

TAMIL NADU ELECTRICITY REGULATORY COMMISSION
CONSULTATIVE PAPER ON POWER PROCUREMENT BY DISTRIBUTION
LICENSEE FROM BAGASSE BASED CO-GENERATION PLANTS AND ALLIED
ISSUES RELATING TO CAPTIVE USE AND THIRD PARTY SALE

(Comments and Suggestions are invited on or before 23 -03-2018)

1.0 Overview

1.1 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 seventeen tariff orders 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 and its promotional aspects.

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

1.3 The total capacity of renewable power in the state is 10745.12 MW of which Bagasse based Co-generation power constitutes 685.4 MW (as on 16-02-2018). The last of the generic tariff order of the Commission in the case of Bagasse based Co-generation power was issued on 31.3.2016 vide Order No.4 of 2016. The control period of this Order No.4 of 2016 on Bagasse based co-generation power plants expires on 31.3.2018.

2.0 Importance of Non-Conventional Energy Sources:

2.1 Non-Conventional Energy Sources are pollution free. Global concern over pollution problems caused by the increase in greenhouse gasses emission and

consequent climate changes have resulted in paradigm shift in the approach towards development of energy sector in all the countries. The need for adoption of clean technology, improving end use efficiency and diversifying energy bases, etc. have all been seriously considered by the Government of India since Sixth Five Year Plan. Renewable energy sources such as wind, solar, mini hydro power project , biomass and bagasse based co-generation are abundant and they not only augment the energy generation, but also contribute to improvement in the environment, drought control, energy conservation, employment generation, upgradation of health and hygiene, social welfare, security of drinking water increased agricultural yield and production of bio-fertilizers. The phase of development has been accelerated through fiscal and tax incentives.

2.2 Electricity Act 2003, National Electricity Policy, Tariff Policy have all addressed the necessity for promotion of the co-generation and generation of electricity from renewable sources of energy.

3.0 Commission's Regulation on New and Renewable Energy Sources

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

3.2 Regulation 4 (2) of the Power Procurement from New and Renewable Sources of Energy Regulation, 2008, specifies as follows:

"(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 issued by the Government of India*

(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. “*

3.3 Regulation 4 of the Power Procurement from New and Renewable Sources of Energy Regulation, 2008 issued by the Commission specifies as follows on determination of tariff and pricing methodology:

“4. Determination of tariff

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

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

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

(c) *(omitted)*

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

(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 issued by the Government of India*
- (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."

3.4 The provisions in Commission's Power Procurement Regulations on Control period is as follows:

"6. Agreement and Control period

The tariff as determined by the Commission by a general or specific order for the purchase of power from each type of renewable source by the distribution licensee as referred to in clause 4(3) shall remain in force for such period as specified by the Commission in such tariff orders. The control period may ordinarily be two years. When the Commission revisits the tariff, the revision shall be applicable only to the generator of new and renewable energy sources commissioned after the date of such revised order."

4. Commission's order on NCES based generation and allied issues.

4.1 The Commission issued Order No.3 dated 15-05-2006 on "Power purchase and allied issues in respect of Non-Conventional Energy Sources based Generating Plants and Non-Conventional Energy Sources based Co-generation Plants". The said Order stipulated tariff rates for power procurement by the Distribution Licensee from Wind Energy Generators (WEGs), Biomass based generators and Bagasse based generators. This was the first Order issued by the Commission on NCES based power plants.

4.2 The Commission issued Order No.3 of 2009 dated 06-05-2009 on

“Comprehensive Tariff Order for Bagasse based Co-generation Plants”. This Order covered tariff rates for power procurement by the Distribution Licensee from Bagasse based co-generators. In the said Order, the Commission fixed the validity of the Order upto 31-03-2011. By Tariff Order No.3 of 2011, the said Order was extended upto 31-12-2011 and it was further extended upto 30-06-2012 by Tariff Order No.6 of 2011 dated 21-12-2011. This Order was again extended upto 31-07-2012 in Tariff Order No. 4 of 2012 dated 30-06-2012.

4.3 The Commission issued Order No.7 of 2012 dated 31-07-2012 on **“Comprehensive Tariff Order for Bagasse based Co-generation plants”**. This Order covered tariff rates for power procurement by the Distribution Licensee from Bagasse based co-generators. In the said Order, the Commission fixed the validity of the Order upto 31-07-2014. Commission in Order No. 4 of 2014, dated 28-07-2014 has extended the validity of the Order till the issue of next order.

4.4 The Commission issued Order No. 4 of 2016, dated 31-03-2016 on **Comprehensive Tariff Order for Bagasse based Co-generation plants”**. This Order covered tariff rates for power procurement by the Distribution Licensee from Bagasse based co-generators.

