



**TELANAGANA STATE ELECTRICITY REGULATORY COMMISSION**  
**5<sup>th</sup> Floor, Singareni Bhavan, Red Hills, Hyderabad-500 004**

O. P.No. 18 of 2016

Dated: 13.06.2016

Sri Ismail Ali Khan, Chairman  
Sri H. Srinivasulu, Member  
Sri L.Manohar Reddy, Member

**In the matter of Suo-Moto Determination of Generic Tariff for energy generated from Municipal Solid Waste (MSW) and Refuse Derived Fuel (RDF) based power projects in the State of Telangana achieving CoD during the period from 13-06-2016 to 31-03-2019**

**INTRODUCTION**

The Protection of environment is a bounden duty of every citizen of this country. Any activity including economic activity is not expected to damage or cause deterioration of fragile eco system. The Commission took cognizance of this fact and felt the necessity of management of waste and it is the need of the hour for sustainable development of the new state. In order to achieve this objective, participation of the stakeholders is vital as they are required to play their role in contributing to a cleaner environment including setting up of the Waste-to-Energy (WTE) plants. In order to move forward in the matter, the Commission has initiated a suo- moto exercise to determine the generic tariff for generation of energy from the Municipal Solid Waste (MSW) projects in the State of Telangana and for procurement of such energy generated from those plants by the licensees in the State, being, the Telangana State Southern Power Distribution Company Limited and the Telangana State Northern Power Distribution Company Limited (Hereinafter referred to as TSDISCOMs).

II. Accordingly, the Commission had proposed the draft norms and invited the written objections, suggestions and comments from all the stake holders vide a

public notice dated 22.01.2016 by fixing the last date of submissions as 12.02.2016.

III. The Commission also undertook, a public hearing in the matter of 'determination of tariff for energy generated from the MSW based power projects' on 11.03.2016, and heard the detailed presentations along with the oral submissions made by the stake holders as well as general public.

IV. Several important issues were raised by the stake holders and the same are considered by the Commission in the analysis made in the subsequent paragraphs including the statement of decision on such issues by passing the following:

## **ORDER**

### **Legislative Provisions**

1. Section 86(1) (e) of the Electricity Act, 2003 (Hereinafter referred to as the 'Act') mandates the State Electricity Regulatory Commission to promote co-generation 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. The Regulatory Commission is also required to specify, for the purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution Licensee.

2. Section 62 of the Act empowers the commission to determine the tariff for supply of electricity by a generating company to a distribution licensee.

3. Clauses ('h') and ('f') of Section 61 of the Act stipulate that the tariff determination by the commission shall be guided to promote generation of electricity from the renewable sources and by the National Electricity Policy and the tariff policy.

4. The National Tariff Policy 2016, mandates a distribution licensee to compulsorily procure 100% power produced from all the Waste-to-Energy plants in the State, in the ratio of their procurement of power from all sources including

their own, at the tariff determined by the Appropriate Commission under Section 62 of the Act.

5. In exercise of the powers vested in it under Section 86(1)(a), (b) ,(c) & (e) read with Section 62(1) of the Act, the Telangana State Electricity Regulatory Commission (Hereinafter referred to as the Commission), through this order, determines the tariff, procurement process and related dispensation/conditions for purchase of power by the Distribution Licensees in the State of Telangana from the Municipal Solid Waste (MSW) based power generating plants.

### **Background**

6. The Ministry of New and Renewable Energy (MNRE) had in the year 1993 set a tariff of Rs. 2.25/Unit for energy generated from Renewable energy sources which included MSW to Energy for the base Financial Year 1994-95 and allowed a 5% simple escalation for every year thereafter.

7. The erstwhile Andhra Pradesh Electricity Regulatory Commission (APERC) in its orders dated March 2004 and March 2009 had proposed a single part tariff for the Municipal waste to energy projects for FY 2004-05 to FY 2013-14 and the details are as under:

<b>Financial Year</b>	<b>Tariff (Rs./Unit)</b>
FY 2004-05	3.37
FY 2005-06	3.48
FY 2006-07	3.59
FY 2007-08	3.70
FY 2008-09	3.81
FY 2009-10	4.04
FY 2010-11	4.15
FY 2011-12	4.26
FY 2012-13	4.37
FY 2013-14	4.48

8. For the MSW to Energy projects in Telangana, there is no applicable tariff after FY 2013-14. The tariff till FY 2013-14 was computed considering the base tariff of Rs. 2.25/Unit in FY 1994-95 with a simple escalation of 5% per annum. As compared to Biomass, Bagasse and other Non-Conventional Energy (NCE) sources,

no specific norms were determined for the MSW to Energy projects and only a single part tariff was adopted for such projects.

9. The Commission now in this order seeks to undertake a holistic exercise for determination of tariff for the Waste-to-Energy plants in the Telangana state whose Commercial Operation Date (COD) is declared during the period FY 2016-17 to FY 2018-19.

10. In order to facilitate the task of determination of tariff and in the light of objectives of the Act, the Commission engaged M/s. KPMG as an independent consultant with a mandate to analyse the operating parameters / norms and economics of the Waste-to-Energy projects in general and special reference to their working in the state of Telangana and also to assist the Commission in the overall process of tariff determination for Waste-to-Energy projects in the state of Telangana. With this object, the consultant was also directed to scrutinise the various existing Central Electricity Regulatory Commission (CERC) and SERC orders relating to the Waste-to-Energy projects in the country.

11. Accordingly, the consultant undertook the field visits to three plants in Telangana state namely (i) M/s. Shalivahana Green Energy (ii) M/s. Hema Sri Power Projects Limited. (iii) M/s. RDF Power Projects Ltd., for collection of data and other functional information for determination of a generic tariff.

12. Upon receipt of the report from the consultant, the Commission issued a draft proposal for Determination of Tariff from the MSW to Energy projects. The Commission called for the suggestions and objections on the proposed tariff norms from various stakeholders and the general public. In continuation thereof, the Commission also conducted a public hearing and heard the stakeholders who submitted their views, comments and objections.

### Parameters Proposed

13. A detailed analysis of the existing and upcoming plants in the Telangana State, which have filed petitions for the tariff determination before the Commission has also been carried out.

### Norm Based Tariff

14. The Commission observes that while there are significant differences in the Waste-to-Energy projects, be it the operational model, technology etc., there is merit in having a common ground for evaluating the Waste-to-Energy projects and fixing a Norm based tariff. Further, determination of tariff on a project specific basis may lead to need for a detailed project-wise due diligence and a greater regulatory scrutiny which can be time consuming. Further, the CERC has also proposed the norms for tariff determination of the Waste-to-Energy projects in the year 2015.

15. After deliberation on the report submitted by the consultant, the Commission proposed the norms which are summarised as under and placed them in public domain for their views or suggestions.

Parameter	Unit	RDF based Power Project	MSW Based Power Project
Capital Cost	Rs. Crs./MW	7	14
PLF	%	65% -First Year 80% - Second Year Onwards	65% -First Year 75% - Second Year Onwards
O&M expenses	% of Capital Cost allowed	6% of Capital cost - 1 <sup>st</sup> year with 5.72% escalation	6% of Capital cost - 1 <sup>st</sup> year with 5.72% escalation
Plant Life	Years	20	20
Salvage Value	%	10.00%	10.00%
Depreciation	%	4.70% for first 15 Years and 3.90% for next 5 years on Capital cost (excluding land cost of Rs. 5 Lakh/MW)	4.68% for first 15 Years and 3.95% for next 5 years on Capital cost (excluding land cost of Rs. 5 Lakh/MW)
Return on Equity (Post Tax)	%	16%	16%
Interest on Debt	%	11.5%	11.5%
Debt-Equity Ratio		70:30	70:30
Interest on Working Capital	%	12.5%	12.5%
Loan Tenure	Years	15	15

Parameter	Unit	RDF based Power Project	MSW Based Power Project
WACC	%	12.85%	12.85%
Discount Rate - Levelised Tariff	%	12.85%	12.85%
Auxiliary Consumption	%	11%	12%
Station Heat Rate	kCal/kWh	4000	-
Gross Calorific Value	kCal/kg	2500	-
Fuel Cost	Rs./ MT	1800	-
Fuel Cost Escalation	%	5%	-
Tax (Income Tax, MAT)		To be reimbursed by DISCOMS on actual payment by Developer	To be reimbursed by DISCOMS on actual payment by Developer
<b>Any tipping fees paid by Govt. of Telangana or Urban Local Body shall be reduced from fuel cost.</b>			

### Stakeholders Responses

16. The Commission had issued the above draft proposal for Determination of Tariff for the Municipal Solid Waste (MSW) to Energy on 22<sup>nd</sup> January 2016. Different norms for Tariff were proposed for the Refused Derived Fuel (RDF) based projects and the MSW based projects. The written comments and suggestions were invited from the stakeholders by 12<sup>th</sup> February 2016. A Public hearing was conducted in the matter of Determination of Tariff from the Municipal Solid Waste (MSW) to Energy on 11<sup>th</sup> March 2016 and heard the stakeholders who submitted their views, comments, objections and suggestions. The Commission, then, proceeded to determine the tariff for the RDF based technologies and the MSW based technology separately for the period FY 2016-17 to FY 2018-19.

