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 15-02-2022)

1.0 Overview

1.1 **Biomass power & cogeneration programme** is implemented with the main objective of promoting technologies for optimum use of country's biomass resources for grid power generation. Biomass materials used for power generation include bagasse, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, groundnut shells, saw dust etc.

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 15781 MW of which Biomass power constitutes 262.59 MW. The last generic Tariff Order of the Commission in the case of Biomass Power was issued on 05-11-2020 vide order No.11 of 2020 which expires on 31-03-2022.

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. The sixth Order on Biomass No.11 of 2020 dated 05-11-2020 with validity for the control period of 2 years till 31-03-2022.

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

As the control period of 2 years is expiring on 31-03-2022, 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 30-06-2021, the grid-connected biomass power generation capacity in India stood at 10.170 GW (which includes Biomass, Bagasse and Waste to Energy). Thus, India

has surpassed the target of 10 GW for the year 2022. The potential of power generation from bio mass has been assessed as around 28 GW.

In Tamil Nadu:

The installed capacity of Biomass based Power Plants in Tamil Nadu is 262.59 MW till December 2021.

The year-wise capacity addition in Tamil Nadu over the past 21 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
2020-21	0
2021-22	0
Total (Upto December 2021)	***262.59***

* 3 MW capacity reduction by M/s TCP Ltd.

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 œmpanies 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 licensee. Such percentage for purchase of power from non- conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the 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.11 of 2020 dated 05-11-2020 for Biomass based Power Plants is valid till 31-03-2022. This Order shall come into force from 01-04-2022.

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.11 of 2020 dated 05-11-2020 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***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
Rs.6.52 Cr/MW	Rs.6.11Cr/MW	Air-Cooled Rs.5.95Cr/MW Water-Cooled Rs.5.85Cr/MW	Rs.5.22Cr/MW	Air-Cooled Rs.5.07Cr/MW Water-Cooled Rs.4.77Cr/MW	Air-Cooled Rs.6.52Cr/MW Water-Cooled Rs.5.59Cr/MW

The Commission in Tariff Order No.11 of 2020 dated 05-11-2020 had considered Rs.6.11 Crores / MW as the capital cost.

In this consultative paper, the Commission assumes the capital cost at Rs.6.52 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*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
80%	80%	75%	a) Stabilization for 6 months : 60% b) During remaining period of the 1st year (after stabilization) : 70% c) Second year onwards : 80%	a)During 1st year : 70% b) Second year onwards : 80%	1st year : 65% 2nd 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 Tariff Order No.11 of 2020 dated 05-11-2020.

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*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
70:30	***70:30***	***70:30***	***70:30***	***70:30***	***70:30***

The Commission in Tariff Order No.11 of 2020 dated 05-11-2020 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 Tariff Order No.11 of 2020 dated 05-11-2020, 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. The loan tenor is 15 years in CERC and KERC.

CERC	***PSERC***	***KARNATAKA***	***MAHARASHTRA***	***GUJARAT***	***HERC***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
15	***--***	***15***	***12***		***13***

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***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
9%	9%	9.50%	11.31%	11.40%	10.13%

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020 adopted an interest rate on term loan of 9.28% p.a.

While the interest rate specified by CERC and PSERC is at 9% and KERC have adopted the interest rate at 9.50%.

The Commission proposes to adopt the interest rate of 9.00%, 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***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
Upto 20 years 16.96% After 20 years 21.52%	Upto 20 years 16.96% After 20 years 21.52%	14% (income tax on RoE pass through)	For first 10 years : 20.39% After 10 years : 22.57%	14%	14%

While CERC and PSERC fixed a RoE of 16.96% p.a. (pre-tax) upto 20 years and 21.52% after 20 years, ROE adopted by KERC is 14% (post-tax).

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020 adopted a RoE of 16.96% (pre-tax) per annum as per CERC norms.

Now, the Commission proposes to continue the existing RoE of 16.96% (pre-tax) upto 20 years and 21.52% after 20 years for the next control period also.

8.1.7. Life of plant and machinery

Orders of other Commissions on life of plant & machinery

CERC	*PSERC*	*KARNATAKA*	*MAHARASHTRA*	*GUJARAT*	*HERC*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
25 years	25 years	25 years	20 years	20 years	20 years

For tariff determination process, the project life of a plant is considered as 25 years. The Commission had adopted 25 years as life of the Plant and Machinery in its Tariff Order No.11 of 2020 dated 05-11-2020.