5. Floating of Consultative paper:

5.1 As the control period of 2 years will expire on 31-03-2018, the Commission is issuing this concept paper to seek the views / suggestions from the stakeholders for the tariff for the next control period.

6. Legal Provisions:

6.1 Related Provisions of the Electricity Act, 2003:

6.1.1. Relevant Provisions of Electricity Act, 2003 are reproduced below:

“Section 3(1): The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy.

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:-*

.....

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

(a) The National Electricity Policy and tariff policy:”

Section 62(1): The Appropriate Commission shall, subject to the provisions of this Act for –

(a) Supply of electricity by a generating company to a distribution licensee:

Section 62(2): The Appropriate Commission may require a licensee or a generating company to furnish separate details, as may be specified in respect of generation, transmission and distribution for determination of tariff.

Section 62(5): The Commission may require a licensee or a generating company to comply with such procedure as may be specified for calculating the expected revenues from the tariff and charges which he or it is permitted to recover.

Section 63: Notwithstanding anything contained in section 62, the Appropriate Commission shall adopt the tariff if such tariff has been determined through transparent process of bidding in accordance with the guidelines issued by the Central Government.

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;"

6.2 Related Provisions of the National Electricity Policy:

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

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

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

also have to be taken for development of technologies and a sustained growth of these sources.

(3) Clause 5.12.2: The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the 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. “

6.3 Related Provisions in the Tariff Policy

6.3.1. The Commission is also guided by the following specific provisions of the Tariff Policy of Government of India (Ministry of Power) relating to NCES:

“ (1) 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.

(2) Clause 6.0: Accelerated growth of the generation capacity sector is

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

(3) Clause 6.4(1): *Pursuant to provisions of section 86(1)(e) of the Act, the appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy shall be taken into account while determining tariff by SERCs. Long term growth trajectory of Renewable Purchase Obligations (RPOs) will be prescribed by the Ministry of Power in consultation with MNRE.*

(4) Clause 6.4(2): *States shall endeavor 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. While determining the tariff from such sources, the Appropriate Commission shall take into account the solar radiation and wind intensity which may differ from area to area to ensure that the benefits are passed on to the consumers.

7.0 Applicability of the proposed Order:

7.1. The Order shall come into force on expiry of the control period of order no. 4 of 2016, dated 31-03-2016. The tariff proposed to be fixed shall be applicable to all Bagasse based Co-generation Plants commissioned during the control period of the Order. The tariff is applicable for purchase of bagasse based co-gen power by Distribution Licensee from Bagasse based Co-generators conforming to this Order. The open access charges and other terms and conditions specified in this Order shall be applicable to all the Bagasse based co-generators, irrespective of their date of commissioning.

8.0 Tariff Methodology

8.1. Cost-Plus Tariff Determination

8.1.1 Cost-plus tariff determination is a more practicable method but it discourages competition and efficiency. However, to encourage the setting up of new co-gen plants and till the competitive bidding is introduced, Cost plus Tariff method is followed. As it can be easily designed to provide adequate return to the investor as assured return will lead to larger investment in renewable power. Accordingly, the Commission proposes the Cost plus Tariff approach in this Order.

8.2 Single Part vs. Two Part Tariff

8.2.1 In the Commission's Order No. 4 of 2016, dated 31-03-2016, Commission adopted the "**Cost plus two part tariff**". Generally, the two part tariff is adopted when the fuel cost varies from time to time and the fuel cost is considered as pass through. The variable component of tariff would take care of such price escalation and in order to accommodate the fuel cost escalations appropriately two part tariff is proposed to be adopted in this Order also.

9.0 Tariff Components:

9.1 The Power Procurement from New and Renewable Sources of Energy Regulation, 2008 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 Bagasse based co-generation.

9.2 The following important factors have been considered to arrive at the tariff and other related issues for Bagasse based co-generation.

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

The issue-wise proposal of the Commission and orders of other Commissions' are discussed below:

9.3 Capital cost per MW:

9.3.1. The Commission adopted Rs.5.20 Crores / MW as the Capital Cost for Order No. 4 of 2016, dated 31-03-2016.

The capital cost considered by other Commissions are as follows:

Sl. No.	Order of ERCs	Capital Cost
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	Rs.4.925 Cr/MW for entire control period
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	Rs.4.829 Cr./MW
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	Rs.4.75 Crore/MW

9.3.2 In the Commission's Order No.4 of 2016 dated 31-03-2016, the Commission adopted a Capital Cost of Rs.5.20 Crore/MW. The capital cost includes evacuation cost up to inter-connection point. The Commission apportions the capital cost on machineries, land and civil works at 85% and 15% respectively.

