

## **TAMIL NADU ELECTRICITY REGULATORY COMMISSION**

### **CONSULTATIVE PAPER ON POWER PROCUREMENT BY DISTRIBUTION LICENSEES 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 31 -01-2020 )*

#### **1.0 Preamble**

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 twenty three 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 12180 MW of which Bagasse based Co-generation power constitutes 710.9 MW (as on 25-11-2019). Last generic tariff order of the Commission in the case of Bagasse based Co-generation power was issued on 28.3.2018 vide Order No.4 of 2018. The control period of this Order No.4 of 2018 on Bagasse based co-generation power plants expires on 31.3.2020.

#### **2.0 Importance of Non-Conventional Energy Sources:**

2.1 The energy which is renewable and doesn't harm to the environment and which

comes from natural resources like solar energy, wind energy, bio mass and bagasse like co-generation are the best sources of Non conventional energy. Non-Conventional Energy Sources are pollution free. Moreover exporting Renewable electricity to the Grid, which displaces fossil fuel intensive electricity from the grid connected power plants and results in emission reduction. 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. Among various renewable sources for energy, Bagasse based co-generation also plays as a good in-house power generation for captive usage.

2.2 Bagasse is often used as a primary fuel source for sugar mills. When burned in quantity, it produces sufficient heat energy to supply all the needs of a typical sugar mill, with energy to spare. To this end, a secondary use for this waste product is in cogeneration, the use of a fuel source to provide both heat energy, used in the mill, and electricity, which is typically sold on to the consumer electrical grid.

2.3 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.

4.5 The Commission issued Order No.4 of 2018, dated 28-03-2018 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 that Order, Commission fixed its control period of two years from April 1, 2018.

## **5. Floating of Consultative paper:**

5.1 As the control period of 2 years will expire on 31-03-2020, 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 2016**

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 2018, dated 28-03-2018 and proposed to effect from 01-04-2020. 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**", and, the same was continued and adopted in Order no.4 of 2018 also. 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 2018, dated 28-03-2018.

**The capital cost considered by other Commissions are as follows:**

SI. No.	Order of ERCs	Capital Cost
1.	CERC's RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	Rs.4.925 Crore/MW
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	Rs.4.66 Crore/MW
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	Rs.4.61 Crore/MW
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	Rs.4.36 Crore/MW
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	Rs.4.70 Crore/MW

9.3.2 In the Commission's Order No.4 of 2018 dated 28-03-2018, the Commission adopted a Capital Cost of Rs.5.20 Crore/MW. The capital cost includes evacuation cost up to the inter-connection point. The Commission apportions the capital cost on plant & machineries, land & civil works as 85% and 15% respectively.

9.3.3 In CERC's (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017, it has been 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 third year of Control Period (i.e. FY2019-20), and will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

9.3.4 It is evident from the CERC's Statement of Reasons (SOR) dated 18<sup>th</sup> April 2017 for the Control Period 2017-2020, that CERC has analysed the normative capital cost for various boiler pressure (ata) and has discussed the data on the normative capital 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 FY2019-20. 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 capital cost fixed by the CERC is only Rs.492.5 Lakh/MW for the FY 2019-20 and the cost of high pressure boiler is also in declining trend in the market. In view of the above, the 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. Considering the no.of operating period (Crushing & Off-season duration) during a year, CERC has fixed the PLF of 60%.

9.4.2 The PLF considered by other Commissions are as follows:

<b>Sl. No.</b>	<b>Order of ERCs</b>	<b>PLF</b>
1.	CERC's RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	60% (in respect of Tamil Nadu)

2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	60%
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	50%
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	55%
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	75%

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 enhance the PLF from 55% to 60%. The PLF is an annual phenomenon for the purpose of fixed cost recovery. Therefore, Commission proposes to adopt a PLF of 60%.

9.4.4 Whenever the generation go beyond 60% PLF, as the annual fixed charges or the capital cost recovery is achieved at the normative PLF of 60%, for any generation beyond the normative PLF of 60%, an incentive would be adequate for the additional efforts and to meet the wear and tear of the plant and equipment. continue the incentive of Rs.0.25 per unit which is already in practice in respect of the Conventional Power Stations.

9.4.5. Therefore, in the existing Order Commission proposes to adopt a normative PLF of 60%; and any generation beyond the normative PLF of 60%, Commission allows Variable Cost and also an incentive of 25 paise per unit.

## **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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	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 FY2019-20 is 10.41%
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	11.40%
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	11.00%
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	10.25%
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	10.50%

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 8.31% notified by the State Bank of India in November 2019 plus 200 basis points which is 10.31% .

