CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Date : 07th October , 2015

Coram: Shri Gireesh B. Pradhan, Chairperson

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STATEMENT OF REASONS

The Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) (Fourth Amendment) Regulations, 2015(Norms for determination of generic tariff for Municipal Solid Waste/Waste to Energy projects and indicative tariff for 2015-16)

1. Introduction

1.1 The Commission received references from the Ministry of Urban Development (MoUD) informing the non operation of many WtE plants in the past due to issues such as non-purchase of power by DISCOMs at preferred tariff and, sought the intervention of CERC to determine generic tariff for Waste to Electricity. MoUD also referred to the key objective of Swachh Bharat Mission of processing 100% solid waste generated in cities/towns by 2nd October 2019. MoUD also requested the Commission for determination of generic tariff for waste to electricity to bring about substantial improvement in solid waste management sector. To aid this objective, the Ministry of Power (MoP) was also in the process of amending the tariff policy to include a provision for State DISCOMs to ***"mandatorily purchase all power generated from municipal solid waste".***

1.2 Taking cognizance of the fact that management of waste is a serious issue in India as also to promote stakeholders to play their role in contributing to a cleaner environment by setting up WtE plants, Central Electricity Regulatory Commission notified draft amendment to Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations , 2012 vide public notice No. L-1/94/CERC/2011 on 10TH August 2015 . Comments were invited from all stakeholders till 10th September 2015. Written comments were received from the following stakeholders :

a) JITF Urban Infrastructure Ltd , New Delhi (JITF)

b) The Tata Power Co. Ltd, Noida, U.P. (Tata Power)

c) Waste Management Association, New Delhi (WMA)

d) Abellon Clean Energy Ltd, Ahmedabad (Abellon)

e) Essel Infraprojects Ltd, Mumbai. (Essel Infra)

f) NN Back Office Services Pvt. Ltd. (Nexus Novus), Benguluru

g) IL &FS Environment Infrastructure & Services Ltd, New Delhi. (ILFS)

h) Power Exchange India Ltd , Mumbai

i) A2Z Infrastructure Ltd, New Delhi (A2Z)

1.3 Subsequently, a public hearing was held on 18th Sept, 2015, where presentations and oral submissions were made by following stakeholders:-

a) A2Z Infrastructure Ltd.

b) Essel Infraprojects Ltd.

c) IL &FS Environment Infrastructure & Services Ltd

d) JITF Urban Infrastructure Ltd

e) KPMG Advisory Services (KPMG)

f) Ramky

1.4 The important issues raised by the stakeholders and Commission's analysis and decisions thereon are presented in the subsequent sections

A. AMENDMENTS TO REGULATIONS

1. Amendment to Regulation 2 - Definitions and Interpretation

1.1 Commission's Proposal in Draft Regulation

a) After sub-clause (o) under clause (1) of Regulation 2 of the Principal Regulations, a new clause (oa) shall be added as under:-

"Municipal solid waste' means and includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes"

b) After sub-clause (s) under clause (1) of Regulation 2 of the Principal Regulations, a new clause (sa) shall be added as under:-

''Refuse Derived Fuel' means segregated combustible fraction of solid waste other than chlorinated plastics in the form of pellets or fluff produced by drying, shredding, dehydrating and compacting combustible components of solid waste that can be used as fuel;"

c) After sub-clause (g) under clause (1)(aa) of Regulation 2 of the Principal Regulations, a new sub-clause (h) shall be added as under:-

"Municipal solid waste (MSW) and Refuse derived fuel (RDF) based power projects - 20 years"

1.2 Comments Received

As regards definition for RDF, A2Z Infrastructure Ltd suggested De-Stoning operation to be included in RDF preparation as removal of stones from MSW for production of RDF is an important operation before shredding.

