Consultation Paper on the Proposed Norms for Determining Generic Tariff for Electricity Generated from MinI-hydel, Bagasse based Co-generation and Biomass based Power Plants to be commissioned during the control period 01.04.2018 to 31.03.2021

I. Preamble:

1. The Karnataka Electricity Regulatory Commission has determined the tariff for the Renewable Energy (RE) based power generation plants vide its Order dated 18.01.2005, under the provisions of the Electricity Act, 2003 and Regulations framed thereunder. The tariff determined in the said Order was made applicable to all power purchase agreements filed before the Commission on and after 10.06.2004 and was applicable for a period of 10 years from the date of commercial operation of the respective plants. Further, the tariff so determined was subject to review after the end of the control period of five years. Hence, the Commission at the end of the control period had issued a Tariff Order for the RE sources on 11.12.2009. The Tariff determined in the said order was applicable to all the Power Purchase Agreements submitted to the Commission for approval on or after 01.01.2010 and for a period of 10 years from the date of signing of PPA. Such tariff was subject to review after five years and was due for revision from 01.01.2015. Subsequently, the Commission passed order on 01.01.2015 determining the tariff for Mini-Hydel, Bagasse based co-generation and Rankine cycle based biomass power plants with water cooled condenser. This tariff determined was made applicable to such power plants commissioned during the period between 01.01.2015 and 31.03.2018 for which PPAs have not been entered into prior to the date of issue of the said Order. Further, the said order also specified that the variable cost determined for Bagasse based co-generation and Rankine cycle based biomass power plants with water cooled condenser will be reviewed after 31.03.2018.

2. Further, the Commission vide its Order dated 10.07.2014, has determined the tariff for Rankine cycle based biomass power plants with air cooled condenser and the tariff determined was made applicable to such

projects achieving commercial operation during the period from 01.04.2014 to 31.03.2018.

3. The Commission vide Order dated 22.01.2015, has also re-determined the tariff for existing biomass based power plants with water cooled condenser and bagasse based co-generation power plants, keeping in view the revised fuel costs, for the period 2014-15 to 2017-18. In the said order the Commission has also stated that where the tariff worked out in the Orde, is lower than the tariff now applicable to existing units, the existing tariff as per PPA shall continue till such time the tariff as determined above exceeds the tariff as per the PPA, after which the tariff as per the above Order shall be applicable. Further, in the said Order it was stated that the fuel cost for the existing biomass based power plants with water cooled condenser and bagasse based co-generation power plants, after 31.03.2018 will be as may be determined by the Commission after taking into account the then prevailing fuel prices and other factors.

4. The Commission has separately issued orders for wind power plants on 04.09.2017 and the tariff determined in the said Order would be in force till 31st March, 2018. The Commission in the said order has stated that the issue of future procurement of wind power only through bidding will be dealt in a separate Order. Therefore, the determination of Tariff for wind power projects is not considered in this paper.

5. In view of the above, there is a need to determine tariff for Mini-Hydel, Bagasse based co-generation and Rankine cycle based biomass power plants with water cooled condenser as well as air-cooled condenser which are likely to be commissioned after 31.03.2018. Further, the tariff for existing bagasse based co-generation and Rankine cycle based biomass power plants with water cooled condenser also needs to revised, keeping in view the proposed revision in fuel costs. Thus, the Commission proposes the norms for determination of tariff for the above power plants as envisaged in this discussion paper.

II. **In exercise of the powers conferred under Section 62(1)(a) read with Section 64 and Section 86(1)(e) and other enabling provisions of the Electricity Act, 2003 and the KERC (Procurement of Energy from Renewable Sources) Regulations,2011, the Karnataka Electricity Regulatory Commission hereby proposes to determine the generic tariff for Mini-hydel Plants, Bagasse based Co-Generation Power Plants and Biomass based Power Plants with water cooled condenser/air cooled condenser. The Commission also proposes to revise the tariff for existing bagasse based co-generation and Rankine cycle based biomass power plants with water cooled condenser keeping in view the proposed revision in fuel costs. Therefore, this consultation paper is being issued inviting comments/views/suggestions from the Stakeholders.**

III. Status of RE Projects in the State:

The RE-installed capacity in the State as on 31.10.2017 is as follows:

Source	**Allotted capacity (MW)**	**Installed capacity MW***
Wind	16308	3840
Mini-Hydro	2997	852
Co-gen in sugar industry	2044	1386
Biomass/biogas	391	134
Waste to energy	26	0
Solar	7185	1493
Total	**28951**	**7705**

***Source: KREDL Website**

It is noted that out of the total allotted capacity of 28, 951MW, allocation of 5862 MW capacity is cancelled and only 7705 MW capacity is installed.

