TAMIL NADU ELECTRICITY REGULATORY COMMISSION

Comprehensive Tariff Order for Municipal Solid Waste (MSW) based Power Plants

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Order No. 3 of 2017, dated 28-03-2017

BEFORE THE TAMIL NADU ELECTRICITY REGULATORY COMMISSION
CHENNAI

Present : **Thiru S. Akshaya Kumar - Chairman**
Thiru G. Rajagopal - Member
Dr.T. Prabhakara Rao - Member

Order No. 3 of 2017, dated 28-03-2017

In the matter of : Power procurement by Distribution Licensee from Municipal Solid Waste (MSW) based Power Plants and allied issues relating to captive use and third party sale.

In exercise of powers conferred by Section 181 read with Section 61 (h) and 86(1) (e) of the Electricity Act 2003, (Central Act 36 of 2003), and after taking into account the stipulations in the National Electricity Policy and the Tariff Policy and in accordance with the Power Procurement from New and Renewable Energy Sources Regulations, 2008 of the Commission and after examining the comments received from the stakeholders, after considering the views of the State Advisory Committee meeting held on 20-03-2017 in accordance with section 88 of the Electricity Act 2003, after examining the comments received from the stakeholders as per Section 64 of Electricity Act 2003, the Tamil Nadu Electricity Regulatory Commission, hereby, passes this order to determine the tariff and other conditions for power procurement by Distribution Licensee from Municipal Solid Waste (MSW) based Power Plants and allied issues relating to captive use and third party sale.

This Order shall take effect on and from the 1st of April 2017.

Sd/-	Sd/-	Sd/-
(Dr. T. Prabhakara Rao)	(G. Rajagopal)	(S. Akshaya Kumar)
Member	Member	Chairman

(By Order of the Commission)

Sd/-
(S.Chinnarajalu).
SECRETARY

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TAMIL NADU ELECTRICITY REGULATORY COMMISSION

"Comprehensive Tariff Order for Municipal Solid Waste (MSW) based Power Plants"

ORDER ON POWER PROCUREMENT BY DISTRIBUTION LICENSEE FROM MUNICIPAL SOLID WASTE (MSW) BASED POWER PLANTS AND ALLIED ISSUES RELATING TO CAPTIVE USE AND THIRD PARTY SALE

1.0 Legislative Provisions:

1.1. Section 86(1)(e) of the Electricity Act 2003(Central Act 36 of 2003) mandates the State Electricity Regulatory Commissions 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 Commissions are 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. Under Section 62, the Act empowers the Commissions to determine the tariff for the supply of electricity by a generating company to a distribution Licensee.

2.0 Commission's Regulation on Power Procurement from New and Renewable Energy Sources of Energy:

2.1 The Commission notified the "Power Procurement from New and Renewable Sources of Energy Regulations 2008" on 08-02-2008 in accordance with the powers vested under Section 61 of the Electricity Act 2003 (Central Act 36 of 2003) which stipulates that the State Electricity Regulatory Commissions shall specify the terms and conditions for the determination of tariff.

2.2 Amongst other important provisions listed in the Regulations, it is also specified that the tariff determined by the Commission shall be applicable for a period of twenty years and the control period may ordinarily be two years.

3.0 Commission's Order on New and Renewable Energy Sources based generation and allied issues.

3.1 The Commission issued Order No. 3 dated 15-05-2006 on "Power purchase and allied issues in respect of Non-Conventional Energy Sources based Generating Plants and Non-Conventional Energy Sources based Co-generation Plants". The said Order stipulated tariff rates for power procurement by the Distribution Licensee from Wind Energy Generators (WEGs), Biomass based generators and Bagasse based generators. In respect of Renewable Energy, Commission has already issued orders for various control periods. In respect of Municipal Solid Waste based power Plants generic tariff order has not been issued and now Commission desires to issue generic order for such type of projects. The Consultative paper now floated is the first of its kind on the power generation by using Municipal Solid Waste.

4.0 Legal Provisions:

4.1 **Related Provisions of the Electricity Act, 2003:**

4.1.1.The Commission is guided by the following provisions of Section 61 of the Electricity Act 2003 which are relevant to this Order:

Section 61 – *"The Appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for the determination of tariff and in doing so, shall be guided by the following namely:-*

(a) The principles and methodologies specified by the Central Commission for determination of the tariff applicable to generating companies and transmission licensees;

(b) The generation, transmission, distribution and supply of electricity are conducted on commercial principles;

(c) The factors which would encourage competition, efficiency, economical use of the resources, good performance and optimum investments;

(d) Safeguarding of consumers' interest and at the same time, recovery of the cost of electricity in a reasonable manner;

(e) The principles rewarding efficiency in performance;

(f) Multiyear tariff principles;

(g) That the tariff progressively reflects the cost of supply of electricity and

also, reduces cross-subsidies in the manner specified by the Appropriate Commission;

(h) The promotion of co-generation and generation of electricity from renewable sources of energy;

(i) The National Electricity Policy and tariff policy:"

Section 86 stipulates the following among other functions of the State Commission.

Section 86(1)(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;"

4.2. Related Provisions of the National Electricity Policy:

4.2.1 The guidelines stipulated in the National Electricity Policy on NCES, which are relevant, are reproduced below:

"(1)Clause 5.2.20: *Feasible potential of non-conventional energy resources, mainly small hydro, wind and biomass would also need to be exploited fully to create additional power generation capacity. With a view to increase the overall share of non-conventional energy sources in the electricity mix, efforts will be made to encourage private sector participation through suitable promotional measures.*

(2)**Clause 5.12.1:** Non-conventional sources of energy being the most environment friendly, there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose, efforts need to be made to reduce the capital cost of projects based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time, adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources.

(3) Clause 5.12.2: The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted

by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the shares of electricity from non-conventional sources would need to be increased as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies. "

4.3 Related Provisions in the Tariff Policy

4.3.1 The Commission is also guided by the following specific provisions of the Tariff Policy of Government of India (Ministry of Power) relating to Renewable Energy Sources:

*" **(1) Clause 5(7) (i):** Tariff fixation for all electricity projects (generation, transmission and distribution) that result in lower Green House Gas (GHG) emissions than the relevant baseline should take into account the benefits obtained from the Clean Development Mechanism(CDM) into consideration, in a manner so as to provide adequate incentive to the project developers.*

***(2) Clause 6.0:** Accelerated growth of the generation capacity sector is essential to meet the estimated growth in demand. Adequacy of generation is also essential for efficient functioning of power markets. At the same time, it is to be ensured that new capacity addition should deliver electricity at most efficient rates to protect the interests of consumers. This policy stipulates the following for meeting these objectives.*

***(3) Clause 6.4(1):** Pursuant to provisions of section 86(1)(e) of the Act, the appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy*

shall be taken into account while determining tariff by SERCs. Long term growth trajectory of Renewable Purchase Obligations (RPOs) will be prescribed by the Ministry of Power in consultation with MNRE.

Provided that cogeneration from sources other than renewable sources shall not be excluded from the applicability of RPOs.

4.3.2. The Ministry of Power, Government of India vide Gazette Notification dated 28-01-2016 issued the revised Tariff Policy and provided compulsory procurement of 100% power produced from all the Waste-to-Energy plants in the State by the Distribution Licensees for disposal of waste besides generation of electricity.

5.0 Promotion of New and Renewable sources of Energy:

5.1 In order to promote new and renewable sources of energy, the Commission has prescribed the minimum percentage of electrical energy which each obligated entity shall purchase from new and renewable sources generators. The obligated entity shall comply with the provisions as stipulated in the Commission's Renewable Purchase Obligations Regulations, 2010, as amended from time to time.

6.0 Applicability of this Order:

6.1 This Order shall come into force from 01-04-2017. The tariff fixed in this Order shall be applicable to all Municipal Solid Waste (MSW) based power generating plants in the State of Tamil Nadu commissioned during the Control Period of this Order for sale of electricity to the distribution licensee.

6.2 This will apply to all MSW based power projects irrespective of the technology therein.

6.3 The open access charges and other terms and conditions specified in this Order shall be applicable to all the municipal solid waste projects irrespective of their date of commissioning.

6.4 In exercise of powers vested under Section 86(1)(a), (b) and (c) read with (e) and Section 62 (1) of the Electricity Act, 2003 and all other powers enabling it in this behalf, the Tamil Nadu Electricity Regulatory Commission determines the tariff and

related dispensation for the purchase of power by the Distribution Licensees from municipal solid waste based power generating plants in the State.

7.0 Tariff Review Period/Control Period

7.1 Regulation 6 of the Power Procurement from New and Renewable Sources of Energy Regulations, 2008 of the Commission specifies that

> *"The tariff as determined by the Commission shall remain in force for such period as specified by the Commission in such tariff orders and the control period may ordinarily be two years"*

7.1.2. The Commission decides that the control period of this Order shall be two years from 01-04-2017 and the Tariff period is twenty years.