9.3.3 In CERC's (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017 has stated that the normative capital cost for the non-fossil fuel based co-generation projects shall be Rs.492.5 Lakh/MW for high boiler pressure projects for the first year of Control Period (i.e. FY2017-18), and will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

9.3.4 The CERC in its Statement of Reasons (SOR) dated 18th April 2017 for the Control Period 2017-2020, has analysed the normative capital cost for various boiler pressure (ata) and has discussed the data on the normative cost from Sugar Development Fund (Ministry of Consumer Affairs, Food & PD). The said data in respect of normative capital cost is Rs.442 Lakh/MT for 87 to 109 (ata) high pressure boiler and Rs.543.00 Lakh/MT for 110 (ata) and above high pressure

boiler. Considering the above, by averaging the normative cost for High Boiler Pressure projects (above 87 ata) CERC has arrived at a capital cost of Rs.492.5 Lakh/MW for FY2017-18. Further, CERC has stated that the higher capital cost of Rs.492.5 Lakh/MW is provided to encourage and ensure deployment of high pressure boilers which are more efficient in nature. This capital cost will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

9.3.5. The CERC has specified the Fuel Cost and PLF State specific but in respect of capital cost it has specified only Rs.492.5 Lakh/MW which is much lower than the capital cost fixed by this Commission. Further, the capital cost fixed by the other Commissions is also much lower than this Commission. In view of the declining trend prevailing in the market, Commission proposes a capital cost of Rs. 4.925 Crore/MW. The capital cost includes evacuation cost up to inter-connection point. The Commission apportions the capital cost on machineries, land and civil works at 85% and 15% respectively.

9.4 Plant Load Factor:

9.4.1 The plant load factor of a Bagasse based power generation depends on number of factors like availability of fuel, vintage of the plant, etc. Commission in all previous Orders has adopted a PLF of 55%. Commission proposes to retain the existing PLF of 55 % for the next control period too.

9.4.2 The PLF considered by other Commissions are as follows:

Sl. No.	Order of ERCs	PLF
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	60% (in respect of Tamil Nadu)
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	60%

3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	60%
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9.4.3 Some of the sugar mills also use fossil fuel during off seasons. Even during the crushing season if the sugarcane is not available supplementary fuel is used therefore the Commission would like to continue with the PLF of 55% on annual basis. The PLF is an annual phenomenon for the purpose of fixed cost recovery.

9.4.4 In some cases, generation may go beyond 55% PLF. Once the annual fixed charges or the capital cost recovery is achieved at the normative PLF of 55%, for any generation beyond the normative PLF of 55%, an incentive would be adequate for the additional efforts and to meet the wear and tear of the plant and equipment. Therefore, Commission allows an incentive of Rs.0.25 per unit which is already in practice in respect of the Conventional Power Stations.

9.4.5. In R.A. No. 3 of 2014, Commission has clarified the matter of PLF and the extract of the same is given below:

....."The 55% PLF is to be calculated based on the energy generated as measured at the generator terminal. The auxiliary consumption of 8.5% has already been accounted for in the determination of tariff. The net billable export to grid would be the energy generated as measured at the generator terminal minus auxiliary consumption minus sugar plant consumption. Therefore, for the purpose of regulating fixed charges and incentive the PLF is to be calculated as the sum of units exported to grid, auxiliary consumption and in-house consumption, in other words, the generation as measured at the generation terminal and not on the basis of energy exported".

9.4.6. In the present proposal also, Commission prefers to maintain status quo on adoption of the same methodology i.e. 55% PLF.

9.5 Debt – Equity Ratio:

9.5.1 The Tariff Policy lays down a debt-equity ratio of 70:30 for power projects. The Commission proposes to adopt this ratio as specified in its Tariff Regulations 2005 and as adopted in the earlier Orders on the new and renewable power.

9.6 Term of Loan and Rate of Interest:

9.6.1 The term of loan and rate of interest considered by other ERCs are as follows:

Sl. No.	Order of ERCs	Term of Loan and rate of interest
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	13 years and normative interest rate of two hundred (200) basis points above the average State Bank of India MCLR (one year tenor) prevalent during the last available six months. Interest rate for FY2017-18 is 10.66%
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	11.00%
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	12.50%

9.6.2 Commission proposes term of loan of 10 years plus one year moratorium as adopted in the previous orders of Bagasse based cogeneration energy. The prevalent lending rate being the marginal cost of funds based lending rate at which the bank prices all its loans, Commission proposes to adopt the latest MCLR (Marginal Cost of funds based Lending Rate) of 1 year of 7.95% notified by the State Bank of India in February 2018 plus 200 basis points which is 9.95% .

9.7 Return on Equity (RoE):

9.7.1 The Return on Equity considered by other ERC's are as follows:

Sl. No.	Order of ERCs	RoE
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	17.56%.
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	For first 10 years @ 16% grossing up with MAT rate of 21.34% and after

		first 10 years @16% grossing up with Income Tax rate of 34.61%
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	16% RoE and any Tax paid on RoE is allowed as a pass through which shall be claimed separately from ESCOMs furnishing proof of payments.

