- 3.2 The Control Period will be from **1st April 2016 to 31st March 2020**. The tariff decided in a particular control period shall apply to all projects which come up within that control period.
- 3.3 The revision in Regulations for next Control Period shall be undertaken at least six months prior to the end of this Control Period and in case Regulations for the next Control Period are not notified until commencement of next Control Period, the tariff norms as per these Regulations shall continue to remain applicable until notification of the revised Regulations subject to adjustments as per revised Regulations.

A4: DETERMINANTS OF TARIFF

- 4.1 Under Section 14 of the Act, no license is required for generation and distribution of power in notified rural areas. Hence, stand-alone biomass power projects, biomass gasification projects and non-fossil fuel based co-generation projects supplying to rural areas will not have their tariffs determined by the Commission.
- 4.2 Biomass power, biomass gasification and non-fossil fuel based co-generation projects feeding to the grid would require tariff at which Distribution Licensees would procure power from these plants. Determination of tariff by the Commission would also facilitate signing of Power Purchase Agreement (PPA) between developers and Distribution Licensee.
- 4.3 The Control Period or review period under these regulations shall be of four years.

Tariff Period

- 4.4 The tariff determined under these Regulations for biomass (Rankine cycle) and non-fossil fuel based co-generation projects shall be applicable for **thirteen (13) years** for the projects having Commercial Operation Date (COD) up to 31st March, 2020.
- 4.5 The tariff determined under these Regulations for biomass (Gasifier) projects shall be applicable for **twenty (20) years** for the projects having Commercial Operation Date (COD) up to 31st March, 2020.
- 4.6 Tariff period under these Regulations shall be considered from the date of commercial operation of the renewable energy generating stations.
- 4.7 The Commission shall determine the generic tariff suo-motu at least six months in advance at the beginning of each year of the Control period for Biomass power projects, biomass gasification projects and non-fossil fuel based co-generation projects.

Project Specific Tariff

- 4.8 Project specific tariff, on case to case basis, may be determined by the Commission on case to case basis if opted for by the developer.

Provided that the Commission while determining the project specific tariff for projects shall be guided by the provisions specified in these Regulations.

Provided further that the financial norms as specified, except for capital cost, shall be ceiling norms while determining the project specific tariff.

- 4.9 A Petition for determination of project specific tariff shall be accompanied by such fee as may be determined by Regulations and shall be accompanied by:
- (a) Information in forms released by the Commission as appendix to these Regulations;
 - (b) Detailed Project Report (DPR) outlining technical and operational details, site specific aspects, and premise for capital cost and financing plan etc.
 - (c) A Statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.
 - (d) A statement containing full details of calculation of any subsidy and incentive received, due or assumed to be due from the Central Government and/or State Government. This statement shall also include the proposed tariff calculated without consideration of the subsidy and incentive.
 - (e) Any other relevant information required by the Commission for the purpose of Tariff Determination;

Tariff Principle

- 4.10 While deciding the tariff for power purchase by Distribution Licensee from renewable sources, the Commission has considered the principles and methodologies specified by:
- (a) National Electricity Policy;
 - (b) National Tariff Policy;
 - (c) Central and State Governments; and
 - (d) Forum of Regulators (FOR) and Central Electricity Regulatory Commission;

- 4.11 Renewable energy technologies like Biomass power, biomass gasification and non-fossil fuel based co-generation projects have a significant fuel cost component. In view of that single part tariff with two components, fixed cost component and fuel cost component, shall be determined on levellised basis considering the year of commissioning of the project for fixed cost component while the fuel cost component shall be specified on year of operation basis.
- 4.12 For the purpose of levellised tariff computation, the discount factor equivalent to Post tax weighted average cost of capital shall be considered.
- 4.13 Levellisation shall be carried out for the ‘useful life’ of the Renewable energy project while tariff shall be specified for the period equivalent to ‘Tariff Period’.