IV. Tariff related issues:

1. Common Issues:

The following are the common issues involved in the determination of tariff:

(i) Applicability:

The proposals as made out in this consultation paper, shall be applicable for Mini-hydel power Plants with installed capacity upto and including 25 MW, Bagasse based Co-Generation Power Plants and Biomass based power plants with water cooled condenser as well as air cooled condenser to be commissioned during the period from 01.04.2018 to 31.03.2021 and the tariff determined shall be applicable for the period of the PPA i.e.,20 years.

Further, based on the fuel parameters proposed in this paper, the Commission proposes to revise the variable costs for existing Bagasse based Co-Generation Power Plants and Biomass based power plants with water cooled condenser also. It is also proposed to retain the fixed cost for existing Bagasse based Co-Generation Power Plants and Biomass based power plants with water cooled condenser as approved in the order dated 22.01.2015 for power plants which have signed PPAs as per 2005 Order & earlier and as per 2009 Order. Also, for power plants which have signed PPAs as per the 2015 Order, the fixed cost as determined in the Order dated 01.01.2015 is proposed to be retained.

(ii) Methodology:

The Commission proposes to determine a levellised tariff for the fixed costs over the life of the project. The variable cost, wherever fuel is involved, would be based on the specific fuel consumption and the proposed fuel cost.

For the purpose of levellised tariff, it is proposed to consider the life period of the plant as 35 years for Mini-hydel plants; and 20 years for bagasse based cogeneration and biomass plants in line with the CERC Regulations in the matter.

Further to compute the levellised tariff, it is proposed to consider the normative weighted average cost of capital[WACC} as the discount factor.

(iii) Tariff to be single part or two parts:

The Commission **proposes to continue single part tariff for Mini-hydel projects** as there is no variable cost component. However, the single part tariff is proposed to be on levellised basis.

In the case of bagasse based co-generation projects and biomass based plants, it is proposed to have two-part tariff, as these power plants use bio-fuel and thus have variable cost components. The fixed cost would be levellised for the life of the plant and the variable cost would be determined for a period of three years.

Further, the recovery of fixed cost is proposed to be linked to normative PLF. For any reduction in normative PLF, the fixed levellised/unit fixed costs shall be reduced on pro-rata basis.

(iv) Factoring of Incentives allowed by the Government in tariff computations:

As has been the practice earlier, the Commission, as a promotional measure, proposes not to factor any incentives or subsidies extended by the Central or State Government, for tariff computations of RE sources.

(v) Power Purchase Agreements[PPAs]:

The RE generators selling electricity to the distribution licensees of the State shall enter into PPA in the standard format approved by

the Commission. Any deviation to the clauses in the standard format shall be approved by the Commission.

(vi) Tariff for infirm power injected during stabilisation period and for energy generated beyond normative PLF:

Tariff for infirm power injected during stabilisation period is proposed to be continued at fifty percent of the generic tariff applicable to the specific type of the project.

For energy generated beyond normative PLF, the tariff is proposed to be the levellised tariff as per the proposed norms in this paper for Mini-hydel power plants. For co-generation and biomass plants, it is proposed to be the variable cost/unit based on the proposed norms plus 2% of the variable cost.

(vii) Sharing of Clean Development Mechanism (CDM) benefits:

The Commission proposes to adopt the sharing of CDM benefits as per the Central Electricity Regulatory Commission (CERC) Regulations dated 17.04.2017, as detailed below:

a) 100% of gross proceeds on account of CDM benefit are to be retained by the project developer in the first year after the date of commercial operation of the generating station,

b) In the second year, the share of beneficiaries shall be 10%, which shall be progressively increased by 10% every year till it reaches 50%, whereafter, the proceeds shall be shared in equal proportion by the generating companies and the beneficiaries.

(vii) **Wheeling & Banking charges and Surcharges, in the case of third party sales:**

For Captive use and third party sale of the energy generated, the Transmission charges, Wheeling & Banking charges, Cross-subsidy surcharge and additional Surcharge shall be as determined by the Commission in its orders issued from time to time.

(viii) Reactive power charges & Start-up Power Charges:

The reactive power charges of 40 paise/kVArh as approved in the 2015 RE Tariff Order is proposed to be continued.

For start-up power and power drawn by the generating units for other purposes (other than during construction), it is proposed to continue the applicable HT industrial tariff, which shall be paid by the generator to the ESCOM where the generator is located. However, such drawal shall be limited to 10% of the monthly energy generated based on normative PLF/CUF and any drawal beyond 10% shall be billed at the applicable temporary tariff.