17. The written comments / views or suggestions were received from the following stakeholders and general public:-

- a) M/s. Hema Sri Power Projects Ltd.
- b) Engineering Staff College of India
- c) Dr. G. Dayakar Reddy, Indian Medical Association
- d) Dr. P Sandhya Rani, Indian Medical Association
- e) Dr. D. Narasimha Reddy, People's Monitoring Group on Electricity Regulation
- f) Shri. Banoth Madanlal

- g) Dr. Syeda Azeem Unnisa , Osmania University
- h) M/s. Leaf Industries Pvt. Ltd.
- i) M/s. INDEN Technologies Pvt. Ltd.
- j) Shri. Venkatesh, MSW Specialist
- k) M/s. Sri Venkateshwara Green Power
- l) Green Crop Society
- m) Dr. KVJ Rao, Swami Vivekananda Institute of Technology
- n) Dr. M. Prasad
- o) M/s. Infrastructure Leasing & Financial Services Limited (IL&FS)
- p) M/s. Shalivahana Green Energy
- q) Shri. Nalla Odelu , Govt. Whip ,Telangana State Legislative Assembly
- r) Shri. Putta Madhukar , MLA , Telangana State
- s) Shri. Diwakar Rao, MLA , Telangana State
- t) M/s. RDF Power Projects Ltd
- u) Shri. M. Dana Kishore , Director of Municipal Administration
- v) M/S. Bio Power Infra Ltd
- w) Shri. Koram Kanakaih, MLA ,Telangana State
- x) Dr. Lubna Sarwath
- y) M/S. Zenith Energy
- z) M/S. Hyderabad Integrated MSW
- aa) Shri. Praveen Prakash

18. During the public hearing the following stakeholders and public have submitted their oral submissions before the Commission.

- a) M/S. Hema Sri Power Projects Ltd.
- b) M/S. Shalivahana Green Energy
- c) M/S. Leaf Industries Private Ltd
- d) M/S. Venkateshwara Green Power
- e) M/S. IL&FS Ltd
- f) M/S. RDF Power Projects Ltd
- g) M/S. Bio Power Infra Ltd
- h) M/S. Hyderabad Integrated MSW
- i) Shri. YVM Reddy

- j) Engineering Staff College of India
- k) TSDISCOMS

**Parameters for the Refuse Derived Fuel (RDF) Based Projects.** The Commission now deals with various parameters that were placed in the public domain for the stakeholders views and also gives its orders on various parameters relating to the RDF based projects. For the sake of clarity, a RDF based project is defined as under:

#### **Definition**

19. The definition of a RDF based project for the purpose of determination of tariff in this order shall be as follows:

- A. **Refuse Derived Fuel (RDF) based power project - A project shall qualify to be termed as a Refuse derived fuel (RDF) based power project, if it is using the new plant and machinery based on the Rankine Cycle Technology (RCT) and using the RDF as fuel sources.**
- B. "Refuse Derived Fuel" means segregated combustible fraction of solid waste other than chlorinated plastics in the form of pellets or fluff produced by drying, de-stoning, shredding, de-hydrating and compacting combustible components of solid waste that can be used as fuel
- C. The new plant & machinery installed in a RDF based project using the RCT should not have been used for generation of power in a project anywhere in India prior to its installation in a RDF based power project in the state of Telangana.

#### **Capital Cost**

20. The Capital cost for power plants using the Refuse Derived Fuel (RDF) as fuel was proposed to be at a sum of Rs. 7 Crores/MW by the Commission in the consultative paper. The comments received on the proposal of the Commission from the stakeholders are discussed below:

#### **Comments Received**

21. M/s. Hema Sri Power Projects Ltd. requested to consider a Capital cost of Rs. 11 Crores /MW for RDF based power projects. Due to the distributed nature of



the project, additional cost was incurred to set up the pre-processing plants at multiple locations. Since the processing plants involved extra Capital expenditure, the same should be factored in the Capital Cost

22. M/s. IL&FS and M/S. Hyderabad Integrated MSW suggested the Capital cost of Rs. 15 Crores /MW for RDF based power projects. They suggested the capital cost of establishing pre-processing facilities is about 30-40% of the capital cost. This has to be factored in for fixing the capital cost of RDF based power projects.

23. M/s. RDF Power Projects Ltd., suggested a Capital Cost of Rs. 10 Crores/MW for RDF based power projects as they would be adhering to the EURO norms which shall result in a higher capital cost. They also suggested that India would slowly move towards EURO norms. This would require additional investment in terms of back scrubbers, chemical treatment with Urea, Lime, and activated Charcoal.

24. M/s. Shalivahana Green Energy and M/s. Sri Venkateshwara Green Power suggested that the capital cost of Rs. 7 Crores/MW is low, and requested the Commission to adhere to the CERC norms of Rs. 9 Crores/ MW.

25. Shri. YVM Reddy independent activist, suggested that Capital cost of around Rs. 12 Crores/MW is required for setting up a RDF based power project capable of handling Indian Waste.

### **Commission's Order**

26. The Capital cost furnished by the project developers before the Commission appeared to be high as compared to the capital cost allowed by some of the State Electricity Regulatory Commissions (SERCs). An analysis of the capital cost was done to determine the reasonable level of Capital Cost. For this purpose a two-step approach has been followed.

- (a) Benchmark the capital cost of the Telangana projects as against the different projects in India and allow a reasonable amount for Preliminary expenses and Interest During Construction period (IDC).
- (b) A Prudent check of capital cost of individual projects either to disallow or reduce any item appropriately based on the assessment.

27. The Commission is of the view that the capital cost of pre-processing facilities of raw material should be included in the Capital Cost. The Developers submitted that the capital cost for pre-processing of raw material comes to around 35-40% of the total capital cost. The CERC also in its order dated 07<sup>th</sup> October 2015 had included the capital cost of pre-processing equipment in the total capital cost. Considering the submissions of the developers, and the orders of other SERCs and CERC, the Commission determines the capital cost at a sum of Rs.9 Crores/MW. The capital cost of Rs.9 Crores/MW is applicable for the projects whose COD is declared during the period FY 2016-17 (w.e.f date of this order) to FY 2018-19. Any project whose COD was declared prior to the date of this order shall not claim the cost of the project at a sum of Rs.9 Crores / MW. The capital cost of Rs.9 Crores/MW remains the same for the entire remaining period of the third control period i.e., upto 31-03-2019.

#### **Plant Load Factor (PLF)**

28. For recovery of Full fixed charges in the Tariffs, the threshold Plant Load Factor for the power projects which use the Refuse Derived Fuel (RDF) was proposed in the norms as under:

- a) During stabilisation : 65%
- b) During remaining period in first year after stabilisation : 65%
- c) From Second year onwards : 80%

#### **Comments Received**

29. M/s. Hema Sri Power Projects Ltd. suggested that as per the actual working data of M/s. Shalivahana Green Energy, the average PLF is around 60% and the same can be adopted.

30. M/s. Sri Venteshwara Green Power suggested the CERC norms can be adopted for most of the parameters but PLF of 80% cannot be achieved practically for Indian Waste.