9.7.2 Commission proposes to adopt normative return on equity of 17.56% as adopted by CERC in its RE Regulations of 2017 and RE Tariff Order for FY2017-18.

9.8. Life of plant and machinery:

9.8.1 Commission in 2012 Order and in 2016 Order considered the life of a plant as 20 years for tariff determination process, therefore the useful life of the plant proposed to be considered by the Commission now is 20 years.

9.9 Depreciation :

9.9.1 The rate of depreciation considered by other Commissions are as follows:

Sl. No.	Order of ERCs	Depreciation
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	5.28% per annum for first 13 years; Balance spread over remaining useful life.
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	5.83% for the first 12 years and 2.50% thereafter for remaining useful life of 8 years
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	5.83% for the first 12 years and balance spread over the life of the plant.

9.9.2 The Commission proposes to continue the existing methodology of depreciation as in its earlier Order dated 31-07-2012 and 31-03-2016 in respect of Bagasse based Co-generation plants which is 4.5% p.a. Straight Line Method on plant and machinery by reckoning 85% of the capital cost as the cost of plant and machinery. The accumulated depreciation shall however be limited to 90% of the cost of plant and machinery.

9.10 Operation and Maintenance (O & M) Expenses:

9.10.1 The O & M Expenses considered by other Commissions are as follows:

Sl. No.	Order of ERCs	O & M Expenses
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	Rs21.13 Lakh/MW(FY2017-18) with an escalation at 5.72%
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	Rs.18.69 Lakh/MW for FY2017-18
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	3.0% of Capital Cost with an escalation of 5.72%

9.10.2 The Commission now proposes to continue with the O & M expenses including insurance at Rs.22.33 Lakh/MW with an annual escalation of 5.72% from the second year onwards.

9.11. Interest and Components of working capital:

9.11.1 The Commission in its Order No. 4 of 2016, dated 31-03-2016, fixed the components of working capital on the following norms:

- a. Fuel stock of one month
- b. O & M Expenses for one month
- c. Receivables equivalent to one month

9.11.2 The Commission now proposes to adopt the same components of working capital.

9.11.3 The rate of interest and components considered by other Commission for calculating the Interest on Working Capital are as follows:

Sl. No.	Order of ERCs	Interest and components
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	Fuel Cost for four months equivalent to normative PLF, O & M expenses for one month, receivables equivalent to two (2) months of fixed and variable charges for sale of electricity calculated on the target PLF and Maintenance spare @ 15% of O & M expenses. Rate of Interest - 300 basis points above the average State Bank of India MCLR (one year tenor).
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	Fuel Cost for four months equivalent to normative PLF, O & M expenses for one month, receivables equivalent

		to two (2) months of fixed and variable charges for sale of electricity calculated on the target PLF and Maintenance spare @ 15% of O & M expenses. Rate of Interest - 11.00%
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	13.25%

9.11.4 Interest on working capital is proposed at 300 basis points above the average State Bank of India MCLR (one year tenor) at 10.95% and one month Fuel Stock, one month Operation and Maintenance cost and two months receivables as working capital components.

9.12. Station Heat Rate:

9.12.1 The Station Heat Rate considered by other Commissions are as follows:

Sl. No.	Order of ERCs	Station Heat Rate
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	3600 kCal/kW/hr
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	3600 kCal/kW/hr

9.12.2 In R.A. No. 3 of 2014, dated 23-02-2016, Commission while revising the Capital Cost has discussed the issue of Station Heat Rate in detail. It was observed that 'Station Heat Rate becomes an associated issue of the capital cost when the capital cost is fixed based on a technology or configuration different from originally conceived one which changes the performance of the plant as such. Increased capital cost is being admitted to accommodate the latest technological advancement in terms of enhanced rating of the BTG. By changing the configuration of the project from 64 ata/400°C to around 110 ata 540°C, the power output increases considerably for the same input'. In the said order Commission felt that while passing on the additional cost due to enhanced configuration of the plant to TANGEDCO, it would be justified to pass on the benefits as well.

9.12.3 In the said order Commission adopted a Station Heat Rate of 3240 Kcal/kWhr. Further, in Order No. 4 of 2016, dated 31-03-2016 too Commission adopted the same Station Heat Rate of 3240 Kcal/kWhr. Commission now proposes the Station Heat Rate of 3240 kCal/kWhr.