## 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	Return on Equity
1.	CERC's RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	17.60% (pre-tax)
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	ROE of 14% (plus) applicable tax payment of MAT @ 21.34% p.a. for first 10 years and Corporate tax @ 34.61% p.a. for next 15 years.
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	15.00% (pre-tax)
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	17.60% (pre-tax)
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	14.00% (income tax pass through) (decreased from 16% to 14%)

9.7.2. CERC adopted the 17.60% (pre-tax) to ensure RoE of 14% considering the average MAT rate of 20.46%. The same has been adopted by many of other ERCs.

9.7.3 Adopting the similar analogy, the Commission proposes to adopt normative return on equity of 16.78% (pre-tax) considering the RoE @ 14% grossing up with the recent average MAT rate of 16.59%.

### 9.8. Life of plant and machinery:

9.8.1. The Commission in its all earlier Orders in 2012, 2016 and in 2018 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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	5.28% per annum for first 13 years; Balance spread over remaining useful life i.e., at 3.05%.

2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	7% (upto 10 years) 2% (11 to 20 years)
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	5.83% for 1 <sup>st</sup> 12 years; and balance for remaining life period
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	5.28% for 13 years; and 3.05 for remaining life period
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	5.38% for 1 <sup>st</sup> 13 years and balance spread equally over life of the plant.

9.9.2 The Commission proposes to continue the existing methodology of depreciation as in its earlier Orders dated 31-07-2012, 31-03-2016 and 28-03-2018 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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	23.62 lakhs/MW for 2019-20 and escalation of 5.72% p.a. over the tariff period
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	3% of project cost and escalation of 5.72% p.a. from 2 <sup>nd</sup> year onwards
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	17.97 lakhs/MW and escalation of 4% p.a. thereafter
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	22.18 lakhs/MW and escalation of 5.00% p.a. thereafter.
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	4% of Cap.cost and escalation of 5.72% p.a. thereafter

9.10.2 The Commission proposes to allow the O&M expenses at the rate of 3% of capital cost. Because, when there is no change in capital cost over a period of 10 years, mere increase in O&M value @ 5% over every previous year may not be justifiable. Therefore, the rate of 3% of capital cost adopted, since the same was taken into consideration by the APTEL while remanding Appeal 199/2012 on the TNERC's Bagasse order in 2012. The same will be escalated by 5.72% every year from 2<sup>nd</sup> year onwards.

### 9.11. Interest and Components of working capital:

9.11.1 The Commission proposes to fix the components of Working capital with the following norms:

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

9.11.2. Since, the same has been adopted in the earlier Bagasse Orders in 2016 & 2018, it has been proposed to continue the same in this Order too.

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

Sl. No.	Order of ERCs	Interest and components of Working Capital
1.	CERC's RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	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.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	Components: (i) Fuel stock for 30 days, (ii) O&M expenses for one month, (iii) Receivables of 1 month for sale, (iv) Maintenance spares @ 1% of capital cost escalated @ 5% p.a. Rate of Interest – SBI rate (8.9%) plus 250 basis points

3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	Components: (i) Fuel cost of 4 months (ii) O&M exp. for one month (iii) Receivable two months (iv) spares for O&M 15% Rate of Interest – 12%
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	Components: (i) O&M expenses one month (ii) 15% of O&M expenses (iii) Receivables-two months (iv) Fuel stock-one month Rate of Interest – 11.25%
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	12%

9.11.4 Commission proposes the Interest on working capital at 11.31% arrived based on the average State Bank of India MCLR (one year tenor) rate prevalent during available six months period i.e., 8.31% plus 300 basis points; 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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	3600 KCal/KW hr
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	3600 KCal/KW hr
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019 (FY 2019-2024)	3400 KCal/KW hr
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	3600 KCal/KW hr
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	3600 KCal/KW hr

9.12.2 The Commission so far in its earlier Orders, adopted a Station Heat Rate of 3240 Kcal/kWhr. Moreover, in Order No. 4 of 2018, dated 28-03-2018 too Commission adopted the same Station Heat Rate of 3240 Kcal/kWhr. As such, the Commission now proposes to adopt 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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	2250 KCal/Kg
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	2250 KCal/Kg
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019	2250 KCal/Kg
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	2250 KCal/Kg
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	2250 KCal/KWhr

9.13.2 In earlier Orders viz., Order No. 7 of 2012, dated 31-07-2012 and in Order No. 4 of 2016, dated 31-03-2016 and also in Order No.4 of 2018, dt.28-03-2018 Commission adopted a GCV of 2300 kCal/kg. 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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	1.6 Kg/KW hr
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	1.6 Kg/KW hr
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019	1.51 Kg/KW hr
4	Telangana ERC's Order Dt.20.10.2018 (FY 2018-2020)	1.6 Kg/KW hr
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	1.6 Kg/KW hr

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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	Rs.1926.63/MT with the escalation of 5%
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	Rs.2075/MT with the escalation of 5%
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019	Rs.1010/MT with the escalation of 5% (2019-20)
4	Telangana ERC's Order Dt.20.10.2018 (FY 2019-2020)	Rs.1848/MT with the escalation of 5%
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	Rs.1161.28/MT (2020-21)

9.15.2 Price of Bagasse notified by the CERC for the year 2019-20 is Rs.1926.63 per ton. The Commission now proposes the same value as adopted by CERC i.e., Rs.1926.63 with an escalation of 5% p.a. for the subsequent year.