(ix) **Merit Order Dispatch**:

The Commission proposes to discontinue with its earlier policy of not applying Merit order dispatch for all RE projects, as the sector has attained maturity. However, scheduling and dispatch from such RE sources shall be as per the Regulations issued from time to time.

2. Common Financial Parameters:

The following financial parameters, which are common to all the categories of renewable sources of generation is proposed to be adopted uniformly for the renewable energy power projects considered in this consultation paper:

(a) Debt Equity Ratio (DE Ratio):

The Commission proposes to continue the existing Debt Equity Ratio of 70:30.

(b) Return on Equity (RoE):

The Commission had earlier adopted RoE of 16% in tune with the RoE adopted by CERC. CERC has revised the RoE to 14% in its Regulations dated 17.04.2017. Therefore, the Commission proposes adoption of RoE of 14% and to allow actual Income Tax paid by the generator on the applicable RoE as a pass through, as per tax rates applicable from time to time.

(c) Interest on Term Loan:

The Commission in its RE Tariff Order dated 01.01.2015, has allowed 12.50% as the interest rate on term-loans. For Rankine cycle biomass power plants also, the Commission in its Order dated 10.07.2014 has allowed 12.50% as the interest rate. The interest rate proposed/adopted by the CERC and some of the other State Regulatory Commissions is indicated below:

Regulatory Commission	Interest rate	Order dated
Andhra Pradesh	12.30%	30.03.2017 Wind Tariff Order
Tamil Nadu	11.00%	28.03.2017 Solar Tariff Order
Maharashtra	11.00%	28.04.2017
Rajasthan	12.30%	10.07.2017 Wind tariff order
Gujarat	11.40%	14.12.2016 Mini-Hydel Tariff Order
Madhya Pradesh	12.00%	17.03.2016 Wind tariff Order
CERC Normative interest rate of two hundred (200) basis points above the average State Bank of India MCLR (Marginal Cost Lending Rate - one-year tenor) prevalent during the last available six months is considered	10.66%	31.05.2017

It is noted that the interest rate adopted by various Commissions is in the range of 10.66% to 12.30%.

The Commission notes that, with effect from 01.04.2017, Indian Renewable Energy Development Agency (IREDA) has revised the interest rates, which varies from 10.35% to 11.50% for RE projects other than wind projects, with a reduction of 25, 20 and 15 base points for grades 1 to 3 respectively with external grading.

Similarly, PFC has revised the rate of interest from 01.06.2017, which varies from 9.60% to 10.0% for State Sector and 9.75% to 11.00% for private sector with rating IR-1 to IR-5 respectively for RE sources other than Biomass Power Plants. For Biomass Power Plants it varies from 10.50% to 11.00% for State Sector and 11.00% to 12.00% for Private Sector.

As per the latest data for November,2017, the MCLR of SBI is ranging between 7.95% to 8.10% for loan tenure varying from one year to three years. Considering 200 bps above MCLR, the maximum interest rate would be 10.10%.

The above facts indicate that the domestic loan would attract interest rate in the range of 9.60 to 12.00%, depending upon the credit ratings of the RE generators, with the average working out to 10.80%.

Hence, the Commission proposes to adopt 11.00% as the interest rate on term loans. The tenure of debt is considered as 13 years in tune with the latest CERC Regulations dated 17.04.2017.

(d) Depreciation:

The Commission proposes to provide 5.38% of the capital cost as the depreciation per annum on straight-line method for the first thirteen years, to ensure debt servicing. The remaining value of the depreciable assets excluding salvage value of 10% is proposed to be recovered during the balance period of the plant life. For this purpose, the value of depreciable assets is proposed to be considered as 85% of the capital cost.

(e) Interest on working capital:

The Commission in its 2015 RE Tariff Order has considered 13.25% as the interest rate on working capital. The interest rate proposed/adopted by the CERC and some of the other State Regulatory Commissions is indicated below:

Regulatory Commission	Interest rate	Order dated
Andhra Pradesh	12.80%	30.03.2017 Wind Tariff Order
Tamil Nadu	11.50%	28.03.2017 Solar Tariff Order
Maharashtra	11.00%	28.04.2017
Rajasthan	11.80%	10.07.2017 Wind tariff order
Gujarat	11.40%	14.12.2016 Mini-Hydel Tariff Order
Madhya Pradesh	12.50%	17.03.2016 Wind tariff Order
CERC Normative interest rate of three hundred (200) basis points above the average State Bank of India MCLR (Marginal Cost Lending Rate - one-year tenor) prevalent during the last available six months is considered	11.66%	31.05.2017

As per the above information, the interest rate on working capital adopted by various Commissions is in the range of 11% to 12.80%.