8.0 Tariff Determination Process

8.1 The Commission has issued the Regulations on Power Procurement from New and Renewable Sources of Energy Regulation, 2008. An important provision of the Regulation which emphasizes on promotion of NCES is reproduced below for reference:

" (1) The Commission shall follow the process mentioned below for the determination of tariff for the power from new and renewable sources based generators, namely:-

a) *initiating the process of fixing the tariff either suo motu or on an application filed by the distribution licensee or by the generator.*

b) *inviting public response on the suo motu proceedings or on the application filed by the distribution licensee or by the generator.*

c) *Omitted*

d) *issuing general / specific tariff order for purchase of power from new and renewable sources based generators.* "

9.0 Tariff / Pricing Methodology

9.1 Tariff /Pricing Methodology specified in Regulation 4 of the Commission's New and Renewable Sources of Energy Regulation, 2008 also details the basic guidelines on the Tariff / Pricing Methodology. Important provisions in the Regulations are reproduced below:

" (2) While deciding the tariff for power purchase by distribution licensee from new and renewable sources based generators, the Commission shall, as far as possible, be guided by the principles and methodologies specified by:

(a) Central Commission

(b) National Electricity Policy

(c) Tariff Policy

(d) Rural Electrification Policy

(e) Forum of Regulators (FOR)

(f) Central and State Governments

(3) The Commission shall, by a general or specific order, determine the tariff for the purchase of power from each kind of new and renewable sources based generators by the distribution licensee. In case of small hydro projects with a capacity of more than 5MW but not exceeding 25 MW capacities, Commission decides the tariff on case to case basis.

Provided where the tariff has been determined by following transparent process of bidding in accordance with the guidelines issued by the Central Government, as provided undersection 63 of the Act, the Commission shall adopt such tariff.

(4) *While determining the tariff, the Commission may, to the extent possible consider to 'permit an allowance / disincentive based on technology, fuel, market risk, environmental benefits and social impact etc., of each type of new and renewable source.*

(5) While determining the tariff, the Commission shall adopt appropriate financial and operational parameters.

(6) While determining the tariff, the Commission may adopt appropriate tariff methodology. "

10. Cost-Plus Tariff Determination

10.1 Regulation 4(6) of "Power Procurement from New and Renewable Sources of Energy Regulations, 2008" empowers the Commission to adopt "appropriate tariff methodology" to determine the tariff for generation of energy from municipal solid waste. Cost- plus tariff determination is a more practical method. It can be easily designed to provide adequate returns to the investor and a surety of returns will lead to larger investment in municipal solid waste plants. On 07-10-2015, the CERC had issued CERC (Terms and Conditions for tariff determination from Renewable Energy Sources) (Fourth Amendment) Regulations, 2015 specifying the norms and terms and conditions for various non-conventional sources of energy including power from municipal solid waste in its Amendment dated 07-10-2015.

11. Single Part Tariff

11.1 Two part tariff is generally adopted when the variable component is significant. As the municipal solid waste plant does not require any purchase of Fuel, the Fuel Cost, Station Heat Rate, Gross Calorific Value and Specific Fuel Consumption are considered as not applicable. Hence, the Commission adopts single part levellised tariff taking into account the Accelerated Depreciation (AD) benefit as done by CERC and many other SERCs.

12. Tariff Components:

The Commission has carried out a detailed analysis of the existing policies/procedures and commercial mechanisms in respect of power generation from municipal solid waste power plants. The tariff determined in a cost plus scenario, would depend significantly on the following operating and financial parameters:

1. Capital Cost
2. Life of Plant and Machinery
3. Plant Load Factor
4. Debt-Equity ratio

5. Term of loan and Interest
6. Return on Equity
7. Components of Working Capital
8. Interest on Working Capital
9. Operation and Maintenance Expenses
10. Depreciation
11. Auxiliary Consumption
12. Fuel Cost
13. Discount Factor

12.1. <u>Capital Cost:</u>

12.1.1. The Capital cost is one of the most important parameters for municipal solid waste power projects for tariff determination. The CERC in its Statement of Reasons dated 07th October 2015 has discussed in detail for fixing the Capital Cost for the municipal solid waste power projects.

> *5.3.6. ……"Considering the comparable nature of technology of biomass and waste to energy plants, the normative capital cost for the Rankine Cycle Combustion based Power Plants utilizing MSW as input shall be in accordance with Biomass Power plant with additional cost consideration for the requirement of a larger boiler and more sophisticated equiments to control flue gas emissions.*

12.1.2. In view of the above, the CERC has fixed a Capital Cost of Rs.15.00 Crores/MW. As the capital cost for preprocessing and fuel generation comes to around 35%-40% of entire capital cost, 40% of the capital cost has been considered as a capital cost of preprocessing and fuel generation facility for MSW.

12.1.3.The capital cost adopted/ proposed by other Regulatory Commissions are as follows:

Name of the Commission	Date of Order/ Regulation	Capital Cost
CERC	Regulation dated 07-10-2015	a) Rs.15.00 Crores/ MW based on Rankine Cycle technology application for municipal solid waste.
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	The Commission shall determine only project specific capital cost and tariff based on prevailing market trends for MSW/RDF projects.
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	MSW - Rs.14.00 Crores/ MW
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	Rs.15.00 Crores/MW
Gujarat	Order No. 4 of 2016, dated 10-11-2016, determination of Tariff and other terms and conditions for procurement of power by Distribution Licensees from MSW projects in Gujarat.	Rs.16.00 Crores/MW for Mass Incineration Technology. If project developer receives any benefit of capital subsidy or any capital financial assistance towards the cost of project, the purchaser of energy or project developer or UDD/ULD/Municipal Corporation shall approach the Commission for re-determination of tariff so as to pass on the benefit to the consumers.
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	Rs.15.75 Crore/MW for MSW project based on Rankine Cycle Technology.
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	Rs.15 Crores/MW for MSW projects based on Rankine Cycle technology.
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	FY2016-17 – Rs.15.00 Cr./MW for the projects based on the Rankine Cycle technology

12.1.4 As regards the suggestions of JITF Urban Infrastructure Limited that the SWM Rules, 2016 provide that only Refuse Derived Fuel (RDF) based technology may be deployed for generation of electricity for MSW based project, it is to be stated that this order is not meant for an exclusive technology / method, but it is a generic order which is applicable across different types of approved technologies.

12.1.5 TANGEDCO agreed for the capital cost of Rs.15.00 Cr/MW proposed in the Consultative Paper. All other stakeholders sought for a capital cost of Rs.18.00 Crores/MW. In the present order Commission after considering the Stakeholders' comments decides to adopt a capital cost of Rs.16.00 Crores / MW for the plants to be commissioned during this control period.

12.1.6 This capital cost is inclusive of equipments/machineries required for handling, preprocessing and segregation of Municipal Solid Waste, Processing of the segregated waste for conversion of fuel, Rankine cycle based power generation plant and disposal of residual waste.

12.2. Life of Plant and Machinery

12.2.1 In the Consultative Paper Commission proposed to adopt 20 years as useful life of Plant and Machinery.

12.2.2 The life of Plant and Machinery adopted /proposed by other commissions is as follows:

Electricity Regulatory Commission	Date of Order/ Regulation	Useful Life of Plant for MSW projects
CERC	Regulation dated 07-10-2015	20 years
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	20 years
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	20 years
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	20 years
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	25 years
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	20 years
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	20 years
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	20 years

12.2.3. As most of the Commissions' have adopted 20 years as life of the Project based on MSW, Commission accepts that the useful life of Plant and Machinery for MSW based power projects as 20 years.

12.3. PLANT LOAD FACTOR (PLF):

12.3.1. In the Consultative Paper Commission proposed to adopt a normative PLF level of 75% for MSW based projects and for any generation beyond the normative PLF, an incentive would be adequate for the additional efforts and to meet the wear and tear of the plant and equipment and therefore Commission proposes an incentive of 25 paise per unit which is already in practice in respect of Biomass based power projects and for Bagasse based co-generation plants.

12.3.2. While TANGEDCO agreed for this PLF, other stakeholders sought for a lower PLF during the stabilization period.

12.3.3. The Plant Load Factor adopted /proposed by other commissions is as follows:

Electricity Regulatory Commission	**Date of Order/ Regulation**	**PLANT LOAD FACTOR**
CERC	Regulation dated 07-10-2015	1) During stabilization - 65% and during the remaining period of first year (after stabilization) – 65% 2)From 2nd year onwards – 75%
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	1) During stabilization - 65% and during the remaining period of first year (after stabilization) – 65% 2)From 2nd year onwards – 75%
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	1st Year - 65.0% 2nd Year onwards – 75.0%
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	1st year – 65% and 75% from 2nd year onwards
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	MSW using mass incineration technology as 65% during the first year of

		commissioning and 75% from 2nd year onwards.
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	75%
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	During Stabilization period @ 65%. During the remaining period of the first year (after stabilization) – 65% and From 2nd year onwards @ 75%
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	a) During first year 65% and b) From 2nd year onwards 75%

12.3.4. In respect of PLF Commission decides to adopt a normative PLF level of 75% for MSW based projects. For any generation beyond the normative PLF, an incentive would be adequate for the additional efforts and to meet the wear and tear of the plant and equipment and therefore Commission allows an incentive of 25 paise per unit to MSW based power plants as being adopted in practice in respect of Biomass plants and for Bagasse based co-generation plants.

12.4. Debt-Equity ratio

12.4.1. In the Consultative Paper Commission proposed a Debt-Equity ratio of 70:30.

12.4.2. Commission has adopted a Debt-Equity ratio of 70:30 in all the other Renewable Sources based Tariff Orders viz. Solar, Wind, Biomass based power plants and Bagasse based Co-generation Plants. All the stakeholders have agreed for this Debt Equity ratio. Hence, in respect of municipal solid waste plants also, Commission decides to adopt a Debt-Equity ratio of 70:30.