Therefore, the Commission also proposes to retain the life of plant and machinery at 25 years for the next control period also.

8.1.8. Depreciation

Orders of other Commissions on Depreciation:

CERC	*PSERC*	*KARNATAKA*	*MAHARASHTRA*	*GUJARAT*	*HERC*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
First 15 years : 4.67%. 16th year onwards : 2%	First 15 years : 4.67%. 16th year onwards : 2%	First 13 years : 4.37% and balance spread equally over the life of the plant.	First 12 years : 5.83% 13th year onwards : 2.505%	First 10 years : 7% 11-20th year: 2% p.a.	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 4.67% for the first 15 years and 2% from the 16th year onwards. The depreciation rates of other ERCs are different to suit their needs.

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020 adopted the rate of Depreciation as 3.6% 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***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
Rs.0.482 Crs. / MW with an escalation of 3.84% per year	Rs.0.4642 Crs. / MW with an escalation of 3.84% per year	Water Cooled 5% with an escalation of 5% per year Air Cooled 4% with an escalation of 5% per year	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	Rs.0.447 Crs. / MW with an escalation of 5.72% per year

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020, allowed Operation and Maintenance expenditure (including insurance) at Rs.46.42 Lakhs with an annual escalation of 3.84% (from second year) as adopted by CERC.

CERC in its Order dated 31-03-2021 has adopted a depreciation rate of Rs.48.20 Lakhs with an annual escalation of 3.84%.

Therefore, the Commission proposes to follow the same O&M Expenses of Rs.48.20 Lakhs with an annual escalation of 3.84% as per CERC norms for the next control period.

8.1.10. Station Heat Rate

Orders of other Commissions on Station Heat Rate

(In Kcal / Kwhr)

CERC	*PSERC*	*KARNATAKA*	*MAHARASHTRA*	*GUJARAT*	*HERC*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
4200	For project using AFBC Boiler 4125 For project using travelling grate Boiler 4200	--	4200	Water cooled 3800 Air cooled 3950	Air cooled 4200 Water cooled 4126

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020 had adopted the CERC station heat rate at 4125 Kcal / Kwhr.

The Commission proposes to adopt the same SHR at 4200 Kcal/Kwhr as adopted the CERC in its order dated 31-03-2021 for the next control period.

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*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
3100	3100	--	3611	4423	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 Tariff Order No.11 of 2020 dated 05-11-2020 had adopted Gross Calorific value of 3100 Kcal / Kwhr.

Therefore, the Commission proposes to retain the same GCV of 3100 Kcal/Kg for the next control period also.

8.1.12. Specific fuel consumption

Orders of other Commissions on Specific fuel consumption:

(in Kg/Kwhr)

CERC	*PSERC*	*KARNATAKA*	*MAHARASHTRA*	*GUJARAT*	*HERC*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
1.35	For project using AFBC Boiler 1.33 For project using grate travelling Boiler 1.35	Water Cooled: 1.21 Air Cooled: 1.18	1.16	Water cooled 0.86 Air cooled 0.89	Air-Cooled: 1.35 Water Cooled: 1.31

As Specific fuel consumption is a function of SHR and GCV, the specific fuel consumption works out to 1.35 Kg/Kwhr.

8.1.13. Fuel Cost:

Orders of other Commissions on fuel cost :

(in Rs. /MT)

CERC	*PSERC*	*KARNATAKA*	*MAHARASHTRA*	*GUJARAT*	*HERC*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
3435.6 with 5% escalation	3960 with 5% escalation	3000	4295.57	3764 with 5% escalation	3605.61 with 5% escalation

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020 had adopted the Fuel cost as prescribed by CERC at Rs.3271.51/MT with 5% escalation p.a. Currently, CERC in its RE Regulations dt. 31-03-2021 has considered the fuel cost of Rs.3435.60/MT (for 2021-22) with 5% escalation in respect of Tamil Nadu. Therefore, the fuel cost for 2022-23 works out to

Rs.3607.38/MT.