9.13 Gross Calorific value of the fuel:

9.13.1 The GCV considered by other Commissions are as follows:

Sl. No.	Order of ERCs	GCV for Bagasse
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	2250 kCal/kg
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	2250 kCal/kg

9.13.2 Commission adopted a GCV of 2300 kCal/kg in Order No. 7 of 2012, dated 31-07-2012 and also in Order No. 4 of 2016, dated 31-03-2016. Commission now proposes to continue with the same GCV of 2300 kCal/kg.

9.14 Specific fuel consumption (SFC) :

9.14.1 The Specific fuel consumption considered by other Commissions are as follows:

Sl. No.	Order of ERCs	Specific fuel consumption
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	1.60 kg/kWhr
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	1.60 kg/kWhr
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	1.60 kg/kWhr

9.14.2 Specific fuel consumption is the resultant of Station Heat Rate and Gross Calorific Value of the fuel. With the above Station Heat Rate at 3240 kCal/kWh and GCV at 2300 kCal/kg the resultant consumption works out to 1.41 kg/kWh and the Commission now proposes the same.

9.15 Fuel Cost:

9.15.1 The fuel cost considered by the other Commissions are as follows:

Sl. No.	Order of ERCs	Fuel Cost and escalation factor
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	Rs.1747.51/MT(FY2017-18) for Tamil Nadu and the fuel cost shall be escalated at 5% for subsequent years.
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	Rs.2273.75/MT for FY2017-18
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	Rs. 1600/MT escalation @ 5.72%

9.15.2 Based on the fuel cost per metric ton notified by CERC in its RE Regulation dated 28-04-2017, Commission now proposes fuel cost as Rs.1834.35 / MT with an escalation of 5% p.a.

9.16. Auxiliary Consumption:

9.16.1 Auxiliary consumption considered by other Commissions are as follows:

Sl. No.	Order of ERCs	Auxiliary consumption
1.	CERC's Regulation(RE-Tariff-2017-2020), dated 17-4-2017	8.50%
2.	Maharashtra ERC's Order dated. 28-4-2017 (for FY2017-18)	8.50%
3.	Karnataka ERC's Order dated 01-01-2015 (upto FY2017-18)	9.00%

Commission in its Order No. 4 of 2016, dated 31-03-2016 adopted an Auxiliary consumption of 8.50%. Commission now proposes to continue with the same.

10. Tariff Determinants:

10.1 The financial and operational parameters in respect of Bagasse based Cogeneration Power projects proposed in the Consultative Paper are tabulated below:

Tariff Components	Values
Capital Cost	Rs.4.925 Crore/MW
PLF	55%
Debt Equity Ratio	70:30
Term of Loan	10 years with 1 year moratorium period
Interest on Loan	9.95%
Return on Equity	17.56%
Life of Plant and Machinery	20 years
Depreciation	4.5% per annum SLM on 85% of the Capital Cost
O & M Expenses	Rs. 22.3386 Lakh/MW with an annual escalation of 5.72% from 2 nd year onwards
Components and Interest on Working Capital	Components: a) One month Fuel Stock b) One month O & M Expenses c) Two months Receivables Rate of Interest – 10.95%
Station Heat Rate(SHR)	3240 kCal/kWh
Gross Calorific Value (GCV)	2300 kCal/kg
Specific Fuel Consumption (SFC)	1.41
Fuel Cost (Rs. PMT)	Rs. 1834.35/MT
Auxiliary Consumption	8.5%

11.0 Tariff:

11.1 Bagasse based Power Generation tariff is computed with reference to the determinants list above.

11.2 Fixed Cost:

11.2.1 The fixed Cost per unit for the whole project life of 20 years is as follows:

(Rs./Unit)

Year	FCC	Year	FCC
1	2.43	11	2.15
2	2.46	12	2.13
3	2.42	13	2.19
4	2.38	14	2.26
5	2.34	15	2.33
6	2.30	16	2.40
7	2.26	17	2.48
8	2.23	18	2.56
9	2.20	19	2.64
10	2.17	20	2.73

11.2.2 The fixed capacity charges specified in this Order will be applicable with reference to the date of commissioning of the plant. The fixed capacity charges specified above will continue to be applicable to the plants commissioned after the expiry of Order No. 4 of 2016, dated 31-03-2016.

11.3 Variable Cost:

11.3.1 The variable cost for the financial year 2018-19 will be Rs.2.83/- per unit and for the financial year 2019-20 will be Rs.2.97/- per unit as discussed supra.

11.3.2. The variable cost will be applicable with reference to the financial year. The variable cost will apply for all plants commissioned on or after 15-05-2006.