12.5. Term of loan and Interest:

12.5.1. In the Consultative Paper Commission proposed a term of loan as 10 (ten) years with a moratorium period of one year for the municipal solid waste projects. Further, with respect to rate of interest on debt, proposed a rate of interest at

12.76% p.a. This Consultative paper was issued during mid-2016 and at that time itself, the trend of falling interest has started and therefore Commission expressed the same in the Consultative paper itself at that time.

12.5.2. The rate of Interest on Debt adopted/ proposed by other Commissions is as follows:

Electricity Regulatory Commission	**Date of Order/ Regulation**	**Rate of Interest on Debt**
CERC	Regulation dated 6-02-2012	Rate equivalent to the average SBI Base Rate prevalent during the first six months of the previous year plus 300 basis points. As per draft generic tariff for various renewable energy technologies for 2016-17 has notified a rate of interest at 12.76%
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	Normative interest rate of two hundred (200) basis points above the average SBI MCLR (One year Tenor) prevalent during the last available six months shall be considered.
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	12.00%
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	For tariff determination purposes, the annual interest rate on debt is 12.00% and the investors are allowed to retain benefits, if any, by taking a cheaper loan.
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	11.80%
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	12.70%
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	
Jharkhand	Determination of Tariff for procurement of Power from Wind,	Avg. SBI Base Rate during first 6 months of previous

	Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	year +3%

12.5.3. CERC in its draft Terms and Conditions for Determination of Tariff for Renewable Energy Sources, February 2017 has proposed normative interest rate of two hundred (200) basis points above the average State Bank of India MCLR (One year Tenor) prevalent during the last available six months.

12.5.4. The prevalent lending rate being the marginal cost of funds based lending rate at which the bank prices all its loans, Commission decides to adopt the latest MCLR rate of 1 year of 8% notified by the State Bank of India in March 2017 plus 300 points which is 11% p.a.

12.5.4. After considering all the above, Commission decides to adopt a term of 10 years with 1 year moratorium as adopted by the Commission in its previous orders on Wind, Bagasse, Biomass power and Solar.

12.6. Return on Equity:

12.6.1. Commission has adopted a Return on Equity of 20% (pre-tax) per annum for Wind, Solar, Biomass based power plants and Bagasse based Cogeneration Plants without linking it to MAT and Income Tax. In the Consultative Paper, Commission proposed a Return on Equity of 20% to the municipal solid waste power plants.

12.6.2. The Return on Equity adopted/proposed by other commissions is as follows:

Electricity Regulatory Commission	**Date of Order/ Regulation**	**Return on Equity**
CERC	Regulation dated 07-10-2015	a)20% p.a. for the first 10 years. b)24% p.a. from 11th year onwards.
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	Normative RoE shall be 14% to be grossed up by prevailing MAT as on 1st April of previous year for the entire useful life of the project.

Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	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.
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	20% pre-tax
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	RoE of 14% and MAT @ 20.389% for first 10 years and corporate tax @ 33.063% for the next 10 years.
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	20% p. a. for the first 10 years and 24% p.a. from 11th year onwards.
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	RoE of 16% and MAT @ 21.34% for 1st 10 years and Income Tax @ 34.61% from 11th year to 20th year.
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	Year 1 to 10 – 20% and from 11th year onwards 24%

12.6.3. The Tariff Regulations of the Commission stipulates 14% (post tax) Return on Equity for conventional fuel based generating stations. The Commission in its Orders issued in 2012 relating to determination of tariff for NCES power (including the Bagasse based Co-gen plants Order No.7 of 2012, dated 31-07-2012), adopted a Return on Equity of 19.85% (pre-tax) without linking to MAT and Income Tax.

12.6.4. In the Tariff Orders issued in 2016, the Commission has adopted a Return on Equity of 20% (pre-tax) per annum for Wind, Solar, Biomass based power plants and Bagasse based Cogeneration Plants without linking it to MAT and Income Tax. In line with the other Orders of the Commission, Commission decides to adopt a Return on Equity at 20% (pre-tax) in respect of Municipal Solid Waste based power plants too.

12.7. Components of Working Capital:

12.7.1. In the Consultative Paper the Commission proposed the components of Working Capital as one month O & M expenses and Receivables at two months and did not consider the fuel cost as there is no expenditure towards it.

12.7.2. The components of Working Capital adopted /proposed by other Commissions are as follows:

Electricity Regulatory Commission	Date of Order/ Regulation	Interest on Working Capital
CERC	Regulation dated 07-10-2015	a)Fuel costs for four months equivalent to normative PLF; b)O & M Expenses for one month; c)Receivables equivalent to 2(Two) months of fixed and variable charges for sale of electricity calculated on the target PLF; d) Maintenance spare @ 15% of operation and maintenance expenses.
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	a)Fuel costs for four months equivalent to normative PLF b)O & M Expenses for one month; c)Receivables equivalent to 2(Two) months of fixed and variable charges for sale of electricity calculated on the target PLF; d) Maintenance spare @ 15% of operation and maintenance expenses.
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	a) O & M Expenses for one month. b) Maintenance (% of O & M) – 15% c) Two months Receivables.
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	a) Operation & Maintenance expenses for one month. b) Receivables equivalent to 2 (two) months of energy charges c) Maintenance spares @ 15% of O & M expenses.
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	a)O & M expenses for one month b)One month receivables for sale of electricity and c) Maintenance Spares @ 1% of the capital cost escalated at 5% per annum.

Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	a)Operation and Maintenance expenses for one month; b) Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF and c) Maintenance spare @ 15% of operation and maintenance expenses.
Haryana	Suo-moto/HERC /RA-4 of 2016, dated 28-9-2016	a)Operation and Maintenance expenses for one month; b) Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF and c)Maintenance spare @ 15% of operation and maintenance expenses.
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	a) Fuel Cost for four (4) months equivalent to normative PLF; b) O & M expenses for one (1) month; c) Receivables equivalent to Two months of fixed and variable charges for sale of electricity calculated on the target PLF; d) Maintenance spares @ 15% of O & M expenses.

12.7.3. In respect of municipal solid waste there is no expenditure in respect of fuel cost. Hence, Commission decides to adopt O & M expenses at one month and Receivables at two months as components of working capital.

12.8. <u>Rate of Interest on Working Capital</u>:

12.8.1. In the Consultative Paper the Commission proposed 13.26% as the rate of interest for calculating Interest on Working Capital. The Consultative paper was issued in mid-2016 and at that time itself the trend of falling interest rate has started and therefore the Commission expressed the same in the Consultative Paper itself at that time.

12.8.2. The rate of Interest on Working Capital adopted by other Commissions is as follows:

Electricity Regulatory Commission	Date of Order/ Regulation	Rate of Interest on Working Capital
CERC	Regulation dated 7.10.2015	Rate equivalent to the average SBI Base Rate prevalent during the first six months of the previous year plus 350 basis points.(13.5%)
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	Normative interest rate of three hundred (300) basis points above the average SBI MCLR (One year Tenor) prevalent during the last available six months for determination of tariff.
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016 (RDF/MSW)	12.50%
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	12.50%
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	11.80%
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	13.2%
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	12.3%
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	Interest rate equivalent to the average SBI Base Rate during first six months of previous year plus 3.5%.

12.8.3. CERC in its draft Terms and Conditions for Determination of Tariff for Renewable Energy Sources, Regulations, 2017 has proposed that Interest on Working Capital shall be at interest rate equivalent to the normative interest rate of three hundred (300) basis points above the average State Bank of MCLR (One year Tenor) prevalent during the last available six months.

12.8.4. In the Financial Market, the current scenario is that the rate of interest is in the declining trend. Hence, Commission decides to adopt 11.50% p.a. for calculating the Interest on Working Capital.

12.9. Operation and Maintenance Expenses:

12.9.1. In the Consultative Paper Commission proposed O & M expenses of 5% of the capital cost with an annual escalation of 5.72% on plant and machinery by reckoning 85% of the capital cost as the cost of plant and machinery. With regard to land and civil works, which constitutes 15% of capital investment, 0.90% of 15% of capital cost would be allowed as Operation and maintenance expenditure every year with an annual escalation of 5.72%.

12.9.2. The O & M Expenses adopted/proposed by other commissions are as follows:

Electricity Regulatory Commission	Date of Order/ Regulation	O & M Expenses
CERC	Regulation dated 07-10-2015	Normative O & M expenses for FY2015-16 shall be @ 6% of normative capital cost and thereafter an escalation of 5.72% p.a.
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	The Commission shall determine only project specific O & M expenses based on the prevailing market trends for MSW/RDF projects. The O & M expenses shall be escalated at the rate of 5.72 % per annum over the Tariff Period.
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016	6% of Capital Cost) with an escalation of 5.72% from 2nd year onwards.
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	5% of the capital cost in the first year with an escalation of 5.72% for each year thereafter.
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	In case of mass incineration @ 6% of capital cost and annual O & M cost escalation @ 5.72% p.a.
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	Rs.94.5 Lakh/MW for the year 2016-17 and escalation at 5.72% p.a. over the Tariff period.
Haryana	Suo-moto/HERC/RA-4 of	For 2016-17 at 6.5% of the

	2016, dated 28-9-2016	normative capital cost and escalated at 5.72% p.a. from 2nd year onwards.
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	6% of Normative Capital Cost with an annual escalation of 5.72% per annum

12.9.3. The Commission has noted that due to more abrasive nature of Municipal Solid Waste, wear and tear of the boiler in such projects shall be more. Also, due to more protective equipments, the O & M cost shall increase to some extent. Therefore, Commission decides to allow O & M expense of 5.5% of the capital cost with an annual escalation of 5.72% on plant and machinery by reckoning 85% of the capital cost as the cost of plant and machinery. With regard to land and civil works, which constitutes 15% of capital investment, 0.90% of 15% of capital cost would be allowed as Operation and maintenance expenditure every year with an annual escalation of 5.72%.