Considering the above facts, the Commission proposes to adopt 12.00% as the interest on working capital.

The Commission in its tariff order dated 01.01.2015 has considered two months' receivables for mini-hydel and bagasse based cogeneration power plants and two months' receivables plus two months' variable costs for biomass based RE power plants as working capital. The Commission proposes to continue the existing norms for computing working capital.

(f) Income Tax:

The Commission proposes to allow Income Tax, surcharge & cess as a pass-through without factoring in the same for tariff computations. The amount of Income Tax, surcharge & cess that has to be claimed shall be worked out on the amount of RoE approved by the Commission. The Income Tax at the rates [including surcharge & cess] prevailing in the relevant years shall be claimed separately from the ESCOMs, duly furnishing the necessary proof of tax payment.

V. **Issues applicable to specific RE projects:**

1. Mini-hydel power plants:

a. Capital cost:

The Commission in its order dated 01.01.2015 had approved a capital cost of Rs. 6.20 Crs/MW including the evacuation cost.

The capital cost considered by the various Commissions is indicated below:

Regulatory Commission	Capital cost- Rs. Crs/MW	Order dated
Gujarath	7.48 for 5 MW to 25 MW 8.20 for less than 5 MW	14.12.2016
Kerala	5.93 for 5 MW to 25 MW 6.46 for less than 5 MW	Kerala State Electricity Regulatory Commission (Renewable Energy) Regulations, 2015. Dated 11.11.2015
MERC	Reduced to 5.45 from 5.51 for > 5 MW and upto and including 25 MW Reduced to 5.99 from 6.05 > 1 MW and upto and including 5 MW	28.04.2017
CERC	7.07 for 5 MW to 25 MW 7.79 for less than 5 MW	31.05.2017

The Commission notes that the capital cost adopted by the SERCs in the neighbouring States of Kerala and Maharashtra is in the range of Rs. 5.45 to 6.46 Crs./MW. **Considering the above facts, the Commission proposes to continue Rs.6.20 Crs/MW as the capital cost including the power evacuation infrastructure cost.**

b. Plant Load factor:

In the order dated 01.01.2015, the Commission has approved a PLF of 30%. The PLF considered by other Commissions is indicated below:

Regulatory Commission	% PLF	Order dated
Gujarath	42	14.12.2016
Kerala	30	Kerala State Electricity Regulatory Commission (Renewable Energy) Regulations, 2015. Dated 11.11.2015
MERC	30	28.04.2017
CERC	30	31.05.2017

Thus, the Commission proposes to continue with the existing PLF of 30%.

c. Auxiliary Consumption:

The auxiliary consumption approved by the Commission in its order dated 01.01.2015, is 1% of the energy generated. The KSERC, the MERC, the GERC, as well as the CERC have also approved auxiliary consumption of 1% for mini-hydel plants. **Hence, the Commission proposes to continue with the existing auxiliary consumption at 1%.**

d. O & M expenses and annual escalation rate:

The O & M expenses approved by the Commission in its Order dated 01.01.2015 is 2.0% of the capital cost with an annual escalation of 5.72%. The O & M expenses considered by other Commissions are indicated as follows:

Regulatory Commission	O & M expenses	Order dated
GERC	2.5% of CC for 5-25 MW capacity and 3.3% of CC for below 5 MW capacity	14.12.2016
Kerala	16.54 lakhs/MW for 5 MW to 25 MW with annual escalation of 5.72% 23.63 lakhs/MW for less than 5 MW with annual escalation of 5.72%	Kerala State Electricity Regulatory Commission (Renewable Energy) Regulations, 2015. Dated 11.11.2015
MERC	16.65 lakhs/MW for > 5 MW and upto and including 25 MW 23.52 lakhs/MW > 1 MW and upto and including 5 MW	28.04.2017
CERC	21 lakhs/MW for 5 MW to 25 MW with annual escalation of 5.72% 29 lakhs/MW for less than 5 MW with annual escalation of 5.72%	31.05.2017

It is proposed to retain O & M expenses at 2.0% of capital cost. The annual escalation is proposed to be continued at 5.72%.

2. Bagasse based Co-generation power plants:

a. Capital cost:

The Commission in its Order dated 01.01.2015 had approved a capital cost of Rs. 4.75 Crs/MW including the power evacuation infrastructure cost.