31. M/s. IL&FS suggested that 80% PLF is too high to be achieved and 70% is a good estimate once the plant is stabilised.

32. M/s. Hyderabad Integrated MSW also suggested that PLF of 80% can't be achieved and 70% be considered after stabilisation.

### Commission's Order

33. The Commission is of the view that the RDF is basically processed from the MSW and is capable of a higher heat content and thereby a higher PLF. We may gainfully refer to and rely on for the purpose of PLF on the order of the Gujarat Electricity Regulatory Commission (GERC) Order in Petition No.1052/2010 Dated 30-07-2011 of M/s.Hanjer Green Power Pvt. Ltd., wherein a PLF of 80% was approved.

34. Coming to M/s. Shalivahana Green Energy which on account of lack of a long term PPA had been selling power in the short term market which involved a significant ramping of power plant up and down according to procurers requirement as well as technical constraints set out by the SLDC in its endeavour to safe and secure integrated grid. Further, not all of the processing facilities were operational which caused the shortage of fuel. Thus, the PLF achieved by M/s. Shalivahana Green Energy cannot serve as a benchmark due to its lack of standard operating situation. The National Tariff Policy, 2016 stipulates that *Distribution Licensee(s) shall compulsorily procure 100% power produced from all the Waste-to-Energy plants in the State*, thus exempting the projects of Waste-to-Energy from the Merit Order Dispatch. With sufficient supply of RDF, a higher PLF can be achieved by these power projects. For the purpose of assured supply of MSW, the erstwhile Govt. of Andhra Pradesh had allotted the Municipal dumps of various towns or municipalities depending on the capacity of generation plant for lifting of the MSW by various Waste-to-Energy power projects on the recommendations of New & Renewable Energy Development Corporation Of A.P Limited (NREDCAP). Thus, the Waste-to-Energy projects in the state of Telangana, have the assured supply of the raw material. Therefore, the Commission has reason to accept the norm of a higher PLF that can be achieved by the Waste-to-Energy power projects. In this regard, we are also fortified by the fact that other SERCs have also allowed for PLF in the range of 60% - 80%.

35. Considering the totality of facts, the Commission in line with the proposed norms determines the Threshold Plant Load Factor for the power projects which use the Refuse Derived Fuel (RDF) as under:

- a) During stabilisation : **65%**

- b) During remaining period in first year after stabilisation : **65%**
- c) From Second year onwards : **80%**
- d) The stabilisation period shall not be more than 6 months from the date of Commissioning of the project.

### **Operation and Maintenance (O&M) Expenses**

36. The Normative O&M expenses for the first year of a power project which uses the Refuse Derived Fuel (RDF) was proposed to be 6% of the capital cost. The Normative O&M escalation of a power project which uses the Refuse Derived Fuel (RDF) was proposed to be 5.72% per annum with effect from 2<sup>nd</sup> year onwards from the COD.

### **Comments Received**

37. M/s. Hema Sri Power Projects Ltd., suggested a higher O&M of 7% of the Capital cost for the first year be allowed as it involved decentralized processing of waste. Further, the labour for work related to waste processing is difficult and expensive. Hence, a higher O&M expenses should be allowed.

38. M/s. IL&FS suggested to consider a fixed O&M expenses of Rs. 90 Lakhs/MW be allowed for the RDF based plants in the first year without pegging it to the capital cost.

### **Commission's Order**

39. The Commission examined the norms of O & M expenses laid down by the CERC and after perusing the order of Gujarat Electricity Regulatory Commission (GERC) in the case of M/s.Hanjer Green Power Pvt. Ltd., we are of the view that 6% of the Capital cost of a power project which uses the RDF is fair and reasonable towards O & M expenses.

40. Since no objections were received, the Normative O&M expenses escalation of a power project which uses the Refuse Derived Fuel (RDF) is determined at 5.72% per annum. However, this escalation of 5.72% is restricted to the remaining period of the third control period.

### **Plant Life**

41. The plant life of a Waste-to-energy power project was proposed to be 20 years

42. No comments / suggestions were received from the developers or objectors.
43. The Commission determines the plant life of a waste-to-energy power plant at 20 years

#### **Debt Equity Ratio**

44. In the consultation paper, the Debt equity ratio for the Waste-to-Energy power plants was proposed to be 70:30 in accordance with the financially accepted normative.
45. No comments or suggestions were received from the stakeholders.
46. The Commission determines the Debt equity ratio for the Waste-to-Energy power plants at 70:30.

#### **Loan Tenure**

47. The loan tenure of 15 years was proposed for the Waste-to-Energy projects considering the plant life in the consultation paper.

#### **Comments Received**

48. M/s. Hema Sri Power Projects Ltd., M/S. Shalivahana Green Energy, M/S. Sri Venkateshwara Green Power, M/S. Hyderabad Integrated MSW and M/S. RDF Power Projects suggested a loan tenure of 12 Years as per the CERC regulations for the Waste-to-Energy projects.
49. M/s. IL&FS mentioned that banks give a higher loan tenure to only those projects which have a high IRR. A loan tenure of 15 years is very high for and it should be reduced to 12 years.

#### **Commission's Order**

50. It is observed that the Loan tenure of actual loans taken by projects in Telangana is 12 years despite the fact that banks give loans for a tenure involving 15 to 25 years to infrastructure sector including power sector.
51. The Commission having considered the claims of all the stake holders changes the loan tenure to 12 years which is in line with the CERC regulations for the Waste to Energy projects. Thus, the Commission reduces the loan tenure from

the proposed norm of 15 years to 12 years to promote the investment in the Waste-to-energy power projects.

### **Depreciation**

52. In the consultative paper, the Commission proposed the Depreciation rate of 4.70% for the first 15 years and 3.90% for the succeeding 5 years for a Power plant based on the RDF. The plant & machinery and other assets have been proposed for depreciation till 10% of their values remain as a salvage value of plant and machinery after completion of the plant life of 20 years. About 70% of the project cost is proposed to be depreciated over the course of the loan tenure and the remaining 20% was proposed to be depreciated over the remaining life of the plant or machinery.

53. No comments or suggestions were received on the depreciation from the stakeholders.

### **Commission's Order**

54. Since the plant life has been determined by the Commission which is different from the proposed loan tenure period, the Commission determines the new depreciation rate at **5.83% for the first 12 years of the plant life and 2.50% for the remaining period of plant life that is 8 years.**

### **Return on Equity**

55. The post-tax Return on equity for the Waste-to-energy power plant was proposed to be 16%.

56. No comments and suggestions were received from the stakeholders.

57. In order to encourage the investment, the Commission determines the Return on Equity at 16% post tax. The Income tax paid by a developer on the Income derived from the power project shall be reimbursed by the DISCOMS against the submission of the original challans of the payment of Tax to the Income Tax department. Further, the DISCOMs shall not pay any income tax liability in respect of income which is not derived from the power projects. In other words, income tax on any income other than the income derived from the power project shall be borne by the developer/generating company.

### **Interest on Term Loan**

58. The Interest rate of 11.5% was proposed for the Waste-to-Energy Projects in the consultative paper by the Commission.

### **Comments Received**

59. M/s.Hema Sri Power Projects Ltd., M/s.Shalivahana Green Energy, M/s.Sri Venkateshwara Green Power, M/s.IL&FS, M/s.Hyderabad Integrated MSW suggested for an interest rate of 13% considering that all the existing and under construction projects had taken loan through the Pooled Municipal Obligation Debt (PMDO) route.

60. Further, M/s. IL&FS suggested that the Waste-to-Energy projects do not come under the priority sector lending and considering their risk profile, 13% interest rate is reasonable

61. M/s.Shalivahana Green Energy argued that the Indian Renewable Energy Development Agency Limited (IREDA) interest rates for Waste-to-Energy projects are around 11.5%, but there are no Waste-to-Energy projects to which IREDA financed in the past.

62. M/s. RDF Power Projects Ltd., suggested that Interest on Long term debt should be taken as 300 basis points above the SBI base lending rates.