1.3 Analysis & Commission's view

On the definition of RDF , the Commission appreciates the contention of the stakeholder that de-stoning is necessary to pre-process the RDF as this would ease the further processing of waste . This has accordingly been suitably incorporated as under :

"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, dehydrating and compacting combustible components of solid waste that can be used as fuel;"

2. Amendment to Regulation 4 –Eligibility Criteria

2.1 Commission's Proposal in Draft Regulation

a) **After clause (g) of Regulation 4 of the Principal Regulations, a new clause (h) shall be added as under:-**

"Municipal solid waste (MSW) based power projects – The project shall qualify to be termed as a Municipal solid waste (MSW) based power project, if it is using new plant and machinery based on Rankine cycle technology and using Municipal solid waste (MSW) as fuel sources"

b) **After clause (h) of Regulation 4 of the Principal Regulations, a new clause (i) shall be added as under:-**

"Refuse derived fuel (RDF) based power projects – The project shall qualify to be termed as a Refuse derived fuel (RDF) based power project, if it is using new plant and machinery based on Rankine cycle technology and using Refuse derived fuel (RDF) as fuel sources"

2.2 Comments Received

2.2.1 A2Z Infrastructure Ltd suggested to include use of Fossil fuel upto 15 % and biomass as support fuel limited to the extent of 25 % of total Fuel Consumption on Annual basis in the eligibility criteria of MSW/RDF based power plants . This is because both MSW and RDF have low bulk energy and high percentage of moisture. Therefore, fossil fuel is required to support efficient combustion.

2.2.2. They support their claim on the following basis :

a) The Commission in its principal RE Regulation in Para 4 (c) has classified a project as a Biomass power project if it uses Biomass Fuel Sources and also restricted use of Fossil Fuel upto 15 % of total fuel consumption on annual basis

b) Ministry of Environment & Forest by way of Gazette Notification 2002 dated 1st December 2009 also mentioned that "Power Plants upto 15 MW based on non- hazardous municipal waste and using auxiliary fuel such as coal/Lignite/ Petroleum upto 15 % are exempt" from Environmental Impact Assessment.

c) Ministry of New & Renewable Energy in their Order of September 2013 has stated that in MSW projects, any waste of RE/ Biomass can be mixed to the extent of 25% based on GCV

2.3. Analysis & Commission's view

2.3.1 On the issue of usage of fossil fuel in WtE plants, the Commission would like to emphasize that the prime objective of the amendment to regulations are to promote usage of RDF/MSW for energy generation. Therefore, by allowing usage of fossil fuel , the very objective of using alternate fuel is defeated.

2.3.2. The Orders issued by GERC since 2010 till 2015 for the WtE projects also make no mention of permitting usage of fossil fuel.

2.3.3 Thus, considering the necessity to promote the usage of Waste material as fuel in WtE plants, the proposed amendment to the Regulations is retained while not permitting usage of either fossil fuel or biomass fuel.

3. Amendment to Regulation 11 – Despatch principles for electricity generated from Renewable Energy Sources

3.1 Commission's Proposal in Draft Regulation

a) After clause (1) of Regulation 11 of the Principal Regulations, a new clause (1a) shall be added as under:-

" The Municipal Solid Waste and Refuse Derived Fuel based power projects shall be treated as 'MUST RUN' power plants and shall not be subjected to 'merit order despatch' principles."

b) Clause (2) of Regulation 11 of the Principal Regulations shall be substituted as under:-

"The biomass power generating station with an installed capacity of 10 MW and above, non-fossil fuel based co-generation projects, municipal solid waste and refuse derived fuel shall be subjected to scheduling and despatch code as specified under CERC (Indian Electricity Grid Code) Regulations, 2010 and Central Electricity Regulatory Commission (Unscheduled Interchange and related matters) Regulations, 2009 including amendments thereto."

3.2 Comments Received

3.2.1 On the issue of WtE plants being subject to **Scheduling and Despatch code**, A2Z Infrastructure Ltd suggested that the scheduling and dispatch code as specified under Indian Electricity Grid Code (IEGC) and Central Electricity Regulatory Commission (Unscheduled Interchange and related matters) Regulations, 2009 including amendments thereto should not be applicable to MSW and RDF plants as WtE sector is in a nascent stage in India. Moreover as MSW and RDF fuel is highly corrosive, abrasive and heterogeneous, they lead to uncertain choking of boiler tubes and increased wear and tear. Therefore, accurate forecasting of power generation from MSW and RDF is difficult. Accordingly, applicability of Scheduling may be considered at a later stage.

