

Jharkhand State Electricity Regulatory Commission



**Order
on
Determination of
Levelling Generation Tariff
for
11.5 MW Municipal Solid Waste (MSW) Project
of
Ranchi Municipal Solid Waste Private Limited
(RMPL)**

Ranchi

June 2017

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List of Abbreviations

Abbreviation	Description
CERC	Central Electricity Regulatory Commission
MSW	Municipal Solid Waste
RMPL	Ranchi MSW Private Limited
FY	Financial Year
GFA	Gross Fixed Assets
GoI	Government of India
JSERC	Jharkhand State Electricity Regulatory Commission
Kg	Kilogram
kCal	Kilocalorie
kWh	Kilowatt-hour
MUs	Million Units
MW	Megawatt
O&M	Operations and Maintenance
PLF	Plant Load Factor
PPA	Power Purchase Agreement
RES	Renewable Energy Sources
R&M	Repair and Maintenance
RoE	Return on Equity
Rs	Rupees
SBI	State Bank of India
SERC	State Electricity Regulatory Commission

BEFORE

Jharkhand State Electricity Regulatory Commission, Ranchi

Case No.: 12 of 2016

In the matter of:

**Petition for determination of Levellised Generation Tariff for 11.5 MW
Municipal Solid Waste Project at Jhiri, Ranchi**

And

In the matter:

Ranchi MSW Pvt. Limited, Flat No. 1507, Shri Radhey Krishna Gardens
Rameshwaram, Bariyatu, Ranchi, Jharkhand – 834009

PRESENT

Hon'ble Mr. R. N. Singh

- Member (Engg.)

Order dated June 21, 2017

In this Petition, Ranchi Municipal Solid Waste Private Limited (hereinafter referred to as 'RMPL') has prayed for determination of levellised generation tariff for 25 years for the power to be generated from the proposed 11.5 MW Municipal Solid Waste power plant of RMPL at Jhiri, Ranchi for sale to Jharkhand Bijli Vitran Nigam Ltd. (JBVNL) in the State of Jharkhand.

A1: INTRODUCTION

Jharkhand State Electricity Regulatory Commission

- 1.1 The Jharkhand State Electricity Regulatory Commission (hereinafter referred to as “JSERC” or “the Commission”) was established by the Government of Jharkhand under Section 17 of the Electricity Regulatory Commission Act, 1998 on August 22, 2002. The Commission became operational with effect from April 24, 2003.
- 1.2 The Government of Jharkhand vide its notification dated August 22, 2002 had defined the functions of JSERC as per Section 22 of the Electricity Regulatory Commission Act, 1998 to be the following, namely:-
- (a) to determine the tariff for electricity, wholesale, bulk, grid or retail, as the case may be, in the manner provided in section 29;
 - (b) to determine the tariff payable for the use of the transmission facilities in the manner provided in section 29;
 - (c) to regulate power purchase and procurement process of the transmission utilities and distribution utilities including the price at which the power shall be procured from the generating companies, generating stations or from other sources for transmission, sale, distribution and supply in the State;
 - (d) to promote competition, efficiency and economy in the activities of the electricity industry to achieve the objectives and purposes of this Act.
- 1.3 After the Electricity Act, 2003 came into force, the earlier Electricity Regulatory Commission Act of 1998 stands repealed and the functions of SERCs are now defined under Section 86 of the Act.
- 1.4 In accordance with Section 86 (1) of the Act, the JSERC discharges the following functions: -
- (a) determine the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be, within the State:

Provided that where open access has been permitted to a category of consumers under section 42, the State Commission shall determine only the wheeling charges and surcharge thereon, if any, for the said category of consumers;
 - (b) regulate electricity purchase and procurement process of distribution licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for purchase of power for distribution and supply within the State;

- (c) facilitate intra-state transmission and wheeling of electricity;
 - (d) issue licences to persons seeking to act as transmission licensees, distribution licensees and electricity traders with respect to their operations within the State;
 - (e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;
 - (f) adjudicate upon the disputes between the licensees and generating companies; and to refer any dispute for arbitration;
 - (g) levy fee for the purposes of this Act;
 - (h) specify State Grid Code consistent with the Grid Code specified under Clause (h) of sub-section (1) of Section 79;
 - (i) specify or enforce standards with respect to quality, continuity and reliability of service by licensees;
 - (j) fix the trading margin in the intra-state trading of electricity, if considered, necessary;
 - (k) discharge such other functions as may be assigned to it under this Act.
- 1.5 The Commission advises the State Government on all or any of the following matters, namely:-
- (a) promotion of competition, efficiency and economy in activities of the electricity industry;
 - (b) promotion of investment in electricity industry;
 - (c) reorganisation and restructuring of electricity industry in the State;
 - (d) matters concerning generation, transmission, distribution and trading of electricity or any other matter referred to the State Commission by that Government.
- 1.6 The State Commission ensures transparency while exercising its powers and discharging its functions.
- 1.7 In discharge of its functions, the State Commission is guided by the National Tariff Policy framed and published by Government of India under the provisions of Section 3 of the Act. The objectives of the present National Tariff Policy are to :

- (a) ensure availability of electricity to consumers at reasonable and competitive rates;
- (b) ensure financial viability of the sector and attract investments;
- (c) promote transparency, consistency and predictability in regulatory approaches across jurisdictions and minimize perceptions of regulatory risks;
- (d) promote competition, efficiency in operations and improvement in quality of supply.
- (e) Promote generation of electricity from Renewable sources;
- (f) Promote Hydroelectric Power generation including Pumped Storage Projects (PSP) to provide adequate peaking reserves, reliable grid operation and integration of variable renewable energy sources;
- (g) Evolve a dynamic and robust electricity infrastructure for better consumer services;
- (h) Facilitate supply of adequate and uninterrupted power to all categories of consumers;
- (i) Ensure creation of adequate capacity including reserves in generation, transmission and distribution in advance, for reliability of supply of electricity to consumers.

The Petitioner – Ranchi Municipal Solid Waste Private Limited, Ranchi

- 1.8 The Petitioner, Ranchi MSW Pvt. Limited (RMPL) is a company incorporated under the Companies Act, 2013 and having its registered office at Flat No. 1507, Shri Radhey Krishna Gardens, Rameshwaram, Bariyatu Ranchi, Jharkhand – 834009.
- 1.9 RMPL is promoted by Essel Infra projects Limited (EIL), which has more than nine years of experience in the infrastructure sector.
- 1.10 The current Petition has been filed by RMPL for determination of levellised generation tariff for the sale of electricity from the proposed 11.5 MW MSW power plant to be set up at Jhiri, Ranchi in the state of Jharkhand.

The Petitioner’s Prayers

- 1.11 The Petitioner in its tariff Petition has prayed for the following before the Commission:

- (a) To approve the levellised tariff of Rs. 9.51/ kWh for the power to be generated from the proposed 11.5 MW Municipal Solid Waste power plant to be set up at Jhiri, Ranchi for sale to Jharkhand Bijli Vitran Nigam Ltd.(JBVNL) in the State of Jharkhand;
- (b) To grant exemption from Merit Order Dispatch Principles for the Project;
- (c) To direct the distribution company to consider the benefit of zero contract demand charges;
- (d) To direct the distribution company to net off the energy which may be drawn during shut down or start up after the CoD of the project against the energy injected into the Grid by the project;
- (e) To grant waiver on Cross Subsidy Surcharge on sale of power from the project in case of sale of power directly to third party;
- (f) To pass such order(s) as the Hon'ble Commission may deem fit and proper keeping in view the facts and circumstances of the case.

Scope of the Present Order

- 1.12 The Commission in this Order has determined the levellised generation tariff for the power to be generated from the proposed 11.5 MW Municipal Solid Waste power plant after thorough scrutiny of the information submitted by the Petitioner.
- 1.13 While approving the generation tariff for the Petitioner, the Commission has taken into consideration the following:
- (a) Material placed on record;
 - (b) Provisions of the Electricity Act, 2003;
 - (c) Provisions of the National Electricity Policy,
 - (d) Provisions of the National Tariff Policy;
 - (e) Principles and provisions laid down in the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refused Derived Fuel based power projects) Regulations, 2016.
- 1.14 Accordingly, the Commission has scrutinized the Petition in detail and hereby issues the Tariff Order for determination of Levellised Generation Tariff for 11.5 MW Municipal Solid Waste (MSW) Project of Ranchi Municipal Solid Waste Private Limited.