The capital cost considered by other Commissions is indicated below:

Regulatory Commission	Capital cost-Rs. Crs/MW	Order dated
Tamil Nadu	5.20	31.03.2016
Maharashtra	4.83 reduced from 4.89	28.04.2017
Gujarat	4.57	08.08.2013
Madhya Pradesh	4.36	01.04.2013
CERC	4.93	31.05.2017

The Commission notes that the capital cost adopted by other Commissions is in the range of Rs. 4.36 to 5.20 Crs/MW. **Considering the above facts, the Commission proposes to continue the capital cost at Rs.4.75 Crs/MW, including the power evacuation infrastructure cost.**

b. Plant Load factor:

In its Order dated 01.01.2015, the Commission has approved a PLF of 60%. The PLF adopted by the CERC and some of the other State Commissions are indicated below:

Regulatory Commission	% PLF	Order dated
Tamil Nadu	55	31.03.2016
Maharashtra	60	28.04.2017
Gujarat	60	08.08.2013
Madhya Pradesh	53	01.04.2013
CERC	53	31.05.2017

The Commission proposes to continue with the existing PLF of 60% for the bagasse co-generation plants.

c. Auxiliary Consumption:

The auxiliary consumption approved by the Commission in its Tariff Order 01.01.2015, for the bagasse based co-generation plants is 9%. The auxiliary consumption adopted by the CERC and some of the other State Commissions are indicated below:

Regulatory Commission	% auxiliary consumption	Order dated
Tamil Nadu	8.50	31.03.2016
Maharashtra	8.50	28.04.2017
Gujarat	8.50	08.08.2013
Madhya Pradesh	8.50	01.04.2013
CERC	8.50	31.05.2017

Considering the above facts, the Commission proposes to revise the auxiliary consumption to 8.5% from the existing 9%, for the bagasse co-generation plants.

d. O & M expenses and annual escalation rate:

In its Order dated 01.01.2015, the Commission has approved 3.0% of the Capital Cost [CC]as the allowable O & M expenses with 5.72% annual escalation. The O & M Cost adopted by the CERC and some of the other State Commissions are indicated below:

Regulatory Commission	O & M cost	Order dated
Tamil Nadu	Rs.18.91 lakhs/MW with 5.72% annual escalation	31.03.2016
Maharashtra	18.69 lakhs/MW for FY18	28.04.2017
Gujarat	3% of CC with 5.72% escalation	08.08.2013
Madhya Pradesh	3% of CC with 5% escalation	01.04.2013
CERC	Rs. 21.13 lakhs/MW with 5.72% escalation	31.05.2017

The Commission proposes to continue 3.0% of the Capital cost as the allowable O & M expenses in the base year with annual escalation of 5.72% for the bagasse co-generation plants.

e. Specific fuel consumption:

The Commission has approved specific fuel consumption of 1.60 kg/kWh for the existing plants considering the calorific value of

bagasse as 2250 kcal/kg and heat rate of 3600 kcal/kWh. The specific fuel consumption adopted by other Commissions is as indicated below:

Regulatory Commission	Specific fuel consumption kg/kWh	Order dated
Tamil Nadu	1.41	31.03.2016
Maharashtra	1.60	28.04.2017
Gujarat	1.60	08.08.2013
Madhya Pradesh	1.60	01.04.2013
CERC	1.60	31.05.2017

The Commission proposes to continue with the existing specific fuel consumption of 1.60 kg/kWh.

f. Fuel Cost:

The Commission has approved the fuel cost of Rs. 1600/ MT with 5.72% annual escalation in its order dated 01.01.2015. For FY19 the fuel cost with 5.72% escalation works out to Rs.1890/MT including transportation cost and other costs. The fuel costs adopted by other Commissions is as indicated below:

Regulatory Commission	Fuel Cost Rs./MT	Order dated
Tamil Nadu	1788	31.03.2016
Maharashtra	2273.75 reduced from 2326.84	28.04.2017
Gujarat	1804	08.08.2013
Madhya Pradesh	1583	01.04.2013
CERC	1964.71	31.05.2017