3.2.2 Waste Management Association & ILFS Environmental Infrastructure Pvt Ltd also suggested that WtE projects should be outside the purview of scheduling as the calorific value of MSW fuel is highly variable and hence complying with scheduling of input power to the grid is very difficult.

3.2.3 Essel Infraprojects Ltd sought exemption from Inter-State Scheduling in case of Energy Sale to DISCOM and 3rd party as it is difficult to control the

instantaneous heat input on account of heterogeneous and bulky fuel and therefore not possible to predict the instantaneous power generation in advance.

3.3. Analysis & Commission's view

3.3.1. The status of must run for the WtE plants is necessary as it aids in disposal of wastes thus protecting the environment and avoiding higher landfills. Generation of power from waste thus serves to keep the environment clean and also cater to the requirements for grid support

3.3.2. On the views of the stakeholders seeking exemption from Scheduling and compliance to dispatch code ,it is reiterated that generation from WtE projects carries certain degree of conformity. This is so as the generators have a fixed schedule of feeding in tonnage of waste. Even though the quality of waste differs in seasons, there is always a fixed pattern . Therefore, it is not difficult to prepare a schedule of generation of power.

3.3.3. Importantly, MSW power unlike wind and solar which are not affected by the vagaries of nature. Also, keeping WtE plants out of the purview of scheduling may hamper the grid discipline. Hence, the above regulation remains unchanged as following:-

Clause (2) of Regulation 11 of the Principal Regulations shall be substituted as under:-

"The biomass power generating station with an installed capacity of 10 MW and above, non-fossil fuel based co-generation projects, municipal solid waste and refuse derived fuel shall be **subjected to** scheduling and despatch code as specified under CERC (Indian Electricity Grid Code) Regulations, 2010 and Central Electricity Regulatory Commission (Unscheduled Interchange and related matters) Regulations, 2009 including amendments thereto."

4. Insertion of new Regulation 33 A : Technology aspect

4.1 Commission's Proposal in Draft Regulation

The norms for tariff determination specified hereunder are for power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) and are based on Rankine cycle technology application

4.2 Comments Received

JITF Integrated Waste Management, New Delhi opined that apart from the suggested technologies by Commission, Pyrolysis and High End Gasifier technologies could be used with same tariff norms . The same is also recommended in the "Report of the Task Force on Waste to Energy" by the Planning Commission in May 2014 . Alternatively, norms could be technology free based on fuel selection as of RDF/MSW.

4.3 Analysis & Commission's view

The Commission opines that the selection of technology is left to the discretion of the developer so as to arrive at a reasonable tariff. Therefore, Pyrolysis and High End Gasifier can also be selected by the developer in addition to Combustion or incineration, Bio-methanation (which can be used for smaller capacity and wet garbage handling)

5. Insertion of new Regulation 33 B : Capital cost

5.1 Commission's Proposal in Draft Regulation

The normative capital costs for FY 2015-16, for power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) and are based on Rankine cycle technology application shall be as under:

i. **Rs 1500 lakh/MW for the power projects which use municipal solid waste (MSW) and are based on Rankine cycle technology application.**

ii. **Rs 900 lakh/MW the power projects which use refuse derived fuel (RDF) and are based on Rankine cycle technology application.**

Provided that the Capital Cost norms for the remaining years of the control period, for municipal solid waste (MSW) and refuse derived fuel (RDF) based power projects shall be reviewed on annual basis.

5.2 Comments Received

5.2.1 A2Z Infrastructure Ltd has proposed capital cost of Rs. 12 Cr/MW for RDF based power plant and Rs 18Cr/MW for MSW based power plant (The same is inclusive of Rs 2 Cr/MW for land and site development) . They also refer to the

Planning Commission Report of Task Force of Waste to Energy of May 2014 which recommended capital cost (excluding land cost) between Rs 5 Crs to Rs 10 Cr / MW depending on the quantum of composition of MSW and RDF and technological options

5.2.2 JITF suggested separate capital cost for Air Cooled Condenser and Water Cooled Condenser as done in Biomass based power plant.