Components of Tariff

- 4.14 Tariff determination using a cost-plus approach requires assumptions on the following operational and financial parameters:
- (a) Capital cost;
 - (b) Plant Load Factor;
 - (c) Auxiliary consumption;
 - (d) Debt-equity ratio ;
 - (e) Term of loan and Interest on long term debt;
 - (f) Depreciation;
 - (g) Operation and Maintenance expenditure;
 - (h) Working capital and interest on working capital;
 - (i) Return on equity.
- 4.15 The subsequent sections detail the terms and conditions of various components set by the Commission for determination of tariff from biomass and co-generation power projects.

Principles of Tariff determination

Capital cost

- 4.16 The capital cost primarily consists of the cost of technology used, plant layout an configuration, type of fuel used, procurement, transportation, storage etc., taxes and duties, cost of inter-connection, civil works, land including leasehold lands and erection & commissioning.
- 4.17 **Biomass (Rankine Cycle):** The normative capital cost for FY 2016-17 shall be considered as given below:

Table 1: Capital cost for Biomass Rankine cycle based power projects

Biomass Rankine Cycle based power projects	Capital Cost (INR Lakh/ MW)
Project [other than rice straw and Juliflora (plantation) based project] with water cooled condenser	560
Project [other than rice straw and Juliflora (plantation) based project] with air cooled condenser	600
For rice straw and Juliflora (plantation) based project with water cooled condenser	611
For rice straw and Juliflora (plantation) based project with air cooled condenser	653

- 4.18 **Biomass Gasifier:** The normative capital cost for FY 2016-17 shall be considered as **INR 593 Lakh/MW**.
- 4.19 **Non fossil fuel based co-generation:** The normative capital cost for FY 2016-17 shall be considered as **INR 453 lakh/MW**.

Provided if any power projects is eligible for capital subsidy either by State Government or MNRE, the net capital cost will be arrived at after deducting the amount of capital subsidy.

- 4.20 The capital cost of the power projects shall be revised over the control period with changes in Wholesale Price Index (WPI) for steel and electrical machinery based on the following indexation formula.

$$\text{Capital cost for } n^{\text{th}} \text{ year, } CC(n) = P\&M_{(n)} * (1+F_1+F_2+F_3)$$

$$\text{Plant \& Machinery cost for } n^{\text{th}} \text{ year, } P\&M_{(n)} = P\&M_{(0)} * (1+d_{(n)})$$

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

Where, $PM_{(0)}$ = Plant & Machinery cost for the base year

$d_{(n)}$ = Capital cost indexation factor for year (n) of Control Period

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$SI_{(n-1)}$ = Average WPI Steel Index prevalent for fiscal year (n-1) of the Control period

$SI_{(0)}$ = Average WPI Steel Index prevalent for calendar year (0) at the beginning of the Control Period

$EI_{(n-1)}$ = Average WPI Electrical Machinery Index prevalent for fiscal year (n-1) of the Control Period

$EI_{(0)}$ = Average WPI Electrical Machinery Index prevalent for calendar year (0) of the Control Period

a = Constant to be determined by Commission from time to time, (In default it is 0.7), for weightage to Steel Index

b = Constant to be determined by Commission from time to time, (In default it is 0.3), for weightage to Electrical Machinery Index

F1 = Factor for Land and Civil work (0.10)

F2 = Factor for Erection and Commissioning (0.09)

F3 = Factor for IDC and Financing Cost (0.14)

Plant load factor

4.21 Plant load factor for Biomass, Biomass gasifier and non-fossil fuel based co-generation projects as given in the table below has been considered for determination of fixed charges component of tariff.