### **Commission's Order**

63. The Commission while keeping in view the lower interest rate offered by IREDA is conscious of the fact that the Waste-to-Energy projects are perceived to be risky as compared to other renewable energy projects. The Commission also took note of the declining trend of Interest rates for the term loans and increase in the term of the loan from Fifteen (15) years to Twenty Five (25) years. Considering the totality of facts, the Commission allows a 0.5% higher interest rate than the rate which was proposed in the consultative paper. Thus, the Commission determines the interest rate at 12% for the Waste-to-Energy projects using the RDF as fuel.

### **Interest on Working Capital**

64. The following norms were proposed for computation of Interest on Working Capital by relying on the CERC Renewable Energy Tariff Regulations which provide for the working capital requirements of the RE projects to include:

- a) Operation & Maintenance expenses for One (1) month
- b) Maintenance spares @ 15% of O&M expenses
- c) Receivables equivalent to Two (2) months for sale of electricity calculated on target PLF
- d) Fuel cost for Four (4) months equivalent to the normative PLF

Basing on the above parameters, the Interest rate on working capital was proposed at 12.5% in the consultation paper by the Commission.

### **Comments Received**

65. M/s. Hema Sri Power Projects Ltd., M/S. Shalivahana Green Energy, M/S. Sri Venkateshwara Green Power, M/S. IL&FS, M/S. Hyderabad Integrated MSW and M/S. RDF Power Projects suggested the interest on short term debt can be taken at 50 basis points above the interest rate on the long term debt.

### **Commission's Order**

66. The interest on long term debt is determined at 12% based on the submissions of the stakeholders and after considering the financial implications. The Commission determines the interest rate on working capital in line with the proposed norms at 12.5% by keeping the other norms as the same as mentioned below

- a) Operation & Maintenance expense for One (1) month
- b) Maintenance spares @ 15% of O&M expenses
- c) Receivables equivalent to Two (2) months for sale of electricity calculated on target PLF
- d) Fuel cost for Four (4) months equivalent to the normative PLF.

### **Auxiliary Consumption**

67. Auxiliary consumption for the power projects which use the Refuse Derived Fuel was proposed in the norms at 11%

### **Comments Received**

68. M/s. Hema Sri Power Projects Ltd. suggested that while the CERC has allowed for 15% Auxiliary consumption, the actual running data from M/S. Shalivahana Green Energy plant reflected to be 13%. Hence they requested at least 13% Auxiliary Consumption to be allowed.



69. M/s. Shalivahana Green Energy, based on the plant running data requested for 13% as Auxiliary consumption

70. M/s. Sri Venkateshwara Green Power, M/S. IL&FS, M/S. RDF Power Projects and M/S. Hyderabad Integrated MSW proposed auxiliary consumption of 15% as per the CERC Norms.

#### **Commission's Order:**

71. The Commission has examined the data submitted by M/S. Shalivahana Green Energy and the Auxiliary consumption therein was 11.14% for FY 2013-14 and 10.84% for FY 2014-15. The Waste-to-Energy developers have requested for 10% auxiliary Consumption in their petitions filed before the Commission. Further, it is brought to our notice that Gujarat ERC and Madhya Pradesh ERC in their orders in years 2011 and 2013 had considered the auxiliary consumption of 11.5%. We follow their orders in this regard.

72. The Commission after detailed analysis of the actual data of M/S. Shalivahana Green Energy, auxiliary consumption taken by other SERCs and the petition of project developers, found no merit in allowing a higher Auxiliary consumption. Hence the Commission, as per the norms proposed, determines the Auxiliary Consumption to be 11% for a power project using the Refuse Derived Fuel.

#### **Station Heat Rate (SHR)**

73. In the consultative paper Station Heat Rate (SHR) for power projects using the Refuse Derived Fuel was proposed to be 4000 kCal/kWh.

#### **Comments Received**

74. M/s. Hema Sri Power Projects Ltd., M/S. Shalivahana Green Energy, M/S. Sri Venkateshwara Green Power, M/S. IL&FS, M/S. RDF Power Projects Ltd and M/S. Hyderabad Integrated MSW suggested that the SHR should be 4200 kCal/kWh as per the CERC norms.

#### **Commission's Order**

75. The Waste-to-Energy developers in this state have requested for a SHR of 4000 kCal/kWh in their petitions filed before the Commission. The CERC in the

final regulation stipulates that as per the data provided by the Ministry of Urban Development Authority, SHR is in the range of 3500 k.Cal/kWh to 4200 k.Cal/kWh.

76. The erstwhile Govt. of Andhra Pradesh had allocated various municipalities to power projects using the MSW as fuel. Thus, a power project is assured of supply of raw material which will avoid frequent shut down and increase in SHR. Considering, the totality of facts, the Station Heat Rate for power plants using the Refuse Derived Fuel at **4000 k.Cal/kWh** as per the norms proposed in the Consultation Paper.

#### **Calorific Value**

77. The calorific value of the Refuse Derived Fuel used for the purpose of determination of tariff was proposed at 2500 kCal/kg in the Consultation Paper.

#### **Comments Received**

78. M/s. Shalivahana Green Energy claimed that a GCV of 2200 kCal/kg be considered for RDF as the GCV of RDF varies from season-to-season, hence, the activity of determination of GCV only once does not give an accurate number.

79. M/s. IL&FS stated that a GCV of 1800 kCal/kg is appropriate for Indian waste and up to 2000 kCal/kg is acceptable.

80. Shri. VM Reddy suggested that GCV of Indian unprocessed waste would be in the range of 400 kCal/kg to 800 kCal/kg. Hence, after processing the GCV would increase due to the removal of inerts. A GCV of 1,600 kCal/kg can be achieved easily. With further processing, a GCV of 2000 kCal/kg at the most can be achieved. To achieve a GCV of 2500kCal/kg, the processing cost would increase to Rs. 3000/tonne. Hence, the processing cost and GCV should be considered appropriately.

#### **Commission's Order**

81. During the course of submissions, it was brought to our notice that in the scientific analysis of the GCV of RDF through the laboratory test, it was found that the GCV ranged between 2,400kCal/kg and 2,500 kCal/kg. Therefore, the Commission is not inclined to accept the arguments of the generators. Thus, the Commission determines the calorific value of RDF at **2,500 kCal/kg** as per the norms proposed and the CERC recommendations made in the final regulations.

## **Fuel Cost**

82. The draft norms proposed the Refuse Derived Fuel (RDF) price during FY 2016-17 at a sum of Rs.1800/tonne.

## **Comments Received**

83. M/s. Hema Sri Power Projects Ltd., suggested that in addition to the processing cost, the developer is incurring a transportation cost to move the RDF from the processing centres to the Power plant. This amounted to Rs. 400/Tonne. In addition, the power plant needs 25% secondary fuels to sustain the combustion which would amount to Rs. 200/Tonne. Hence, the total fuel cost comes to Rs.2,400/Tonne.

84. M/s. Shalivahana Green Energy suggested that the base line processing cost of Rs. 1,800/Tonne as per CERC norms was for a single cluster and hence suggested a transportation cost of Rs. 450/Tonne to be allowed as some ULBs allotted to them are very far. An additional sum of Rs. 200/Tonne to be allowed for secondary fuels. They suggested a total fuel cost of Rs. 2,450/Tonne.

85. Shri. YVM Reddy suggested that the processing cost would depend on the output of RDF which will be produced. Moving grate boilers are cheaper and will require RDF devoid of moisture costing from Rs. 2,000/Tonne to Rs. 2,500/Tonne. Advanced technology boilers will be able to tolerate moisture in RDF and hence the processing cost comes to about Rs. 1,500/Tonne.

## **Commission's Order**

86. The Commission directs that the usage of secondary fuels shall be limited to only start-up operations and hence requirement of additional cost of secondary fuel usage shall not be considered. As per the data provided by the developers, the cost of processing RDF ranges from Rs. 752/tonne to Rs. 825/tonne and the cost of transportation ranges from Rs. 652/tonne to Rs. 1,305/tonne. The total fuel cost ranges from Rs. 1,400/tonne to Rs. 2,100/tonne.

87. The GERC and MPERC in their orders in the years 2011 and 2013 had considered a fuel cost of Rs. 1,320/Tonne. Considering the totality of facts, the Commission determines the fuel cost of RDF at Rs.1,800/Tonne as per the proposed norms and the data furnished by the developers and the CERC recommendations in its regulations.