For RDF

- Water Cooled Condenser - Rs 900 lakh/MW
- Air Cooled Condenser - Rs 1000 lakh/MW

For MSW

- Water Cooled Condenser - Rs 1500 lakh/MW
- Air Cooled Condenser - Rs 1600 lakh/MW

5.2.3 Tata Power opined that the capital cost for RDF and MSW project is without considering cost of land. As Municipality offers land for WtE plant and Waste processing to developer on nominal rental basis i.e. at Rs 1 / sq.m, it should be clarified that nominal rental for land would be considered for cost of land.

5.2.4 IL & FS Environmental Infrastructure & Services Ltd and Waste Management Association suggested that the capital cost of RDF based WtE plant amounts to Rs. 12 Crore / MW . Similarly Waste Management Association suggests that the capital cost of MSW based WtE plant should be revised to Rs. 18 Cr/ MW . This is to consider all additional costs such as steel being used in the boilers, type of grate, furnace design, higher quantum of refractory, usage of air-cooled grates, heterogeneous and corrosive fuel, flue gas treatment systems using activated carbon, lime and urea, flue gas emission monitoring system and disposal of fly ash .

5.2.5 Essel Infrastructure stated that the capital cost for various projects under execution is about 30% higher than that proposed by the Commission . As such projects are in the nascent stage, the cost of technology and other equipment have yet to reach economies of scale and thus capital cost is on a higher side vis-a-vis other conventional sources of energy. Other components of capital cost should include cost of imported equipment. The recent depreciation of Indian rupee has also affected the landed cost of equipment in India. Therefore, norms should be individually considered for plant & machinery, civil and construction cost, cost of scientific landfill sites, evacuation infrastructure, soft costs, etc.

5.2.6 Representative from Ramky Group stated that due to technology being imported, grates being made of special material, expensive bag filters and refractors and other high operating costs, Commission may consider capital costs at Rs 18 Cr/MW

5.3 Analysis & Commission's view

5.3.1. The Commission has noted the views of the stakeholders that MSW (which is the input for WtE plant) is abrasive containing combustible chloride material due to which the equipment needs to be specially designed to burn MSW in designed boilers. As the flue gases are also corrosive in nature, world-wide, such plants are far more expensive than coal based thermal and biomass based power plants due to the emphasis on sophisticated emission reduction processes.

5.3.2. While CERC had fixed the capital cost of a biomass power at Rs 445 lakh per MW for the FY 2012-13 , the same was increased for the FY 2015-16 to Rs 558.705 lakh/MW for Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser.

5.3.3. Similarly, MoUD forwarded data which had been provided by the developers of MSW projects where the capital cost ranged from Rs 8.88 Crore to Rs 26.33 Crore/MW. The average of all data provided by MoUD for Capital Cost / MW is 16.72 Cr per MW.

5.3.4. The Madhya Pradesh Electricity Regulatory Commission (MPERC) determined generic Tariff for MSW projects in 2013 and considered Capital Cost at Rs 6 Cr per MW (excluding land cost) when the stakeholders claimed capital cost in the range of 6 Crs to Rs 12.5 Crs per MW.

5.3.5. The Gujarat Electricity Regulatory Commission (GERC) determined project specific tariff for RDF based project and MSW based projects in 2010, 2014 and 2015. In its Order for Hanjer Green Power (P) Ltd, the capital cost for the RDF plant was determined at Rs 6.90 Cr/MW (inclusive of land cost), the capital cost for an exclusive MSW based project (excluding land cost) was fixed at Rs 17.78 Crs / MW and Rs 14 Cr/MW for a plant whose fuel consisted of 10% RDF and 90% MSW . However, while approving the capital cost, GERC did not factor the incentives

5.3.6. The Commission has considered all the parameters and has been liberal in acknowledging the constraints expressed by stakeholders in arriving at a reasonable capital cost. Therefore, 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 equipments to control flue gas emissions .

5.3.7. Therefore, in line with the Commission's proposal, the benchmark capital cost for **RDF based WtE plant is fixed at Rs 900 lakh/MW(Rupees Nine Crore per MW) and Rs 1500 lakh/MW (Rupees Fifteen Crore per MW) for MSW power projects.** As the capital cost for preprocessing comes to around 35-40% of entire capital cost, 40% of the capital cost has been considered as capital cost of preprocessing facility for MSW.