12.10. <u>Depreciation:</u>

12.10.1. In the Consultative Paper Commission proposed adoption of depreciation at 4.5% p.a. Straight Line Method on Plant and Machinery by reckoning 85% of capital cost as the cost of plant and machinery. The accumulated depreciation shall however be limited to 90% of the cost of plant and machinery.

12.10.2. The rates of Depreciation adopted/proposed by other commissions are as follows:

Electricity Regulatory Commission	Date of Order/ Regulation	Depreciation
CERC	Regulation dated 6-02-2012	Depreciation at 5.83% for 12 years and at 2.51% from 13th year

		onwards.
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	Depreciation at the rate of 5.28% p.a. for the first 13 years and at 3.05% for the useful life of the project.
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016	a) For 1st 12 years – 5.83% and b) 2.50% for the following 8 years.
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	7% p.a. for the first 10 years and balance 20% to be spread over the next ten years.
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	a)For 1st 10 years @ 7% p.a. and b)From 11th year onwards @ 2.00% p.a.
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	a)At 5.83% p.a. for the first 12 years and from 13th year onwards the remaining depreciation shall be spread over the useful life.
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	a)For 1st 10 years at7% p.a. and from 11th year to 20th year at 2% p.a.
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	a) Year 1 to 12 – 5.83% and b) from 13th year onwards remaining depreciation spread over useful life.

12.10.3. Commission decides to adopt depreciation at 4.5% p.a. Straight Line Method on Plant and machinery by reckoning 85% of capital cost as the cost of plant and machinery as followed by the Commission in its other Tariff orders like Biomass and Bagasse based Co-generation Sugar Mills. The accumulated depreciation shall however be limited to 90% of the cost of plant and machinery.

12.11. Auxiliary Consumption

12.11.1. In the Consultative Paper Commission proposed for adoption of 15% of Auxiliary Consumption.

12.11.2. The Auxiliary Consumption adopted by other Commissions is as follows:

Electricity Regulatory Commission	Date of Order/ Regulation	Auxiliary Consumption
CERC	Regulation dated 07-10-2015	15%
CERC	Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, dated 16-02-2017.	15% for MSW/RDF project
Telangana	Order dated 13-06-2016 in O.P.No.18 of 2016	12%
Madhya Pradesh	SMP-10/2016, Order dated 29-06-2016	15%
Gujarat	Order No. 4 of 2016, dated 10-11-2016.	16%
Chhattisgarh	SMP No. 39 of 2016, dated 8-9-2016	15%
Haryana	Suo-moto/HERC/RA-4 of 2016, dated 28-9-2016	15.5%
Jharkhand	Determination of Tariff for procurement of Power from Wind, Biogas, Municipal Solid Waste and Refuse Derived Fuel based Power Projects) Regulations, 2016 (in force up to 31-3-2020)	15%

12.11.3. CERC has considered an Auxiliary Consumption of 15%. The Commission has noted that due to use of more preprocessing, post processing and protective equipments, extra allowance of Auxiliary consumption is warranted and therefore decides to adopt an auxiliary consumption of 15% in line with CERC

12.12. Fuel Cost:

12.12.1. In the Consultative Paper, the Commission has not proposed any fuel cost for MSW based projects because the cost of fuel preparation is included in the

overall Capital Cost of the Project that will address both Capacity Charges and Operation and Maintenance Cost of Fuel preparation.

12.12.2. The Commission does not find it appropriate to consider fuel cost in this case. Therefore, the fuel cost is not allowed and the related norms like Station Heat Rate, Fuel cost escalation, Gross Calorific Value, etc. are not applicable herein.

12.13 Discount Factor:

12.13.1. The Commission adopts a discount factor of 9.24% equal to the post tax weighted average cost of the capital on the basis of normative debt: equity ratio (70:30) for the purpose of levellised tariff computation.

12.14 Tariff Determinants

The financial and operational parameters in respect of Municipal Solid Waste to energy projects adopted in the Order are tabulated below:

Sl. No.	Tariff Components	VALUES
1.	Capital Cost	Rs.16.00 Crores/MW
2.	Life of plant and machinery	20 years
3.	Plant Load Factor (PLF)	75%
4.	Debt-Equity ratio	70:30
5.	Term of loan and interest	10 years with a moratorium period of one year. Interest at 11.00%
6.	Return on Equity	20% (pre-tax)
7.	Components of working capital	a) O & M expenses at one month and b) Two months Receivables
8.	Rate of interest for interest on working capital	11.50%
9(a)	O and M Expenses for plant and machinery on 85% of the capital cost	5.5% with an escalation of 5.72% from 2nd year onwards.
9(b)	O & M Expenses for land and civil works on 15% of capital cost	0.90% with an escalation of 5.72% from 2nd year onwards.

10.	Depreciation	4.5% SLM on 85% of the capital cost
11.	Auxiliary Consumption	15%
12.	Discount rate	9.24%
13.	Levellised Tariff without AD	Rs.6.16/- per unit
14.	Levellised Tariff with AD	Rs.6.06 /- per unit

13. Tariff

13.1 MSW power tariff is computed with reference to the determinants listed above. The tariff works out to Rs.6.16/- per unit for projects without Accelerated Depreciation (AD) benefit. The AD benefit component of the tariff is Rs.0.10 per unit. The tariff for the generators availing AD benefit will be the tariff arrived at after deduction of AD benefit from the tariff as determined above. The respective working sheets are enclosed in Annexure III.

14 . Related issues:

The following are the related issues for energy generation from Municipal Solid Waste plants:

1. Transmission and Wheeling Charges and Scheduling and System Operation Charges.
2. Cross Subsidy Surcharge
3. CDM Benefits
4. Reactive Power Charges
5. Grid availability charges
6. Adjustment of energy generated
7. Energy Wheeling Agreement and Fees
8. Billing and payments
9. Security Deposit
10. Power factor disincentive
11. Metering
12. Connectivity and Evacuation of energy
13. Energy Purchase Agreement

14. Scheduling of power generation
15. Parallel operation charges

The above charges are applicable to Municipal Solid Waste based power plants irrespective of their year of installation. These are discussed in detail in the following paragraphs.

14.1. <u>Transmission and Wheeling Charges and Scheduling and System Operation Charges:</u>

14.1.1. Transmission, Wheeling and Scheduling and System Operation charges are generally regulated by the Commission's Tariff regulations, Open Access Regulations and Commission's Order on Open Access charges issued from time to time. However, as a promotional measure, under section 86(1)(e) of the Electricity Act, 2003, the Commission decides to charge at the rate of 50% (in each) of the transmission charges, wheeling charges and Scheduling and System Operation charges as applicable to the conventional power to the MSW plants. Apart from these charges, actual line losses in kind as specified in the respective Order of the Commission and as amended from time to time are also deductible in kind for the captive use and third party sale. In respect of plants availing Renewable Energy Certificates (REC), 100% of the respective charges as specified in the relevant orders shall apply.

14.2. Cross Subsidy Surcharge (CSS):

14..2.1. In respect of Cross Subsidy Surcharge, the Commission decides to adopt 50% of the charges applicable to conventional power.

14.3. CDM Benefits:

14.3.1. In respect of MSW based power projects, Commission decides to adopt the sharing of CDM benefits as recommended by FOR, the CDM benefits should be shared on gross basis starting from 100% to developers in the first year and thereafter reducing by 10% every year till the sharing becomes equal (50:50) between the developer and the consumer in the sixth year. Thereafter, the sharing of CDM benefits will remain equal till such time the benefits accrue.

14.4. Reactive Power Charges:

14.4.1. Commission decides to adopt the reactive power charges for the MSW based Power Plants as specified in its Order on Open Access charges issued from time to time.

14.5. Grid Availability Charges:

14.5.1. In respect of Grid Availability Charges, Commission decides that the following charges shall be regulated as follows:

a. Startup Charges –

The Startup charges shall be as per the Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 in force.

b. Standby Charges –

If adequate generation does not materialize or if drawal by the captive / third party consumer exceeds generation, the energy charges and demand charges shall be regulated as specified in the Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 in force.

14.6. Adjustment of energy generated:

14.6.1. Commission decides that the Adjustment of energy shall be as per the Commission's Open Access Regulations in force.

14.7. Energy Wheeling Agreement and Fees:

14.7.1. Commission decides to adopt that the format of Energy Wheeling Agreement, application and agreement fees, procedure and terms and conditions shall be governed by Commission's following regulations in force and as amended from time to time.

1. TNERC's Grid Connectivity and Intra State Open Access Regulations, 2014.
2. Power Procurement from New and Renewable Sources of Energy Regulations, 2008.

