TAMIL NADU ELECTRICITY REGULATORY COMMISSION

Comprehensive Tariff Order for Bagasse based Co-generation plants

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Order No. 4 of 2016, dated 31-03-2016

BEFORE THE TAMIL NADU ELECTRICITY REGULATORY COMMISSION
CHENNAI

Present : **Thiru S. Akshaya Kumar - Chairman**
Thiru G. Rajagopal - Member
Dr.T. Prabhakara Rao - Member

Order No. 4 of 2016, dated 31-03-2016

In the matter of : Power procurement by Distribution Licensee from Bagasse based Co-generation plants and allied issues relating to captive use and third party sale.

In exercise of powers conferred by Section 181 read with Section 61 (h) and 86(1) (e) of the Electricity Act 2003, (Central Act 36 of 2003), and after taking into account the stipulations in the National Electricity Policy and the Tariff Policy and in accordance with the Power Procurement from New and Renewable Energy Sources Regulations, 2008 of the Commission and after examining the comments received from the stakeholders, after considering the views of the State Advisory Committee meeting held on 17-03-2016 in accordance with section 88 of the Electricity Act 2003, after examining the comments received from the stakeholders as per Section 64 of Electricity Act 2003, the Tamil Nadu Electricity Regulatory Commission, hereby, passes this order to determine the tariff and other conditions for power procurement by Distribution Licensee from Bagasse based Co-generation plants and allied issues relating to captive use and third party sale.

This Order shall take effect on and from the 1st of April 2016.

Sd/-	Sd/-	Sd/-
(Dr.T. Prabhakara Rao)	(G. Rajagopal)	(S. Akshaya Kumar)
Member	Member	Chairman

(By Order of the Commission)

Sd/-
(S.Chinnarajalu)
Secretary

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TAMIL NADU ELECTRICITY REGULATORY COMMISSION

"Comprehensive Tariff Order for Bagasse based Co-generation plants"

ORDER ON POWER PROCUREMENT BY DISTRIBUTION LICENSEE FROM BAGASSE BASED CO-GENERATION PLANTS AND ALLIED ISSUES RELATING TO CAPTIVE USE AND THIRD PARTY SALE

1.0 PREAMBLE

1.1Power Scenario in Tamil Nadu

The generating capacity connected to the Tamil Nadu's grid including the allocation from Central Generating stations is 13883.5 MW as on 29-2-2016 comprising of 4,660 MW from TANGEDCO's four thermal stations, 516 MW from four gas turbine stations, 2288 MW from hydro stations, 852.5 MW from private generating stations, 68 MW as contribution to Tamil Nadu grid by sale of electricity from captive generating and biomass plants, 5464 MW as Tamil Nadu's share from central generating stations and 35 MW as external assistance.

1.1.1 Generating capacity from privately owned wind farms is 7512 MW as on 29-02-2016. The installed capacity of cogeneration plants is 659.4 MW and biomass power projects is 230 MW. The solar generation capacity is 581.26 MW.

1.1.2. The present demand in the State is around 13700 MW. The expected peak may vary from 14200 MW to 14800 MW. The peak power requirement is increasing at the rate of around 8% annually in the State. Therefore any capacity addition will help the State to a great extent.

1.2 Importance of New and Renewable Energy Sources:

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.

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.

2. Commission's Regulation on New and Renewable Energy Sources:

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.

Amongst other important provisions listed in the Regulations, it is also specified that the tariff determined by the Commission shall be applicable for a period of twenty years and the control period may ordinarily be two years.

3. Commission's order on New and Renewable Energy Sources based generation and allied issues.

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 New and

Renewable based generating power plants.

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.

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. Floating of Consultative Paper:

4.1. The Commission floated a Consultative Paper to elicit the views of the stakeholders before issuing a generic tariff order and hosted it in the Commission's website on 25-09-2014 inviting views/suggestions from the stakeholders.

4.2. The list of stakeholders who submitted written comments is placed in **Annexure I.**

4.4. A meeting of the State Advisory Committee (SAC) was also held on 17-03-2016 to elicit their views. The list of SAC members who participated in the meeting is placed in **Annexure II**.

4.5. Taking into account the views of various stakeholders and the views of the SAC members, the Commission issues this comprehensive Tariff Order on Bagasse based co-generation plants.