5.3.8. With due regard to the fact that waste to energy is an emerging technology, the Commission has decided that the Capital Cost norms for the remaining years of the control period, for municipal solid waste (MSW) and refuse derived fuel (RDF) based power projects shall be reviewed on annual basis.

6. Insertion of new Regulation 33 C : Plant Load Factor

6.1 Commission's Proposal in Draft Regulation

(1) Threshold Plant Load Factor for determining fixed charge component of tariff for the power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) shall be:

a) During Stabilisation	**:**	**65%**
b) During the remaining period of the first year (after stabilization)	**:**	**65%**
c) From 2nd Year onwards	**:**	**70 %**

(2) The stabilisation period shall not be more than 6 months from the date of commissioning of the project.

6.2 Comments Received

No Comments were received

6.3 Analysis and Commission's decision

6.3.1 The Commission had proposed PLF for MSW and RDF plants at 65% for the first year and 70% from the second year onwards. No comments were received in this context. However, the Commission reviewed the feasibility of the PLF of MSW and RDF projects based

on the available information, eg. in the orders of some of the State Commissions it was found that the PLF of MSW based projects could be different from the RDF based projects because of the independent nature of fuel source. PLF is dependent on factors like availability of fuel supply, number of operating hours, moisture content of fuel etc.

6.3.2 In Maharashtra Electricity Regulatory Commission (MERC) Order of 2014 for Rochem Green Energy Pvt. Ltd, "*RGEPL submitted that the Capacity Utilisation Factor (CUF) is an important performance parameter for any power plant, and is dependent on factors such as continuous availability of reliable quality fuel supply, plant availability and un-constrained off-take (high load factor). RGEPL further submitted that considering the availability of MSW from PMC, variation in the quality of MSW across the seasons, the Capacity Utilization Factor as 65 % during stabilization period (first year of operation) and 75 % over the remaining useful life of the project may be considered as reasonable for the purpose of tariff computation"*

GERC in its Orders of 2014 and 2015 for Abellon Clean and RGE Surat (which are primarly MSW plants), permitted PLF of 60% for 1st year and 80% / 85.6% from 2nd year onwards.

The Commission has taken note of the above.

6.3.3 RDF is basically processed from MSW and is capable of higher heat content and higher PLF. GERC in its Order of 2011 for Hanjer Green Power have permitted higher PLF of 80% in this regard.

6.3.4 Therefore, in view of the above, the threshold Plant Load Factor for determining fixed charge component of tariff for the power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) shall be:

	PLF	MSW	RDF
a)	**During Stabilisation**	**65%**	**65%**
b)	**During the remaining period of the first year (after stabilization)**	**65%**	**65%**
c)	**From 2nd Year onwards**	**75%**	**80%**

7. Insertion of new Regulation 33 D : Auxiliary consumption

7.1 Commission's Proposal in Draft Regulation

The auxiliary power consumption for the power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) shall be 12.5%

7.2 Comments Received

7.2.1. Abellon Clean Energy Ltd., opined that Auxiliary consumption for MSW based WtE plants operating on air-cooled condenser to be 15 % as it is technically incorrect to assume that a 13.85 MW plant running on MSW where the fuel requirement is 748 TPD will have the same equipment capacity sizing as a 13.85 MW biomass based power plant where the fuel requirement is only 262 TPD. Therefore, the following may be studied before fixing the auxiliary consumption:-

- Global operational data
- Usage of air cooled and water cooled condensers
- Higher usage of MSW in MSW plants vis-a-vis biomass plants
- Biomass and WtE plants cannot be compared due to design of plant, combustion technologies
- Requirement of larger ash handling in WtE plants.

7.2.3 Essel Infraprojects suggested that auxiliary consumption for MSW based plant is normally in excess of 15% due to continuous working and additional auxiliaries in various stages of MSW processing. This is due to difference in auxiliary system for MSW and biomass projects in the feeding system, combustion grate, hydraulic station, consumption of air for firing requiring 40 & bigger fans in MSW plant, requirement of start up burners etc. They also refered to MERC and GERC Orders specifying auxiliary consumption to be 15 % and 16 % respectively.