Table 2: Plant load factor

Power project	PLF (%)
a) Biomass	
(i) During stabilization (6 months)	60%
(ii) During remaining period of first year (after stabilization)	70%
(iii) Second year onwards	80%
b) Biomass Gasifier	85%
c) Non fossil-fuel based cogeneration project	53%

Auxiliary consumption

4.22 The auxiliary power consumption factor for the determination of the tariff for Biomass (Rankine and Gasifier) based projects and Non-fossil fuel based co-generation projects are summarized as under:

Table 3: Auxiliary Consumption Factor

Power project	Auxiliary consumption factor (%)
a) Biomass (Rankine Cycle)	
(i). Using water cooled condenser	- During First (1 st) year of operation: 11.00% - From Second (2 nd) year onwards: 10.00%
(ii). Using air cooled condenser	- During First (1 st) year of operation: 13.00% - From Second (2 nd) year onwards: 12.00%
b) Biomass Gasifier	10.00%
C) Non-fossil fuel co-generation	8.50%

Life of plant

4.23 The life of plant shall be considered as under:

- (a) Biomass power project with Rankine cycle technology **20 years**
- (b) Biomass gasifier based power project **20 years**
- (c) Non-fossil fuel cogeneration project **20 years**

Debt equity ratio

4.24 For generic tariff, to be determined based on suo-motu petition, the debt equity ratio shall be **70:30**.

4.25 For Project specific tariff, the following provisions shall apply:-

If the equity actually employed is more than 30%, the amount of equity in excess of 30% shall be treated as normative loan.

Provided that, in case the equity employed is less than 30%, the actual equity employed is to be considered.

Term of loan and Interest on long term debt

4.26 For the purpose of determination of tariff, loan tenure of 12 years shall be considered.

4.27 The loans arrived at in the manner indicated shall be considered as gross normative loan for calculation for interest on loan. The normative loan outstanding as on April 1st of every year shall be worked out by deducting the cumulative repayment up to March 31st of previous year from the gross normative loan.

4.28 Notwithstanding any moratorium period availed power project, the repayment of loan shall be considered from the first year of commercial operation of the project and shall be equal to the annual depreciation allowed.

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- 4.29 For the purpose of computation of tariff the normative interest rate on long term loan shall be considered as average State Bank of India (SBI) Base rate prevalent during the first six months of the previous year plus 300 basis points.

Depreciation

- 4.30 The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission. The Salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the Capital Cost of the asset.

Provided that land is not a depreciable asset and its cost shall be excluded while computing the 90% of the capital cost.

- 4.31 Depreciation per annum shall be based on 'Differential Depreciation Approach' over loan period beyond loan tenure over useful life computed on Straight Line Method'. The depreciation rate for the first 12 years of the Tariff Period shall be 5.83% per annum and the remaining depreciation shall be spread over the remaining useful life of the project from 13th year onwards.

- 4.32 Depreciation shall be chargeable from the first year of commercial operation.

Provided that in case of commercial operation of the asset for part of the year, depreciation shall be charged on pro rata basis.

Operation and Maintenance expenses

- 4.33 Operation and Maintenance expenses consist of employee expenses, administrative and general expenses, repairs and maintenance expenses, cost of spares and insurance expenses.

- 4.34 The normative O&M expenses for FY 2016-17 shall be as follows:

- | | |
|------------------------------------------|-------------------|
| (a) Biomass (Rankine Cycle): | INR 47.00 Lakh/MW |
| (b) Biomass Gasifier: | INR 50.00 Lakh/MW |
| (c) Non fossil fuel based co-generation: | INR 20.00 Lacs/MW |

- 4.35 Normative O&M expenses allowed at the commencement of the Control Period under these Regulations i.e. FY 2016-17 shall be escalated at the rate of 5.72% per annum.

Interest on working capital

- 4.36 The working capital requirement in respect of Biomass (Rankine Cycle Technology), Biomass Gasifier and Non-fossil fuel Co-generation shall be computed in accordance with the following:

- (a) Fuel costs for four (4) months equivalent to normative PLF;

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- (b) Operation & Maintenance expenses for one (1) month;
- (c) Receivables equivalent to two (2) months of fixed and variable charges for sale of electricity calculated on the target PLF;
- (d) Maintenance spares @ 15% of Operation and Maintenance expenses.

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

Return on equity

4.38 The value base for the equity shall be 30% of the capital cost or actual equity (in case of project specific tariff determination as determined under Regulation 4.25).

4.39 The return on equity shall be as under :

- (a) 20% per annum for the first 10 years.
- (b) 24% per annum 11th years onwards.