The Commission notes that proposal to set up the co-generation plant is to optimally utilise the scarce energy sources readily available, as an integral part of Sugar factory. Otherwise, the owners of sugar factory will have to handle the problem of disposal of bagasse. Thus, as an integral part of the sugar factory the co-generation plant is set up with almost self-sufficiency in fuel supply for power production. Thus, the Commission is of the view

that the in-house bagasse produced by sugarcane crushing, does not involve any cash outflows. Nevertheless, a nominal price has to be attributed to the bagasse generated internally. In this regard, the Commission notes that for bagasse fuel, the Commission had determined a cost of RS.1600/ton in its Order dated 01.01.2015 and that the cost for FY19, considering escalation of 5.72% would be Rs.1890/MT, which includes the cost of transportation also. The Commission notes that during the proceedings of the Tariff Order dated 01.01.2015, the farmers had submitted that the transportation cost would be Rs. 2000/load for one load of 1.5 tonnes of biomass. Thus, the approximate transportation cost/tonne would be Rs. 1300/-. Hence, the Commission is of the view that, for the internally generated bagasse, considering a cost of Rs.600/tonne would be the reasonable [Rs.1890- Rs. 1300). **Therefore, the Commission proposes a fuel cost of Rs.600/tonne in the base year, for the fuel generated internally. Alternative, for the fuel generated internally, the Commission proposes to:**

a. **link the fuel cost to the domestic pit head unwashed coal cost with GCV of 2250 kcal/kg, on calorific value basis, which varies from Rs.470 to RS.560/MT; or**
b. **link the fuel cost to administered price of sugarcane and consider 30% of such price as bagasse cost, as every tonne of sugarcane crushed produces 30% of bagasse. The administered price for FY18 is fixed at Rs.255 /quintal. Thus, the proposed bagasse price would be Rs.765/MT**

Further for the fuel purchased from outside, the fuel cost for FY 19 is proposed to be Rs.1890/MT and such fuel purchase should be minimal and shall not exceed 20% of the total annual fuel requirement.

Therefore, for the purpose of tariff calculations, the Commission proposes ratio of 80: 20 for the internally generated bagasse and bagasse purchased from outside. Further, an annual escalation of 5.72% is proposed for the fuel cost for bagasse purchased.

The above Fuel Cost is proposed to be made applicable to all the existing bagasse based co-generation plants who have signed PPAs with ESCOMs

as per 2005 RE tariff order & earlier, as per the 2009 RE Tariff Order and as per the 2015 RE Tariff Order and accordingly the tariff for these power plants would be revised for 2018-19 to 2020-21.

3. Biomass based power plants with water cooled condenser and Air cooled condenser:

a. Capital cost:

The Commission in its order dated 01.01.2015, had approved a capital cost of Rs. 5.70 Crs/MW including the power evacuation infrastructure cost for Rankine cycle based biomass power plants with water cooled condenser. Further, for biomass power plants with air cooled condenser, the Commission in its order dated 10.07.2014 had approved a capital cost of RS.5.80 Crs/ MW. The capital cost considered by other Commissions is indicated below:

Regulatory Commission	Capital cost-Rs. Crs/MW	Order dated
Tamil Nadu	5.50 irrespective of technology	31.03.2016
Maharashtra	4.88 irrespective of technology reduced from 4.94	28.04.2017
Gujarat	Water Cooled Condenser: 4.68 Air-Cooled Condenser: 4.98	30.09.2013
Madhya Pradesh	4.63 irrespective of technology	03.05.2013
Rajasthan	Water Cooled Condenser: 5.41 Air-Cooled Condenser: 5.76	23.08.2016
CERC	Water Cooled condenser: 5.59 for other than rice Straw & juliflora and 6.11 for rice Straw & juliflora. Air-Cooled Condenser: 6.00 for other than rice Straw & juliflora and 6.52 for rice Straw & juliflora.	31.05.2017

The Commission notes that the capital cost adopted by other Commissions excluding CERC, is in the range of Rs. 4.63 Crs to Rs 5.50 Crs/MW for water cooled condenser based power plants and

in the range of Rs. 4.63 Crs to Rs. 5.76 Crs/MW for air cooled condenser based power plants.

Therefore, the Commission proposes to retain the capital cost including the power evacuation infrastructure cost at Rs.5.70 Crs/MW for water cooled condenser based power plants and at Rs.5.80 Crs/MW for air cooled condenser based power plants.

b. Plant Load factor:

In the Order dated 01.01.2015 and 10.07.2014, the Commission has approved a PLF of 75% for both water cooled as well as air-cooled condenser based power plants. The PLF adopted by the CERC and some of the other State Commissions are indicated below:

Regulatory Commission	% PLF	Order dated
Tamil Nadu	80% irrespective of technology used	31.03.2016
Maharashtra	60% during stabilisation period; 70% during remaining period of first year after stabilisation; 80% -second year onwards	28.04.2017
Gujarat	70% for 1st year & 80% from 2nd year Onwards irrespective of technology used	30.09.2013
Madhya Pradesh	60% during stabilisation period; 70% during remaining period of first year after stabilisation; 80% -second year onwards irrespective of technology used	02.03.2012
Rajasthan	60% during stabilisation period; 70% during remaining period of first year after stabilisation; 75% -second year onwards irrespective of technology used	23.08.2016
CERC	60% during stabilisation period; 70% during remaining period of first year after stabilisation; 80% -second year onwards irrespective of technology used	31.05.2017