88. Further, the Commission directs that the generator or the developer shall not transport the municipal solid waste from the multiple points in crude form or original form (waste as is where is basis) and shall transport only inflammable portion of the municipal solid waste from the urban local body dumping centre to the plant site of the developer so as to protect the environment. Further, the inflammable waste of municipal solid waste should be transported as far as possible after 7:00 P.M. onwards.

### Fuel Cost Escalation

89. A 5% annual fuel cost escalation was proposed for the RDF based power projects in the consultation paper.

90. No comments were received on this parameter from the stakeholders.

### Commission's Order:

91. The fuel cost comprises of two components, namely, processing cost and transportation cost. For computing the fuel price escalation, the increase in processing cost can be linked to increase in Wholesale Price Index (WPI) while increase in transportation cost can be linked to increase in diesel / petrol price.

92. The fuel price escalation mechanism proposed by this order is similar to the fuel price escalation mechanism applicable to other forms of renewable energy sources like biomass, bagasse, industrial waste etc. The fuel price comprises of two components as stated above, the escalation requires another factor for purchase cost also. It is observed that there is no fuel purchase cost for the RDF as it is procured from the Urban Local Body (ULB) free of cost and accordingly, the Commission has considered only the processing and the transportation costs in the fuel price escalation mechanism for the RDF based power projects.

93. The Commission is of the view that both the indices are of dynamic in nature and are subject to severe volatility due to pressure of market forces. Accordingly, in the absence of the objections or suggestions on the aspect, the Commission determines the fuel cost escalation for price of RDF as per the formula shown below.

$$P_{(n)} = P_{(n-1)} \left\{ a * \left( \frac{WPI_{(n-1)}}{WPI_{(n-2)}} \right) + b \left( \frac{Pd_{(n-1)}}{Pd_{(n-2)}} \right) \right\}$$

P (n): Price per tonne of fuel for n<sup>th</sup> year

P (n-1): Price per tonne of fuel for (n-1)<sup>th</sup> year

a: Factor representing RDF Processing cost which is taken as 0.5

b: Factor representing transportation cost which is taken as 0.5

WPI (n-1): Wholesale Price Index for April of (n-1)<sup>th</sup> year

WPI (n-2): Wholesale Price Index for April of (n-2)<sup>th</sup> year

Pd (n-1): Weighted average price of High Speed Diesel for (n-1)<sup>th</sup> year

Pd (n-2): Weighted average price of High Speed Diesel for (n-2)<sup>th</sup> year

94. Further, the formula evolved in para 93 is applicable only for the remaining period of the third control period.

**Parameters for the Municipal Solid Waste (MSW) Based Projects** The Commission now deals with various parameters that were placed in the public domain for stakeholders views and also gives its orders on various parameters relating to the MSW based projects. For the sake of clarity, a MSW based project is defined as under.

#### **Definition**

95. The definition of a MSW project for the purpose of determination of tariff in this order shall be as follows:

- A. Municipal Solid Waste (MSW) based power project - A project shall qualify to be termed as a Municipal Solid Waste (MSW) based power project, if it is using the new plant and machinery based on the Rankine Cycle Technology (RCT) and using the Municipal Solid Waste (MSW) as fuel sources.**
  
- B. "Municipal Solid Waste" means commercial and residential wastes generated in a municipal or notified areas either in solid or semi-solid form including treated biomedical waste but excluding industrial hazardous wastes.**

- C. The new plant & machinery installed in a MSW based project using the RCT should not have been used for generation of power in a project anywhere in India prior to its installation in a MSW based power project in the State of Telangana.

### **Capital Cost**

96. The Commission proposed in the consultation paper that the Capital cost for a power plant using the Municipal Solid Waste (MSW) as fuel at a sum of Rs. 14 Crores/MW

97. No comments were received from the stake holders

98. The Commission in line with the proposed norms determines the Capital cost for a Power plant using the Municipal Solid waste as fuel at a sum of **Rs.14 Crores/MW.**

### **Plant Load Factor (PLF)**

99. Threshold Plant Load Factor for a power project which uses the Municipal Solid Waste was proposed in the norms as under

- a) During stabilisation : 65%
- b) During remaining period in first year after stabilisation : 65%
- c) From Second year onwards : 75 %

100. The stabilisation period shall not be more than 6 months from the date of Commissioning of the project.

101. No Comments were received from the stake holders

102. The Commission in line with the proposed norms determines the Threshold Plant Load Factor for determining the fixed charge component of tariff for a power project which uses the Municipal Solid Waste as:

- a) During stabilisation : 65%
- b) During remaining period in first year after stabilisation : 65%
- c) From Second year onwards : 75%

### **Operation and Maintenance Expenses**

103. The Normative O&M expenses for the first year of a power project which uses the Municipal Solid Waste (MSW) was proposed at 6% of the capital cost in the consultation paper.

104. The Normative O&M escalation of a power project which uses the Municipal Solid Waste was proposed to be 5.72% per annum

105. No comments or suggestions were received from the stakeholders.

106. The Commission as per the proposed norms, determines the normative Operation and Maintenance expenses for the first year of a power project at 6% of the capital cost of MSW project.

107. The Normative O&M escalation of a power project which uses the Municipal Solid Waste is determined at **5.72% per annum** for the remaining period of the Third Control Period.

### **Plant Life**

108. The Commission proposed a plant life of 20 years for the MSW based projects. The stake holders choose not to object to the proposed plant life norm as the technology is at a nascent stage. Taking notice of the fact that the MSW projects are the need of the hour and contribute to the environmental protection, the Commission agrees to the normative of 20 years of the plant life of a MSW project.

### **Debt Equity Ratio**

109. In the consultative paper, the debt equity ratio for a MSW power plant was proposed at a ratio of 70:30 in accordance with financially accepted normative. There is no objection for the same from the project developers and the Commission adopted a similar parameter for the Waste-to-Energy power project using the RDF as fuel. The Commission determines the debt equity ratio for a MSW power plant at a ratio of 70:30.

### **Loan Tenure**

110. The tenure of the loan that may be availed of by the MSW projects was proposed at 15 years considering a plant life of 20 years as determined earlier in connection with the RDF based power projects.

111. No comments or suggestions were received on the proposal as the proposal is akin to the proposal made in respect of the RDF based projects.

112. It is noticed that the loan tenure of actual loans taken by the projects established in the Telangana state, by and large is 12 years. The Commission having considered the submissions of all the stake holders changes the loan tenure to 12 years in line with the CERC regulations for the MSW projects and determines the loan tenure from the proposed norm of 15 years to **12 years**.

### **Depreciation**

113. The Commission proposed the Depreciation rate of 4.68% for the first 15 years and 3.95% for the succeeding 5 years for power plants based on the MSW. The Plant & Machinery and other assets were proposed for depreciation till 10% of their values remain as a salvage value after completion of the plant life of 20 years. About 70% of the project cost is proposed to be depreciated over the course of the loan tenure and the remaining 20% of the cost is proposed to be depreciated over the remaining life of the plant. No comments and suggestion were received on the depreciation from the stakeholders.

### **Commission's Order**

114. Since the plant life has been determined by the Commission which is different from the proposed loan tenure period, the Commission determines the new depreciation rate at **5.83% for the first 12 years of the plant life and 2.50% for the remaining period of plant life that is 8 years**. Thus, the depreciation rate has been linked to the loan tenure period.

### **Return on Equity**

115. The post-tax return of equity for a MSW power plant was proposed to be 16%. None of the stakeholders had any objection for the same. In order to encourage investment, the Commission determines the Return on Equity to be 16% post tax and the tax paid has to be reimbursed by the DISCOMS against the submission of original challans of the payment of tax to the Income Tax department. The DISCOMs shall reimburse the income tax liability on the income derived from the power project and they shall not reimburse any tax on income not derived from the power project. In other words, income tax on any income



other than the income derived from the power project shall be borne by the developer/generating company.