7.3 Analysis and Commission's decision

7.3.1 For biomass projects, auxiliary consumption is fixed at 10% after stabilization. However, unlike any other power station, the Rankine Cycle Combustion Based Power Plants utilizing MSW as input requires to install MSW handling facilities that consume higher electricity

7.3.2 While MPERC considered 11.5% as auxiliary consumption, GERC has considered 11.5% as auxiliary consumption for RDF based projects in its Order of 2010 for Hanjer Power for the reason that auxiliary consumption of the plant depends on the consumption of the auxiliary units associated with the main plant and machineries.

7.3.3 In its Order in 2013 for Abellon Clean Ahmedabad Ltd (based on 10% RDF and 90% MSW), GERC allowed auxiliary consumption of 12% for the MSW plant which used air cooled condenser

7.3.4. Maharashtra Electricity Regulatory Commission (MERC) in its Order of 2014 for the MSW plant for Rochem Green Energy (P) Ltd had approved auxiliary consumption of 15% based on various technical parameters of other componants of the plant

7.3.5 In 2014, GERC in the Order for RGE Surat for MSW plants, raised the auxiliary consumption to 16% as it was noted that , in comparison to conventional coal/ biomass and bagasse plant, consumption of energy in MSW plants takes place in various auxiliary equipments (which differ in size, quantities, capacities)

7.3.6 The Commission has noted the comments received and the views of other Commissions in their Orders for MSW and RDF based WtE plants and is of the view that the auxiliary consumption for both MSW plants and RDF plants may be increased to 15% in view of the fact that the equipment for processing the Waste material is of higher capacity with changed design, combustion technologies vis-à-vis conventional plants

7.3.7 Accordingly, while the normative Auxiliary Consumption for Rankine Cycle Combustion based Power Plants utilizing **RDF** as input **and MSW plants** for determining fixed charge component of tariff **is fixed at 15 %.**

7.3.8 The Regulations are modified as hereunder :

The auxiliary power consumption for the power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) shall be 15%

8. Insertion of new Regulation 33 E : Station Heat Rate

8.1 Commission's Proposal on in draft regulation:

The Station Heat Rate for power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) shall be 4200 kcal/kWh.

8.2 Comments Received

JITF opined that similar to biomass projects , Vibrating Grate/ Reciprocating Grate type Boiler are advisable to be used in WtE project. As the chlorine content in fuel differs, the SHR also differs. Thus SHR of 4500/kcal/kwh may be considered for WtE projects.

8.3 Analysis and Commission's decision

8.3.1 In biomass power plants, CERC has taken design SHR and provided 10%-12% operating margin. MSW fuel is abrasive and having heterogeneous characteristics. It has poor physical and chemical characteristics and is an inferior fuel even when compared with Paddy straw. The Boiler has low thermal efficiency and the efficiency of the boiler will further decrease due to corrosion in furnace by the chloride content deposited on furnace, super heater & boiler tubes.

8.3.2. MPERC has considered SHR of 4000 kCal/kWh for the purpose of determination of tariff

8.3.3 While GERC in its Orders of 2010 for Hanjer and 2014 for Abellon Clean has considered SHR of 4100 kCal/kWh, the same was reduced to 3587 kCal/kwh with conversion efficiency of 24% for RGE Surat in 2015.

8.3.4. As per data provided by MoUD, SHR of MSW projects ranges from 3500 Kcal/Kwh to 4200 kcal/Kwh

8.3.5. The Commission opines that it has been reasonable in proposing SHR after all technical considerations.

8.3.6. Accordingly, the proposed Regulations of **SHR for RDF and MSW power projects to be 4200 Kcal/kWh is retained .**

9. Insertion of new Regulation 33 F : Operation and Maintenance Expenses

9.1 Commission's Proposal on in draft regulation:

(1) Normative O&M expenses for FY 2015-16 for the power projects which use municipal solid waste (MSW) or refuse derived fuel (RDF) shall be 5% of normative capital cost.

(2) Normative O&M expenses allowed for FY 2015-16 for the power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) respectively under these Regulations shall be escalated @ 5.72% per annum.