14.8. Billing and Payment:

14.8.1. Commission decides to adopt the following in respect of Billing and payment:

i) When a renewable energy generator sells power to the distribution licensee, the generator will raise a bill every month for the net energy sold after deducting the charges for startup power and reactive power. The bill amount is due only after one month. If the distribution licensee makes the payment within a period of one month of presentation of bills by a generating company, a rebate of 1% shall be allowed. Any delayed payment beyond 60 days is liable for interest at the rate of 1% per month.

14.9. Security Deposit:

14.9.1. As regards the security deposit to be paid by captive /third party user, Commission decides that the charges corresponding to two times of the maximum net energy supplied by the distribution licensee in any month in the preceding financial year shall be taken as the basis for the payment of security deposit.

14.10. Power factor disincentive:

14.10.1. Commission decides that the Power factor disincentive may be regulated for the power factor recorded in the meter at the user end as specified in the relevant regulations/orders in force.

14.11. Metering:

14.11.1. In respect of Metering Commission decides to adopt that the metering and communication shall be in accordance with the following Regulations/Codes in force and any specific orders of the Commission on metering and ABT whenever issued:

a) Central Electricity Authority (Installation and Operation of Meters) Regulations 2006.

b) Tamil Nadu Electricity Distribution Code.

c) Tamil Nadu Grid Code.

d) Tamil Nadu Electricity Regulatory Commission's Grid Connectivity and Intra State Open Access Regulations, 2014.

14.12. Connectivity and Evacuation of Energy:

14.12.1. In respect of Connectivity and Evacuation of Energy, Commission decides that the provisions contained in Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013 and its amendments shall be complied with. The connectivity and power evacuation system shall be provided as per the Act/ Codes/Regulations/ Orders in force.

14.13. Energy Purchase Agreement:

14.13.1. Commission decides to adopt that the format of the Energy Purchase Agreement (EPA) shall be evolved as specified in the Commission's Regulations in force. The agreement shall be valid for a minimum period of twenty years. The distribution licensee shall execute the Energy Purchase Agreement or convey its decision in line with this order within a month of receipt of application from the generator. The parties to the agreement may be given the option of exiting in case of violation with three months' notice to the other party.

14.14. Scheduling of Power:

14.14.1. Commission decides that the generator shall follow the scheduling procedure as specified in Indian Electricity Grid Code and Tamil Nadu Electricity Grid Code and other Regulations, Codes and Orders of the Commission.

14.15. Parallel Operation Charges

14.15.1. Commission decides that in respect of MSW based power generators who consumes power on captive basis in the same location but wish to avail Renewable Energy Certificate (REC) may opt for paralleling of their generators with the grid without actually wheeling their power. Such generators shall have to pay 50% of applicable parallel operation charges to the respective distribution licensee as specified in the relevant regulations.

15. Acknowledgement:

15.1. The Commission would like to place on record and acknowledge with thanks, the contributions by the officers and staff of the Commission and the valuable

guidance provided by the experts and members of the State Advisory Committee. The Commission also appreciates the pain taken by the stakeholders in offering their suggestions. The Commission also recognizes the input of the TANGEDCO which have been helpful to the Commission in finalizing this Tariff Order.

Sd/-	Sd/-	Sd/-
(Dr. T. Prabhakara Rao)	(G. Rajagopal)	(S. Akshaya Kumar)
Member	Member	Chairman

(By Order of the Commission)

Sd/-
(S.Chinnarajalu).
SECRETARY

Annexure I

MINUTES OF THE 30th STATE ADVISORY COMMITTEE (SAC) MEETING OF TAMIL NADU ELECTRICITY REGULATORY COMMISSION HELD ON 20th March 2017 AT HOTEL SAVERA, CHENNAI

Members Present:

1. Thiru. S. Akshaya Kumar, Chairman, TNERC
2. Thiru. G. Rajagopal, Member, TNERC
3. Dr. T. Prabhakara Rao, Member, TNERC
4. Dr. M. Saikumar, CMD, TNEB Ltd. & TANGEDCO Ltd. and Chairman, TANTRANSCO Ltd.
5. Thiru. K. Alagu, Member, SAC
6. Dr. A.S. Kandasamy, Member, SAC
7. Dr. K. Selvaraj, Member, SAC
8. Thiru. C. Babu, Member, SAC
9. Thiru. K. Kathirmathiyon, Member, SAC
10. Thiru. G.S. Rajamani, Member, SAC
11. Thiru. M.R. Krishnan, Member, SAC

Chairman, TNERC welcomed the members of the State Advisory Committee(SAC). He introduced the new members of SAC. He stated that there are two agenda for discussion, one on the tariff for Municipal Solid Waste (MSW) based power plants and the other on the Comprehensive tariff order on Solar power. He gave brief details about both the agenda issues. There are multi various methods and technologies available to be adopted to convert Municipal Solid Waste to energy such as mass incineration, gasification, pyrolysis,

biomethanation, RDF etc. However, Commission has all along been following the method of having a generic tariff and better to leave the choice of the technology to the promoter and follow the same here also. On Tariff redetermination for Solar Thermal and Solar Photovoltaic (SPV),though Solar Thermal technology had not come up in a big way, but real fireworks are going on in the photovoltaic arena. With successive biddings on SPV based projects in various parts of the country finding new low rates, it was thought of whether at all there exists any need to fix a feed in tariff. In such situation, where the Utility is opting for bidding route the feed in tariff may serve as a benchmark. TANGEDCO has gone for bidding route and got rates lesser than the benchmark ratebut they did not get sufficient quantum. In case they are not able to garner sufficient quantum through tender route, they might have to fall back on the feed in tariff. Also there may be cases where some promoters who have signed PPA in earlier regime of Tariff order could not achieve the COD within the control period. In such cases there is need for feed in tariffapplicable beyond the control period.

(i) Deputy Director/Tariff made the presentation on the issues dealt in the consultative paperon tariff determination on Power procurement from MSW.

Chairman/TNERC requested the members to offer their views on the various issues on power procurement from MSW. The views expressed by the members of the SAC are as follows:

Thiru. M.S. Rajamani–Managing the MSW is a complex subjectand the use of correct type of technology in India is necessary. He thanked the Commission for proposing a reasonableTariff for Power procurement from MSW. He added that the MSW shall be segregated at the source. He suggested providing early bird incentive atsome paise/unit to the power generators from MSW who starts commercial production within a specified period say 6 months or 1 year etc. While determining the tariff for MSW, the Commission shall consider the tariff determined by the neighbouring States so that investors are attracted.

Thiru. M.R. Krishnan – He raised a query whether land cost is included in the Capital Cost and land filling doesn't contaminate the nearby water body.

Chairman, TNERC – The capital cost proposed is inclusive of allrequirements including land cost.The land is usually provided by the urban municipality which includes the place for receiving, segregating etc. at a very low cost say Re.1 p.a. as lease rent.

Dr.M.Saikumar, CMD/TANGEDCO- TNERC's job is fixing tariff and TANGEDCO has to buy the power at that price. There ends the matter. The Urban Local Municipality normally invites tender. The bidder quotes the lowest amount, keeping in mind the tariff fixed by the Commission. As far as TANGEDCO is concerned, it procures the power from MSW generators at the tariff determined by the Commission.The tariff should be reasonable since it has a bearing on the overall power procurement cost of TANGEDCO and ultimately the retail consumers will have to pay for it.

Dr. A.S. Kandasamy–The Fair Life Period of MSW power plants should be reduced so that the depreciation will be high. He also suggested thatthe income derived from sale of bye-product such as fertilizer, avoidance of waste disposal cost etc. shall also be considered while generating the electricity from MSW. The tariff derived by the Commission is acceptable in the National interest.

Thiru. K. Kathirmathiyon–A reasonable tariff to MSW project is important at the same time cost implication to distribution licensee is also equally important. Therefore, the tariff determined should be a balanced one.

Dr.M.Saikumar, CMD/TANGEDCO– The method of providing Viability Gap Funding (VGF) may be resorted to by the Urban Local Body (ULB) to solve the problem associated with the cost of transportation etc. from the households to the dumping yard, segregation etc. so that the TANGEDCO is not penalized by factoring that cost into tariff as any way ULB has to pay for disposing of the MSW.

Thiru. M.S. Rajamani –As per the Electricity Act, 2003, the State Commission, interalia, has the duty to promote cogeneration and generation of electricity from renewable sources of energy. As a promotional measure, TNERC may provide early bird incentive for power generation from MSWs.

Thiru. M.R. Krishnan – He wanted to know about the target for Renewable Purchase Obligation (RPO) for MSW like RPO for Solar.

Dr.M.Saikumar, CMD/TANGEDCO– Since MSW is in nascent stage, there is no target RPO for MSW. If there is a target RPO for MSW and no project comes in, then we will end up with buying Renewable Energy Certificates (REC), which will have a cost implication and as such will reflect in the ARR and ultimately the retail tariff consumers will end up with paying higher tariff.

Thiru. K. Kathirmathiyon – The local bodies should take care of for the disposal of waste.

Thiru. G. Rajagopal, Member, TNERC– It is seen from the presentation that Tariff fixed for MSW by CERC is Rs.7.04 per unit, Telangana Rs.5.90, MP Rs.6.39. Gujarat Rs.7.03, Chattisgarh Rs.7.22, Haryana Rs.7.05 whereas the tariff now proposed for TN is Rs.5.79/unit. He has raised a point whether in any other State the tariff for MSW power plants is lesser than the tariff proposed by this Commission in the consultative paper. He said that the Tariff for the MSW should be reasonably higher considering the alternative cost of its disposal and its hazardous effect on the health of the public who will end up paying higher health cost if the MSW is not properly disposed off.