#### **Interest on Term Loan**

116. The consultative paper proposed an interest rate of 11.5% for a MSW Project.

117. The stake holders reiterated the submissions made in respect of the RDF projects.

118. The Commission while keeping in view the lower interest rates offered by IREDA is also conscious of the fact that the MSW projects are perceived to be more riskier as compared to other renewable energy projects. The Commission also took note of the declining trend of Interest rates and a longer tenure for term loans varying from 15 years to 25 years. Considering the totality of facts, a 0.5% higher interest rate than the proposed rate is allowed. The Commission determines the interest rate at 12% for a MSW project.

#### **Interest on Working Capital**

119. The following norms were proposed for computation of interest on working capital. The CERC RE Tariff Regulations provided for the working capital requirements of a RE project to include

- a) Operation & Maintenance expenses for 1 month
- b) Maintenance spares @ 15% of O&M expenses
- c) Receivables equivalent to 2 months for sale of electricity calculated on target PLF

Basing on the above factors the interest on working capital was proposed at 12.5%

120. The stake holders preferred not to object the proposals made by the Commission as the same are in line with the RDF based projects.

#### **Commission's Order**

121. The Commission determines the interest on working capital for a MSW project in line with a RDF project which has been given interest rate on working capital at 12.5% with the following norms.

- a) Operation & Maintenance expenses for 1 month
- b) Maintenance spares @ 15% of O & M expenses

- c) Receivables equivalent to 2 months for sale of electricity calculated on target PLF

### **Auxiliary Consumption**

122. The auxiliary consumption for a power project which uses the MSW was proposed in the norms as 12%. The stake holders relied on the submissions made in respect of a RDF based project.

123. The Commission is of the view that energy consumed in the processing facilities forms a part of auxiliary consumption in case of a MSW based project and an extra 1% has been allowed for a MSW project. Accordingly, following the norms proposed in the consultative paper, the Commission determines the auxiliary consumption at 12% for a MSW based projects.

### **Other parameters in respect of MSW projects**

124. The Commission is of the view that several parameters like station heat rate, gross calorific value, fuel cost and its escalation percentage are not required to be considered as a part of generic tariff determination as the MSW is delivered free of cost to a project developer at a pre-determined location by a municipality or other local body. Accordingly, norms related to Variable cost like SHR, GCV, Fuel Cost and Fuel Cost escalation have not been considered in this order by the Commission.

### **Other Issues - relating to RDF or MSW Projects**

#### **Secondary Fuels**

125. The Government of India as well as State Governments have been issuing guidelines in respect of non-conventional / renewable energy projects providing for various functional, operational and tariff guidelines / policies set out to encourage such non-conventional / renewable energy projects. One of the parameters that is considered is that of usage of secondary fuels. In order to encourage the RDF and the MSW projects the Commission proposed not to allow secondary fuels in the operation of these projects.

### **Comments Received**

126. M/s. Hema Sri Power Projects Limited suggested the use of secondary fuels to the extent of 25% as GCV of MSW or RDF on a standalone basis is not sufficient

for combustion. Originally the plant was envisaged at the time when Ministry of New & Renewable Energy has allowed for mixing of Biomass to the extent of 25% based on GCV. The detailed project report was prepared considering the usage of secondary fuel.

127. M/s. Shalivahana Green Energy requested for the usage of secondary fuels up to 25% as the plant was operational since 2010. Secondary fuel is essential for the combustion to sustain in a boiler and therefore 100% of RDF usage is practically not possible with the current boiler design.

128. M/s. I L & F S suggested to allow secondary fuels for the existing and near completion plants as their boilers have been designed taking into account the 25% secondary fuels allowance and it is difficult to operate the power plant on 100% MSW.

#### **Commission's Order**

129. The Commission is of the view that while passing a generic tariff order, the most competitive practices should be encouraged. The developers using older technology have no reason to seek reduction of the bench marking of parameters for all the developers so as to allow themselves the use of secondary fuels when better technical alternatives are available and such alternatives should benefit the end consumer. Therefore, in order to sustain and attract investment in favour of renewable sources, the Commission is not inclined to allow any secondary fuels by this order.

130. Having said that no secondary fuel usage is allowed, the Commission cannot be aloof to the technical constraints faced by such plants during the start of a plant. Accordingly, secondary fuel may be used for giving necessary support during the start-up operations only. The recent National Tariff Policy issued in January 2016, mandates the must-run status for the waste to energy projects and to demonstrate this requirement, the developer is required to maintain the records of such start-up operations including the secondary fuel consumption for such operations.

131. Further, the DISCOMs in whose jurisdiction, a project is located shall make an inspection of the power project regarding the usage of the fuel by a team of three Engineers' once in four months and submit a report that no fossil fuel other

than the Municipal Solid Waste / RDF is being used as a fuel by the generator. Further, the DISCOMs shall ensure that the team which conducts the inspection in the next quarter shall not comprise of the same Engineers' who had conducted the previous inspection. In other words, the team should comprise of different Engineers' among its employees other than the Engineers' who conducted the earlier inspection and a copy of the report prepared by such a team shall also be sent to the Commission for its perusal and verification.

132. Any generator or developer is found to be using coal, or biomass or diesel or any fossil fuel for running the power projects except for starting operations, the DISCOMs shall be at liberty to cancel the Power Purchase Agreement with the generator by giving two months' notice or any period as per the suppliers' default covenant in the respective Power Purchase Agreement entered into by a Developer/Generator with the DISCOM(S).

#### **Incentives**

133. The Commission in its consultative paper had proposed that any incentives like tipping fees, government grants or subsidy, etc., shall be passed on to the DISCOMS.

#### **Comments Received**

134. M/s. IL&FS in its written comments and in the hearing suggested that tipping fees if applicable are for encouraging the WTE projects and to promote investment in this sector. Hence these should not be factored into the tariff consideration when setting the tariff.

135. M/s. Bio Power Infra in the written comments suggested that the Commission should not interfere with the government grants / benefits of the WTE processing plants / power plants.

#### **Commission's Order**

136. While the incentives and other measures announced by the Government of India or the Government of Telangana are for the promotion of the WTE projects, it is pertinent to note that the electricity consumers should not be unduly burdened with the higher tariffs. In this regard, the DISCOMs have drawn our attention to the fact that the preamble of the Act, 2003 which enjoins upon the Commission to ensure that the consumer interest is protected. Therefore, the

same needs to be factored in while determination of the tariffs. On the same length, the Commission is also to ensure environmentally benign policies. Thus, the effort of the Commission is to balance the interest of the industry and the consumers. This shall ensure reasonable returns to the project developers and also shall not pose any undue burden to the consumer.

137. Thus, the Commission determines that any incentives, including but not limited to tipping fees, interest rates, Government grants, generation based incentives shall be passed on to the Distribution Companies

### **Scheduling and Despatch**

138. The Waste-to-Energy Power Projects in the state of Telangana shall be treated as must-run i.e., not subjected to the Merit Order Despatch. The generating company has to furnish the Day-Ahead Schedule and maintain it. However, for the purpose of Grid stability and discipline in the event of contingencies arise and when no other means of Grid discipline is available, the schedule can be changed by the State Load Despatch Centre (SLDC) keeping in view the CERC (Indian Electricity Grid Code) Regulation, 2010 (as amended up-to-date) and CERC (Un-scheduled Interchange and related matters), Regulations, 2009 including amendments thereto.

### **Applicability of the Order**

139. This tariff shall be applicable to all MSW or RDF based power plants whose Commercial Operation Date (COD) is declared during the balance period of third control period i.e., (w.e.f the date of the order in FY 2016-17 to FY 2018-19).