12 Use of Fossil Fuel:

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

13. Monitoring Mechanism for the use of fossil fuel:

13.1 The Project developer shall furnish to the State Nodal Agency, a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered Accountant to the beneficiary (with a copy to appropriate agency appointed by the Commission for the purpose of monitoring the fossil and non-fossil fuel consumption) for each month, along with the monthly energy bill. The statement shall cover details such as -

- a) Quantity of fuel (in tone) for each fuel type (bagasse and fossil fuels) consumed and procured during the month of power generation purposes,
- b) Cumulative quantity (in tonne) of each fuel type consumed and procured till the end of that month during the year,
- c) Actual (gross and net) energy generation (denominated in units) during the month,
- d) Cumulative actual (gross and net) energy generation (denominated in units) until the end of that month during the year,
- e) Opening fuel stock quantity (in tonne),
- f) Receipt of fuel quantity (in tonne) at the power plant site and
- g) Closing fuel stock quantity (in tonne) for each fuel type (bagasse and fossil fuels) available at the power plant site.

13.2 Non-compliance with the condition of fossil fuel usage by the project developer, during any financial year, shall result in withdrawal of applicability of tariff for such bagasse based power project.

14.0 Related issues:

The following are the related issues for energy generation from bagasse based cogeneration plants:

1. Transmission and wheeling charges & Scheduling and system operation
2. Cross Subsidy Surcharge
3. CDM Benefits
4. Reactive power charges
5. Grid availability charges
6. Adjustment of energy generated
7. Application fees and agreement fees
8. Billing and payments
9. Payment security and Security deposit
10. Power factor
11. Metering
12. Connectivity and Evacuation of energy
13. Energy Purchase and Wheeling Agreement
14. Scheduling of power generation
15. Parallel Operation Charges
16. Tariff review period / Control period
17. Quantum of power purchase by the Distribution Licensee

14.1 It is proposed that the above charges / terms are applicable to all bagasse based co-gen plants irrespective of their year of installation. These are discussed in detail in the following paragraphs.

14.2. Transmission and wheeling charges & Scheduling and system operation charges:

14.2.1. Transmission, Wheeling and Scheduling & System operation charges are generally regulated by the Commission's Tariff regulations, Grid Connectivity &

Open Access regulations and Commission's order on open access charges issued from time to time. However, as a promotional measure, under sections 61 and 86(1)(e) of the Act, Commission in the tariff orders of 2012 and 2016 fixed 60% of the charges applicable for conventional power for Bagasse based Cogeneration plants. The concessions granted are being subsidized by other users of the network and ultimately borne by the consumers.

14.2.2 With regard to 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.

14.2.3 Commission proposes to withdraw the incentives in phases by reducing the same by 10% every two years. Commission proposes the transmission, wheeling and scheduling and system operation charges at 70% of that applicable for conventional power plants notified by the Commission from time to time.

14.2.4 Apart from these charges, actual line losses in kind as specified in the respective Order of the Commission and as amended from time to time are also payable for the captive use and third party sale. For generators who are availing Renewable Energy Certificate (REC), normal transmission charges, wheeling charges, Scheduling and System operation charges and line losses will apply.

14.3. Cross subsidy surcharge:

14.3.1. The Commission in its tariff orders related to renewable power has ordered to levy 50% of the cross subsidy surcharge for third party open access consumers. Commission in respect of Wind energy and Solar energy proposes for withdrawal of incentives in phases every year by reducing the same by 10%

every two years. Commission proposes levy of 60% of cross subsidy surcharge applicable to conventional power.

14.4. CDM Benefits:

14.4.1 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.”

14.4.2 The Commission accepted the formula recommended by the Forum of Regulators in its earlier order. The Commission proposes to adopt the same formula. The distribution licensee shall account for the CDM receipts in the next ARR filing.

14.5 Reactive Power Charges:

Commission proposes to adopt the reactive power charges for bagasse based co-generating plants as specified in its Order on Open Access charges issued from time to time.

14.6. Grid availability charges:

14.6.1 The charges for startup power of generators shall be as per Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 in force.

14.6.2. Similarly, if adequate generation does not materialize or if drawal by the captive / third party consumer exceeds generation, the energy charges and

demand charges shall be regulated as specified in the Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 in force.

14.7. Adjustment of energy generated:

14.7.1. The Commission in Order No.4 of 2016, dated 31-03-2016, decided that the adjustment of energy shall be as per the Commission's Open Access Regulations in force.

14.7.2. The Commission proposes to continue with the existing procedure.

14.8. Application Fees and Agreement Fees:

14.8.1. The Commission in its Order No.4 of 2016, dated 31-03-2016 had stated that the Intra State Open Access Regulations 2005 of the Commission was amended in 2008 to provide for concession in application fees and agreement fees for generators of non-conventional and renewable sources of energy.

14.8.2. The application fees and agreement fees for the Energy Purchase Agreement (EPA) and Energy Wheeling Agreement (EWA) shall be as specified in the Commission's Intra State Open Access Regulations, 2005 and Fees and Fines Regulations, 2004 in force. The fees of EPA shall be collected by the licensee and passed on to the Commission. Whenever the Commission revises the above fees, the revised fees shall be payable by the Bagasse based co-generators.

