
TAMIL NADU ELECTRICITY REGULATORY COMMISSION

Consultative paper on power procurement by distribution licensee from Biomass based power plants and allied issues relating to captive use and third party sale

(Comments and Suggestions are invited on or before 10-01-2020)

1.0 Overview

1.1 Biomass is an industry term for getting energy by burning Organic material that comes from plants and animals. Plants or plant-based materials that are not used for food or feed, and are specifically called lignocellulosic biomass. Biomass is a renewable and sustainable source of energy, it can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel.

1.2 The Commission in exercise of the powers vested under the Electricity Act, 2003 and in compliance with the mandate of the Act to promote renewable energy has so far issued several Tariff Orders from time to time in respect of various sources of renewable energy. These orders on renewable energy sources covered Tariff determination for purchase of power by the Distribution licensee, issues related to open access, its promotional aspects and banking of energy depending on the source of renewable power.

1.3 The conducive policies of the Central and State Government for promotion of renewable power has helped the sector to achieve a remarkable progress.

1.4 The total capacity of renewable power in the State is 12180 MW of which Biomass power constitutes 265.59 MW. The last generic Tariff Order of the

Commission in the case of Biomass Power was issued on 28-03-2018 vide order No.3 of 2018 which expires on 31-03-2020.

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

Sub-section (h) of section 61 of the Electricity Act 2003 (Central Act 36 of 2003) stipulates that the State Electricity Regulatory Commissions shall specify the terms and conditions for the determination of tariff, the Commission notified the "Power Procurement from New and Renewable Sources of Energy Regulations 2008" on 08-02-2008 which have been subsequently amended from time to time, as required. Clause 6 of the said Regulations state that while the tariff determined by the Commission would be in force for the time period mentioned in the Tariff Order, the control period would ordinarily be two years.

1.6 Commission's order on NCES based biomass generation and allied Issues

1.6.1. The Commission has so far issued five tariff orders in respect of Biomass. While the first Order No. 3 of 2006 dated 15-05-2006 was a comprehensive order for Wind Energy Generators (WEGs), Biomass based generators and Bagasse based co-generators, the second Order No.2 of 2009 dated 27-04-2009 was issued exclusively for Biomass based power plants and valid upto 31-03-2011 and further extended till 30-06-2012 by way of Tariff Order No. 5 of 2011 dated 21-12-2011. The third Order on Biomass No. 8 of 2012 dated 31-07-2012 was issued with validity for the control period of 2 years till 31-07-2014, which was extended vide Order No.5 of 2014 dt. 28-07-2014 upto the date of issue of next Tariff Order. The fourth

Order on Biomass No.5 of 2016 dated 31-03-2016 was issued with validity for the control period of 2 years till 31-03-2018. The fifth Order on Biomass No.3 of 2018 dated 28-03-2018 was issued with validity for the control period of 2 years till 31-03-2020.

1.7 Commission's initiative on tariff revision for Biomass based generation

As the control period of 2 years is expiring on 31-03-2020, the Commission is issuing this consultative paper to seek the views / suggestions from the stakeholders for the tariff determination for the next control period.

2. Biomass based Power Scenario:

In India:

The biomass power generation capacity in India has rapidly grown over the last few years as the Indian government focused on increasing power generation through renewable energy sources. As of December 1, 2019, the grid-connected biomass power generation capacity in India stood at 9.95 GW (which includes Biomass, Bagasse and Waste to Energy), up from 4.95 GW as of March 31, 2016. Going by the current growth rate in biomass power generation, India is likely to surpass the target of 10 GW by the end of the next fiscal year, way ahead of the target year of 2022. The potential of power generation from bio mass has been assessed as around 25 GW.

In Tamil Nadu:

The installed capacity of Biomass based Power Plants in Tamil Nadu is 265.59 MW till October 2019.

The year-wise capacity addition in Tamil Nadu over the past 19 years is furnished below:

Year	Capacity Addition in MW
upto 2002	18.00
2002-03	1.60
2003-04	0.00
2004-05	1.50
2005-06	7.75
2006-07	17.50
2007-08	26.50
2008-09	36.70
2009-10	27.50
2010-11	6.95
2011-12	25.00
2012-13	8.40
2013-14	33.60
2014-15	19.00
2015-16	0.00
2016-17	0.00
2017-18	7.67
2018-19	27.92
2019-20	0
Till October 2019-Total	265.59

3. Legal Provisions

3.1 Related Provisions of the Electricity Act, 2003:

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

3.1.2. **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) multi year 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:"

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

3.1.4. **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;"

3.2 Related Provisions of the National Electricity Policy:

3.2.1. The guidelines stipulated in the National Electricity Policy on NCES, which are relevant to this Order are reproduced below:

3.2.2. **Clause 5.2.20:** *"Feasible potential of non-conventional energy resources, mainly small hydro, wind and bio-mass 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."*

3.2.3. **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.”