Station heat rate

4.40 The station heat rates for biomass and non-fossil fuel based co-generation projects shall be considered as under:

Table 4: Station Heat Rate (SHR)

Power project	PLF (%)
a) Biomass	
(i) Using travelling grate boilers	4200
(ii) Using ABFC boilers	4125
b) Non-fossil fuel co-generation	3600

Fuel Mix

4.41 The Biomass based power generating stations are to be designed in a way that it uses different types of non-fossil fuels available within the vicinity of biomass power project such as crop residues, agro-industrial residues, forest residues etc. and other biomass fuels as may be approved by the Ministry of Non- Renewable Energy (MNRE). The biomass power generating companies are to ensure fuel management plan to ensure adequate availability of fuel to meet the respective project requirements.

4.42 The normative specific fuel consumption shall be 1.25 kg per kWh for Biomass Gasifier based power generating stations.

Calorific Value

- 4.43 Biomass (Rankine and Gasification): The calorific value of biomass fuel used for determination of tariff shall be 3174 kCal/kg.
- 4.44 Non-fossil fuel based co-generation: The calorific value for bagasse used for determination of tariff shall be 2250 kCal/kg.

Fuel cost

- 4.45 The fuel costs for the first year of Control Period i.e. FY 2016-17 for Biomass (Rankine and Gasifier) and Non-fossil fuel based co-generation projects shall be as under:

Table 5: Fuel Cost for FY 2016-17

Power project	Fuel Cost (INR/Tonne)
a) Biomass (Rankine Cycle)	3000.00
b) Biomass Gasifier	3000.00
C) Non-fossil fuel co-generation	1920.00

- 4.46 The fuel cost will change each year based on whether a Renewable Energy Power Project developer opts for fuel price indexation, as described below or an escalation factor of 5%. Hence, while calculating the total applicable tariff for Biomass Power Projects, non-fossil fuel based co-generation projects and Biomass Gasifier based power Projects, levellisation of only fixed component is considered and the variable component for the first year of operation (i.e. 2016-17) is specified.

Provided that the biomass price may be reviewed by the Commission at the end of third year of the control period.

- 4.47 The following indexing mechanism for adjustment of fuel prices for each year of operation will be applicable for determination of applicable variable charge component of tariff, in case developer wishes to opt for indexing mechanism:

$$P_{(n)} = P_{(n-1)} * \{ a * (WPI_{(n)}/WPI_{(n-1)}) + b * (1+IRC_{(n-1)}) + c * (Pd_{(n)}/Pd_{(n-1)}) \}$$

Where,

$P_{(n)}$ = Price per tonne of biomass for the n^{th} year to be considered for tariff determination

$P_{(n-1)}$ = Price per tonne of biomass for the $(n-1)^{th}$ year to be considered for tariff determination.

a = Factor representing fuel handling cost

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b = Factor representing fuel cost

c = Factor representing transportation cost

$IRC_{(n-1)}$ = Average Annual Inflation Rate for indexed energy charge component in case of captive coal mine source (in %) to be applicable for (n-1)th year, as may be specified by CERC for 'Payment purpose' as per competitive Bidding Guidelines

Pd_n = Weighted average price of HSD for nth year

Pd_{n-1} = Weighted average price of HSD for (n-1)th year

WPI_n = Whole sale price index for the month of April of nth year

WPI_{n-1} = Wholesale price index for month of April of (n-1)th year

Where a, b & c will be specified by the Commission from time to time. **In default, these factors shall be 0.2, 0.6 & 0.2 respectively.**

Variable charges

4.48 Variable charge for the nth year shall be determined as under:

$$VC_n = VC_1 \times (P_n/P_1) \text{ 'or' } VC_n = VC_1 \times (1.05)^{(n-1)} \text{ (Optional)}$$

Where,

VC_1 represents the variable charge based on biomass price P_1 for FY 2016-17 as specified under Regulation 4.45 and shall be determined as under:

$$VC_1 = [SHR / GCV] \times [1 / (1 - \text{Aux. consumption Factor})] \times (P_1/1000)$$

Where;

P_1 = Fuel price in INR/ Tonne for FY 2016-17

SHR = Station heat rate in kCal/kWh

GCV = Gross Calorific value in kCal/kg

4.49 The cost parameters considered by the Commission to determine tariff for power generated from Biomass (Rankine cycle), Biomass Gasifier and Non-fossil fuel based co-generation have been summarised in following table.