The Commission proposes to continue with the existing PLF of 75% for the biomass based power generation plants, irrespective of the technology adopted.

c. Auxiliary Consumption:

The auxiliary consumption approved by the Commission for the existing Biomass plants is 10% for both water-cooled and air-cooled condenser based power plants. The auxiliary consumption adopted by the CERC and some of the other State Commissions are indicated below:

Regulatory Commission	% auxiliary consumption	Order dated
Tamil Nadu	10% irrespective of technology	31.03.2016
Maharashtra	10% irrespective of technology	28.04.2017
Gujarat	10% irrespective of technology	30.09.2013
Madhya Pradesh	10% irrespective of technology	02.03.2012
Rajasthan	Water Cooled Condenser: 10.50% during stabilisation period of six months and 10% thereafter Air cooled condenser: 12.50% during stabilisation period of six months and 12% thereafter	23.08.2016
CERC	Water Cooled Condenser: 11% during first year and 10% from second year onwards Air cooled condenser: 13% during first year and 12% from second year onwards	31.05.2017

The Commission proposes to continue with the existing auxiliary consumption of 10% for the biomass based power generation plants, irrespective of the technology adopted.

d. O & M expenses and annual escalation rate:

The Commission, In the Order dated 01.01.2015, has approved 30 lakhs/MW [i.e 5.3% of CC] as the allowable O & M expenses with 5.72% annual escalation for water cooled condenser based power

plants and in the Order dated 10.07.2014, the Commission has approved Rs. 23.20 lakhs/MW as the allowable O & M expenses [4% of the CC] with 5.0% annual escalation for air cooled condenser based power plants. The O & M cost adopted by the CERC and some of the other State Commissions is indicated below:

Regulatory Commission	**O & M cost**	**Order dated**
Tamil Nadu	4.5% of the capital cost with escalation of 5.72% on plant and machinery by considering 85% of the capital cost as the cost of plant and machinery. For land and civil works, which constitutes 15% of capital investment, 0.90% of 15% of capital cost would be continued as Operation and Maintenance expenditure every year with an annual escalation of 5.72%.	31.03.2016
Maharashtra	28.39 lakhs/MW for FY18 considering 5.32% of CC for FY16 and applying escalation factors as per Regulations	28.04.2017
Gujarat	5% of CC escalated by 5.72% every year, irrespective of technology used	30.09.2013
Madhya Pradesh	4% of CC escalated by 5.72% every year, irrespective of technology used	02.03.2012
Rajasthan	Water cooled: 37.72 lakhs/MW for FY17 Air-cooled: 40.22 Lakhs/MW for FY 17 Annual Escalation :5.85%	23.08.2016
CERC	40 Lakhs/MW for FY18 escalated by 5.72% every year, irrespective of technology used	31.05.2017

The Commission proposes to adopt 5.0% of the Capital Cost [CC]as the allowable O & M expenses in the base year FY19 for biomass

power plants with water cooled condenser and 4% of CC for air-cooled condenser power plants. The annual escalation is proposed at 5.72%.

e. Specific fuel consumption:

The Commission has approved specific fuel consumption of 1.18 kg/kWh for the existing plants with air cooled condenser considering the calorific value of Biomass as 3300 kcal/kg and heat rate of 3900 kcal/kWh. Similarly, for water cooled power plants, the Commission has approved specific fuel consumption of 1.21 kg/kWh, considering the calorific value of Biomass as 3300 kcal/kg and heat rate of 4000 kcal/kWh The specific fuel consumption adopted by other Commissions is as indicated below:

Regulatory Commission	Specific fuel consumption kg/kWh	Order dated
Andhra Pradesh	1.35 irrespective of technology SHR: 4200 kcal/Unit; GCV: 3100 kcal/kg	16.05.2014
Tamil Nadu	1.20 irrespective of technology SHR: 3840 kcal/Unit; GCV: 3200 kcal/kg	31.03.2016
Maharashtra	1.16 irrespective of technology SHR: 4200 kcal/Unit; GCV: 3611 kcal/kg	28.04.2017
Gujarat	Water cooled:1.12 SHR:3800 kacl/kWh; GCV:3400 kcal/kg Air cooled:1.16 SHR:3950 kacl/kWh; GCV:3400 kcal/kg	30.09.2013
Madhya Pradesh	1.35 irrespective of technology SHR: 4200 kcal/Unit; GCV: 3100 kcal/kg	30.11.2016
Rajasthan	Water cooled:1.24 SHR:4200 kacl/kWh[after stabilisation period]; GCV:3400 kcal/kg Air cooled:1.31 SHR:4440 kacl/kWh[after stabilisation period]; GCV:3400 kcal/kg	23.08.2016
CERC	1.35 for travelling grate boiler SHR: 4200 kcal/unit; GCV:3100 kcal/kg 1.33 for AFBC boiler SHR: 4125 kcal/unit; GCV:3100 kcal/kg	31.05.2017