14.8.3.. Whenever there is a change in the usage of energy from bagasse based co-gen or a change in the drawl point, etc., there will be extra work to the licensee. Therefore, an additional fees equivalent to the application fees and agreement fees shall be leviable by the licensee on the generator.

14.8.4. The Commission proposes to continue the same as in the Order No.4 of 2016, dated 31-03-2016.

14.9. Billing and payments:

14.9.1 The Commission in its Order No.4 of 2016, dated 31-03-2016 had specified that when a renewable energy generator sells power to the distribution licensee, the generator will raise a bill every month for the net energy sold after deducting the charges for startup power and reactive power. The bill amount is due only after one month. If the distribution licensee makes the payment within a period of one month of presentation of bills by a generating company, a rebate of 1% shall be allowed. Any delayed payment beyond 60 days is liable for interest at the rate of 1% per month.

14.9.2 Commission now proposes to continue the above dispensation. The Commission also proposes that if a bagasse based co-generator utilizes the 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 month for the net energy supplied. The licensee should record the generation and consumption on the same day as far as possible. While preparing the bill, peak hour generation shall be adjusted against peak hour consumption. Off-peak hour generation shall be adjusted against off-peak hour consumption. Normal hour generation shall be adjusted against normal hour consumption. Excess consumption will be charged at the tariff applicable to the consumer as per the Regulations / Orders of the Commission in force. Appropriate transmission and wheeling charges, scheduling and system operation charges and cross subsidy surcharge, wherever applicable, shall be recovered from the open access consumers. The net amount recoverable from the consumer shall be raised in the bill as per their normal billing schedule.

14.9.3 Peak, Off-peak and normal hours shall be as defined in Terms & Conditions for Determination of Tariff Regulations, 2005 as amended from time to time. Presently, as per Clause 11 (2) of the Terms and Conditions for determination of Tariff Regulations, 2005 – defines Peak hour as “ *the time between 06.00 hrs and 09.00 hrs and between 18.00 hrs and 21.00 hours*”. Clause 11(3) of the Terms and Conditions for determination of Tariff Regulations, 2005 defines off-peak hour as “*the duration between 22.00 hours and 05.00 hours*”. Balance hours are normal hours.

14.10. Payment security and Security deposit:

14.10.1. In Commission's Order No.4 of 2016, dated 31-03-2016, the Commission had stated that the Tariff Policy calls for adequate and bankable security arrangement to the generating companies. This mechanism has been found impractical, as there are more number of generators and the monolith distribution licensee is unable to offer security for such numbers. In the said Order, it had been stated that the interest for delayed payment by the licensee at 1% per month would serve the ends of justice.

14.10.2. With respect to the security deposit of the consumer, it was decided that 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 by the consumers.

14.10.3. The Commission now proposes to continue the existing system in respect of the payment security and security deposit.

14.11. Power factor:

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

14.12 Metering:

14.12.1. The Commission in its Order No.4 of 2016, dated 31-03-2016 had decided to adopt the metering and communication in accordance with the following Regulations/ Codes, as amended from time to time:

- (a) Central Electricity Authority (Installation and Operation of Meters) Regulations 2006
- (b) Tamil Nadu Electricity Distribution Code 2004
- (c))Tamil Nadu Grid Code 2004
- (d) Tamil Nadu Electricity Regulatory Commission - Intra State Open Access Regulations, 2005.

14.12.2. The Commission now proposes to continue the same.

14.13. Connectivity and Evacuation of energy:

14.13.1. The Commission in its Order No.4 of 2016, dated 31-03-2016 had ruled that the connectivity and power evacuation system shall be provided as per the Act, Codes, Regulations and Orders in force.

14.13.2. The Commission now proposes to continue the same as in the previous Order.

14.14. Energy Purchase and Wheeling Agreement:

14.14.1. The Commission in its Order No.4 of 2016, dated 31-03-2016 had decided that the format of the Energy Purchase Agreement (EPA) shall be evolved as specified in the Commission's Regulations in force. The agreement shall be valid for a minimum period of twenty years. The distribution licensee shall execute the Energy Purchase Agreement within a month of receipt of application

from the generator. The parties to the agreement may be given the option of exiting in case of violation with three months' notice to the other party.

14.14.2. The format of Energy Wheeling Agreement (EWA) shall be evolved as specified in the Commission's Regulations in force. The period and other terms of agreement shall be as per the terms of Open Access Regulations issued by the Commission.