Thiru.K.Alagu - The tariff is reasonable. If privatization is encouraged for collection of waste, there will be more employment opportunities. Local Bodies should encourage collection of waste.

Dr. K. Selvaraj– The viability of the project is to be seen rather than tariff or cost. Land, transportation, segregation of MSW at source level are important. The projects will be of small capacities. Therefore

initially, it is to be leveraged. Whether project will happen at this tariff, covering the related costs is to be seen. We should support the developers.

Dr. A.S. Kandasamy– The health aspect should be considered. Public will inhale carbon monoxide. The local bodies should encourage investors to set up power generation from MSW. Hence, the viability of the investors who undertake this project needs to be supported by way of reduction in transport cost, cost of segregation of MSW etc. Also, the procurement of power generation from MSW will not be a major source of energy for TANGEDCO and as such the fixing of higher power procurement cost for MSW will not affect much in the TANGEDCO's power purchase cost. The discussion will not be fruitful unless the investors are satisfied with the viability of the MSW project.

(ii) Deputy Director (Engineering), TNERC presented the discussion paper on the revision of tariff for power procurement from solar.

Thiru M.S. Rajamani – Suggestions given initially after the presentation for Municipal Solid Waste plants are in general applicable for both the consultative papers. He said that on TANGEDCO's views on the paper, he leaves it to the Commission's considered views. Further, he stated that since the State has considerable solar insolation setting up of mini solar plants could be considered. Such plants would electrify villages where there is no reach of electricity or where the end voltage is poor. Karnataka has mini plants in few places. Commission and TANGEDCO could make a study on installation of mini solar projects.

Thiru A.S.Kandasamy – Solar thermal and Solar photo voltaic work under the principle of sunshine. When power generated from solar photovoltaic plant is available at a cheaper price, Solar thermal plants need not be thought of. In U.S.A. there is only one demonstrative plant for Solar thermal. He further stated that the tariff proposed by the Commission for solar PV is reasonable which if further lowered would not attract projects. This is to be viewed in the context of depleting fossil fuels and promotion of renewable power and clean energy. He further added that TANGEDCO would be in a dilemma in encouraging renewable power that is infirm and will have a tendency to contract firm power. He suggested that some form of subsidy could be given to TANGEDCO as otherwise it would be difficult for them to match infirm power with firm power. Ultimately there is a requirement for a pollution free environment.

Dr.M.Saikumar, CMD/TANGEDCO – The rate discovered through their tender is Rs. 4.40 per unit and so it is a better rate. The next time when the utility goes for reverse bidding, Rs.4.40 per unit would be the ceiling.

Thiru. G. Rajagopal, Member, TNERC – The response to the tender of the TANGEDCO and the quantity contracted should be sufficient as otherwise the utility would not be able to fulfil the solar purchase obligation.

Dr.M.Saikumar, CMD/TANGEDCO– If that is the case, Solar RECs are available at Rs.3.30 per unit. Solar Purchase Obligation could be fulfilled by purchase of power at such a rate.

Thiru K.Kathirmathiyon – He agreed that solar power should be encouraged and further stated that the tariff of Rs.4.50 per unit is reasonable and this tariff could serve as the benchmark price. He further sought to be clarified on the slot to slot adjustment made in the energy accounting and billing procedure.

Chairman/TNERC explained in detail how the slot wise adjustment of energy is done.

Dr. T. Prabhakara Rao, Member, TNERC – TN has the highest RE capacity penetration currently among all states. Challenges of RE on the grid have to be taken note of and adequate measures to balance demand and supply need to be put in place. As regards Mini solar plants, Micro grids were tried in remote areas in some States by Private developers, but due to poor collections, the attempts were not further expanded. However, latest PV technology has minimized the degradation to a reasonable extent. As regards the Municipal Solid Waste based power plants local bodies should take initiative to encourage such plants by removing bottlenecks in the implementation and by sensitizing public about the need to encourage solid waste management.

Thiru. G. Rajagopal, Member, TNERC– Thanked all the SAC members for their participation and valuable suggestions made and assured that all information given would be considered by the Commission.

ANNEXURE – II

Abstract of comments received from various stakeholders on "Consultative Paper on Comprehensive Tariff Order for Municipal Solid Waste (MSW) based Power Plants".

1. Tamil Nadu Generation and Distribution Corporation Ltd. (TANGEDCO).
2. Timarpur-Okhla Waste Management Co Pvt Ltd (on behalf of JITF Urban Infrastructure Ltd.)
3. Coastal India Trading Systems Ltd.(on behalf of CMTS VSI Recycling BV)
4. Orient Green Power Company Ltd.(OGP)
5. Pallavapuram Tambaram MSW Pvt. Ltd. (Formerly Essel Pallavapuram MSW Pvt. Ltd.) on behalf of Essel Infraprojects Ltd.(EIL)

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1. Capital Cost

Tamil Nadu Generation and Distribution Corporation Ltd. **(TANGEDCO)** concurred with the Capital Cost of Rs.15.00 Crores/MW as proposed by the Commission.

JITF Urban Infrastructure Ltd**. (JITF)** has stated that the Commission has considered the Mass Incineration Technology only for tariff determination where MSW will directly be fed into boiler for combustion without any segregation and processing.

Further, they have also extracted the Rule (which prohibits mass incineration technology and mandates only RDF based technology for Waste to Energy Facility) from Solid Waste Management Rule 2016.

Para No.21: Criteria for waste to energy process -

(1) Non-recyclable waste having calorific value of 1500 K/cal/kg or more shall not be disposed of on landfills and ***shall only be utilized for generating energy either or through refuse derived fuel*** *or by giving away as feed stock for preparing refuse derived fuel".*

Note: (e) Only *low Sulphur fuel like LDO, LSHS, Diesel, bio-mass, coal, LNG, CNG,* ***RDF*** *and bio-gas* ***shall be used as fuel in the incinerator".***

The JITF has also furnished comments on Technology, capital cost, and other parameters.

Technology:

JITF has stated that mass incineration is not allowed as per Solid Waste Management Rule 2016(SWM Rules, 2016) and it has further stated that the same has been prohibited by National Green Tribunal.

Further, JITF has also stated that only RDF based incineration, gasification, pyrolysis or any other technologies should be considered for the tariff determination and the approach paper may be reworked for RDF based technologies.

Further, they have also requested the Commission to consider the RDF based technologies only for waste to Energy Projects while fixing the norms for determination of tariff for procurement of power from municipal solid waste projects with some premium over other RE projects for the sake of promotion.

JITF has stated that the capital cost considered by the Commission is much conservative. Wherein, the cost incurred in already setup plant (16MW MSW based power plant in Okhla, New Delhi) has been computed to Rs.292 Crores for 16 MW. This works out to Rs.18.25 Crores/MW.

Further as per the Emission norms envisaged under Solid Waste Management Rule 2016, it is required to comply most stringent parameters for Waste to Energy Power Plants which leads to additional capital investment on pollution measures like installation of flue gas cleaning system comprises of lime scrubber & activated carbon filters. It is further stated that there may be two kinds of configurations of the Waste to Energy plant to be adopted by developers detailed as under:

i) Where the Power generating unit and MSW processing unit for RDF production have been integrated under one unit, the respective capital cost reflecting into power generating unit and fuel cost to be taken as zero.

ii) Where the MSW processing unit for RDF production has been separated from Power Generating unit, capital cost to be reflected under this configuration model should represent the cost of power generating unit only. The cost of MSW processing section have been computed under

fuel cost to be considered while tariff determination which actually reflects the recovery of cost of MSW processing unit only.

Thus, Rs.18 Crore/MW cost is proposed to be considered under configuration 1 and Rs.15 Crore/MW to be considered under configuration 2 along with RDF fuel cost.

Further, JITF has also stated that there should also be different project cost category based on the above configuration and also the additional cost associated for installation of Air Cool Condenser may appropriately be added in to the capital cost.

CMTS-VSI Recycling B V, Netherlands (**CMTS**) has requested the Commission to fix capital cost of Rs.75 crores / MW. CMTS requested the above capital cost based on the following:

The burning technology of MSW offered by CMTS is different than Biomass and that involves various processes, Bio-methanation, two stages Gasification and Pyrolysis, Incineration, etc. currently waste to energy projects in Europe, South East Asia, using these Thermal technologies to achieve Zero waste and zero odor are costing over Euro 10 to 15 million per MW of installed capacity. As the gases generated are highly corrosive and abrasive slag, expensive Corrosion Resistant Inconel Boiler Tubes to ensure continuous power generation has to be installed. In addition to this, MSW and C & D waste sorting out plants will be involving various chemical operations will add to the cost substantially. They have requested that the additional cost due to using of specialized methods shall be considered by the Commission while fixing the capital cost of the Project.

Essel Infraprojects Limited (EIL) has stated that the capital cost for various projects under execution is about 20-30% higher side due to its varying scope including combination of the following viz. closure of their existing dump site, constructing weighing bridges, secondary transportation, building transfer stations, development of scientific land fill (SLF) sites, closure of SLF post concession period, post-closure of O & M, site location, soil parameters, composition, quantity and calorific value of waste, construction of boiler, steam turbine and chimney foundations, need for secondary fuel. They requested the Commission to consider

the norms individually for Plant and Machinery, Civil and construction cost, Cost of scientific landfill sites, evacuation infrastructure, soft costs, etc. and fix a capital cost of Rs.18.00 Crores/MW.