A2: PROCEDURAL BACKGROUND

Background

- 2.1 Ranchi Municipal Corporation (RMC), Government of Jharkhand (GoJ) is the administrative body responsible for the civic and infrastructural assets in the city of Ranchi in Jharkhand. RMPL entered into a Concession Agreement with RMC on 31st October 2015. As per the Concession Agreement, the project is to be executed on Design Build Finance Operate Transfer (DBFOT) basis.
- 2.2 RMPL, the Petitioner, has decided to set up a mass- burn controlled combustion technology based Waste to Energy (WtE) Power Plant at Jhiri Village in Ranchi city.
- 2.3 The current Petition has been filed by RMPL for determination of tariff for the sale of electricity from the proposed 11.5 MW MSW power plant.

Information Gaps in the Petition

- 2.4 In accordance with Section 64(3) of the Act, the State Electricity Regulatory Commission, within one hundred and twenty days of the filing of application for determination of tariff, is required to either accept it and issue a tariff order or reject the application for reasons to be recorded in writing. The Commission accepted the application submitted by the Petitioner for determination of tariff. As part of tariff determination exercise, several deficiencies/information gaps were observed in the Petition submitted by the Petitioner.
- 2.5 These information gaps were communicated to the Petitioner vide letter no.
 - (a) JSERC/ Case (T) No. 12 of 2016/ 393 dated September 07, 2016
 - (b) JSERC/ Case (Tariff) No. 12 of 2016/ 715 dated February 13, 2017
- 2.6 The Petitioner subsequently submitted its response to the aforesaid letters and provided the requisite additional data/ information vide following letters:
 - (a) Letter dated September 28, 2016
 - (b) RMPL/JSERC/ 02 dated October 06, 2016
 - (c) RMPL/ JSERC/ Feb. 2017/ 01 dated February 28, 2017
 - (d) RMPL/ JSERC/ June 2017/ 01 dated June 08, 2017
 - (e) RMPL/ JSERC/ June 2017/ 02 dated June 16, 2017

- 2.7 The Commission scrutinized the additional data/information and upon its validation, has passed this Order on the petition filed by the Petitioner

Inviting Public Comments/Suggestions

- 2.8 The Commission directed the Petitioner to make available copies of the Petition to the members of general public on request, and also issue a public notice inviting comments/suggestions on the Petition.
- 2.9 The aforesaid public notice was issued by the Petitioner in various newspapers on March 25 and 26, 2017 and a period of twenty one (21) days was given to the members of the general public for submitting their comments/suggestions.

Table 1: List of newspapers and dates on which the public notice by RMPL appeared

Sl. No.	Newspaper	Date of Publication
1.	Times of India	March 25 and 26, 2017
2.	Hindustan Times	March 25 and 26, 2017
3.	Prabhat Khabar	March 25 and 26, 2017
4.	Sanmarg	March 25 and 26, 2017

- 2.10 Subsequently, the Commission also issued a notice on its website www.jserc.org and various newspapers for conducting the public hearing on the Tariff petition filed by the Petitioner. The details of the newspapers where the notice was issued by the Commission are as under:

Table 2: List of newspapers and dates on which the public notice by JSERC appeared

Sl. No.	Newspaper	Date of Publication
1.	Hindustan	May 17, 2017
2.	Prabhat Khabar	May 17, 2017
3.	Ranchi Express	May 17, 2017
4.	Sanmarg	May 17, 2017
5.	Awami News	May 18, 2017
6.	Morning India	May 18, 2017
7.	Dainik Bhaskar	May 18, 2017
8.	Daini Jagran	May 18, 2017

Submission of Comments/ Suggestions and Conduct of Public Hearing

- 2.11 A public hearing was held on May 24, 2017 at Ranchi and respondents voiced their views on the Petition filed by the Petitioner. The comments/suggestions voiced by the respondents and the Petitioner's response thereon along with the Commissions analysis on the response provided by the Petitioner are detailed in the **Section A4** of this Order.

A3: SUMMARY OF PETITION FILED BY THE PETITIONER

- 3.1 RMPL has filed the Petition before the Commission for determination of levellised tariff for the power to be generated from the proposed 11.5 MW Municipal Solid Waste power project.
- 3.2 The Petitioner has considered the following components of fixed cost for determining the tariff for the proposed Waste to Energy Plant:
- (a) Capital Cost
 - (b) Operation and Maintenance Expenses
 - (c) Interest on Long Term Loan
 - (d) Depreciation
 - (e) Interest on Working Capital
 - (f) Return on Equity
- 3.3 The cost parameters considered by the Petitioner to determine tariff for the power to be generated from MSW power projects is summarized in the table below:

Table 3: Parameters submitted by Petitioner in the Petition

Head	Particulars	Units	Submitted by Petitioner
Operational parameters	Capacity	MW	11.50
	Plant Load Factor – 1st Year	%	65%
	Plant Load Factor – 2nd Year	%	75%
	Auxiliary Consumption	%	16.00%
	Useful Life	Year	25
	Tariff Period	Year	25
Project cost	Capital Cost	Rs. Lakh	23,550.84
Sources of Fund - Debt	Debt: Equity Ratio	%	70 : 30
	Debt amount	Rs. Lakh	16,485.59
	Repayment period	Year	12
	Interest Rate	%	12.76%
Sources of Fund - Equity	Equity Amount	Rs. Lakh	7065.25
	Return on Equity for first 10 years	%	20.00%
	Return on Equity for 11th year onwards	%	24.00%
	Discount rate	%	10.56%
Depreciation	Depreciation rate for first 12 years	%	5.83%
	Depreciation rate from 13th year onwards	%	7.69%
	Salvage value	%	10%
O&M	O&M Expenses	Rs. Lakh	1,132.50

Head	Particulars	Units	Submitted by Petitioner
	Escalation factor for O&M expenses	%	5.72%
Royalty	Royalty fee to be paid to Municipal Corporation	% of Revenue	5.00%
Working Capital	O&M Expense	Rs. Lakh	1 month
	Maintenance spares	Rs. Lakh	15% of O&M expense
	Receivables	Rs. Lakh	2 months
	Fuel stock	Rs. Lakh	4 months
	Interest on Working Capital	%	13.26%
Fuel related	Municipal Solid Waste	%	100%
	GCV of MSW	kCal/kg	1,650.00
	Price of MSW	Rs./ Tonne	Stated as Royalty
Tariff	Levellised Tariff for 25 Years	Rs/kWh	9.51

A4: PUBLIC CONSULTATION PROCESS

- 4.1 In order to maintain transparency in the process for approval of the levellised generation tariff for the Petitioner, the Commission involved the stakeholders by initiating a public consultation process to understand their views on various aspects of the Petition filed by RMPL.
- 4.2 Accordingly, the public hearing on the Petition was held on 24th May 2017 in Hotel Ranchi Ashok, Doranda, Ranchi. The list of participants is attached as Annexure.
- 4.3 The comments and suggestion of the members of the public along with the response thereon of the Petitioner and the views of the Commission are detailed hereunder:

Capital Cost of the Project

Public Comments/ Suggestions

- 4.4 As per Clause 5 of CERC Regulation (Statement of Reason) dated October 07, 2015 “in line with the Commission’s proposal, the benchmark capital cost for RDF based WtE plant is fixed at Rs. 900 lakh/ MW and Rs. 1500 lakh/ MW for MSW power projects”. While the project proponent has assumed 2047.9 lakh/MW.

Petitioner’s response

- 4.5 The Petitioner submitted that CERC has given the benchmark project cost of Rs. 15 Cr/ MW and Rs. 9 Cr/MW for MSW based Waste to Energy Project and RDF based Waste to Energy Project respectively.
- 4.6 Capital cost for such projects depends on following various parameters.
- a) Technology selection which is capable of handling waste available with wide variation in quality
 - b) Sizing of the plant considering the MSW quality available over the entire plant life
 - c) Distance for evacuation system
 - d) Landfill, closure as well as Ash Disposal Plant
 - e) Suitability of land available and the modifications required
 - f) Imported technology involves in-depth preparatory studies. Hence pre-operative expenses increases
- 4.7 The Petitioner mentioned that in case of Ranchi, considering all the above factors, the project cost has been considered as Rs. 235. 51 Cr i.e. Rs. 20.48 Cr/MW for project specific tariff approval.