140. Summary of Determined Norms

<b>Proposed and Finalised norms for Determination of Tariff for Waste to Energy projects in Telangana</b>		
<b>Parameter</b>	<b>Proposed</b>	<b>Finalised</b>
Capital Cost	Rs. 7 Crs / MW - RDF Rs. 14 Crs/MW - MSW	Rs. 9 Crs / MW - RDF Rs. 14 Crs/MW - MSW
PLF	First Year : 65%, Second Year : 80% - RDF First Year : 65%, Second Year : 75% - MSW	First Year : 65%, Second Year : 80% - RDF First Year : 65%, Second Year : 75% - MSW

**Proposed and Finalised norms for Determination of Tariff for Waste to Energy projects in Telangana**

Parameter	Proposed	Finalised
O&M first Year	6% of CAPEX	6% of CAPEX
O&M escalation	5.72%	5.72%
Plant Life	20 Years	20 Years
Land Value	Rs. 5 Lakhs /MW	Rs. 5 Lakhs /MW
Salvage Value	10%	10%
Depreciation	4.70% for first 15 years and 3.90% for the following 5 years - MSW 4.68% for first 15 years and 3.95% for the following 5 years - RDF	5.83% for the first 12 years and 2.50% for the following 8 years - MSW 5.83% for the first 12 years and 2.50% for the following 8 years - RDF
Return on Equity (RoE) (Post Tax)	16%	16%
Interest on Debt	11.5%	12%
Loan Tenure	15 Years	12 Years
Debt-Equity Ratio	70:30	70:30
Working Capital Components	Operation & Maintenance expense for 1 month Maintenance spares @ 15% of O&M expenses Receivables equivalent to 2 months for sale of electricity calculated on target PLF Fuel cost for 4 months equivalent to normative PLF (only for RDF)	Operation & Maintenance expense for 1 month Maintenance spares @ 15% of O&M expenses Receivables equivalent to 2 months for sale of electricity calculated on target PLF Fuel cost for 4 months equivalent to normative PLF (only for RDF)
Interest on Working Capital	12.5%	12.5%
Aux. Cons	11% - RDF 12% - MSW	11% - RDF 12% - MSW
Station Heat Rate	4000 kCal/kWh - RDF	4000 kCal/kWh - RDF
GCV	2500 kCal/kg - RDF	2500 kCal/kg - RDF
Secondary Fuels	Not Allowed	Not Allowed
Fuel Cost	Rs. 1800/tonne - RDF MSW - Nil	Rs. 1800/tonne - RDF MSW - Nil
Fuel Cost escalation	5% - RDF	As per escalation formula - RDF

Proposed and Finalised norms for Determination of Tariff for Waste to Energy projects in Telangana		
Parameter	Proposed	Finalised
Discount Rate <sup>1</sup>	12.85%	13.20%

### Tariff Computation

141. The Commission hereby orders that a power plant using the MSW as fuel shall receive only levelised fixed cost whereas those using the RDF shall receive a levelised fixed cost and variable cost determined by the escalation mechanism stipulated by the Commission. However, escalation mechanism for variable cost shall be restricted to the remaining years of the 3<sup>rd</sup> control period.

142. The tariff applicable to all the MSW based power plants whose Commercial Operation Date (COD) is declared during the balance period of third control period i.e., (w.e.f the date of the order in FY 2016-17 to FY 2018-19) shall be a sum of Rs. 5.90 / kWh.

143. The levelised fixed cost for complete life of RDF based projects whose Commercial Operation Date (COD) is declared during the remaining control period i.e., (w.e.f. the date of the order in FY 2016-17 to FY 2018-19) shall be a sum of **Rs.3.83/kWh**. Further, the same fixed cost i.e., **Rs.3.83ps/kWh** shall be applicable for the entire life of the plant. The first year variable tariff for FY 2016-17 shall be a sum of **Rs.3.24 / kWh**. Hence, the tariff for FY 2016-17 is **Rs.7.07 / kWh**.

144. The tables are shown in the annexures to the order.

*This order is corrected and signed on this 13<sup>th</sup> day of June, 2016*

Sd/-  
(L. MANOHAR REDDY)  
MEMBER

Sd/-  
(H. SRINIVASULU)  
MEMBER

Sd/-  
(ISMAIL ALI KHAN)  
CHAIRMAN

<sup>1</sup> Discount rate = (Debt component \* Interest on term loan) + (Equity component \* Return on Equity), i.e (70%\*12%)+(30%\*16%)

ANNEXURE

*Table 1 Tariff in Rs./kWh for RDF based power plants using indicative 5% fuel escalation*

Year	FY 2016-17	FY 2017-18	FY 2018-19
Fixed Cost	3.83	3.83	3.83
Variable Cost	3.24	3.40	3.57
Total Cost	7.07	7.23	7.40



# 1 Annexures

## Table 2 COMPUTATION OF GENERIC TARIFF FOR MSW BASED PROJECTS:

Norm Based MSW	Unit	Value
PLF (1st Year)	%	65.0%
PLF (2nd Year onward)	%	75.0%
Installed Capacity	MW	1
Useful Life	Years	20
Auxiliary Consumption	%	12.00%
Capital Cost per MW	Rs Lakh	1,400
O&M Expenses per MW	Rs Lakh	84
O&M Escalation	%	5.72%
Salvage Value	%	10.00%
Depreciation Rate-1 (1-12 year)	%	5.83%
Depreciation Rate-2 (13th year onward)	%	2.50%
Loan Tenure	Years	12
Interest on Term Loan	%	12.00%
Interest on Working Capital	%	12.50%
Debt	%	70%
Return on Equity	%	16%
Discount Rate - Levelised Tariff	%	13.20%

Units Generation	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Total Generation	MU	5.69	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
Net Generation	MU	5.01	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
<b>Tariff Components (Fixed Charge)</b>																					
O&M Expenses	Rs Lakh	84.00	88.80	93.88	99.25	104.93	110.93	117.28	123.99	131.08	138.58	146.50	154.88	163.74	173.11	183.01	193.48	204.55	216.25	228.62	241.69
Depreciation	Rs Lakh	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	81.67	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Interest on Term Loan	Rs Lakh	112.7	102.9	93.1	83.3	73.5	63.7	53.9	44.1	34.3	24.5	14.7	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest on Working Capital	Rs Lakh	9.85	9.89	9.94	10.01	10.09	10.19	10.30	10.44	10.59	10.76	10.96	11.18	10.54	11.01	11.52	12.05	12.62	13.22	13.85	14.52
Return on Equity	Rs Lakh	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2	67.2
Total Fixed Cost	Rs Lakh	<b>355.42</b>	<b>350.46</b>	<b>345.79</b>	<b>341.43</b>	<b>337.39</b>	<b>333.69</b>	<b>330.35</b>	<b>327.39</b>	<b>324.84</b>	<b>322.71</b>	<b>321.03</b>	<b>319.83</b>	<b>276.48</b>	<b>286.32</b>	<b>296.73</b>	<b>307.73</b>	<b>319.37</b>	<b>331.66</b>	<b>344.67</b>	<b>358.41</b>
<b>Per unit Tariff Components</b>																					
PU O&M Expenses	Rs/KWh	1.68	1.54	1.62	1.72	1.81	1.92	2.03	2.14	2.27	2.40	2.53	2.68	2.83	2.99	3.17	3.35	3.54	3.74	3.95	4.18
PU Depreciation	Rs/KWh	1.63	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
PU Interest on Term Loan	Rs/KWh	2.25	1.78	1.61	1.44	1.27	1.10	0.93	0.76	0.59	0.42	0.25	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PU Interest on Working Capital	Rs/KWh	0.20	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25
PU Return on Equity	Rs/KWh	1.34	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
PU Tariff Components	Rs/KWh	<b>7.09</b>	<b>6.06</b>	<b>5.98</b>	<b>5.91</b>	<b>5.84</b>	<b>5.77</b>	<b>5.71</b>	<b>5.66</b>	<b>5.62</b>	<b>5.58</b>	<b>5.55</b>	<b>5.53</b>	<b>4.78</b>	<b>4.95</b>	<b>5.13</b>	<b>5.32</b>	<b>5.52</b>	<b>5.74</b>	<b>5.96</b>	<b>6.20</b>
<b>Levelised Tariff</b>																					
Discount Factor		1.00	0.88	0.78	0.69	0.61	0.54	0.48	0.42	0.37	0.33	0.29	0.26	0.23	0.20	0.18	0.16	0.14	0.12	0.11	0.09
Discounted Tariff Components	Rs/KWh	7.09	5.35	4.67	4.07	3.55	3.10	2.72	2.38	2.08	1.83	1.61	1.41	1.08	0.99	0.90	0.83	0.76	0.70	0.64	0.59
Levelised Tariff (20 Years)	Rs/KWh	<b>5.90</b>																			
<b>Working Capital Schedule</b>																					
O&M Expenses for one month	Rs Lakh	7.0	7.4	7.8	8.3	8.7	9.2	9.8	10.3	10.9	11.5	12.2	12.9	13.6	14.4	15.3	16.1	17.0	18.0	19.1	20.1
Receivables for 2 months	Rs Lakh	59.2	58.4	57.6	56.9	56.2	55.6	55.1	54.6	54.1	53.8	53.5	53.3	46.1	47.7	49.5	51.3	53.2	55.3	57.4	59.7
Maintenance @15% of O&M expenses	Rs Lakh	12.6	13.3	14.1	14.9	15.7	16.6	17.6	18.6	19.7	20.8	22.0	23.2	24.6	26.0	27.5	29.0	30.7	32.4	34.3	36.3