The Commission proposes the fuel cost at Rs.3435.60/MT (for 2022-23) 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***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
O&M charges : 1 month Maintenance spares :15% of O&M expenses Receivables for Debtors : 1.5 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	Air Cooled: Fuel stock : 6 months Water Cooled: 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.11 of 2020 dated 05-11-2020, 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*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
10.50%	--	10.50%	11.81%	11.40%	9.13%

The Commission in its Tariff Order No.11 of 2020 dated 05-11-2020 had adopted Interest on working capital at 10.28%.

The Commission proposes to adopt the interest rate of 10%, 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*
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2019***
12%	a) Water cooled : 10% b) Air cooled : 12%	10%	10%	10%	Air-Cooled & 1st Year: 12.50% 2nd Year onwards: 12% Water Cooled 10%

The Commission in its last Tariff Order No.11 of 2020 dated 05-11-2020 had 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.

Considering the unprecedented situation that arose due to the outbreak of the Covid-19 pandemic where several restrictions were in place on the movement of public and opening of offices etc., and the gradual slowdown in economic activity, Commission decides to retain the levy of transmission, wheeling and scheduling and system operation charges at 60% of that applicable for conventional power 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 continue to levy of 60% 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 within 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 25 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.

This Commission decides to retain the control period of 2 years from the date of coming into force of this order to 31-03-2024 and the tariff period shall be 25 years.

9. Tariff

9.1 Tariff Orders of other Commissions:

(Rs./unit)

CERC	***PSERC***	***KARNATAKA***	***MAHARASHTRA***	***GUJARAT***	***HERC***
31-03-2021	***18-09-2020***	***08-06-2021***	***30-04-2019***	***15-03-2018***	***01-04-2017***
Variable cost for FY 2021-22 : 5.29 Fixed cost for FY 2021-22: 2.87 Applicable tariff : 8.16	Variable cost for FY 2020-21 : 6.10 Fixed cost for FY 2020-21: 2.94 Applicable tariff : 9.04	a) Air cooled Variable cost : FY-22 : 3.93 FY-23 : 4.13 FY-24 : 4.34 Fixed Cost : 2.03 Applicable tariff : FY-22 : 5.96 b) Water cooled Variable cost : FY-22 : 4.03 FY-23 : 4.24 FY-24 : 4.45 Fixed Cost : 2.15 Applicable tariff FY-22 : 6.18	Levellised tariff (Variable) : Rs 5.55/unit Levellised tariff (Fixed): Rs.2.28/unit Levellised tariff : Rs 7.83/unit	Air cooled: Levellised tariff (variable) : Rs. 4.17/unit Levellised tariff (fixed) : Rs. 1.91/unit Levellised tariff : Rs.6.08/unit Water cooled: Levellised tariff (variable) : Rs. 4.01/unit Levellised tariff (fixed) : Rs. 1.80/unit Levellised tariff : Rs.5.81/unit	Air cooled: Levellised tariff (variable) : Rs. 7.77/unit Levellised tariff (Fixed) : Rs. 3.06/unit Levellised tariff : Rs.10.83/unit Water cooled: Levellised tariff (variable) : Rs. 7.46/unit Levellised tariff (fixed) : Rs. 2.65/unit Levellised tariff : Rs.10.11/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: (As per the working sheet annexed)

(Amount in Rs./unit)

Year	***FC***		***Year***	***FC***
1	2.43		14	2.38
2	2.47		15	2.44
3	2.44		16	2.51
4	2.42		17	2.57

5	2.39		18	2.64
6	2.37		19	2.72
7	2.35		20	2.79
8	2.33		21	3.01
9	2.31		22	3.09
10	2.29		23	3.18
11	2.28		24	3.27
12	2.27		25	3.36
13	2.32			

9.2.2. Variable Costs

9.2.2.1. The variable cost for the financial year 2022-23 will be Rs.5.15 per unit and for the financial year 2023-24 will be Rs.5.41 per unit. The workings are as under:

FY 2022-23 : (Rs.3.435*1.35)/.9 = Rs.5.15/unit

FY 2023-24 : (Rs.3.61*1.5)/.9 = Rs.5.41/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 25 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 (2022-23) is Rs.7.59/unit and for the 2nd year (2023-24) is Rs.7.88/unit.