### 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 RE Generic Order (RE-Tariff-2019-2020), dated 19-03-2019	8.5%
2.	Gujarat ERC's Order dated. 15-03-2018 (upto FY2019-20)	8.5%
3.	Uttar pradesh ERC's Regulations 2019, dated 25-07-2019	8.5%
4	Telangana ERC's Order Dt.20.10.2018 (FY 2019-2020)	9.00%
5	Karnataka ERC's Order, dated 14-05-2018 (FY 2018-2021)	8.5%

9.16.2. In its earlier Orders in No.4 of 2016, dt.31-03-2016 and Order no.4 of 2018, dt.28-03-2018 Commission adopted an Auxiliary consumption of 8.50%. The Commission now proposes to continue with the same rate.

### 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	60%
Debt Equity Ratio	70:30
Term of Loan	10 years with 1 year moratorium period
Interest on Loan	10.31%
Return on Equity	16.78%
Life of Plant and Machinery	20 years
Depreciation	4.5% per annum SLM on 85% of the Capital Cost
O & M Expenses	3% of Capital Cost with an annual escalation of 5.72% from 2 <sup>nd</sup> 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 – 11.31%
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. 1926.63/MT
Auxiliary Consumption	8.5%
Variable Cost	
2020-21	Rs.2.97 per Unit
2021-22	Rs.3.12 per Unit
Fixed Cost	
2020-21	Rs.2.08 per Unit
2021-22	Rs.2.10 per Unit
<b>Total Cost</b>	
<b>2020-21</b>	<b>Rs.5.05 per Unit</b>
<b>2021-22</b>	<b>Rs.5.22 per Unit</b>



**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	2.08	11	1.69
2	2.10	12	1.65
3	2.05	13	1.69
4	2.00	14	1.74
5	1.95	15	1.78
6	1.90	16	1.83
7	1.86	17	1.88
8	1.81	18	1.93
9	1.77	19	1.99
10	1.73	20	2.05

11.2.2 The fixed capacity charges specified in this Order will be applicable with reference to the date of commissioning of the plant.

**11.3 Variable Cost:**

11.3.1 The variable cost for the financial year 2020-21 will be Rs.2.97/- per unit and for the financial year 2021-22 will be Rs.3.12/- 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. Parallel Operation Charges
15. Tariff review period / Control period
16. 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. As the Bagasse based Co-generation plants were enjoying the concessional charges for the long run in past, with the assurance to withdraw the same over the period, which were being subsidized by other users of the network and ultimately borne by the consumers, the Commission decides to levy the applicable charges fixed from time to time as stated under Grid Connectivity & Open access Regulations, 2014.

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.

14.2.3 The Commission proposes the transmission, wheeling and scheduling and system operation charges for these co-generation plants as 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) also, 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 proposes to levy of 100% 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 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.

**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, Deviation Settlement Mechanism and other orders of the Commission 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 and Deviation Settlement Mechanism and other relevant Orders.

**14.7. Adjustment of energy generated:**

14.7.1. The Commission decides that the adjustment of energy shall be as per the Commission's Grid Connectivity and Open Access Regulations, Deviation Settlement Mechanism (DSM) and other relevant orders.

**14.8. Application Fees and Agreement Fees:**

14.8.1. The Commission in its Bagasse Orders in 2016 and 2018 had stated that the Intra State Open Access Regulations 2014 of the Commission 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, 2014 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 2018, dated 28-03-2018.

#### **14.9. Billing and payments:**

14.9.1 The Commission in its Order No.4 of 2018, dated 28-03-2018 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. Commission now proposes to continue the above dispensation.

14.9.2 Energy Accounting shall be regulated by the Commission's Regulation/Orders on Open access, Deviation Settlement Mechanism and any other Orders. Till such time the DSM is implemented in the State, 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 during the billing period. Slot wise adjustment shall be made for the billing period. However, peak hour generation can be adjusted to normal hour or off peak hour consumption of the billing period. Normal hour generation shall be adjusted against normal hour

consumption. Excess consumption will be charged at the tariff applicable to the consumer subject to the terms and conditions of supply.

14.9.3. When DSM is implemented, 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.

14.9.4. 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.

14.9.5 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. 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 Bagasse Order of 2016 & 2018, Commission



considered 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.