*3.2.4. **Clause 5.12.2:** “The Electricity Act 2003 provides that power 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 license. 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 share 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.”*

3.3 Related Provisions in the Tariff Policy

3.3.1. The Commission is guided by the following specific provisions of the Tariff Policy issued by the Ministry of Power, Government of India relating to promote generation of electricity from renewable sources.

3.3.2. **Second Proviso to Clause 5.2:** *“Provided also that the State Government can notify a policy to encourage investment in the State by allowing setting up of generating plants, including from renewable energy sources out of which a maximum of 35% of the installed capacity can be*

procured by the Distribution Licensees of that State for which the tariff may be determined under Section 62 of the Electricity Act, 2003.”

3.3.3. Clause 5.11(i): *“Tariff fixation for all electricity projects (generation, transmission and distribution) that result in lower Green House Gas (GHG) emissions than the relevant base line 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.”*

3.3.4. 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....”*

3.3.5. Clause 6.4 (1): *“Pursuant to provisions of section 86(l)(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.”

3.3.6. Clause 6.4(2): *“States shall endeavour to procure power*

from renewable energy sources through competitive bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from renewable energy sources from projects above the notified capacity, shall be done through competitive bidding process, from the date to be notified by the Central Government.

However, till such notification, any such procurement of power from renewable energy sources projects, may be done under Section 62 of the Electricity Act, 2003.....”

4. Promotion of New and Renewable Source of Energy

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

5. Applicability of the Order

5.1 The Tariff Order No.3 of 2018 dated 28-03-2018 for Biomass based Power Plants is valid till 31-03-2020. This Order shall come into force from 01-04-2020.

5.2 The tariff proposed to be fixed shall be applicable to all Biomass based Power Plants commissioned during the control period of the Order. The tariff is applicable for purchase of Biomass based Power by Distribution Licensee from Biomass based Power Plants conforming to this Order. The open access charges and other terms and conditions specified in this Order shall be

applicable to all the Biomass based Power Plants, irrespective of their date of commissioning.

5.3 The agreement between the generators and the distribution licensee in relation to all plants commissioned on or after the date of issue of the tariff order shall be in conformity with the said order. The existing Energy Purchase Agreements (EPA) between the generators and the distribution licensee in relation to the tariff shall continue to be valid.

6. Tariff Determination Process

6.1. With regard to tariff determination, the relevant portions of regulation 4 of the Power Procurement from New and Renewable Sources of Energy Regulation, 2008, are reproduced below:

(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 on expiry of control period and on expiry of the extended validity period of the earlier order 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."*

7. Tariff / Pricing Methodology

7.1 The relevant portion of Tariff / Pricing Methodology as specified in Regulation 4 of the Power Procurement from New and Renewable Sources of Energy Regulation, 2008, is 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 Electricity Regulatory 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.

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 under section 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”.

7.2 Cost-Plus Tariff Determination

Cost-Plus Tariff Determination is not the best method as it discourages competition and efficiency. However, to encourage the Biomass based power generation plants and till competitive bidding is introduced, Cost-Plus method is followed. As it can be easily designed to provide adequate return to the investor, the Commission adopts Cost-Plus Tariff approach in this Order.

7.3 Single Part vs. Two Part Tariff

7.3.1. Whenever the fuel cost varies from time to time and the fuel cost is considered as a pass through, the “Cost Plus Two Part Tariff” is adopted. In these cases, the variable component of the tariff would account for any price escalation. The Commission in its Order No.3 of 2018 dated 28-03-2018 adopted the “Cost Plus Two Part Tariff” as the stakeholders were of the view that the two part tariff was convenient to accommodate the fuel cost escalation appropriately. Accordingly, the same approach is proposed for this Order too.

8.0 Issues Relating to Tariff and allied matters:

The Power Procurement from New and Renewable Sources Energy Regulation, 2008, of the Commission specifies that while determining the tariff, the Commission shall adopt appropriate financial and operational

parameters for the tariff determined in a cost-plus scenario.

The Commission has carried out a detailed analysis of the existing policies/procedures and commercial mechanisms in respect of Biomass based power plants.

The following important factors have been considered to arrive at the tariff and other related issues for Biomass based power plants.