Table 6: Cost parameters considered by Commission for Tariff Determination

Parameters	Biomass (Rankine)	Biomass (Gasifier)	Non-fossil fuel based Co-generation
Capital cost (INR Lacs/MW) for FY 2016-17 and further escalated based on indexation formula provided in Regulation 4.20	i) Other than rice straw and Juliflora (plantation) based projects with water cooled condenser: 560 ii) Other than rice straw and Juliflora (plantation) based projects with air cooled condenser: 600 iii) For rice straw and Juliflora (plantation) based project with water cooled condenser: 611 iv) For rice straw and Juliflora (plantation) based project with air cooled condenser: 653	593	453
Plant load factor (%)	i) During stabilization (6 moths): 60% ii) During remaining period of first year (after stabilization): 70% iii) Second year onwards: 80%	85%	53%
Life of plant (year)	20	20	20
Auxiliary consumption (%)	i) Water cooled condenser: - First year: 11.00% - Second year onwards: 10.00% i) Air cooled condenser: - First year: 13.00% - Second year onwards: 12.00%	10.00%	8.50%
Debt equity ratio	70:30	70:30	70:30
Loan repayment	12 yrs	12 yrs	12 yrs

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Parameters	Biomass (Rankine)	Biomass (Gasifier)	Non-fossil fuel based Co-generation
Interest on loan	Average SBI Base Rate during first 6 months of previous years + 3%	Average SBI Base Rate during first 6 months of previous years + 3%	Average SBI Base Rate during first 6 months of previous years + 3%
Interest on Working Capital	Average SBI Base Rate during first 6 months of previous years + 3.5%	Average SBI Base Rate during first 6 months of previous years + 3.5%	Average SBI Base Rate during first 6 months of previous years + 3.5%
O&M expenses (INR Lakh/ MW) for FY 2016-17	47.00	50.00	20.00
Annual escalation in O&M expenses (%)	5.72%	5.72%	5.72%
Depreciation	Yr 1 to 12: 5.83% 13 th Yr onwards: Remaining depreciation spread over useful life	Yr 1 to 12: 5.83% 13 th Yr onwards: Remaining depreciation spread	Yr 1 to 12: 5.83% 13 th Yr onwards: Remaining depreciation spread
Residual value	10% of capital cost	10% of capital cost	10% of capital cost
Return on equity (pre-tax)	Yr 1 to 10 - 20% 11 th Yr onwards - 24%	Yr 1 to 10 - 20% 11 th Yr onwards - 24%	Yr 1 to 10 - 20% 11 th Yr onwards - 24%
Station heat rate (kCal/kWh)	i) Using travelling grate boilers: 4200 ii) Using ABFC boilers: 4125	i) Using travelling grate boilers: 4200 ii) Using ABFC boilers: 4125	3600
Gross Calorific value (kCal/kg)	3174	3174	2250
Fuel Cost for FY 2016-17 (INR/tonne)	3000.00	3000.00	1920.00

A5: OTHER TERMS AND CONDITIONS

Transmission and Wheeling

- 5.1 In case of third party sale or for captive use both within the State or outside, the transmission charges and wheeling charges shall be recovered in cash and transmission losses and wheeling losses shall be recovered in kind as under:
- (a) For use of transmission network, transmission charges and losses as determined by the Commission in respect of open access transactions would be applicable.
 - (b) For use of distribution licensee's network, the wheeling charges and losses as determined by the Commission in respect of open access transactions at respective voltage levels at which electricity is supplied, would be applicable.
 - (c) For use of both EHV and distribution network, both transmission and wheeling charges as well as losses, as applicable shall be payable.