5. Bagasse based Co-generation Power Scenario in Tamil Nadu:

Tamil Nadu is blessed with conducive meteorological and topographical settings for electricity generation through Renewable energy sources. As on 15-03-2016, the installed capacity of Bagasse based Co-generation plants in Tamil Nadu is 659.4MW.

6. Legal Provisions:

6.1 Related Provisions of the Electricity Act, 2003:

The Commission is guided by the following provisions of Section 61 of the Electricity Act 2003 which are relevant to this Order:

Section 61 – *"The Appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for the determination of tariff and in doing so, shall be guided by the following namely:-*

(a) The principles and methodologies specified by the Central Commission for determination of the tariff applicable to generating companies and transmission licensees;

(b) The generation, transmission, distribution and supply of electricity are conducted on commercial principles;

(c) The factors which would encourage competition, efficiency, economical use of the resources, good performance and optimum investments;

(d) Safeguarding of consumers' interest and at the same time, recovery of the cost of electricity in a reasonable manner;

(e) The principles rewarding efficiency in performance;

(f) Multiyear tariff principles;

(g) That the tariff progressively reflects the cost of supply of electricity and also, reduces cross-subsidies in the manner specified by the Appropriate Commission;

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

(i) The National Electricity Policy and tariff policy:"

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

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:

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 shares 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

The Commission is also guided by the following specific provisions of the Tariff Policy of Government of India (Ministry of Power) relating to Renewable Energy Sources:

*" **(1) Clause 5(7) (i):** Tariff fixation for all electricity projects (generation, transmission and distribution) that result in lower Green House Gas (GHG) emissions than the relevant baseline 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.*

Provided that cogeneration from sources other than renewable sources shall not be excluded from the applicability of RPOs.

***(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 Promotion of New and Renewable sources of Energy:

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

8.0 Applicability of the proposed Order:

This Order shall come into force from 01-04-2016. The tariff fixed in this Order shall be applicable to all Bagasse based Co-generation Plants commissioned during the control period of this 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.

9.0 Tariff Determination Process:

The Commission has issued the Regulations on Power Procurement from New and Renewable Sources of Energy Regulation, 2008. Important provisions of the Regulation which emphasis on promotion of NCES is reproduced below for reference:

" (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.* "

10.Tariff / Pricing Methodology

Regulation 4 of the Power Procurement from New and Renewable Sources of Energy Regulation, 2008 also details the basic guidelines on the Tariff / Pricing Methodology. Important provisions in the Regulations are reproduced below:

" (2) While deciding the tariff for power purchase by distribution licensee from new and renewable sources based generators, the Commission shall, as far as possible, be guided by the principles and methodologies specified by:

(a) Central Commission
(b) National Electricity Policy
(c) Tariff Policy
(d) Rural Electrification Policy
(e) Forum of Regulators (FOR)
(f) Central and State Governments

(3) The Commission shall, by a general or specific order, determine the tariff for the purchase of power from each kind of new and renewable sources based generators by the distribution licensee.

Provided where the tariff has been determined by following transparent process of bidding in accordance with the guidelines issued by the Central Government, as provided undersection 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. "

10.1 Cost-Plus Tariff Determination

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 adopts the Cost plus Tariff approach in this Order.

10.2 Single Part vs. Two Part Tariff

In the Commission's Order No. 7 of 2012, dated 31-07-2012, the 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. Hence, a two part tariff is proposed to be adopted in this Order also.

11.0 Issues Relating to Tariff and allied matters:

11.1 Tariff Components

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.

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
5. Interest rate for the loan
6. Return on Equity
7. Life of plant and machinery
8. Depreciation
9. O & M Expenses
10. Station Heat rate
11. Gross calorific value of the fuel
12. Specific fuel consumption
13. Fuel cost
14. Components of working capital
15. Interest on working capital
16. Auxiliary consumption

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

11.2. Capital Cost per MW :

11.2.1. The Commission adopted Rs.4.20 Crores/ MW as the Capital Cost for Order No.7 of 2012 dated 31-07-2012. In the Consultative Paper Commission proposed a Capital Cost of Rs.4.41 Crores / MW. The capital cost includes evacuation cost upto inter-connection point. The Commission apportions the capital cost on machineries, land and civil works as 85% and 15% respectively.