1. Capital cost per MW
2. Plant Load Factor (PLF)
3. Debt – Equity ratio
4. Term of loan
5. Interest rate for the loan
6. Return on Equity
7. Life of plant and machinery
8. Depreciation
9. O & M Expenses
10. Station Heat rate
11. Gross calorific value of the fuel
12. Specific fuel consumption
13. Fuel cost
14. Components of working capital
15. Interest on working capital
16. Auxiliary consumption

The issue-wise suggestions of the Commission are discussed below:

8.1.1. Capital cost per MW:

Orders of other Commissions on Capital Cost:

(Rs. in Cr/MW)

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
Rs.6.11Cr/MW	Rs.6.11Cr/MW	Air-Cooled Rs.5.86Cr/MW <u>Water-Cooled</u> Rs.5.76Cr/MW	Rs.5.22Cr/MW	Air-Cooled Rs.5.07Cr/MW <u>Water-Cooled</u> Rs.4.77Cr/MW	Air-Cooled Rs.6.00Cr/MW <u>Water-Cooled</u> Rs.5.59Cr/MW

The Commission in Order No.3 of 2018 dated 28-03-2018 had considered Rs.5.50 Crores / MW as the capital cost.

In this consultative paper, the Commission assumes the capital cost at Rs.6.11 Crs./MW as fixed by CERC. The capital cost includes evacuation cost up to inter-connection point. The Commission also apportions the capital cost on machineries, land and civil works at 85% and 15% respectively.

8.1.2. Plant Load Factor:

Orders of other Commissions on PLF:

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
a) During stabilization (6 mths) : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 80%	a) During stabilization (6 mths) : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 80%	75%	a) Stabilization for 6 months : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 80%	a)During 1 st year : 70% b) Second year onwards : 80%	<u>Air-Cooled & Water Cooled</u> 1 st year : 65% 2 nd year onwards : 80%

The plant load factor of a Biomass based power generation depends on number of factors like availability of fuel, vintage of the plant, etc. The Commission had assumed the PLF at 80% in Order No.3 of 2018 dated 28-03-2018.

PLF at 80% has been maintained in all the earlier tariff orders of the Commission and hence the Commission now proposes to retain the PLF at 80%.

8.1.3. Debt - Equity Ratio:

Orders of other Commissions on Debt-Equity Ratio :

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
70:30	70:30	70:30	70:30	70:30	Air-Cooled & Water Cooled 70:30

The Commission in Order No.3 of 2018 dated 28-03-2018 had specified the ratio as 70:30.

Debt equity ratio of 70:30 is an established financial norm and therefore, the Commission proposes to maintain the norm at 70:30 for the next control period also.

8.1.4. Term of loan

In its Order No.3 of 2018 dated 28-03-2018, the Commission had fixed the tenure of the term loans at 10 years with a moratorium of one year on the consideration that financial institutions generally sanction loans for this time period. While the loan tenor is 13 years in CERC, it is assumed at

12 years in Maharashtra.

Therefore, the Commission proposes to maintain the same norm of ten years with a moratorium of one year for the next control period also.

8.1.5. Interest rate for the loan

Orders of other Commissions on Interest rate for Term Loan:

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
10.41%	10.41%	10.50%	11.31%	11.40%	Air-Cooled & Water Cooled 10.17%

The Commission in its Order No.3 of 2018 dated 28-03-2018 adopted an interest rate on term loan of 9.95% p.a., as specified by CERC.

While the interest rate specified by CERC is at 10.41% and Maharashtra have adopted the interest rate at 11.31%.

The Commission proposes to adopt the interest rate of 10.31%, which is 200 basis points above the average State Bank of India Marginal Cost of Funds based Lending Rate (MCLR) (one year tenor) prevalent during the last available six months, for the next control period.

8.1.6. Return on Equity

Orders of other Commissions on RoE

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
17.60%	17.60%	14% (income tax on RoE pass through)	For first 10 years : 20.39% After 10 years : 22.57%	14%	<u>Air-Cooled & Water Cooled</u> 14%

While CERC fixed a RoE of 17.60% p.a. (pre-tax), ROE adopted by Maharashtra is 20.39% (pre-tax) for the first 10 years and 22.57% (pre-tax) after 10 years and Gujarat is 14% (post-tax).

The Commission in its Order No.3 of 2018 dated 28-03-2018 adopted a RoE of 17.56% (pre-tax) per annum without linking it to MAT and IT.

Now, the Commission proposes a RoE of 17.60% p.a. (pre-tax) as per CERC norms for the next control period.

8.1.7. Life of plant and machinery

Orders of other Commissions on life of plant & machinery

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
20 years	20 years	20 years	20 years	20 years	<u>Air-Cooled & Water Cooled</u> 20 years

For tariff determination process, the project life of a plant is considered as 20 years. The Commission had adopted 20 years as life of the Plant and Machinery in its Order No.3 of 2018 dated 28-03-2018.

All other ERCs have adopted 20 years as the life of the plant and machinery. Therefore, the Commission also proposes to retain the life of plant and machinery at 20 years for the next control period also.