EIL requested that the tariff for Wte to be determined in "Project Specific" way. Further, it has stated that EIL does not oppose generic tariff but also supports this mechanism. Only request to Hon'ble Commission is to reconsider the regulations/cost factors so that the tariff determined is accepted gracefully.

2. <u>Life of Plant and Machinery</u>

TANGEDCO and JITF concurred with the life of Plant and Machinery proposed by the Commission.

CMTS has suggested for 15 years for life of Plant and Machinery as since Gasification, Incineration, Flue Gas treatment deals with highly corrosive and abrasive gases.

3. <u>Plant Load Factor (PLF)</u>

TANGEDCO concurred with the PLF proposed by the Commission.

JITF has stated that operation of such Waste to Energy Plant requires some stabilization period of around one year due to its complexity to operate not only power plant but also MSW processing section to produce RDF efficiently. Handling of MSW itself is a most complex job. .JITF requested the Commission to lower PLF of 65% during stabilization period in line with the CERC recommendation and requested to retain 75% PLF from 2nd year onwards.

CMTS has requested the Commission to consider 65% PLF in the first year of operation, 70% PLF in the second year of operation and 75% PLF from third year onwards. Incentive of 75 paise may be considered if higher PLF is achieved.

EIL has requested the Commission to consider a PLF of 65% for the first year and 75% from second year onwards.

4. <u>Debt-Equity Ratio</u>

TANGEDCO, JITF, CMTS and EIL Infra Ltd. concurred with the Debt-Equity ratio of 70:30 proposed by the Commission.

5. <u>Term of Loan and Interest</u>

TANGEDCO concurred with the term of loan proposed by the Commission but requested for change in the rate of Interest at 12.00%.

JITF has stated that the lending rate above 300 basis points to average SBI Base rate prevalent during the first six months of the previous year is not practically achievable from the financial institutions. JIITF requested the Commission to consider not lower than 15% Rate of Interest for the waste to Energy Projects. JITF has further stated that it is difficult to raise funds due to non-availability of success stories in the sector and even if the financial institutions agree, they agree for a higher lending rate which varies from 15% to 18%.

CMTS and EIL have concurred with the proposal of Commission in respect of term of loan and the rate of interest.

Orient Green Power Company Limited (OGP) has stated that the power plants using solid waste are neither treated as a priority sector nor as an infrastructure sector by the Banks while funding the project. This has resulted in levying interest rate of 15.5% to 17% for both term loan and for working capital cost. Hence, they have requested the Commission to consider the prevailing rate charged by the banks/financial institutions.

6. <u>Return on Equity</u>

TANGEDCO concurred with the Return on Equity (20% pre-tax) proposed by the Commission.

JITF and CMTS have requested the Commission to fix the Return on Equity as 20% p.a. for the first 10 years and 24% p.a. from 11th year onwards.

EIL requested the Commission to consider the ROE of 20% for the first 10 years and 24% from the 11th year onwards.

7. <u>Components of Working Capital</u>

TANGEDCO concurred with the components of working capital proposed by the Commission.

JITF has requested to include the Spare parts cost under Working Capital components since it has significant contribution to the working capital like any other renewable power plant. Further, under configuration 2 as envisaged earlier at Capital Cost column, fuel cost for 4 months also needed to be added under Working Capital which will automatically be computed to zero under configuration 1 where fuel cost is zero.

JITF requested that in line with CERC's Order dated 7-10-2015, the Commission to include (a) fuel cost for four months equivalent to normative PLF; (b) O & M Expenses for one month; (c) Receivables equivalent to two months of fixed and variable charges for sale of electricity calculated on the target PLF; and (d) Maintenance spare @ 15% of operation and maintenance expenses.

CMTS has stated that though no costs for Fuel delivery are there, they will be spending on the MSW sorting out and processing @ Rs.1500/MT of MSW and C & D waste. TNERC may include four months of this sorting cost plus O & M cost of four months and Receivables of two months plus Maintenance spare at 15% of O & M charges.

OGP requested the Commission to include 25% of O & M charges towards Maintenance spares in the components of Working Capital.

EIL has stated that Interest on Working Capital of 13.26% on the working capital considered by the Commission is optimal.

8. <u>Rate of Interest on Working Capital</u>

TANGEDCO requested the Commission to adopt 12.50% as rate of interest for calculation of working capital.

JITF has requested the Commission to consider a rate of interest for calculating working capital in the range of 15% to 16%.

CMTS has concurred with the rate of interest proposed by the Commission.

OGP has requested the Commission to consider interest rate of 15.5% to 17%.

9. <u>Operation and Maintenance Expenses:</u>

TANGEDCO concurred with the O & M expenses proposed by the Commission in the Consultative Paper.

JITF has stated that based on the operational experience of Okhla plant O & M cost should be nearer to 6.5% of the capital cost due to higher maintenance and consumables required for operation and maintenance of Waste to Energy Plants like limes dozing, activated carbon and periodical bag filter replacement.

CMTS has requested the Commission to consider O & M cost @ 8.33% of Project cost with an escalation of 6% per year because of high value consumables and chemicals.

EIL has stated that the O & M cost has to be determined after considering the following viz. Corrosive and abrasive composition of MSW fouls the boiler, super heater and refractory lining requiring frequent cleaning and replacement. Special tiles/bars used in grate requires periodical replacement (which needs to be imported), Start-up of the Plant requires LDO. More shut-downs necessitate consumption of fuel oil for start-up. The plant consists of bag filters for stringent control on dust and emissions which requires frequent replacement. Ash removal & Disposal cost is higher due to the fact that MSW has higher than normal ash generation (15-20% ash/inert content) due to presence of inert material/dirt/stones/other debris. Manpower cost for expats is high till the knowledge is transferred to local operators and Engineers. This cost is to be considered for want of their expert services in absence of equally experienced professionals in India. Spare parts which may cost to the tune of 20% of the overall O & M cost. Cost of Sorting and Processing inside the Pit will arise. The operation of the Waste to Energy plant is completely different from the Biomass based renewable energy plants. Most sophisticated expertise is required for grate operation and fuel feeding operation (Grab cranes) and flue gas treatment systems that includes Bag house. Conventional fossil fuel or renewable fuel based power plants does not require such

expertise. Most importantly, O & M contractor will have an obligation of establishing operational availability of 7500 hours per annum. This is possible only when plant is maintained and operated in a scientific way by following standard operating practices, good engineering practices and taking care of opportunity maintenance and preventive maintenance as per the maintenance planner.

EIL Infra requested the Commission to consider O & M cost (including emission control cost) of 6.50% of the capital cost and an escalation of 5.72% per annum for the waste-to-energy Project.

10. Depreciation:

TANGEDCO concurred with the Depreciation proposed by the Commission in the Consultative Paper.

JITF requested that the depreciation may be considered as per the industry practice and as recommended by CERC in its order dated 07-10-2015 i.e. 5.83% p.a. for the first 12 years and 2.51% from 13th year onwards.

EIL requested the Commission to consider depreciation at 5.83% for 12 years and at 2.51% from 13th year onwards.

CMTS requested the Commission to consider 7% per annum in the first 10 years and from 11th year onwards at 1.33% p.a. as per order dated 4-8-2015 by GERC.

OGP requested the Commission to consider the cost of land and building in addition to the cost of Plant and Machinery. Further, OGP has also requested the Commission to consider depreciation at 7% SLM for the first 10 years and remaining 20% to be spread over the useful life of the plant from 11th year onwards.

11. Auxiliary Consumption

TANGEDCO, JITF and CMTS have concurred with the Auxiliary Consumption proposed by the Commission in the Consultative Paper.

EIL has stated that the Auxiliary consumption of MSW plants is normally higher owing to:

- Round the clock (24 hours) working:
- Additional auxiliaries in various stages of MSW processing and various equipment of the plant such as waste cranes, primary air system, primary air pre-heater, start-up & auxiliary burners, hydraulic station, dry reactor, $Ca(OH)_2$ metering and transport, Ash discharge conveyors, etc.

In view of the above, EIL has requested the Commission to consider the total auxiliary consumption of 16%.

12. Fuel Cost

JITF has stated that as per configuration # 1 fuel cost may be considered as 0 but at the same time for configuration # 2 model where MSW processing plant is not integrated with power generating stations, it should be kept in line with CERC. The fuel cost which basically in RDF production / preparation cost to be incurred at MSW processing section which has been adopted Rs.1800/MT by CERC for 2015-16 with escalation of 5% p.a. Thus for FY2016-17 it should be Rs.1890/MT.

EIL has stated that there may be cases where the Municipal Bodies may not provide the entire requirement of waste during which the project company may have to use any other fuel as supplementary fuel to honor the power commitments as per PPA. It has further stated that the experience in Jabalpur is that during rainy season additional supplementary fuel is required (like bagasse, husk) to burn the water dipped waste. In view of this the supplementary fuel cost should be allowed as a tariff component wherever incurred.

13. Must Run Status of Waste to Energy Plants:

JITF has stated that the Wastes to Energy Plants are considered as renewable energy category. MSW fuels are very inconsistent in terms of its composition/ Characteristics & corresponding GCVs which varies widely and thus, it is much uncertain to predict power generation possibility out of the plant. However, it needs to be operated round the clock to avoid any piling of MSW within the plant premises and in the city as well.