Commission's views

4.8 The Commission has noted the observation of the stakeholder and the reply of the Petitioner. The Commission's view are given in the section 5.10 of the order.

GCV of MSW

Public Comments/ Suggestions

4.9 As per Clause 10 of CERC Regulation (Statement of Reason) dated October 07, 2015 "Calorific value at 2500 kCal/ kg for RDF based waste to energy power projects". While the project proponent has assumed GCV of 1650 k Cal/kg.

Petitioner's response

4.10 The Petitioner submitted that the quality of MSW is not homogenous in nature. CERC has considered the value of GCV of 2500 kCal/kg for RDF based Waste to Energy (WtE) project and not considered any GCV for MSW based WtE projects. CERC has provided a general norm without keeping any specific project in mind.

4.11 In case of Ranchi, the waste characterization study was carried out through an independent consultant by doing random sampling as per the details given in section 8.17 (page 43) and table 7 (page 44) of the Petition. Based on the study, which highlights the on ground reality, the GCV of 1650 kCal/ kg has been considered.

Commission's views

4.12 The Commission has noted the observation of the stakeholder and the reply of the Petitioner.

MSW Rules

Public Comments/ Suggestions

4.13 The MSW Rules given in the Petitioner's submission is mentioned as MSW Rules 2000 whereas currently MSW Rules 2016 are applicable.

Petitioner's response

4.14 The Petitioner submitted that the aspects pertaining to Sanitary Landfill (SLF) are uniform in both MSW Rules 2000 and MSW Rules 2016. The Petitioner requests the Commission to refer to the MSW Rules 2016.

Commission's views

- 4.15 The Commission has noted the observation of the stakeholder and the reply of the Petitioner. The Commission feels that the Petitioner being in the business of setting up and operating of Waste to Energy (WtE) projects should remain updated and should always refer to the updated Rules in their communication even if the new rules are uniform with that of the previously notified.

PLF

Public Comments/ Suggestions

- 4.16 The PLF shall be 65% and 75% for the first year and the second year onwards respectively.

Petitioner's response

- 4.17 The Petitioner submitted that the PLF considered in the Petition is 65% for the first year and 75% from the second year onwards for computation. The PLF considered is as per the JSERC (Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Plants) Regulations, 2016.

Commission's views

- 4.18 The Commission has noted the observation of the stakeholder and the reply of the Petitioner.

Auxiliary Consumption

Public Comments/ Suggestions

- 4.19 The auxiliary consumption shall not be more than 15% which is also given by CERC.

Petitioner's response

- 4.20 The Petitioner submitted that the Auxiliary consumption of 16% considered by the Petitioner is due to following factors associated with the proposed MSW plant at Ranchi
- a) As mentioned in DPR (Annexure 14 of the petition) the moisture content in Ranchi was observed between 43% and 80%. It requires sophisticated MSW mixing systems, and about 3-4 days of MSW handling and mixing to make it uniform and reduce the extent of moisture in MSW before it is feed to the boiler for combustion. This significantly adds to the auxiliary consumption in the processing facility.

- b) The project site is located in hilly rocky terrain. It doesn't have nearby access to the water body, and the connectivity to water pipeline is also difficult. Therefore, the project design had to choose alternatives which demand lesser water. Accordingly, the proposed project is set to deploy air cooled condenser in place of water cooled condenser. This calls for additional equipment and higher capacity fans, resulting into higher auxiliary consumption.
- c) Stricter emission control norms specified by MoEF requires highly sophisticated flue gas treatment system to comply emission norms. Since, the feedstock to the proposed project (MSW) is highly polluting and corrosive, flue gases require extensive cleaning than typical coal/ biomass based project. This leads to additional power consumption in auxiliary.
- d) In addition to the above, there are some specific systems which are unique to the MSW WtE project and which have to be run for the operation of the plant. The systems are namely MSW Feeding system, Ram feeder system, Combustion grate, Hydraulic station, Flue gas cleaning system, Bottom ash extraction system etc.

The complete list of auxiliaries to be run will lead to a consumption of 1.840 MW i.e. 16% of the gross power generated.

Commission's views

- 4.21 The Commission has noted the observation of the stakeholder and the reply of the Petitioner. The Commission has dealt with the approval of Auxiliary consumption in Section 5.46 of the Order.

Station Heat Rate

Public Comments/ Suggestions

- 4.22 The Station Heat Rate shall be 4200 kCal/ kWh as given by CERC norms.

Petitioner's response

- 4.23 The Station Heat Rate (SHR) is a relevant aspect to consider when the project is to be designed for a fuel with specific Gross Calorific Value (GCV). Hon'ble CERC has specified the norm for SHR only in the case of RDF based Waste to Energy projects. It is pertinent to highlight that CERC has decisively not specified any such norm for MSW based WtE project because of appropriate reasons.

Commission's views

- 4.24 The Commission has noted the observation of the stakeholder and the reply of the Petitioner.

Operation and Maintenance

Public Comments/ Suggestions

4.25 The O&M expenses shall not be more than 6% as indicated by CERC norms.

Petitioner's response

4.26 The Petitioner submitted that the O&M costs projected in the Petition are well within the limits as prescribed by the relevant regulations.

The O&M expenses claimed under the Petition is given below

Table 4: O&M expenses claimed by the Petitioner

Particulars	Amount for the first year (in lakh)
O&M for the processing facility	1092.50
SLF Maintenance	40.00
Total O&M cost	1132.50
Total Capital cost	23550.84
O&M as a % of Capital cost	4.81%

4.27 The Petitioner submitted that the efforts invested in identifying the prudent technology would stand to benefit throughout the operating life of the project, in terms of significantly lowering the O&M expense. The project has the O&M profile which is 18% lesser than the norm specified by Hon'ble JSERC.

Commission's views

4.28 The Commission has noted the observation of the stakeholder and the reply of the Petitioner. The Commission has dealt with the approval of Operation and Maintenance in Section 5.57 of the Order.

A5: TARIFF DETERMINATION FOR THE PROPOSED 11.5 MW MUNICIPAL SOLID WASTE POWER PROJECT

5.1 The Petitioner intends to set up an integrated MSW facility consisting of waste segregation, material recovery, waste to energy generation and development of a sanitary landfill in the proposed complex. The Petitioner has submitted that the project being developed is specific to the requirements of Ranchi city and hence has requested the Commission to determine the tariff on a project specific basis.

5.2 As per Regulation 4.8 of the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016,

“Project specific tariff, on case to case basis, may be determined by the Commission 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.”

5.3 The Commission has scrutinized the Petition filed by RMPL for determination of levellised tariff for its proposed 11.5 MW Municipal Solid Waste based Waste to Energy power plant and based on the submissions, has proceeded for determination of the tariff in accordance with the provisions laid out in the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016.

5.4 The Petitioner vide letter RMPL/ JSERC/ Feb. 2017/ 01 dated February 28, 2017 submitted that the expected date of commissioning of the plant is February, 2019. However, considering the current progress of the project, it is unlikely that the project will be commissioned in the 4th quarter of FY 2018-19. The Commission for the purpose of determination of tariff has considered FY 2019-20 as the first year of operation of the plant.

5.5 The component-wise description of the Petitioner’s submission and the Commission’s analysis thereon is given in the following sections.