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)

Sd/-
Secretary
Tamil Nadu Electricity Regulatory Commission

Annexure - 3

COMPONENTS OF BIOMASS TARIFF

Sl.No.	Parameters	Values
1	Capital Investment	Rs. 6.52 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	9.00% p.a.
6	Return on Equity	16.96% (pre-tax) upto 20 years and 21.52% after 20 years
7	Life of the Plant	25 years
8	Depreciation	3.6% p.a. on SLM on 85% of capital cost
9	O & M Charges	Rs.48.20 Lakhs with an annual escalation of 3.84%
10	Station Heat Rate	4200 kCal/kWh
11	Calorific Value of fuel	3100 kCal/kg
12	Specific fuel Consumption	1.35 kg/kWh
13	Fuel Cost (FY 2022-23)	Rs.3435.60/MT with 5% escalation from 2nd year onwards
14	Working capital components	One month fuel stock, one month O&M and two month receivables
15	Interest on working capital	10.00% p.a.
16	Auxiliary consumption	10%

BIOMASS TARIFF CALCULATION

Year	O & M charges	Interest on loan	Depn.	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	4820000	4107600	1995120	32503524	401667	2708627	7975364	11085658	1108566	3317376	15348662	6307200	2.43	5.15	7.59
2	5005088	4107600	1995120	34128701	417091	2844058	8284746	11545895	1154589	3317376	15579773	6307200	2.47	5.41	7.88
3	5197283	3696840	1995120	35835136	433107	2986261	8539609	11958977	1195898	3317376	15402517	6307200	2.44		
4	5396859	3286080	1995120	37626893	449738	3135574	8810315	12395628	1239563	3317376	15234998	6307200	2.42		
5	5604098	2875320	1995120	39508237	467008	3292353	9097642	12857003	1285700	3317376	15077615	6307200	2.39		
6	5819296	2464560	1995120	41483649	484941	3456971	9402405	13344318	1334432	3317376	14930784	6307200	2.37		
7	6042757	2053800	1995120	43557831	503563	3629819	9725461	13858844	1385884	3317376	14794937	6307200	2.35		
8	6274799	1643040	1995120	45735723	522900	3811310	10067708	14401918	1440192	3317376	14670526	6307200	2.33		
9	6515751	1232280	1995120	48022509	542979	4001876	10430088	14974943	1497494	3317376	14558021	6307200	2.31		
10	6765956	821520	1995120	50423635	563830	4201970	10813591	15579390	1557939	3317376	14457911	6307200	2.29		
11	7025768	410760	1995120	52944816	585481	4412068	11219254	16216802	1621680	3317376	14370705	6307200	2.28		
12	7295558		1995120	55592057	607963	4632671	11648165	16888800	1688880	3317376	14296934	6307200	2.27		
13	7575707		1995120	58371660	631309	4864305	12171089	17666703	1766670	3317376	14654874	6307200	2.32		
14	7866615		1995120	61290243	655551	5107520	12719604	18482675	1848267	3317376	15027378	6307200	2.38		
15	8168693		1995120	64354755	680724	5362896	13294967	19338588	1933859	3317376	15415047	6307200	2.44		
16	8482370		1995120	67572493	706864	5631041	13898500	20236405	2023641	3317376	15818507	6307200	2.51		
17	8808093		1995120	70951118	734008	5912593	14531588	21178189	2117819	3317376	16238408	6307200	2.57		
18	9146324		1995120	74498674	762194	6208223	15195684	22166100	2216610	3317376	16675430	6307200	2.64		
19	9497543		1995120	78223607	791462	6518634	15892315	23202410	2320241	3317376	17130280	6307200	2.72		
20	9862249		1995120	82134788	821854	6844566	16623080	24289500	2428950	3317376	17603695	6307200	2.79		
21	10240959		1995120	86241527	853413	7186794	17540837	25581044	2558104	4209312	19003495	6307200	3.01		
22	10634212		1995120	90553603	886184	7546134	18344996	26777314	2677731	4209312	19516375	6307200	3.09		
23	11042566		1995120	95081283	920214	7923440	19188584	28032238	2803224	4209312	20050221	6307200	3.18		
24	11466600		1995120	99835348	955550	8319612	20073542	29348704	2934870	4209312	20605902	6307200	3.27		
25	11906918		1995120	104827115	992243	8735593	21001906	30729742	3072974	4209312	21184324	6307200	3.36		