Table 3 COMPUTATION OF GENERIC TARIFF FOR RDF BASED POWER PROJECTS:

Parameters Norm Based RDF	Unit	Value
PLF (1st Year)	%	65.0%
PLF (2nd Year onward)	%	80.0%
Installed Capacity	MW	1
Useful Life	Years	20
Auxiliary Consumption	%	11.00%
Capital Cost per MW	Rs Lakh	900
O&M Expenses per MW	Rs Lakh	54
O&M Escalation	%	5.72%
Salvage Value	%	10.00%
Depreciation Rate-1 (1-12 year)	%	5.83%
Depreciation Rate-2 (13th year onward)	%	2.50%
Loan Tenure	Years	12
Interest on Term Loan	%	12.00%
Interest on Working Capital	%	12.50%
Debt	%	70%
Return on Equity	%	16%
Discount Rate - Levelised Tariff	%	13.20%
SHR	kCat/kWh	4,000
GCV	kCat/kg	2,500
Fuel Cost	Rs./Tonne	1,800
Fuel Cost escalation (indicative)	%	5%

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Total Generation	MU	5.69	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01
Net Generation	MU	5.07	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24
<b>Tariff Components (Fixed Charge)</b>																					
O&M Expenses	Rs Lakh	54.00	57.09	60.35	63.81	67.46	71.31	75.39	79.71	84.27	89.09	94.18	99.57	105.26	111.29	117.65	124.38	131.49	139.02	146.97	155.37
Depreciation	Rs Lakh	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50	52.50
Interest on Term Loan	Rs Lakh	72.5	66.2	59.9	53.6	47.3	41.0	34.7	28.4	22.1	15.8	9.5	3.2	-	-	-	-	-	-	-	-
Interest on Working Capital	Rs Lakh	16.80	19.89	20.59	21.35	22.15	22.99	23.89	24.84	25.84	26.91	28.03	29.22	29.91	31.37	32.91	34.53	36.23	38.02	39.91	41.89
Return on Equity	Rs Lakh	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2
Total Fixed Cost	Rs Lakh	<b>238.95</b>	<b>238.82</b>	<b>236.50</b>	<b>234.40</b>	<b>232.55</b>	<b>230.96</b>	<b>229.63</b>	<b>228.59</b>	<b>227.86</b>	<b>227.44</b>	<b>227.36</b>	<b>227.64</b>	<b>200.87</b>	<b>208.36</b>	<b>216.26</b>	<b>224.61</b>	<b>233.43</b>	<b>242.74</b>	<b>252.57</b>	<b>262.96</b>
<b>Tariff Components (Variable Charge)</b>																					
Fuel Quantity	Tonnes	9,110	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213	11,213
Fuel Cost	Rs./Tonne	1,800	1,890	1,985	2,084	2,188	2,297	2,412	2,533	2,659	2,792	2,932	3,079	3,233	3,394	3,564	3,742	3,929	4,126	4,332	4,549
Fuel Cost	Rs. Lakh	164	212	223	234	245	258	270	284	298	313	329	345	362	381	400	420	441	463	486	510
<b>Per unit Tariff Components</b>																					
PU O&M Expenses	Rs/KWh	1.07	0.92	0.97	1.02	1.08	1.14	1.21	1.28	1.35	1.43	1.51	1.60	1.69	1.78	1.89	1.99	2.11	2.23	2.36	2.49
PU Depreciation	Rs/KWh	1.04	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
PU Interest on Term Loan	Rs/KWh	1.43	1.06	0.96	0.86	0.76	0.66	0.56	0.45	0.35	0.25	0.15	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PU Interest on Working Capital	Rs/KWh	0.33	0.32	0.33	0.34	0.36	0.37	0.38	0.40	0.41	0.43	0.45	0.47	0.48	0.50	0.53	0.55	0.58	0.61	0.64	0.67
PU Return on Equity	Rs/KWh	0.85	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
<b>PU Fixed Cost</b>	<b>Rs/KWh</b>	<b>4.72</b>	<b>3.83</b>	<b>3.79</b>	<b>3.76</b>	<b>3.73</b>	<b>3.70</b>	<b>3.68</b>	<b>3.67</b>	<b>3.65</b>	<b>3.65</b>	<b>3.65</b>	<b>3.65</b>	<b>3.22</b>	<b>3.34</b>	<b>3.47</b>	<b>3.60</b>	<b>3.74</b>	<b>3.89</b>	<b>4.05</b>	<b>4.22</b>
<b>PU Variable Cost</b>	<b>Rs/KWh</b>	<b>3.24</b>	<b>3.40</b>	<b>3.57</b>	<b>3.75</b>	<b>3.93</b>	<b>4.13</b>	<b>4.34</b>	<b>4.55</b>	<b>4.78</b>	<b>5.02</b>	<b>5.27</b>	<b>5.53</b>	<b>5.81</b>	<b>6.10</b>	<b>6.41</b>	<b>6.73</b>	<b>7.06</b>	<b>7.42</b>	<b>7.79</b>	<b>8.18</b>
<b>PU Tariff Components</b>	<b>Rs/KWh</b>	<b>7.95</b>	<b>7.23</b>	<b>7.36</b>	<b>7.50</b>	<b>7.66</b>	<b>7.83</b>	<b>8.02</b>	<b>8.22</b>	<b>8.43</b>	<b>8.67</b>	<b>8.92</b>	<b>9.18</b>	<b>9.03</b>	<b>9.44</b>	<b>9.87</b>	<b>10.33</b>	<b>10.81</b>	<b>11.31</b>	<b>11.84</b>	<b>12.39</b>
<b>Levelised Tariff</b>																					
Discount Factor		1.00	0.88	0.78	0.69	0.61	0.54	0.48	0.42	0.37	0.33	0.29	0.26	0.23	0.20	0.18	0.16	0.14	0.12	0.11	0.09
Discounted Tariff Components	Rs/KWh	7.95	6.38	5.74	5.17	4.67	4.21	3.81	3.45	3.13	2.84	2.58	2.35	2.04	1.88	1.74	1.61	1.49	1.37	1.27	1.18
<b>Levelised Fixed Cost</b>	<b>Rs/KWh</b>	<b>3.83</b>																			
<b>PU Payable Tariff</b>	<b>Rs/KWh</b>	<b>7.07</b>	<b>7.23</b>	<b>7.40</b>																	
<b>Working Capital Schedule</b>																					
O&M Expenses for one month	Rs Lakh	4.5	4.8	5.0	5.3	5.6	5.9	6.3	6.6	7.0	7.4	7.8	8.3	8.8	9.3	9.8	10.4	11.0	11.6	12.2	12.9
Receivables for 2 months	Rs Lakh	67.2	75.1	76.5	78.0	79.6	81.4	83.4	85.4	87.7	90.1	92.7	95.5	93.9	98.2	102.6	107.4	112.3	117.6	123.1	128.8
Fuel Cost	Rs Lakh	54.7	70.6	74.2	77.9	81.8	85.9	90.2	94.7	99.4	104.4	109.6	115.1	120.8	126.9	133.2	139.9	146.9	154.2	161.9	170.0
Maintenance @15% of O&M expenses	Rs Lakh	8.1	8.6	9.1	9.6	10.1	10.7	11.3	12.0	12.6	13.4	14.1	14.9	15.8	16.7	17.6	18.7	19.7	20.9	22.0	23.3