Balancing and Settlement code

- 5.2 All renewable energy power plants, except for biomass power plants, with installed capacity of 10 MW and above shall be treated as 'MUST RUN' power plants and shall not be subjected to 'merit order despatch' principles.
- 5.3 The biomass power generating station with an installed capacity of 10MW and above and non-fossil fuel based co-generation projects shall be subjected to scheduling and dispatch code as specified under Indian Electricity Grid Code (IEGC) and Central Electricity Regulatory Commission (Unscheduled Interchange and related matters) Regulations, 2009 including as amended from time to time.

Metering and billing

- 5.4 The metering and communication arrangements shall be provided in accordance with the JSERC (Terms and Conditions for Intra-state Open Access) Regulations, 2016 and subsequent amendments thereof, Grid Code and Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 in consultation with Distribution Licensee/State Transmission Utility. The periodicity of testing, checking, calibration etc., will be governed by the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 and regulations issued by the Commission from time to time in this regard.
- 5.5 Main and Check Meters shall have facility to communicate its reading to State Load Dispatch Centre on real time basis or otherwise as may be specified by the Commission.

5.6 Meter reading shall be taken as per the procedure devised by the Distribution Licensee/State Load Despatch Centre. The term 'Meter' shall include Current transformers, voltage/potential transformers, wiring between them and meter box/panel etc.

5.7 Billing of the metered energy shall be carried out on a monthly basis.

Payment mechanism

5.8 The Commission prescribes a settlement period of 60 days from the date of presentation of the bill for the net energy sold after deducting the charges for start-up power and reactive power to the concerned Distribution Licensee where the power is injected, in order to ensure that the generating company has an assurance of cash inflow for the energy delivered to the grid.

5.9 In case of delay beyond the 60 days payment period, the Distribution Licensee shall pay a late payment surcharge at the rate of 1.25% per month to the generating company.

5.10 In case the Distribution Licensee makes the payment other than through letter of credit within 30 days from the date of presentation of bills by the generating company, a rebate of 1% billed amount shall be allowed by the generating company.

Third party sale

5.11 In case of default in payment for more than three months continuously by the Distribution Licensee, the generating company can sell power to the third party.

5.12 In those cases where the developer has an existing arrangement for third party supply or for captive consumption and in case the generating company desires to terminate the agreement with third party and to supply to the Distribution Licensee, the Distribution Licensee with the prior permission of the Commission, shall purchase the power at the rate as determined by the Commission in these regulations.

Start-up power

5.13 The biomass power generators (Rankine and Gasification) and non-fossil fuel co-generation power generators shall be entitled to draw start up power from the Distribution Licensee's network. The drawal of energy by the generator during the start up from the Distribution Licensee shall be adjusted against the generated energy.

Drawing of power during shut down

- 5.14 The biomass power generators (Rankine and Gasification) and non-fossil fuel co-generation power generators shall be entitled to draw power from the Distribution Licensee's network during shutdown period of its plant or other emergencies. The energy consumed shall be billed at the temporary rate applicable to HT Industrial category. The drawal by the biomass power generators (Rankine and Gasification) and non-fossil fuel co-generation power generators shall not normally exceed 11.5 % of the MW capacity it delivers to the Distribution Licensee.

Banking

- 5.15 Jharkhand does not have a Renewable Policy as yet to deal with this issue. But it is recommended that facility for 100% banking of generated power is allowed on the condition that banked power will not be returned by more than a fixed quantity at one time.
- 5.16 Utilities should facilitate banking through proper arrangement so that power banked during off-peak period is not drawn during peak season.

Evacuation Infrastructure

- 5.17 The State Transmission Utility (STU) shall bear 100% of the cost of evacuation infrastructure.