8.1.8. Depreciation

Orders of other Commissions on Depreciation:

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
First 13 years : 5.28%. 14 th year onwards : 3.051%	First 13 years : 5.28%. 14 th year onwards : 3.051%	First 13 years : 5.38% and balance spread equally over the life of the plant.	First 12 years : 5.83% 13 th year onwards : 2.505%	First 10 years : 7% 11-20 th year: 2% p.a.	<u>Air-Cooled & Water Cooled</u> First 13 years : 5.38% and balance spread equally over the life of the plant.

CERC in its Order has fixed the depreciation rate as 5.28% for the first 13 years and 3.051% from the 14th year onwards. The depreciation rates of other ERCs are different to suit their needs.

The Commission in its Order No. 3 of 2018 dated 28-03-2018 adopted the rate of Depreciation as 4.5% p.a. SLM on Plant and Machinery by considering 85% of the capital cost while the accumulated depreciation would be limited to 90% of the plant and machinery.

Therefore, the Commission proposes to continue the existing depreciation rate for the next control period also.

8.1.9. Operation and Maintenance Expenses

Orders of other Commissions on O & M Expenses:

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
Rs.0.45 Crs. / MW with an escalation of 5.72% per year	Rs.0.45 Crs. / MW with an escalation of 5.72% per year	<u>Water Cooled</u> 5% with an escalation of 5.72%. <u>Air Cooled</u> 4% with an escalation of 5.72%.	Rs. 0.30 Crs / MW for FY 2019-20 with an escalation of 2.63% per year	5% of the capital cost for the first year with an escalation of 5.72% per year	<u>Air-Cooled & Water Cooled</u> Rs.0.40 Crs. / MW with an escalation of 5.72% per year

The Commission in its Order No. 3 of 2018 dated 28-03-2018, allowed Operation and Maintenance expenditure (including insurance) at 5% with annual escalation of 5.72% (from second year) 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% was allowed as Operation and Maintenance expenditure every year with an annual escalation of 5.72%.

Therefore, the Commission proposes to follow the procedure as adopted in its 2018 order for the next control period also.

8.1.10. Station Heat Rate

Orders of other Commissions on Station Heat Rate

(In Kcal / Kwhr)

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
4125	For project using AFBC Boiler 4125 For project using grate travelling Boiler 4200	--	4200	Water cooled 3800 Air cooled 3950	Air-Cooled & Water Cooled 4063

The Commission in its Order No. 3 of 2018 dated 28-03-2018 fixed the station heat rate at 3840 Kcal / Kwhr.

The Commission proposes to retain the SHR at 3840 Kcal/Kwhr as followed in its order in 2018 for the next control period also.

8.1.11. Gross calorific value of the fuel

Orders of other Commissions on Gross calorific value of the fuel

(In Kcal/Kg)

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
3100	3100	--	3611	4423	Air-Cooled & Water Cooled 3100

Most of the ERCs including CERC have fixed the Gross Calorific Value in the range of 3100 – 4423 Kcal/Kwhr. The Commission in its Order No. 3 of 2018 dated 28-03-2018 adopted Gross Calorific value of 3200 Kcal / Kwhr.

Therefore, the Commission proposes to retain the same GCV of 3200 Kcal/Kg for the next control period also as adopted in its 2018 order.

8.1.12. Specific fuel consumption

Orders of other Commissions on Specific fuel consumption:

(in Kg/Kwhr)

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
1.33	1.33	Water Cooled: 1.21 Air Cooled: 1.18	1.16	Water cooled 0.86 Air cooled 0.89	Air-Cooled & Water Cooled 1.31

As Specific fuel consumption is a function of SHR and GCV, the specific fuel consumption works out to 1.20 Kg/Kwhr.

8.1.13. Fuel Cost:

Orders of other Commissions on fuel cost :

(in Rs. /MT)

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
3115.72 with 5% escalation	3771.17 with 5% escalation	2500	4295.57	3764 with 5% escalation	Air-Cooled & Water Cooled 3270 with 5% escalation

The Commission in its Order No.3 of 2018 dated 28-03-2018 adopted Fuel cost as prescribed by CERC at Rs.2967.35/MT with 5% escalation p.a. during the control period as per CERC norms. Currently, CERC in its RE Regulations dt. 19-03-2019 has considered fuel cost of Rs.3115.72/MT (for 2019-20) with 5% escalation in respect of Tamil Nadu. Therefore, the fuel cost for 2020-21 works out to Rs.3271.51/MT.

The Commission proposes the fuel cost at Rs.3271.51/MT (for 2020-21) as adopted by CERC for the next control period with 5% escalation p.a.