APPROVAL OF CAPITAL COST

Capital cost of the Project

Petitioner's submission

5.6 The Petitioner has submitted that the total estimated capital cost of the project is Rs 235.51 Cr. The major components of the capital cost submitted by the Petitioner are detailed hereunder:

- a) Plant and Machinery
- b) Building and Civil cost (including Ash disposal plant)
- c) Engineering expenses
- d) Landfill and closure
- e) Transmission cost
- f) Contingency expenses
- g) Costs for PMC, Consultancy and Financing expenses
- h) Interest during construction
- i) Pre-operative expenses

5.7 The break up summary of the total capital cost for the 11.5 MW plant as submitted is shown in the table below:

Table 5: Summary of capital cost breakup submitted by the Petitioner

Particulars	Capital cost submitted (Rs. Lakh)	Basis of estimation
Plant & Machinery	12,974.00	Based on offer received from M/s Hitachi Zosen who will be the OEMs for the plant and machinery
Building and Civil cost (including Ash disposal plant)	3,500.00	Cost of building foundations of Boiler, Steam Turbine and Chimney and for construction of other associated plants. Also includes cost of construction of MSW storage bunker for mixing of MSW which is a specific requirement for an MSW plant
Engineering expenses	700.00	Cost quoted by M/s Hitachi Zosen for the complete engineering services which is exclusive of the cost of plant and

		machinery. The services include process design, civil, mechanical, electrical, instrumentation, automation and any other related activities etc.
Landfill and closure	1,280.00	Cost of landfill construction for disposing the inert wastes from Municipal areas and residual wastes from the processing plant and cost of post construction closure
Transmission cost	735.00	Cost of setting up 11km of Transmission line and associated equipment
Total Hard cost	19,189.00	
Contingency expenses	575.67	3% of the project hard costs. To meet any project cost escalation due to unforeseen circumstances and for forex rate fluctuations as some components will be imported.
Costs for PMC, Consultancy and Financing expenses	959.45	% of hard costs of the Project PMC charges – 1.5% Consultancy - 1.5% Financing expenses – 2%
Interest during construction	2,634.83	IDC calculated based on interest on long term debt at 12.76%
Pre-operative expenses	191.89	1% of the project hard costs Techno commercial study, project feasibility studies, design and engineering etc.
Total Capital cost (Rs. Lakh)	23,550.84	
Total Capital cost (Rs. Cr)	235.51	<i>(rounded off)</i>

5.8 The Petitioner further mentioned that the capital cost of a Waste to Energy plant is comparatively higher than a conventional power plant due to additional cost for components like Combustion grate and Control system, Leachate treatment plant, Fuel feeding system, Flue gas treatment system, Effluent treatment system etc.

5.9 The Petitioner has requested the Commission to approve the higher tariff considering the environmental and social importance of a waste to energy plant as it serves a dual purpose of energy generation and waste disposal.

Commission's analysis

5.10 JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for determining the capital cost of the project:

The capital cost primarily consists of the cost of technology used, plant layout and 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.

...

Municipal solid waste based power project: *The normative capital cost for FY 2016-17 is INR 1500 Lakh/MW.*

...

Provided that the Capital Cost norms for the remaining years of the Control Period, for municipal solid waste and refuse derived fuel based power projects shall be reviewed on annual basis.

- 5.11 JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 for determination of Project Specific Tariff also specifies the following:

“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;”*

- 5.12 The Commission while scrutinizing the submissions observed that the Petitioner had not submitted any supporting documents to substantiate the claim of capital cost. The Commission vide letter JSERC/ Case (T) No. 12 f 2016/ 393 dated September 07, 2016 directed the Petitioner to submit details, justifications and documentary evidence in support of each of the heads mentioned under capital cost. The Petitioner was also directed to submit break-up of the imported and indigenous equipment along with hedging measures if any considered to safeguard itself against any exchange rate variations.
- 5.13 The Petitioner vide letter dated September 28, 2016 submitted its replies to the queries raised by the Commission. The details as submitted along with further clarifications as sought by the Commission as response of the Petitioner is summarised in the following section

a) Plant and Machinery

The Petitioner has submitted a detailed description of all the equipment to be installed under plant and machinery. The major components are listed below

- i. Refuse Cranes
- ii. Moving Grate system
- iii. Hopper and Chute
- iv. Feeder
- v. Automatic Combustion control system
- vi. Air Supply system including Primary and Secondary air system
- vii. Boiler
- viii. Evaporator
- ix. Flue Gas Treatment system
- x. Quenching Chamber

The Petitioner claimed Rs. 129.74 Cr as the cost of Plant and Machinery. The Commission vide letter JSERC/ Case (T) No. 12 of 2016/393 dated September 07, 2016 had directed the Petitioner to submit documentary evidence in support of their claim.

The Petitioner submitted an indicative price offer from M/s Hitachi Zosen India Private Limited. The indicative quote submitted by the OEM vide letter no. HZHYD/ESSEL/160515 dated May 15, 2016 includes design and engineering, supply, transportation, erection and commissioning and basic civil works for the complete EPC of the OEM's equipment. The OEM also mentioned that 9% of the value quoted will consist of imported components. Upon calculation, the approximate exposure to imported components will be around Rs. 11.67 Cr.

The Commission vide letter JSERC/ Case (T) No. 12 of 2016/ 715 dated February 13, 2017 again directed the Petitioner to submit details of work order placed with the OEM for prudence check. The Petitioner vide letter RMPL/ JSERC/ Feb. 2017/ 01 dated February 28, 2017 submitted that the contract with M/s Hitachi Zosen is under finalization.

b) Building and Civil cost (including Ash disposal plant)

The Petitioner estimated an amount of Rs. 35 Cr towards Building and Civil Cost (including Ash disposal plant) and submitted the following in support of the same:

Table 6: Summary of breakup of building and civil cost submitted by the Petitioner

Particulars of Civil Works	Reference of Documents	Amount
Civil RCC waste pit to hold 7-8 days of waste for continuous feeding including earthwork/ PCC-RCC work, Masonry, Structural steel, Roofing, plastering and painting etc.	M/s Jagdamba Construction Company quote dated 08.05.2016	29.80
Construction of Chimney of 1.67 m diameter and 50 m height	M/s Ujjwal Construction letter no. UC/16-17/013 dated 06.05.2016	1.05
Ash handling plant (includes 3 nos. of Tipper)	Ash handling plant	0.65
	Ashok Leyland invoice dated 07.05.2016 for 3 Tippers	0.77
	Catepillar quote CMS/16-17/CAT/424B dated 03.05.2016 for Hydraulic Excavator	0.45
	Automatic Flyash Brick Making Machine quote from Benny Enterprise dated 06.05.2016	0.26
Rock Blasting	Rates submitted by M/s Mahavir Prasad vide letter 16-17/010 dated 10.05.2016	2.02
Total		35.00

The Commission has undertaken a detailed analysis of the submissions of the Petitioner including the supporting documents. The methodology used by the Petitioner to estimate the cost towards building and civil works does not seem to be as per standard practice and has some issues in this case. The Petitioner has only submitted quotes which have been provided by third parties. As such the Petitioner does not seem to have undertaken a transparent and competitive process to discover the most efficient cost from possible suppliers. It can be ascertained from the Petitioner's submission that the quotes received were based only on telephonic discussions. Further, there is no justification on how the quantities in BOQs were arrived at and their costing.

The Petitioner has mentioned quotes of Tippers, Hydraulic Excavators, Fly ash Brick making machine etc. under Ash Disposal Plant in Building and Civil works. Whereas no estimations of expenditure against actual civil work required for construction of the ash disposal plant has been provided.

c) Engineering expenses

The Petitioner estimated Rs. 7 Cr as cost towards engineering and has submitted the indicative prices quoted by M/s Hitachi Zosen India Private Limited. The Petitioner submitted that the scope includes detail engineering services covering Process design, Civil, Mechanical, Piping, Electrical, Instrumentation, Automation including structural design using software, piping isometric drawings using software and other related activities as applicable.

d) Landfill and closure

The Petitioner submitted that as per the Concession Agreement signed with Ranchi Municipal Corporation, the Petitioner is also required to construct a sanitary landfill site. The Petitioner has estimated expenditure of Rs. 12.80 Cr towards the same. The details submitted are as under

Table 7: Details of Landfill submitted by the Petitioner

Particulars of Civil Works	Reference of Documents	Amount (Cr.)
Civil work for Landfill Civil work for Leachate tank for Geo-synthetic work for Landfill Leachate Tank Equipment	Petitioner has submitted quote from M/s Mahavir Prasad dated 10.05.2016 Quotes submitted by M/s Arhant Geosynthetics	7.67
O&M Cost for sanitary Landfill (Includes cost of bull loader, JCB, Maintenance cost of the Vehicles, Cost of Manpower etc.)	Petitioner has submitted only a calculation sheet with rates	0.49
Civil and Liner work for capping and closure of landfill	Petitioner has submitted only a calculation sheet with quantities and rates with partial documents to support the basis of the calculation. A quote from M/s Mahavir Prasad of amount Rs. 1.92 Cr was submitted	4.22
Post closure O&M	Petitioner has submitted only a calculation sheet with quantities and rates with no documents to support the basis of the calculation	0.41
Total		12.80

e) Transmission cost

The Petitioner submitted that it has considered Rs. 7.35 Cr as cost of developing a transmission line of ~ 11km for evacuation of power from its project. The Commission sought clarification from the Petitioner for the transmission cost as the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations 2016 specify that the State Transmission Utility (STU)/ Distribution licensee shall bear 100% of the cost of evacuation infrastructure. Subsequently, the Petitioner submitted that it will approach the STU for the same.

f) Contingency expenses

The Petitioner submitted that it has considered 3% of the hard cost i.e. Rs. 5.76 Cr as contingency expenses mainly to meet unforeseen expenses like currency risk. The Petitioner also submitted that GERC in case of determination of tariff for RGE Surat Private Limited has allowed contingency expenses as 3%.