Hence, Waste to Energy Plants should be retained with Must Run status only as in other states. These plants should also be kept out from the purview of Merit Order Dispatch Principles and Unscheduled Interchange Implications.

Discounting Factor

JITF has stated that the Discounting factor shall be the weighted average cost of Capital (WACC) in line with the CERC Regulation 2012 i.e. at 10.64%.

Related Issues:

1. **Transmission and Wheeling Charges:**

TANGEDCO accepted the Commission's proposal in respect of Transmission, Wheeling, Scheduling and System Operation Charges as in the Consultative Paper. TANGEDCO also accepted that apart from these charges actual line losses in kind as specified in the respective Order of the Commission and as amended from time to time are also deductible in kind for the captive use and third party sale. In respect of plants availing REC, 100% of the respective charges as specified in the relevant orders shall apply.

EIL has requested the Commission not to levy these charges.

2. **Cross Subsidy Surcharge (CSS):**

TANGEDCO and CMTS have accepted for 50% of the applicable CSS as proposed by the Commission.

EIL has requested the Commission not to levy these charges.

3. **CDM Benefits:**

TANGEDCO, CMTS and EIL have accepted for the proposal of the Commission in respect of CDM Benefits.

4. **Reactive Power Charges:**

TANGEDCO and CMTS have accepted the proposal of the Commission.

5. **Grid Availability Charges:**

In respect of startup charges TANGEDCO accepted the proposal of the Commission.

CMTS has accepted the proposal of the Commission.

6. **Adjustment of energy generated:**

TANGEDCO and CMTS have stated that the adjustment of energy shall be as per the Commission's Open Access Regulations and related orders in force.

7. **Energy Wheeling Agreement and Fees:**

TANGEDCO and CMTS have accepted the proposal of the Commission.

EIL has requested the Commission, as a promotional measure to waive the wheeling charges proposed by the Commission.

8. Billing and Payment:

TANGEDCO has stated that in case of sale to TANGEDCO, the norms of levy of penalty for the delayed payment beyond 30 days for the Distribution Licensee, as proposed in the Consultative paper may be withdrawn by the Commission. The surplus energy if any available after wheeling the energy to captive/third party users may be treated as lapsed. TANGEDCO has agreed for all other terms discussed in the consultative paper under the heading of "Billing and Payments" is agreeable.

CMTS and EIL have accepted the proposal of the Commission.

9. Security Deposit:

TANGEDCO and CMTS have accepted the Security Deposit as proposed by the Commission.

10. Power factor disincentive:

TANGEDCO accepted to the proposal of Power factor disincentive as proposed by the Commission.

11. Metering:

TANGEDCO and CMTS have accepted the proposal of the Commission in respect of Metering.

12. Connectivity and Evacuation of Energy:

TANGEDCO and CMTS have accepted the Connectivity and Evacuation of Energy as proposed by the Commission.

13. Energy Purchase Agreement:

TANGEDCO and CMTS have accepted the Energy Purchase Agreement as proposed by the Commission.

14. Scheduling of Power:

CMTS has accepted the proposal of the Commission.

15. Tariff review period /Control period:

TANGEDCO, CMTS and EIL have accepted for the control period of two years and tariff period of twenty years.

16. **Parallel operation charges:**

CMTS has accepted the proposal of the Commission.

17. Tariff:

TANGEDCO requested for a levellised fixed cost of Rs.5.71/- per unit with an AD benefit of Rs.0.45/unit and for an applicable tariff rate of Rs.5.26/- per unit.

CMTS has requested the Commission to fix the Tariff at Rs.22.50 per kWh.

EIL has stated that tariff issued by other commissions namely GERC, UPERC, OERC and TERI report clearly indicates that the tariff is well above Rs.7 per kWh. With the tariff proposed by the Commission, the feasibility for operating MSW plants is extremely difficult. In view of this project specific tariff may be issued by the Commission.

ANNEXURE -III

MSW BASED PROJECTS

Capital cost	**160000000**		**Rs.16.00 Cr./MW**																		
Debt	112000000																				
Equity	48000000																				
PLF	**75%**																				
Rate of Interest on Debt	11.00%																				
Depreciation on 85% of CC	4.50%																				
O & M 5% on 85 %CC with annual escalation of 5.72%	**5.50%**																				
O & M 0.90% on 15% CC with an annual escalation of 5.72%	0.90%																				
Term of loan	10 years with one (1) year moratorium																				
Return on Equity (pre-tax)	20%																				
Working Capital Components	O & M Expenses for 1 month and 2months receivables																				
Interest on W.Cap.	11.50%																				
Life of Plant	20 years																				
Residual value (10%)	16000000																				
Aux.consump.	15%																				
Discount factor	0.0924																				
Tariff Details																					
Years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	
Gross Generation	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	6570000	
Auxiliary	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	
Net Generation	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	
Components of W.Cap.																					
2 months Receivables	6084920	6160439	6030932	5905992	5785879	5670871	5561259	5457352	5359476	5267976	5183653	5106045	5245318	5392558	5548219	5712785	5886764	6070694	6265145	6470719	
1 months O & M	641333	678018	716800	757801	801147	846973	895420	946638	1000786	1058031	1118761	1182755	1250408	1321932	1397546	1477486	1561998	1651344	1745801	1845661	
Interest on Debt	12320000	12320000	11088000	9856000	8624000	7392000	6160000	4928000	3696000	2464000	1232000										
ROE	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	9600000	
Depreciation	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	6120000	
O & M Expenses	7696000	8136211.2	8601602.5	9093614.1	9613768.9	10163676	10745039	11359654.96	12009427.22	12696366	13425138	14193056	15004899	15863179	16770553	17729828	18743974	19816130	20949612	22147930	
Interest on Working	773519	786423	775989	766336	757508	749552	742518	736459	731430	727491	724778	723212	747008	772166	798763	826881	856608	888034	921259	956384	
Total fixed cost	**36509519**	**36962634**	**36185592**	**35435950**	**34715277**	**34025229**	**33367557**	**32744114**	**32156857**	**31607857**	**31101916**	**30636268**	**31471907**	**32355345**	**33289316**	**34276709**	**35320582**	**36424164**	**37590871**	**38824314**	
Tariff	6.54	6.62	6.48	6.35	6.22	6.09	5.98	5.86	5.76	5.66	5.57	5.49	5.64	5.79	5.96	6.14	6.32	6.52	6.73	6.95	
Discount factor	1.00	0.92	0.84	0.77	0.70	0.64	0.59	0.54	0.49	0.45	0.41	0.38	0.35	0.32	0.29	0.27	0.24	0.22	0.20	0.19	
Present Value	6.54	6.06	5.43	4.87	4.37	3.92	3.52	3.16	2.84	2.55	2.30	2.08	1.95	1.84	1.73	1.63	1.54	1.45	1.37	1.30	
Levellized Tariff (Rs.)	**6.16**																				

Determination of Accelerated Depreciation benefit

Depreciation amount	90%																				
Book depreciation rate	5.28%																				
Tax depreciation rate	40%																				
Income Tax (Normal rate)	34.61%																				
Capital Cost	**160000000**																				
YEARS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	
Book depreciation rate	2.64%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	2.88%			
Bk Depn in lakhs	4224000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	8448000	4608000			
Accelerated Depreciation																					
Opening	60%	30%	3%	0.6%	0.12%	0.02%	0.005%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%				
Allowed	30.0%	27.00%	2.40%	0.48%	0.10%	0.02%	0.00%	0.00%	0.00%	0.00%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%				
Closing	30%	3%	1%	0.12%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%				
AD	48000000	43200000	3840000	768000	153600	30720	6144	1229	246	49											
Net Depn benefit	43776000	34752000	-4608000	-7680000	-8294400	-8417280	-8441856	-8446771.2	-8447754.24	-8447951	-8448000	-8448000	-8448000	-8448000	-8448000	-8448000	-8448000	-4608000			
Tax benefit	15150874	12027667	-1594829	-2658048	-2870692	-2913221	-2921726.4	-2923427.51	-2923767.742	-2923836	-2923853	-2923853	-2923853	-2923853	-2923853	-2923853	-2923853	-1594829			
Energy generation	2792250	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	5584500	
Discount factor	1.00	0.92	0.84	0.77	0.70	0.64	0.59	0.54	0.49	0.45	0.41	0.38	0.35	0.32	0.29	0.27	0.24	0.22	0.20	0.19	9.80379173
Av DCF	1	0.96	0.88	0.80	0.73	0.67	0.62	0.56	0.52	0.47	0.43	0.40	0.36	0.33	0.30	0.28	0.25	0.23	0.21	0.20	10.2105269
DCF En. Gen.	2792250	5348319.2	4895934.8	4481815.1	4102723.5	3755697.1	3438023.7	3147220	2881015	2637325.8	2414249.2	2210041.4	2023106.4	1851983.1	1695334.2	1551935.4	1420665.9	1300499.7	1190497.7	1089800.2	54228437.5
Tax benefit with DCF	15150874	11518991	-1398187	-2133204	-2108990	-1959204	-1798722.2	-1647537	-1508357	-1380805	-1264018	-1157102	-1059229	-969634.9	-887618.9	-812540.2	-743812	-371398.4	0	0	5469504
AD benefit	**0.10**																				
Levellised tariff with AD benefit (in Rs.)	**6.06**																				