14.15. Scheduling of power generation:

14.15.1. The Commission in its Order No.4 of 2016, dated 31-03-2016 had reiterated that the generator shall follow the scheduling procedure as specified in Indian Electricity Grid Code and Tamil Nadu Electricity Grid Code and other Regulations, Codes and Orders of the Commission. Depending upon the availability of Bagasse, the generators should be in a position to declare the availability on a day-ahead basis. The Commission now proposes to adopt the same.

14.16. Parallel Operation Charges

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

14.17. Control Period / Tariff Review Period:

14.17.1 Clause 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.

14.17.2. The Commission proposes a control period of two years from the date of issue of the final order and the tariff period is twenty years.

14.18. Quantum of power purchase by the Distribution Licensee:

14.18.1 The distribution licensee can purchase bagasse based cogen power at the rate determined by the Commission from the bagasse based cogen 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.**

PARAMETERS		VALUES
Capital Cost (in Rs.)		49250000
Debt - 70% (in Rs.)		34475000
Equity - 30% (in Rs.)		14775000
Interest on Debt		9.95%
Depreciation- SLM at 4.5% on 85% of Capital Cost - (in Rs.)		1883813
Interest on Working Capital		10.95%
Components of working capital		
Fuel Cost	1month	
O & M	1month	
Receivables	2 months	
Return on Equity	17.5600%	
(ROE as per CERC)		
O & M Expenses - (in Rs.)	2233895	
Gross generation @ 55% PLF (in	4818000	
Auxiliary Consumption	8.50%	
Net Generation (in Units)	4408470	
Fuel Cost (Rs./MT)	1834.35	
Station Heat Rate kCal/kWh	3240	
GCV kCal/kg	2300	
SFC kg/kWh	1.41	

ANNEXURE - IV

WORKING SHEET FOR TARIFF COMPUTATION FOR BAGASSE BASED CO-GENERATION PLANTS

Year	O & M charges (Rs)	Interest on loan (Rs)	Depreciation (Rs)	Fuel cost (Rs)	Working capital (Rs)					Return on Equity (Rs)	Total Fixed Cost (Rs)	Units generated Less Auxilliary	Fixed Cost (Rs / unit)	Variable Cost (Rs / unit)	Total Cost per unit (Rs /
					O & M expenses	Fuel	Receivables	Total Working Capital	Interest on Working Capital						
1	2233895	3430263	1883813	12461437	186158	1038453	3860112	5084723	556777	2594490	10699238	4408470	2.43	2.83	5.25
2	2361674	3430263	1883813	13084508	196806	1090376	3988744	5275925	577714	2594490	10847953	4408470	2.46	2.97	5.43
3	2496762	3087236	1883813	13738734	208064	1144894	4065730	5418688	593346	2594490	10655647	4408470	2.42		
4	2639577	2744210	1883813	14425671	219965	1202139	4149644	5571748	610106	2594490	10472196	4408470	2.38		
5	2790561	2401184	1883813	15146954	232547	1262246	4240842	5735635	628052	2594490	10298099	4408470	2.34		
6	2950181	2058158	1883813	15904302	245848	1325358	4339698	5910905	647244	2594490	10133885	4408470	2.30		
7	3118931	1715131	1883813	16699517	259911	1391626	4446605	6098142	667747	2594490	9980111	4408470	2.26		
8	3297334	1372105	1883813	17534493	274778	1461208	4561977	6297962	689627	2594490	9837368	4408470	2.23		
9	3485941	1029079	1883813	18411217	290495	1534268	4686249	6511013	712956	2594490	9706279	4408470	2.20		
10	3685337	686053	1883813	19331778	307111	1610982	4819880	6737973	737808	2594490	9587500	4408470	2.17		
11	3896139	343026	1883813	20298367	324678	1691531	4963349	6979558	764262	2594490	9481729	4408470	2.15		
12	4118998		1883813	21313285	343250	1776107	5117164	7236521	792399	2594490	9389699	4408470	2.13		
13	4354604		1883813	22378950	362884	1864912	5340090	7567886	828684	2594490	9661590	4408470	2.19		
14	4603688		1883813	23497897	383641	1958158	5574453	7916252	866830	2594490	9948820	4408470	2.26		
15	4867019		1883813	24672792	405585	2056066	5820841	8282492	906933	2594490	10252254	4408470	2.33		
16	5145412		1883813	25906432	428784	2158869	6079873	8667527	949094	2594490	10572809	4408470	2.40		
17	5439730		1883813	27201753	453311	2266813	6352201	9072324	993420	2594490	10911452	4408470	2.48		
18	5750882		1883813	28561841	479240	2380153	6638508	9497901	1040020	2594490	11269205	4408470	2.56		
19	6079833		1883813	29989933	506653	2499161	6939514	9945327	1089013	2594490	11647149	4408470	2.64		
20	6427599		1883813	31489430	535633	2624119	7255976	10415728	1140522	2594490	12046424	4408470	2.73		