The Commission vide letter JSERC/ Case (T) No. 12 of 2016/ 393 dated September 07, 2016 directed the Petitioner to provide clarification on the exchange rates considered for imports and hedging measures (if any) that may have been considered. The Petitioner in its reply did not provide any details about exchange rate considered as well as any hedging cost.

It can be ascertained from the document submitted that only 9% of the total value of Plant and Machinery is expected to be imported which amounts to approximately Rs. 11.67 Cr.

From the above it is clear that the amount considered by the Petitioner for contingency expenses is on a higher side considering that only 9% of the P&M will be imported.

Further, the Petitioner submitted that the contingency expenses has been considered to tide over any other unforeseen expenses. The Petitioner has failed to mention which other risks it anticipates during the course of implementation of this project and mitigation measures planned. Although there may or may not be unforeseen expenses, Petitioner has been unable to provide sufficient clarity on what could be the nature of such expenses other than citing the approved expenses of RGE Surat.

g) Costs for PMC, Consultancy and Financing expenses

The Petitioner submitted that it has estimated an amount of Rs. 9.60 Cr towards PMC, Consultancy and Financing expenses.

The Commission vide letter JSERC/ Case (T) No. 12 of 2016/ 393 dated September 07, 2016 directed the Petitioner to provide justifications for each component under this head with requisite supporting documents.

Subsequently, the Petitioner submitted that an amount of Rs. 5.76 Cr has been considered under PMC and Consultancy charges. The Petitioner submitted a copy of proposal dated May 09, 2016 from M/s Holtec Consulting Private Limited, Gurgaon to support its submission.

The Petitioner has been unable to submit any basis for estimation of balance amount of Rs. 3.84 Cr towards financing expenses.

h) Interest during construction

The Commission vide letter JSERC/ Case (T) No. 12 of 2016/393 dated September 07, 2016 and vide letter JSERC/ Case (T) No. 12 of 2016/ 715 dated February 13, 2017 directed the Petitioner to submit detailed computation of the IDC charges considered.

Subsequently, the Petitioner in its replies submitted a detailed calculation of IDC. The IDC computation submitted is based on the interest on long term debt at 12.76% per annum.

i) Pre-operative expenses

The Petitioner submitted an amount of Rs. 1.92 Cr towards pre-operative expenses involving payment to Ranchi Municipal Corporation and Jharkhand Industrial Infrastructure Development Corporation for project development expenses and to meet other expenses.

Further, the Petitioner vide letter RMPL/ JSERC/ Feb. 2017/ 01 dated February 28, 2017 mentioned that an amount of Rs. 2.10 Cr had been spent upto January 2017 under the head of pre-operative expenses.

5.14 In spite of multiple opportunities provided to the Petitioner to provide necessary justifications, clarifications and supporting documents, there were still some information gaps. Therefore, during the public hearing on May 24, 2017, the Petitioner was again directed by the Commission to submit the following

- a) To provide justification for selection of the vendor for Plant & Machinery and Civil Works and to describe the method adopted for selection
- b) To make available to the Commission the Audited accounts of similar WtE plant which the Petitioner has commissioned recently
- c) To submit the total project cost as on CoD of the WtE plant which the Petitioner has commissioned recently

- 5.15 The Petitioner vide letter RMPL/JSERC/June 2017/01 dated June 08, 2017 submitted that it had undertaken detailed technology assessment while selecting the waste processing technology for the proposed project. It involved extensive discussions with prospective vendors, including the site visits to several operational plants globally. For this a team comprising of three members visited two plants in China namely Teda Environmental processing facility in the City of Dalian and a processing facility in Gonzou in China. The Petitioner also submitted that it had visited gasification plants in India and Germany so as to evaluate available technologies in the ‘waste to energy’ space.
- 5.16 The Petitioner provided a comparison of the quotes received from three global players:

Table 8: Comparative quotes from 3 Global WtE players

Particulars of P&M	Price (Rs. Lakh)		
	M/s Hitachi Zosen	M/s Plantec	M/s Envicon
	For 1 x 11.5 MW with 600 TPD Capacity	For 6 x 2 MW plant with 280 TPD capacity each	For 1 x 15 MW with 600 TPD capacity
FOR site price including design and supply of the WtE plant	Included	Included	Included
Erection and Commissioning at Site	Included	Included	Included
Basic civil works linked with P&M only for the main areas (basis is 20 t/sq. m at 1.5 m depth of soil bearing capacity)	Included	Included	Included
Total Price (Rs. Lakh)	16,474	51,000	68,151

- 5.17 The Petitioner submitted that M/s Hitachi Zosen emerged as the most cost effective vendor for 600 TPD MSW based WtE project. The Petitioner therefore selected M/s Hitachi Zosen for the current project. The Petitioner further submitted that it conducted several rounds of negotiations post which M/s Hitachi Zosen agreed to supply P&M at Rs. 12,974 lacs.
- 5.18 In response to the direction of the Commission as mentioned above, the Petitioner submitted particulars of quotations received for civil work. M/s JCC provided the most competitive quote for civil works at Rs 2980 lacs.

- 5.19 The Commission after taking into consideration all of the Petitioner’s submission and after due prudence check is of the view that the capital cost of Rs. 235. 51 Cr submitted by the Petitioner is not suitably justified and is on the higher side. The Petitioner has based all its estimations on quotations and proposals received from OEMs and third parties and as such none of the major packages have been planned to be procured through transparent and competitive processes. Further, there is no actual work orders or proof of execution for any of the works proposed for the project. Considering these factors, the Commission is of the view that it shall not be prudent to approve the Capital cost of the project based only on estimates received from select suppliers and costing methodology as proposed by the Petitioner and as detailed in the above paragraphs.
- 5.20 Considering the above constraints, the Commission considers it prudent to approve the capital cost as per the norms specified under JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 for Municipal Solid Waste power project. Meanwhile, the Commission also referred to the following Tariff Orders issued by the respective State Electricity Regulatory Commission in the previous year in order to benchmark the possible capital cost:

Table 9: Tariff orders issued by State Commissions

Sl. No	Tariff Orders	Date of Issue	Capital Cost (Cr.)
1.	Order issued by Bihar Electricity Regulatory Commission for MSW based power plants to be Commissioned in FY 2016-17	August 01, 2016	15.00 Cr/ MW
2.	Tariff order issued by Madhya Pradesh Electricity Regulatory Commission	June 2016	15.00 Cr/ MW
3.	Tariff order issued by Telangana State Electricity Regulatory Commission	June 06, 2016	14.00 Cr/ MW
4.	Tariff order issued by Karnataka Electricity Regulatory Commission	September 19, 2016	17.00 Cr/ MW
5.	Tariff order issued by Gujarat Electricity Regulatory Commission	November 10, 2016	16.00 Cr/ MW

- 5.21 From the above table, it is clear that the capital cost proposed by the Petitioner is significantly higher than the normative capital cost approved by various SERCs.
- 5.22 The normative capital cost as provided in the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 is given below:

“Municipal solid waste based power project: The normative capital cost for FY 2016-17 is INR 1500 Lakh/MW.”