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 Orders No.4 of 2016, dated 31-03-2016 and Order no.4 of 2018, dt.28-03-2018 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 – Grid connectivity & Intra State Open Access Regulations, 2014.

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 2018, dated 28-03-2018 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 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. Parallel Operation Charges**

14.15.1. Commission proposes that in respect of Bagasse based power generators who consumes power on captive basis in the same location may opt for paralleling of their generators with the grid without actually wheeling their power. Such generators shall have to pay the applicable parallel operation charges to the respective distribution licensee as specified in the relevant regulations.

14.15.2. The Parallel Operation charges in respect of the plants under REC option may be collected on par with the conventional power plants, as already in force.

**14.16. Control Period / Tariff Review Period:**

14.16.1 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.

14.16.2. The Commission proposes a control period of two years from 01-04-2020 and the tariff period is twenty years.

**14.17. 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. 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.**

TNERC - CONSULTATIVE PAPER - 2020		
COMPONENTS OF BAGASSE BASED CO-GENERATION TARIFF		
PARAMETERS	VALUES	
Capital Cost (in Rs.)	49250000	
Debt - 70% (in Rs.)	34475000	
Equity - 30% (in Rs.)	14775000	
Interest on Debt	10.31%	
Depreciation- SLM at 4.5% on 85% of Capital Cost - (in Rs.)	1883813	
Interest on Working Capital	11.31%	
Components of working capital		
Fuel Cost	1month	
O & M	1month	
Receivables	2 months	
Return on Equity (ROE as per CERC)	16.7800%	
O & M Expenses - (in Rs.)	1477500	3% of cap.cost
Gross generation @ 60% PLF (in Units)	5256000	
Auxiliary Consumption	8.50%	
Net Generation (in Units)	4809240	
Fuel Cost (Rs./MT)	1926.63	
Station Heat Rate kCal/kWh	3240	
GCV kCal/kg	2300	
SFC kg/kWh	1.41	

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 consumption ( Units )	Fixed Cost ( Rs / unit)	Variable Cost (Rs / unit)	Total Cost per unit (Rs / unit)	
					O & M expenses	Fuel	Receivables	Total Working Capital							Interest on Working Capital
1	1477500	3554373	1883813	14278178	123125	1189848	4046545	5359518	606161	2479245	10001091	4809240	2.08	2.97	5.05
2	1562013	3554373	1883813	14992087	130168	1249341	4183450	5562958	629171	2479245	10108614	4809240	2.10	3.12	5.22
3	1651360	3198935	1883813	15741691	137613	1311808	4266927	5716348	646519	2479245	9859872	4809240	2.05		
4	1745818	2843498	1883813	16528776	145485	1377398	4357707	5880590	665095	2479245	9617468	4809240	2.00		
5	1845679	2488061	1883813	17355214	153807	1446268	4456162	6056236	684960	2479245	9381757	4809240	1.95		
6	1951252	2132624	1883813	18222975	162604	1518581	4562682	6243867	706181	2479245	9153114	4809240	1.90		
7	2062863	1777186	1883813	19134124	171905	1594510	4677676	6444092	728827	2479245	8931934	4809240	1.86		
8	2180859	1421749	1883813	20090830	181738	1674236	4801577	6657552	752969	2479245	8718634	4809240	1.81		
9	2305604	1066312	1883813	21095372	192134	1757948	4934838	6884920	778684	2479245	8513658	4809240	1.77		
10	2437485	710875	1883813	22150140	203124	1845845	5077935	7126904	806053	2479245	8317469	4809240	1.73		
11	2576909	355437	1883813	23257647	214742	1938137	5231368	7384248	835158	2479245	8130562	4809240	1.69		
12	2724308		1883813	24420530	227026	2035044	5395664	7657734	866090	2479245	7953455	4809240	1.65		
13	2880138		1883813	25641556	240012	2136796	5631753	8008561	905768	2479245	8148964	4809240	1.69		
14	3044882		1883813	26923634	253740	2243636	5879839	8377216	947463	2479245	8355403	4809240	1.74		
15	3219049		1883813	28269816	268254	2355818	6140533	8764605	991277	2479245	8573384	4809240	1.78		
16	3403179		1883813	29683306	283598	2473609	6414477	9171684	1037317	2479245	8803554	4809240	1.83		
17	3597841		1883813	31167472	299820	2597289	6702345	9599454	1085698	2479245	9046597	4809240	1.88		
18	3803637		1883813	32725845	316970	2727154	7004846	10048970	1136539	2479245	9303233	4809240	1.93		
19	4021206		1883813	34362137	335100	2863511	7322727	10521339	1189963	2479245	9574226	4809240	1.99		
20	4251218		1883813	36080244	354268	3006687	7656771	11017726	1246105	2479245	9860381	4809240	2.05		