9.2 Comments Received

9.2.1. Essel Infra have stated that as per the Technical Memorandum on Investment and Funding Strategies prepared under the National Master Plan for development of Waste to Energy by National Bio-Energy Board under the MNRE, 2006, the O&M cost for MSW based WtE project is in range of 6.5 - 9.44% for MSW (using Bio-methanation and Gasification technology) and 13.5% for RDF based WtE projects. Accordingly, they have suggested the O&M norms to be in the range of 6-7.5% for MSW based WtE plants

9.2.2. JITF proposed to fix the O&M cost at 8 % of the capital cost for 2015-16 with an escalation of 5.72% thereafter. This is being suggested in view of additional costs being incurred to treat the flue gases by using activated carbon, hydrated lime, bag filters and separate lechate treatment.

9.2.3. Tata Power commented (based on budgetary quotes received for technology providers for complete O&M Charges) that the proposed norms need to be revised upwards to Rs 1 Cr/MW for MSW power plants.

9.2.4. IL &FS suggested that the O&M Cost for RDF based plant should be considered at least at 7.7% of capital cost , keeping in view additional costs at Rs. 10 lakh / MW incurred for installing Bag Filters to remove the Suspended Particulate Matters, costs on lime injection and disposal of Fly Ash either in landfill or by way of blocks.

9.3 Analysis and Commission's decision

9.3.1. The Operation and Maintenance Expenses comprise manpower expenses, insurance expenses, spares and repairs, consumables and other expenses (statutory fees etc.).

9.3.2 While GERC has considered 5% and 4.78% of capital cost as the O&M expenses in its Order for Hanjer Green Power in 2010 and for Abellon Clean in 2014 respectively, it had considered 7.58% of capital cost for RGE Surat based on project specific design.

9.3.3. MPERC has considered 5% of capital cost as the O&M Expenses with 5.72% escalation factor.

9.3.4. In view of the above and considering the fact that higher expenses are involved in treating the wastes (being heterogeneous in nature), the normative O&M expenses for the first year of the Control Period (i.e, FY 2015- 16) for the Rankine Cycle Combustion Based Power Plants utilizing MSW / RDF as input for determining fixed charge component of Tariff is considered at **6 % of normative capital** cost determined and approved, which would be **escalated at the rate of 5.72%** per annum.

9.3.5. Hence, on the normative capital cost of Rs. 9 Crores/MW for RDF based MSW power projects and Rs 15 Crore/MW for MSW power projects, the normative O&M expenses for 2015-16 works out to Rs. 0.54 Crores / MW and Rs. 0.90 Crore/MW respectively.

9.3.6 Accordingly, the proposed Regulation is amended as following:-

(1) Normative O&M expenses for FY 2015-16 for the power projects which use municipal solid waste (MSW) or refuse derived fuel (RDF) shall be 6% of normative capital cost.

(2) Normative O&M expenses allowed for FY 2015-16 for the power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) respectively under these Regulations shall be escalated @ 5.72% per annum.

10. Insertion of new Regulation 33 G : Calorific Value

10.1 Commission's Proposal in draft regulation:

The calorific value of the refuse derived fuel (RDF) used for the purpose of determination of tariff shall be 2500 kcal/kg.

10.2 Comments Received

10.2.1. JITF and A2Z commented that GCV of RDF should be adopted as 2250 kcal/kg as the same has been considered by other SERCs too. Moreover, while the GCV of raw MSW varies between 800-1000 kcal/kg, after processing of MSW , the resultant GCV is in the range of 2000 to 2400 Kcal/kg

10.2.2. Tata Power commented that calorific value of RDF based WtE projects should be 2500 Kcal/Kg and the GCV for MSW should be separately specified, as there is no variable cost factor for power from MSW.

10.2.3. Abellon Energy and KPMG suggested that same GCV cannot be considered for Raw MSW and RDF

10.3 Analysis and Commission's decision

10.3.1 The history of waste to energy plants in India suggests that the major reason of failure of waste to energy plants is variable calorific value of Indian wastes. Indian wastes are low in organic contents therefore its waste has low calorific value

10.3.2 GERC in its Order for Abellon Clean in 2014 has considered 1820 kcal/kg for MSW and 2250 kcal/kg for RDF. In its Order for MSW plant for RGE Surat in 2015, GERC fixed a GCV of 1650 kCal/kg.

10.3.3. MPERC has considered calorific value of 2250 kCal/kg for the purpose of determination of tariff