Incentive by Central / State government

- 5.18 The Government of Jharkhand has notified the Jharkhand Industrial Policy 2012. The policy delineates enabling policies and incentives promoting industrial investment in the state. According to the Jharkhand Industrial Policy 2012:
- (a) The State proposes to promote increasing use of renewable and environmental friendly sources of energy. Thrust will be given to develop these on BOT basis through private sector participation.
 - (b) The State has substantial biomass availability due to its large agricultural base. These energy units could be based on paddy-waste, rice straw / husk, Jhari leaves, twigs, geo-thermal, solar etc.
 - (c) A power plant generating power from renewable sources, with commercial operation, shall be deemed to be a new industrial unit and will be entitled to all the incentives under the Industrial policy. These plants will not be liable to pay 50% electricity duty for a period of 10 years.
 - (d) New or existing industrial units setting up captive power plant shall be exempted from the payment of 50% of electricity duty for a period of five years for self – consumption or captive use (i.e. in respect of power being used by the plant) from the date of its commissioning.

- 5.19 The Commission shall take into consideration any incentive or subsidy offered by the Central or State Government, including accelerated depreciation benefit if availed by the generating company, for the renewable energy power plants while determining the tariff under these Regulations.

Provided that the following principles shall be considered for ascertaining income tax benefit on account of accelerated depreciation, if availed, for the purpose of tariff determination:

- (a) Assessment of benefit shall be based on normative capital cost, accelerated depreciation rate as per relevant provisions under Income Tax Act and corporate income tax rate.
- (b) Capitalization of RE projects during second half of the fiscal year. Per unit benefit shall be derived on levelled basis at discount factor equivalent to Post Tax weighted average cost of capital.

Taxes and Duties

- 5.20 Tariff determined under these Regulations shall be exclusive of taxes and duties as may be levied by the appropriate Government:

Provided that the taxes and duties levied by the government shall be allowed to pass through on actual incurred basis

Single Window Clearance

- 5.21 The developers shall be granted approvals and clearances in line with the Jharkhand State Industrial Policy 2012.

A6: POWER TO REMOVE DIFFICULTIES

- 6.1 In case of any difficulty in giving effect to any of the provisions of this Regulation, the Commission may by general or special order, issue appropriate directions to Generators, Transmission Licensee(s), Distribution Licensee(s) etc., to take suitable action, not being inconsistent with the provisions of the Act, which appear to the Commission to be necessary or expedient for the purpose of removing the difficulty.
- 6.2 The generators, Licensees may make an application to the Commission and seek suitable orders to remove any difficulties that may arise in implementation of these regulations.

A7: POWER TO AMEND

- 7.1 The Commission may from time to time add, vary, alter, suspend, modify, amend or repeal any provisions of this Regulation.

A8: SAVINGS

- 8.1 Nothing in these Regulations shall be deemed to limit or otherwise affect the inherent power of the Commission to make such orders as may be necessary to meet the ends of justice or to prevent abuses of the process of the Commission.
- 8.2 Nothing in this Regulations shall bar the Commission from adopting in conformity with the provisions of the Act a procedure, which is at variance with any of the provisions of these Regulations, if the Commission, in view of the special circumstances of a matter or class of matters and for reasons to be recorded in writing, deems it necessary or expedient for dealing with such a matter or class of matters.
- 8.3 Nothing in these Regulations shall, expressly or impliedly, bar the Commission dealing with any matter or exercising any power under the Act for which no Regulations or Regulations have been framed, and the Commission may deal with such matters, powers and functions in a manner it thinks fit.

(By order of the Commission)

(A.K. Mehta)

Secretary

Jharkhand State Electricity Regulatory Commission

Appendix

Form 1.1 Form Template for Biomass (Rankine)/ Biomass (Gasifier)/ Non Fossil fuel based co-generation