- 5.23 Though Waste to Energy Projects have previously been in a nascent stage in India, the projects are gaining acceptance encouraged by policy support and facilitative regulatory framework. As the number of WtE plants increase, it can be reasonably anticipated that the overall project cost should also come down as has been the case of other technologies. The latest benchmarking of costs also highlights that though there is a minor variation, the overall capital cost specified in the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 is near about the overall range of approved normative capital cost for MSW.
- 5.24 The Petitioner vide letter RMPL/ JSERC/ June 2017/ 02 dated June 16, 2017 submitted the Audited accounts of the 11.5 MW WtE plant which the Petitioner has commissioned in Jabalpur on May 12, 2016 and also submitted the total capital cost of the Jabalpur MSW Plant as on CoD duly certified by statutory auditors. The details of the project capital cost as on CoD is given in the following table:

Table 10: Capital Cost as on CoD of 11.5 MW Jabalpur WtE Plant as submitted by the Petitioner

Sl. No	Particulars	Amount (Rs. Cr)
1.	Plant and Machinery	116.90
2.	Building and Civil	22.20
3.	Engineering Expenses	6.63
4.	Ash Disposal plant	2.00
5.	Transmission cost	4.02
	Total Hard Cost	151.75
6.	Interest during construction	16.09
7.	Pre-operative expenses	7.54
	Total Project Cost	175.38

- 5.25 The Commission observed that the capital cost arrived by the Commission normatively and the audited cost submitted by the Petitioner of a plant of similar capacity are nearly same and varies by ~ Rs. 2.88 Cr.
- 5.26 Hence, after undertaking a detailed scrutiny of the Petitioner’s submission, normative cost of WtE projects of other states, actual cost incurred by the Petitioner for the WtE plant of same capacity at similar location as well as the capital cost provided in the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016, the Commission has arrived at the total capital cost for the proposed project at Rs. 172.50 Cr considering the normative capital cost of Rs. 15 Cr/ MW

- 5.27 The Commission has also considered the submissions made the Petitioner in its letter RMPL/ JSERC/ June 2017/ 02 dated June 16, 2017 wherein it had submitted that there are differences in condition between Ranchi and Jabalpur projects of the Petitioner. The Petitioner in the aforesaid letter highlighted the major differences between the project at Jabalpur and that of the proposed plant at Ranchi:
- a) A transmission line of length 11 km is to be laid
 - b) As per clause 5.10.2 and clause 17.6 of the Concession Agreement, 5% of the revenue received will have to be shared with Ranchi Municipal Corporation
 - c) In Ranchi, landfill and closure is in the scope of the Petitioner
 - d) The land at Jhiri is rocky and undulating which will require rock blasting and levelling work. Land reclamation work will also be involved as the old waste had been dumped at the site from last 10-15 years.
- 5.28 As regards to the construction of the transmission line, the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies that the cost of development of the Transmission line will be borne by the state transmission utility and the Petitioner is directed to take up this matter with the appropriate authorities. Accordingly, no additional expenditure shall be allowed under this head.
- 5.29 With regards to the sharing of 5% of the revenue with Ranchi Municipal Corporation as per the Concession Agreement, the Commission is of the view that the Petitioner should bear the cost of the revenue sharing from its oncome from the project. As such the prevailing JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 do not provide for past through of royalty payments to beneficiaries through tariff.
- 5.30 The Commission also observed that as per Clause 17.2 of the Concession Agreement, the Ranchi Municipal Corporation has agreed to pay the Petitioner a Tipping fee per ton of MSW. The Commission vide JSERC/ Case (T) No. 12 of 2016/ 393 dated September 07, 2016 had directed the Petitioner submit the details of the tipping fee.
- 5.31 The Petitioner vide letter dated September 28, 2016 submitted that the quoted tipping fee is Rs. 1950 per ton of MSW for the base year. Tipping fees at 80% will be paid up to CoD of the WtE plant and after CoD, 100% of tipping fee will be paid. The Tipping fee will be escalated as per the Schedule XX of the Concession Agreement. The revenue from tipping fee is an additional revenue and the Petitioner has not considered the same in their calculations while arriving at the tariff in their Petition.

- 5.32 For the purpose of tariff determination, the Commission has not considered the impact of Tipping Fees while arriving at the levellised tariff of the WtE plant as the benefit of tipping fees is not envisaged as a pass through in tariff as per the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016.
- 5.33 With regards to the additional scope of Sanitary landfill and closure activities, the Commission has observed that the same was not under the scope of the Petitioner in Jabalpur but has to be developed by the Petitioner at Ranchi as per the Concession Agreement.
- 5.34 The Petitioner had submitted the estimates of cost towards sanitary landfill which are detailed in Section 5. 12 (d) of the present order. The Petitioner has estimated an amount of Rs. 12.80 Cr for the Sanitary Landfill and closure activities.
- 5.35 Since the Petitioner had submitted only estimates and quotes of vendors, the Commission felt it necessary to refer to the orders of other Commission wherein similar cases have been dealt with. In the order of Bihar Electricity Regulatory Commission for case no. 22/2015 for M/s Patna Green Energy Private Limited (PGEPL), the concerned Petitioner had submitted an estimated amount of Rs. 22.75 Cr for developing landfill system and leachate treatment system. BERC in its order while approving the additional 22.75 Cr had stated the following

“For sanitary landfill cost a sum of Rs. 22.75 crores is mentioned in the table 23 of the petition. But no cost details have been submitted. However, subsequently on 4.09.2015, petitioner submitted a cost break-up for Sanitary Landfill as detailed below:-

- 1. Landfilled composite system - Rs1800 lakh*
- 2. Leachate Treatment System & Other monitoring system - Rs 475 lakhs*

The Commission is of the view that there will be requirement of additional leachate treatment system at sanitary landfill site over and above the same required at the plant site. The Commission also views that although, after combustion under Mass burn controlled combustion technology residue left is around 20% only, yet the volume of such leachate over the period of the life of the plant will be very high. Therefore the cost of Leachate Treatment system for the sanitary Landfill amounting to Rs. 475 Lakh as claimed by petitioner is approved.

Hence, The Commission hereby approves a total cost of Rs 2275 lakhs comprising of cost of Land filled composite system- Rs.1800 lakh and Leachate Treatment System & Other monitoring system-Rs 475 lakhs.”

- 5.36 In case of the project under consideration, the Commission after considering the submission of the Petitioner is of the view that it is necessary to develop the sanitary landfill along with Leachate system is developed at the project site at Ranchi. Accordingly, Commission has considered the estimated total cost of Rs. 12.80 Cr towards this expense.
- 5.37 The Commission has considered the submission of the Petitioner with respect to the site specific need for earthwork in excavation including rock blasting/ excavation of hard rock. The Commission on scrutiny of the submitted information has found that the unit rates in the costing towards this work are significantly higher than the prevailing rates for such works. Further, estimation of transportation cost is also without sufficient justification on the basis of the same and is on the higher side. Therefore as against the claimed expenditure of Rs. 2.02 Cr, the Commission approves expenditure of Rs. 1.01 Cr towards these expense.
- 5.38 Hence, considering the reasons mentioned in the sections above, the Commission hereby approves Rs. 186.31 Cr as the capital cost of the project. The approved capital cost per MW is Rs. 16.20 Cr/ MW.

Table 11: Capital cost approved by the Commission

Sl. No	Particulars	Amount (Rs. Cr)
1.	Normative capital cost for 11.5 MW	172.50
2.	Cost for developing sanitary landfill and leachate system	12.80
3.	Rock blasting/ rock excavation	1.01
	Approved Capital Cost	186.31

NORMS OF OPERATION

Plant Load Factor (PLF)

Petitioner's submission

- 5.39 The Petitioner has submitted that the PLF has been considered at 65% for the first year of operation and at 75% from second year onwards.

Commission's analysis

- 5.40 JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the Plant load factor for Municipal Solid Waste based power plants as given in the following:

- a) During First year of operation - 65%
- b) From Second year onwards - 75%

Based on the submission of the Petitioner and as per the provisions of the Regulations, the Commission has approved the Plant load factor at 65% for the first year of operation and at 75% from second year onwards.