The Commission notes that the specific fuel consumption varies from 1.12 to 1.35 kg/unit across the States. The Commission in its Order dated 01.01.2015 has approved specific fuel consumption of 1.21 kg/kWh for water cooled condenser based power plants and 1.18 kg/kWh for air cooled based power plants. **Therefore, it is proposed to adopt specific fuel consumption of 1.21 kg/kWh for water cooled based power plants and 1.18 kg/kWh for air cooled condenser based power plants.**

f. Fuel Cost:

The Commission notes that biomass fuel cost allowed by APERC, TNERC, GERC, MPERC & RERC is in the range of RS.2613 to RS.2892/MT. The Commission has approved the fuel cost of Rs. 2100/ MT with 5.72% annual escalation in its order dated 01.01.2015. As the fuel cost depends upon the State specific issues like availability of different types of biomass, taxes, transportation cost etc., **the Commission proposes to adopt a fuel price of Rs.2500/MT for biomass fuel in the State for both water cooled and air cooled condenser based power plants, applying 5.72% annual escalation on Rs.2100/MT.**

The above Fuel Cost is proposed to be made applicable to all the existing biomass based power plants with water cooled condenser, who have signed PPAs with ESCOMs as per 2005 RE Tariff Order & earlier, as per 2009 RE Tariff Order and as per 2015 RE Tariff Order and accordingly the tariff for these power plants would be revised for the period of 2018-19 to 2020-21.

VI. **Gist of the proposed parameters**:

The gist of the proposed parameters is indicated below:

Parameter	Mini-Hydel		Co-generation		Biomass	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
Debt: Equity	70:30	70:30	70:30	70:30	70:30	70:30
RoE	16%	14%	16%	14%	16%	14%
Income Tax	Pass through	Pass through	Pass through	Pass through	Pass through	Pass through
Interest on term loan	12.50%	11.00%	12.50%	11.00%	12.50%	11.00%
Depreciation	5.83% for the first 12-years, and the balance spread over the life of the project	5.38% for the first 13-years, and the balance spread over the life of the project	5.83% for the first 12-years, and the balance spread over the life of the project	5.38% for the first 13-years, and the balance spread over the life of the project	5.83% for the first 12-years, and the balance spread over the life of the water cooled condenser based project 7% for the first 10-years for air cooled condenser based project	5.38% for the first 13-years, and the balance spread over the life of the project
Interest on WC	13.25%	12.00%	13.25%	12.00%	13.25%	12.00%
Capital Cost[CC] - Rs Crs/MW	6.20	6.20	4.75	4.75	5.70 for water cooled & 5.80 for air	5.70 for water cooled & 5.80 for air

					cooled	cooled
O& M as percentage of CC for base year	2.0%	2.0%	3.0%	3.0%	5.30% for water cooled & 4% for air cooled	5.0% of CC for water cooled and 4% of CC for air cooled condenser based power plants
O & M annual escalation	5.72%	5.72%	5.72%	5.72%	5.72% for water cooled & 5% for air cooled	5.72%
PLF	30	30	60%	60%	75%	75%
Auxiliary	1%	1%	9%	8.5%	10%	10%
Specific Fuel consumption-Kg/kWh	Not applicable	Not applicable	1.60	1.60	1.21 for water cooled & 1.18 for air cooled	1.21 for water cooled and 1.18 for air cooled
Fuel Cost-Rs/MT	Not applicable	Not applicable	1600	Rs.470 to 765 for in-house bagasse and Rs.1890 for bagasse purchased	2100 for water cooled & 2000 for air cooled	2500

VII. The Commission invites written comments/views/ suggestions on the above proposals from the stakeholders so as to reach Commission latest by 10.01.2018. In case the stakeholders suggest different capital cost, they are requested to furnish the breakup of capital cost namely land cost, plant & machinery cost, civil work cost, labour cost, Interest during construction, insurance, taxes etc. Further they are requested to furnish documentary evidence to substantiate their comments/views/ suggestions.

Approved by the Commission

Sd/-

Secretary