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Amount
1	Power Generation				
		Capacity			
			Installed Power Generation Capacity	MW	
			Capacity Utilization Factor	%	
			Auxiliary consumption	%	
			Useful Life	Years	
2	Project Cost		Normative Capital Cost	Rs Lacs	
		Capital Cost/MW	Capital Cost	Rs Lacs	
		-	Capital subsidy (if any)	Rs Lacs	
		-	Net capital cost	Rs Lacs	
3	Sources of Fund				
			Tariff Period	Years	
		<u>Debt: Equity</u>			
			Debt	%	
			Equity	%	
			Total Debt Amount	Rs Lacs	
			Total Equity Amount	Rs Lacs	
		<u>Debt Component</u>			
			Loan Amount	Rs Lacs	
			Moratorium Period	years	
			Repayment Period(include Moratorium)	years	
			Interest Rate	%	
		<u>Equity Component</u>			
			Equity amount	Rs Lacs	
			Return on Equity for first 10 years	% p.a	
			RoE Period	Year	
			Return on Equity 11th year onwards	% p.a	
			Weighted average of ROE	%	
			Discount Rate (WACC)	%	
4	Financial Assumptions				
		<u>Fiscal Assumptions</u>			
			Income Tax	%	
			MAT Rate (for first 10 years)	%	
			80 IA benefits	Yes/No	
		<u>Depreciation</u>			

JSERC (Biomass and Non-Fossil fuel based Co-Generation Projects) Regulations, 2016

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Amount
			Depreciation Rate for first 12 years	%	
			Depreciation Rate 13th year onwards	%	
			Years for 5.83% rate	Years	
			Salvage value	%	
5	Working Capital				
		O&M Charges		Months	
		Maintenance Spare	(% of O&M expenses)	%	
		Receivables for Debtors		Months	
		on energy charges			
		Interest On Working Capital		%	
6	Operation & Maintenance				
		Normative O&M Expenses		Rs Lakh	
		O&M Expenses Per Annum			
		Escalation Factor		%	
7	Incentives (if any)				
		GBI		Rs Lakh p.a.	
		Period for GBI		Years	
8.	Fuel related assumptions	Station heat rate	During stabilization	kCal/kWh	
			Post stabilization	kCal/kWh	
		Fuel types & mix	Biomass fuel Rankine cycle	%	
			Biomass fuel Gasifier	%	
			Co-generation fuel	%	
			GCV of Biomass (Rankine)	kCal/kg	
			GCV of Biomass (Gasifier)	kCal/kg	
			GCV of Co-generation fuel	kCal/kg	
			Price of Biomass (Rankine)	INR/Tonne	
			Price of Biomass (Gasifier)	INR/Tonne	
			Price of co-generation fuel	INR/Tonne	
		Indexation or escalation used			
			Indexation factor	% p.a	
			Escalation factor	% p.a	

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Form 1.2 Form Template for Biomass (Rankine)/ Biomass (Gasifier)/ Non fossil fuel co-generation – Determination of Tariff

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Installed Capacity	MW																						
Gross/Net Generation	MU																						

Tariff Components (Fixed Charge)	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
O&M Expenses	Rs Lakh																						
Depreciation	Rs Lakh																						
Interest on term loan	Rs Lakh																						
Interest on working Capital	Rs Lakh																						
Return on Equity	Rs Lakh																						
Total Fixed Cost	Rs Lakh																						

Levelling tariff corresponding to Useful life

Per Unit Cost of Generation	Unit		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Variable cost	Rs/kWh																						
O&M expn	Rs/kWh																						
Depreciation	Rs/kWh																						
Int. on term loan	Rs/kWh																						
Int. on working capital	Rs/kWh																						
RoE	Rs/kWh																						
Total COG per unit	Rs/kWh																						

Per Unit Cost of Generation	Unit		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Discount Factor																							
Discounted Tariff Components	Rs/kWh																						
Levelling Tariff		Rs Lakhs																					
Levelling Tariff		Rs/Unit																					

JSERC (Biomass and Non-Fossil fuel based Co-Generation Projects) Regulations, 2016

Project specific values of variables used in Capital cost Indexation

Variable	Description	Value
		Biomass (Rankine)/ Biomass (Gasifier)/ Co-generation project
a	Weightage of steel index	0.70
b	Weightage of electrical machinery index	0.30
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

Project specific values of variables used in Fuel cost Indexation

Variable	Description	Value
		Biomass (Rankine)/ Biomass (Gasifier)/ Co-generation project
A	Factor for Fuel handling cost	0.2
B	Factor for Fuel cost	0.6
C	Factor for Transportation cost	0.2