Life of Plant

Petitioner's submission

- 5.41 The Petitioner submitted that as per the Concession Agreement signed between RMPL and RMC, the project life has been considered as 25 years. Hence, the Petitioner has considered the same in their tariff petition.

Commission's analysis

- 5.42 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the Life of Plant for Municipal Solid Waste based power plants as 20 years.
- 5.43 The Commission has accordingly approved the life of the plant as 20 years.

Auxiliary Consumption

Petitioner's submission

- 5.44 The Petitioner in their Petition has considered an auxiliary consumption of 15%. According to the Petitioner, the waste to energy power projects require increased volume of air for the complete combustion of high-moisture and low calorific value MSW. This results in requirement of higher capacity fans and more load on the system. Also there are other auxiliary units like flue treatment plant, side wall cooling fan, cleaning systems etc. which also consume additional power from the plant.
- 5.45 The Petitioner in a subsequent submission RMPL/JSERC/ 02 dated October 06, 2016 re-submitted the auxiliary consumption at 16%.

Commission's analysis

- 5.46 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the auxiliary consumption of the MSW based power plants at 15%.

- 5.47 The Commission has noted the submission of the Petitioner regarding higher auxiliary consumption for waste to energy plants. However, the Commission of the view that the proposed norms are sufficient. Hence the Commission approves the Auxiliary consumption of the plant at 15%.

Debt Equity ratio

Petitioner's submission

- 5.48 The Petitioner submitted that a debt: equity ratio of 70:30 has been considered and the interest has been calculated assuming a normative debt of 70% of the total project cost.

Commission's analysis

- 5.49 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for determining the debt equity ratio

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

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.”

- 5.50 The Commission vide letter no. JSERC/ Case (Tariff) No. 12 of 2016/ 715 dated February 13, 2017 had directed the Petitioner to specify the actual equity employed by the promoters in the project. The Petitioner vide letter RMPL/ JSERC/ Feb. 2017/ 01 dated February 28, 2017 submitted that the project is yet to achieve a financial closure and the same is expected to be completed in May 2017. Hence the Petitioner is not in a position to submit the actual equity which will be required for the project. The Petitioner further submitted that the equity will be infused by the sponsors as per project requirement over the development period of the project.
- 5.51 The Commission for the purpose of tariff determination has approved the normative debt: equity ratio at 70:30 for the project.

Term of Loan and Interest on long term debt

Petitioner's submission

- 5.52 The Petitioner submitted that it has considered the long term debt at 70% of the submitted Capital Cost.
- 5.53 The Petitioner has considered the average of the SBI Base rate prevalent during the first six months of FY 16 and added 300 basis points to arrive at the interest of 12.76% for long term loan.
- 5.54 The repayment period has been considered as 12 years with equal instalments in line with the Regulations.

Commission's analysis

- 5.55 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for term of loan and interest on long term debt:

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

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.

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.

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."

- 5.56 The Commission has considered the base rate of SBI prevalent in the first six months of the year FY 2016-17 and the weighted average base rate arrived is 9.30%. Therefore the Commission approves the rate of interest on long term debt at 12.30%.

Operations and Maintenance Expenses

Petitioner's submission

5.57 The Petitioner has considered the O&M cost for the MSW waste-to-energy project at Rs. 1132.50 lakh with an annual escalation of 5.72%. The O&M expenses of Rs 1132.50 Lakh includes Rs. 1092.50 Lakh in accordance with the prevailing JSERC regulations and Rs. 40 Lakh for SLF maintenance.

Commission's analysis

5.58 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for determining Operation and Maintenance Expenses (O&M):

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

...

Normative O&M expenses for FY 2016-17 for the power projects which use Municipal solid waste or Refuse derived fuel shall be 6% of normative capital cost.

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

5.59 The Commission has approved the Capital cost at Rs. 186.31 Cr for the project. However the normative capital cost for 11.5 MW plants is Rs. 172.50 Cr. Accordingly the O&M expenses for the year at 6% of the normative capital cost will be Rs. 10.35 Cr. The Petitioner vide letter RMPL/ JSERC/ Feb. 2017/ 01 dated February 28, 2017 has specified that the plant will be commissioned by February 2019. However, the Commission has considered FY 2019-20 as the first year of operation of the plant. The O&M expenses for the subsequent years has been escalated at 5.72% per year.

Depreciation

Petitioner's submission

5.60 The Petitioner has submitted that in line with the provisions regarding depreciation, a salvage value of 10% has been considered and thus the plant has been depreciated up to 90% of the asset value.

- 5.61 Depreciation has been considered at 5.83% per annum for the first twelve years and the balance amount of the project cost has been depreciated over the remaining years of the project equally.

Commission's analysis

- 5.62 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for depreciation

“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.

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

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

- 5.63 In accordance with Regulation, the Commission has considered depreciation rate of 5.83% for the first 12 years and 2.5% for the remaining 8 years of the total plant life to calculate the depreciation of the project.

Interest on Working Capital

Petitioner's submission

- 5.64 The Petitioner has worked out the interest on working capital as per the following:

- (f) O&M expense for one month;
- (g) Receivables equivalent to two months of fixed and variable charges for sale of electricity calculated on the target PLF;
- (h) Maintenance spare equivalent to 15% of O&M expenses;

- 5.65 The Petitioner has considered the rate of interest on working capital at 13.26%.

Commission's analysis

5.66 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for the determination of interest on working capital

“The working capital requirement in respect of Biogas, Municipal solid waste and Refuse Derived Fuel based power projects shall be computed in accordance with the following:

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

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.”

5.67 As specified in the Regulations, no fuel cost shall be considered for MSW based power plant. Hence the fuel cost component in the working capital will be zero.

5.68 The Commission has considered the base rate of SBI prevalent in the first six months of the year FY 2016-17 and the weighted average base rate arrived is 9.30%. Therefore the Commission approves the rate of interest on long term debt at 12.80%.

Return on Equity (RoE)

Petitioner's submission

5.69 The Petitioner has submitted that in line with Regulations, equity has been considered at 30% of capital cost of the project.

5.70 Further, the pre-tax return on equity has been considered at 20% for first ten years of the project life and 24% for the next ten years.

Commission's analysis

5.71 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following for the determination of Return on Equity

“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)

The return on equity (pre-tax) shall be as under:

- (e) 20% per annum for the first 10 years.
- (f) 24% per annum 11th years onwards.”

- 5.72 The Commission has considered a normative debt equity ratio of 70:30 to determine the tariff for the Petitioner’s plant.
- 5.73 As specified in the Regulations, the Commission has determined Return on Equity at 20% for the first 10 years and 24% for the remaining 10 years of the project.

Approved Levellised Generation Tariff

Petitioner’s submission

- 5.74 The Petitioner has proposed levellised tariff of Rs 9.51/kWh for 25 years of the useful life of the plant.

Commission’s analysis

- 5.75 Based on the approval granted for the capital cost, various operational and financial parameters as discussed above, the Commission has calculated the fixed cost for each year of the tariff period i.e. 20 years as per the provisions specified in the JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016
- 5.76 The discount factor considered for the purpose of levellisation is equal to the post-tax weighted average cost of the capital (WACC) on the basis of normative debt to equity ratio (70:30) specified in the Regulations.
- Interest rate considered for the loan component (i.e.70%) of capital cost is 12.30%
 - For equity component (i.e. 30%), the Commission has computed the weighted average post-tax ROE of 14.39% based on weighted average pre-tax ROE of 22% considering ROE of 20% for the first 10 years and 24% for the remaining 10 years.
 - The discount factor derived by this method for all technology is 9.95%.
((12.30% × 0.70 × (1 – 34.61 %)) + (14.39% × 0.30)).
- 5.77 The parameters considered by the Commission to determine the levellised tariff for power generated from the Petitioner’s plant have been summarized in the table below:

Table 12: Parameters submitted by the Petitioner and approved by the Commission

Head	Particulars	Units	Submitted by Petitioner	Approved by Commission
Operational parameters	Capacity	MW	11.50	11.50
	Plant Load Factor – 1st Year	%	65%	65%
	Plant Load Factor – 2nd Year	%	75%	75%
	Auxiliary Consumption	%	16.00%	15.00%
	Useful Life	Year	25	20
	Tariff Period	Year	25	20
Project cost	Capital Cost	Rs. Lakh	23,550.84	18,631.44
Sources of Fund - Debt	Debt: Equity Ratio	%	70 : 30	70 : 30
	Debt amount	Rs. Lakh	16,485.59	13042.01
	Repayment period	Year	12	12
	Interest Rate	%	12.76%	12.30%
Sources of Fund - Equity	Equity Amount	Rs. Lakh	7065.25	5589.43
	Return on Equity for first 10 years	%	20.00%	20.00%
	Return on Equity for 11th year onwards	%	24.00%	24.00%
	Discount rate	%	10.56%	9.95%
Depreciation	Depreciation rate for first 12 years	%	5.83%	5.83%
	Depreciation rate from 13th year onwards	%	7.69%	2.50%
	Salvage value	%	10%	10%
O&M	O&M Expenses	Rs. Lakh	1,132.50	1,035.00
	Escalation factor for O&M expenses	%	5.72%	5.72%
Royalty	Royalty fee to be paid to Municipal Corporation	% of Revenue	5.00%	Not approved
Working Capital	O&M Expense	Rs. Lakh	1 month	1 month
	Maintenance spares	Rs. Lakh	15% of O&M expense	15% of O&M expense
	Receivables	Rs. Lakh	2 months	2 months
	Fuel stock	Rs. Lakh	4 months	Price of fuel considered zero
	Interest on Working Capital	%	13.26%	12.80%
Tariff	Levellised Tariff for 25 Years	Rs/kWh	9.51	7.29

5.78 Accordingly, the levellised tariff for a period of 20 years for power generated from the 11.5 MW Waste to Energy plant is determined as Rs 7.29/ kWh as detailed in Table 12 of this Order.

Other issues

Petitioner's submission

- 5.79 The Petitioner in its Tariff Petition has also prayed before the Commission for the following:
- a. To grant exemption from Merit Order Dispatch Principles for the project.
 - b. To direct the distribution company to consider the benefit of zero contract demand charges
 - c. To direct the distribution company to net off the energy which may be drawn during shut down or start up after the CoD of the project against the energy injected into the Grid by the project;
 - d. To grant waiver on Cross Subsidy Surcharge on sale of power from the project in case of sale of power directly to third party;

Commission's analysis

- 5.80 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 specifies the following

“All renewable energy power plants, except wind power generation 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.”

- 5.81 In view of the provisions specified in the Regulations, the Petitioner's plant is exempted from Merit Order Dispatch Principles.
- 5.82 The contract demand of the Petitioner for availing supply from the distribution licensee shall be as per applicable JSERC Electricity Supply Code Regulations 2016.
- 5.83 The JSERC (Determination of Tariff for Procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 also specifies the following for accounting of power to be taken during start-up and shutdown.

“Start-up power

The wind energy, biogas, municipal solid waste and refuse derived fuel based 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

The wind energy, biogas, municipal solid waste and refuse derived fuel based 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 shall not normally exceed 11.5 % of the MW capacity it delivers to the Distribution Licensee.”

- 5.84 With regards to the prayers of the Petitioner to net off of the power drawn during start-up and shutdown against the generated energy, the Commission clarifies that the accounting of the same shall be as per the aforesaid provisions already specified in the applicable Regulations.
- 5.85 The levy of Cross Subsidy Surcharge shall be as per the JSERC (Terms and Conditions for Intra-State Open Access) Regulations, 2016 and orders from the Commission as notified from time to time.
- 5.86 The tariff determined shall be applicable only in case the project achieves the Commercial Operation Date (CoD) up to 31st March 2020. The approved tariff shall be considered for a period of twenty years from the date of commercial operation of the generating station.

The Order is signed and issued by the Jharkhand State Electricity Regulatory Commission on this the 21st of June, 2017.

Date: June 21, 2017

Place: Ranchi

**Sd/-
(R. N. Singh)
MEMBER (Engg.)**

Table 13: Approved Tariff for the Waste to Energy Plant

Year of Operation	1	2	3	4	5	6	7	8	9	10
Installed Capacity (MW)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Net Generation (MU)	55.66	64.22	64.22	64.22	64.22	64.22	64.22	64.22	64.22	64.22
COST OF GENERATION (Rs Lakh)										
O&M Expenses	1035.00	1094.20	1156.79	1222.96	1292.91	1366.87	1445.05	1527.71	1615.09	1707.48
Depreciation	1086.83	1086.83	1086.83	1086.83	1086.83	1086.83	1086.83	1086.83	1086.83	1086.83
Interest on term loan	1537.33	1403.65	1269.97	1136.28	1002.60	868.92	735.24	601.56	467.88	334.20
Interest on working Capital	135.72	135.90	136.26	136.81	137.55	138.51	139.69	141.10	142.75	144.67
Return on Equity	1117.89	1117.89	1117.89	1117.89	1117.89	1117.89	1117.89	1117.89	1117.89	1117.89
Total Fixed Cost	4912.76	4838.47	4767.74	4700.77	4637.79	4579.02	4524.70	4475.09	4430.45	4391.07
PER UNIT COST OF GENERATION (Rs/kWh)										
O&M Expenses	1.86	1.70	1.80	1.90	2.01	2.13	2.25	2.38	2.51	2.66
Depreciation	1.95	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.69
Interest on term loan	2.76	2.19	1.98	1.77	1.56	1.35	1.14	0.94	0.73	0.52
Interest on working Capital	0.24	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.23
Return on Equity	2.01	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74
Total COG per unit	8.83	7.53	7.42	7.32	7.22	7.13	7.05	6.97	6.90	6.84
Discount Factor	1.000	0.910	0.827	0.752	0.684	0.622	0.566	0.515	0.468	0.426
Levellised Tariff (Rs/Kwh)	7.29									

Year of Operation	11	12	13	14	15	16	17	18	19	20
Installed Capacity (MW)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Net Generation (MU)	64.22	64.22	64.22	64.22	64.22	64.22	64.22	64.22	64.22	64.22
COST OF GENERATION (Rs Lakh)										
O&M Expenses	1805.14	1908.40	2017.56	2132.96	2254.97	2383.95	2520.31	2664.48	2816.89	2978.01
Depreciation	1086.83	1086.83	465.79	465.79	465.79	465.79	465.79	465.79	465.79	465.79
Interest on term loan	200.52	66.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	151.74	154.23	144.95	150.98	157.37	164.11	171.25	178.79	186.76	195.19
Return on Equity	1341.46	1341.46	1341.46	1341.46	1341.46	1341.46	1341.46	1341.46	1341.46	1341.46
Total Fixed Cost	4585.70	4557.77	3969.76	4091.20	4219.59	4355.32	4498.81	4650.52	4810.90	4980.45
PER UNIT COST OF GENERATION (Rs/kWh)										
O&M Expenses	2.81	2.97	3.14	3.32	3.51	3.71	3.92	4.15	4.39	4.64
Depreciation	1.69	1.69	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Interest on term loan	0.31	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	0.24	0.24	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30
Return on Equity	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09
Total COG per unit	7.14	7.10	6.18	6.37	6.57	6.78	7.01	7.24	7.49	7.76
Discount Factor	0.387	0.352	0.321	0.292	0.265	0.241	0.219	0.200	0.181	0.165

ANNEXURE**List of participating members of public in the public hearing****Table 14: List of participating members of public in the public hearing**

Sl. No.	Name	Address / Organization if any
1	Anshul Agarwal	JUSCO, Jamshedpur
2	Amit Sharma	Ranchi MSW Pvt. Limited
3	Mahesh Ghagre	Ranchi MSW Pvt. Limited
4	Nitin Upadhye	Ranchi MSW Pvt. Limited
5	Arun K. Singh	Ranchi MSW Pvt. Limited
6	Brijesh Kumar	Ranchi MSW Pvt. Limited
7	S. B. Saran	DGM (F&A), JBVNL
	Rishi Nandan	ESE, JBVNL
9	Guneet Singh	JBVNL
10	T. Biswas	-
11	Anita Prasad	JBVNL
12	Rajkumar Choudhury	JBVNL
13	Ravishankar Kumar	JBVNL