8.1.14. Components of working capital

Orders of Other Commissions on Components of Working Capital

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
O&M charges : 1 month Maintenance spares :15% of O&M expenses Receivables for Debtors : 2 months Fuel stock : 4 months	O&M charges : 1 month Maintenance spares :15% of O&M expenses Receivables for Debtors : 2 months Fuel stock : 4 months	Receivables: 2 months Variable Costs : 2 months	O&M expenses : 1 month Maintenance spares :15% of O&M expenses Receivables for Debtors : 2 months Fuel stock : 4 months	Fuel stock : 30 Days O&M expenses : 1 month Receivables: 1 month charges for sale of electricity Maintenance spares :1% of capital cost with 5% escalation	Fuel stock : 4 months Receivables : 2 month O&M expenses : 1 month Maintenance spares :15% of O&M

As per the last Tariff Order No.3 of 2018 dated 28-03-2018, the working capital is based on the following norms:

- Fuel stock – One month
- O & M Expenses – One month
- Receivables - Two months

The Commission proposes to retain the aforesaid norms for the next control period also.

8.1.15. Interest on working capital

Orders of Other Commissions on Interest on Working Capital

(in % p.a.)

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
11.41%	11.41%	11.50%	11.81%	11.40%	<u>Air-Cooled & Water Cooled</u> 10.17%

The Commission in its Order No.3 of 2018 dated 28-03-2018 adopted Interest on working capital at 10.95%.

The Commission proposes to adopt the interest rate of 11.31%, which is 300 basis points above the average State Bank of India Marginal Cost of Funds based Lending Rate (MCLR) (one year tenor) prevalent during the last available six months, for the next control period.

8.1.16. Auxiliary Consumption

Orders of other Commissions on Auxiliary Consumption:

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
a) Water cooled i) During 1 st year of operation : 11% ii) From 2 nd year onwards : 10% b) Air cooled : i) During 1 st year of operation : 13% ii) From 2 nd year onwards : 12%	a) Water cooled i) During 1 st year of operation : 11% ii) From 2 nd year onwards : 10% b) Air cooled : i) During 1 st year of operation : 13% ii) From 2 nd year onwards : 12%	10%	10%	10%	<u>Air-Cooled & Water Cooled</u> 12%

The Commission in its last Tariff Order No. 3 of 2018 dated 28-03-2018 adopted Auxiliary Consumption at 10%. In other Commissions Orders, the auxiliary consumption adopted is in the range of 10% to 12%.

Therefore, the Commission proposes to retain the auxiliary consumption at 10% for the next control period also.

8.2 Related issues

The following are the issues related to power generation, transmission, wheeling and consumption from Biomass based power plants:

1. Open Access charges and line losses
2. Cross subsidy surcharge
3. CDM benefits
4. Reactive power charges
5. Grid availability charges
6. Energy Accounting and Billing Procedure
7. Energy Wheeling Agreement and fees
8. Security Deposit
9. Power factor disincentive
10. Metering
11. Connectivity and Evacuation of Power
12. Harmonics
13. Billing and Payments
14. Energy Purchase Agreement (EPA)
15. Tariff Review Period / Control Period

The above charges / terms are applicable to all biomass based power generating plants irrespective of their year of commissioning. These are discussed in detail in the following paragraphs.

8.2.1. Open Access charges and line losses

Transmission, Wheeling and Scheduling & 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 Act, the Commission in the last tariff order adopted 60% in each of the transmission, wheeling and scheduling and system operation charges as applicable to the conventional power to the Biomass power.

In the case of scheduling and system operation charges, the work done by SLDC is the same as in the case of conventional power. SLDC has to monitor the grid operations effectively on real time basis. The scheduling and system operation charges have to be determined in a non-discriminatory manner with reference to the functions of SLDC and there cannot be any concession.

Commission does not want to take away all the concession at one go, and therefore decides that Transmission, Wheeling and Scheduling & System Operation charges are adopted at 100% of that applicable for conventional power plants notified by the Commission from time to time.

In respect of the plants availing Renewable Energy Certificates (REC), 100% of the respective charges as specified in the relevant orders shall apply.

Apart from these charges, the Biomass Power Generators shall have to bear the actual line losses in kind as specified in the respective orders of the Commission and as amended from time to time.

8.2.2 Cross subsidy surcharge

The Commission in its last tariff order for Biomass power, has ordered to levy 60% of the cross subsidy surcharge for third party open access consumers. In this consultative paper, Commission proposes to withdraw incentives in phases and proposes levy of 100% of cross subsidy surcharge as applicable for conventional power plants.

8.2.3 CDM benefits

In the earlier orders issued on renewable energy, the Commission adopted the following formula for sharing of CDM benefits as suggested by the Forum of Regulators (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.”

The Commission accepted the formula recommended by the Forum of Regulators in its earlier orders. The Commission decides to continue the same formula. The generators shall furnish details of receipts of CDM to the distribution licensee and the distribution licensee shall account for the CDM receipts in the next ARR filing.

8.2.4. Reactive power charges

Commission proposes to continue the reactive power charges as specified in its Order on Open Access charges issued from time to time.

8.2.5. Grid availability charges

In this consultative paper, the Commission proposes that the charges for startup power of generators shall be as per Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 in force. Similarly, if adequate generation does not materialize or if drawl 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.

The Commission decides to continue the above procedure.

8.2.6. Energy Accounting and Billing Procedure

The energy accounting shall be regulated by the Commission's Regulations on open access, DSM and Order on open access. If a Biomass power generator utilizes power for captive use or if he sells it to a third party, the distribution licensee shall raise the bill at the end of the billing period for the net energy supplied. The licensee shall record the slot wise generation and consumption during the billing period. Slot wise adjustment shall be for the billing period. Peak hour generation can be adjusted to normal hour or off peak hour consumption of the billing period and normal hour generation can be adjusted to off peak hour consumption of the billing period. Excess consumption will be charged at the tariff applicable to the consumer subject to the terms and conditions of supply.

The licensee shall record the time block wise generation and consumption during the billing period. Time block wise adjustment shall be made for the billing period. Excess consumption will be

charged at the tariff applicable to the consumer subject to the terms and conditions of supply.

The Commission decides that after the billing period, the balance energy may be sold at the rate of 75% of the respective Biomass tariff fixed by the Commission in the respective orders.

8.2.7. Energy Wheeling Agreement and fees

The format for Energy Wheeling Agreement, application and agreement fees, procedure and terms & conditions shall be governed by Commission's following regulations in force and as amended from time to time:

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

8.2.8. Security Deposit

As regards the security deposit to be paid by captive /third party user, the Commission decides to retain the present arrangements i.e., charges corresponding to two times 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.

8.2.9. Power factor disincentive

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.

8.2.10. Metering

The Commission proposes that metering and communication shall be in accordance with the following regulations in force and any specific orders of the Commission on metering whenever issued:

- (1) Central Electricity Authority (Installation and Operation of Meters) Regulations 2006 and as amended from time to time.
- (2) Tamil Nadu Electricity Distribution and Supply Codes
- (3) Tamil Nadu Electricity Grid Code
- (4) Tamil Nadu Electricity Regulatory Commission's Grid Connectivity and Intra State Open Access Regulations, 2014

8.2.11 . Connectivity and Evacuation of Power

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.

8.2.12. Harmonics

The Biomass Power Generators shall follow the CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013 in respect of harmonics. It is the responsibility of the generator to provide adequate filtering mechanism to limit the harmonics within the stipulated norms. It shall be done before connecting the generator

to the grid and the harmonics shall be measured by the respective distribution licensee during the commissioning. If the Biomass Power Generators inject the harmonics beyond the stipulated limit, they shall pay a compensation of 15% of applicable generation tariff rate to the distribution licensee in whose area the plant is located till such time it is reduced within the stipulated limit. The distribution licensee is responsible for measurement of harmonics with standard meters and issue notices for payment of compensation charges if the harmonics is beyond the stipulated limit. A minimum of 15 days notice period shall be given for payment of compensation charges.

8.2.13. Billing and Payments

When a Biomass power generator sells power to the distribution licensee, the generator shall raise the bill every month for the net energy sold after deducting the charges for power drawn from distribution licensee, reactive power charges etc. The distribution licensee shall make payment to the generator in 60 days of receipt of the bill. Any delayed payment beyond 60 days is liable for interest at the rate of 1% per month.

8.2.14 Energy Purchase Agreement (EPA)

The format for Energy Purchase Agreement (EPA) shall be evolved as specified in the Commission's "Power procurement from New and Renewable sources of energy Regulations 2008" and amended from time to time. The agreement shall be valid for 20 years or life of the plant specified in the respective tariff order. The distribution licensee shall execute the Energy Purchase Agreement or convey its decision in line with this order within a month of receipt of the proposal from the generator for selling the power.

The agreement fees are governed by the Commission's Fees and Fines regulation.

8.2.15 Tariff Review Period / Control Period

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.

Commission decides to retain the control period of 2 years from the date of coming into force of this order, and the tariff period shall be 20 years.

9. Tariff

9.1 Orders of other Commissions on Tariff

CERC	PSERC	KARNATAKA	MAHARASHTRA	GUJARAT	HERC
19-03-2019	13-09-2019	14-05-2018	30-04-2019	15-03-2018	01-04-2017
Variable cost for FY 2019-20 : Rs 4.66/unit Fixed cost for FY 2019-20: Rs.2.92/unit Applicable tariff : Rs 7.58/unit	Variable cost for FY 2019-20 : Rs 5.74/unit Fixed cost for FY 2019-20: Rs.3.01/unit Applicable tariff : Rs 8.75/unit	a) <u>Air cooled</u> Variable cost : Rs 3.47/unit Fixed Cost : Rs 2.07/unit Applicable tariff : Rs 5.54/unit b) <u>Water cooled</u> Variable cost : Rs.3.55/unit Fixed Cost : Rs 2.19/unit Applicable tariff : Rs.5.74/unit	Levellised tariff (Variable) : Rs 5.55/unit Levellised tariff (Fixed): Rs.2.28/unit Levellised tariff : Rs 7.83/unit	<u>Air cooled:</u> Levellised tariff (variable) : Rs. 4.17/unit Levellised tariff (fixed) : Rs. 1.91/unit Levellised tariff : Rs.6.08/unit <u>Water cooled:</u> Levellised tariff (variable) : Rs. 4.01/unit Levellised tariff (fixed) : Rs. 1.80/unit Levellised tariff : Rs.5.81/unit	<u>Air cooled:</u> Levellised tariff (variable) : Rs. 6.81/unit Levellised tariff (Fixed) : Rs. 2.69/unit Levellised tariff : Rs.9.50/unit <u>Water cooled:</u> Levellised tariff (variable) : Rs. 6.81/unit Levellised tariff (fixed) : Rs. 2.60/unit Levellised tariff : Rs.9.41/unit

9.2. With the adoption of above financial and operational parameters the tariff rate for the new plants works out as follows:

9.2.1. Fixed costs:

(Amount in Rs./unit)

Year	FC		Year	FCC
1	2.17		11	1.94
2	2.21		12	1.92
3	2.17		13	1.98
4	2.13		14	2.04
5	2.10		15	2.10
6	2.06		16	2.17
7	2.03		17	2.24
8	2.01		18	2.31
9	1.98		19	2.39
10	1.96		20	2.47

9.2.2. Variable Costs

9.2.2.1. The variable cost for the financial year 2020-21 will be Rs.4.36 per unit and for the financial year 2021-22 will be Rs.4.58 per unit.

9.2.2.2. The fixed capacity charges will be applicable with reference to the date of commissioning of the plant and the variable cost will be applicable with reference to the financial year. The Fixed capacity charges specified above will be continued to be applicable to the entire agreement period of 20 years.

9.2.2.3. The fixed charges specified in this Order will be applicable to the plants commissioned on or after the date of issuance of this Order and the variable cost specified in this Order will apply to all plants

commissioned on or after 15-05-2006.

9.2.3. Total Cost

As the control period of the Order is two years, the total cost inclusive of fixed and variable charges for the 1st year (2020-21) is Rs.6.54/unit and for the 2nd year is Rs.6.79/unit (2021-22).

9.3. Use of Fossil Fuel

The use of fossil fuels shall be limited to the extent of 15% of total fuel consumption on annual basis.

9.4 Quantum of power purchase by the Distribution Licensee

The distribution licensee can purchase Biomass energy at the rate determined by the Commission from the Biomass Power Generators to meet the Renewable Power Purchase Obligations (RPO) requirement on "first come first served basis". It is open to the Distribution licensee to procure the same through competitive bidding route following the guidelines of Government of India if it can realize a more competitive rate than the one determined by Commission's Order. For any procurement in excess of RPO, specific approval shall be obtained from the Commission.

(By Order of the Commission)

**Secretary
Tamil Nadu Electricity Regulatory Commission**

Annexure - 3**Components of Biomass Tariff**

Sl.No.	PARAMETERS	VALUES
1	Capital Investment	Rs.6.11 Cr/MW
2	Plant Load Factor	80%
3	Debt Equity Ratio	70:30
4	Term of Loan	10 years with 1 year moratorium
5	Interest on Loan	10.31% p.a
6	Return on Equity	17.60% (Pre-Tax)
7	Life of the Plant	20 years
8	Depreciation	4.5% p.a. on SLM on 85% of capital cost
9	O & M Charges for machinery	5% with escalation of 5.72% from 2 nd year on 85% of capital cost
10	O & M Charges for land and civil works	0.90% with escalation of 5.72% from 2 nd year on 15% of capital cost
11	Station Heat Rate	3840 kCal/kWh
12	Calorific Value of fuel	3200 kCal/kg
13	Specific fuel Consumption	1.20kg/kWh
14	Fuel Cost (FY 2020-21)	3271.51/MT with 5% escalation from 2 nd year onwards
15	Working capital components	One month fuel stock, one month O&M and two month receivables
16	Interest on working capital	11.31% p.a.
17	Auxiliary consumption	10%

COMPONENTS OF BIOMASS TARIFF

Sl. No.	PARAMETERS	VALUES
1	Capital Investment	Rs.6.11 Cr / MW
2	Plant Load Factor	80%
3	Debt Equity Ratio	70 : 30
4	Term of Loan	10 years with one year moratorium
5	Interest on loan	10.31% p.a
6	Return on Equity	17.60% (Pre-tax)
7	Life of the plant	20 years
8	Depreciation	4.5% p.a on SLM on 85% of capital cost
9	O & M charges for machinery	5% with escalation of 5.72% from 2nd year on 85% of capital cost
10	O & M charges for land and civil works	0.90% with escalation of 5.72% from 2nd year on 15% of capital cost
12	Station Heat Rate	3840 kcal/ kwh
13	Calorific value of fuel	3200 kcal / kg
14	Specific fuel consumption	1.20 kg / kwh
15	Fuel cost (FY 2020-21)	Rs.3271.51 / MT with 5% escalation from 2nd year onwards
16	Working capital componants	One Month Fuel stock, One month O & M and Two months Receivables
17	Interest on working capital	11.31% p.a
18	Auxiliary consumption	10.00%

BIOMASS TARIFF CALCULATION

Year	O & M charges for machinery	O & M charges for land & civil works	Total O & M charges for machinery, land & civil works	Interest on loan	Deprn.	Fuel cost	Working Capital					ROE	Total FC	Units gen Less Aux consump	Fixed Cost	Variable Cost	Total
							O & M Expenses	Fuel	Receivables	Total WC	Int on WC						
1	2596750	82485	2679235	4409587	2337075	27512090	223270	2292674	6870954.3	9386898	1061658	3226080	13713635	6307200	2.17	4.36	6.54
2	2745284	87203	2832487	4409587	2337075	28887695	236041	2407308	7133106.9	9776455	1105717	3226080	13910946	6307200	2.21	4.58	6.79
3	2902314	92191	2994506	3968628	2337075	30332080	249542	2527673	7333651.3	10110867	1143539	3226080	13669828	6307200	2.17		
4	3068327	97464	3165791	3527670	2337075	31848684	263816	2654057	7548168.1	10466041	1183709	3226080	13440325	6307200	2.13		
5	3243835	103039	3346874	3086711	2337075	33441118	278906	2786760	7777367.6	10843034	1226347	3226080	13223087	6307200	2.10		
6	3429382	108933	3538316	2645752	2337075	35113174	294860	2926098	8021995.8	11242953	1271578	3226080	13018801	6307200	2.06		
7	3625543	115164	3740707	2204794	2337075	36868833	311726	3072403	8282837	11666965	1319534	3226080	12828190	6307200	2.03		
8	3832924	121752	3954676	1763835	2337075	38712274	329556	3226023	8560715.5	12116295	1370353	3226080	12652019	6307200	2.01		
9	4052167	128716	4180883	1322876	2337075	40647888	348407	3387324	8856497.2	12592228	1424181	3226080	12491095	6307200	1.98		
10	4283951	136078	4420030	881917.4	2337075	42680282	368336	3556690	9171092.6	13096119	1481171	3226080	12346273	6307200	1.96		
11	4528993	143862	4672856	440958.7	2337075	44814296	389405	3734525	9505458.2	13629388	1541484	3226080	12218453	6307200	1.94		
12	4788052	152091	4940143		2337075	47055011	411679	3921251	9860599.5	14193529	1605288	3226080	12108586	6307200	1.92		
13	5061928	160791	5222719		2337075	49407762	435227	4117313	10312478	14865018	1681234	3226080	12467108	6307200	1.98		
14	5351471	169988	5521459		2337075	51878150	460122	4323179	10787300	15570600	1761035	3226080	12845648	6307200	2.04		
15	5657575	179711	5837286		2337075	54472057	486440	4539338	11286231	16312010	1844888	3226080	13245329	6307200	2.10		
16	5981188	189991	6171179		2337075	57195660	514265	4766305	11810499	17091069	1933000	3226080	13667334	6307200	2.17		
17	6323312	200858	6524170		2337075	60055443	543681	5004620	12361392	17909694	2025586	3226080	14112911	6307200	2.24		
18	6685005	212347	6897353		2337075	63058215	574779	5254851	12940266	18769897	2122875	3226080	14583383	6307200	2.31		
19	7067388	224493	7291881		2337075	66211126	607657	5517594	13548545	19673795	2225106	3226080	15080143	6307200	2.39		
20	7471642	237335	7708977		2337075	69521682	642415	5793474	14187724	20623612	2332531	3226080	15604662	6307200	2.47		