11.2.2. The Director of sugar, Department of Sugar has stated that the capital cost proposed by the Commission was Rs.4.41 Crores per MW whereas the tentative project cost as per TANGEDCO is Rs.5.27 Crores per MW.

11.2.3. TANGEDCO concurred with the proposal of the Commission for a Capital Cost of Rs.4.41 Crores/MW inclusive of evacuation cost upto interconnection point. The capital cost on machineries, land and civil works – 85% and 15% respectively.

11.2.4. South Indian Sugar Mills Association (SISMA) has stated that the Hon'ble Appellate Tribunal in its judgement dated 04-09-2013 in Appeal No.199/2012 has held that while determining the normative parameters, the statement of reasons given by CERC would form part of the guiding principles which have to be considered in the context of local/State circumstances.

11.2.5. SISMA further stated that the APTEL in its judgment dated 04-09-2013 in Appeal No.199/2012 has held that the evacuation costs have to be added to the capital cost if the sugar mills are called upon to bear the evacuation cost.

11.2.6. SISMA has stated that the Capital Cost relevant for 2014-16 relevant to 2500 TCD capacity mill and 110 bar power plant Configuration would be Rs.5.80 Crores/MW. In respect of Air Cooled Condensers an additional amount at 5% of Capital Cost of Rs.0.29 Crores/MW has to be added and the Cost of Evacuation to Interconnection point (I/P) would be Rs.0.32 Crores/MW. The total Capital Cost to be allowed for the above period would be Rs.6.41 Crores /MW.

11.2.7. The capital cost adopted in the Orders of other Commissions are as follows:

CERC	Karnataka	Maharashtra	Gujarat	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 25-1-2016	Order dated 08-08-2013	Order dated 5.8.2014 (existing plants)	Order dated 01-04-2013
Rs.4.52479 Cr/MW	Rs.4.75 Cr/MW	Rs.4.8902 Cr./MW	Rs.4.57 Cr./MW	Rs.3.25 Cr/MW	Rs.4.36 Cr./MW

11.2.8. In Order No.7 of 2012, dated 31-07-2012, it was stated that the Commission sought clarification as to how the cost allocation is done for power generation and other uses since steam is used in power generation as well as sugar production. When the steam is extracted from the turbine for use in sugar mill, it is also not clear whether the steam after use in sugar mill is condensed and brought back *to* the steam cycle or it is wasted. The energy content of the steam extracted as well as the makeup water requirement is not made available. If these details were available, the Commission could have worked out the allocation of cost for use of steam in power generation viz-a'-viz sugar manufacture. In the absence of such a detailed analysis, the Commission would like to use thumb rule method for giving benefit to the power segment for the steam used for sugar manufacture which is not a regulated business. In case these details are made available by the bagasse based co-generation plants, a detailed analysis can be carried out in future, atleast for the next tariff order. In the absence of any explanation by the generators and in the absence of any details in this regard, the Commission deducted 10% of the fixed capacity charges towards steam extracted and used in sugar manufacture.

11.2.9. Pursuant to the directions of the Hon'ble APTEL in Appeal No. 192 of 2012, Order dated 04-09-2013 and in R.P. No.13 of 2013, Order dated 30-06-2014, Commission initiated R. A. No. 3 of 2014 and pronounced its orders on 23-02-2016.

11.2.10. In R. A. No. 3 of 2014, SISMA provided details relating to mode of operation viz. Condensation mode (without extraction of steam), Extraction mode (with extraction of steam) with different approaches. Commission studied the submissions made by SISMA and after careful consideration, Commission decided not to consider any deduction in fixed cost in case of the steam extracted and used in sugar manufacture.

11.2.11. Hence, in the present Order also Commission adopts the same methodology and deduction in fixed cost towards extraction of steam for sugar manufacturing has not been made.

11.2.12. In R.A. No. 3 of 2014, Commission adopted a Capital Cost of Rs.5.10 Crores per MW. The Capital Cost includes evacuation cost upto the inter-connection point. The Commission apportions the capital cost on machineries, land and civil works at 85% and 15% respectively.

11.2.13. Commission noted that in view of the global economic slowdown, prices for capital equipments are steeply falling. Commission decides to consider a Capital Cost of Rs. 5.20 Crores/MW. The Capital Cost includes evacuation cost upto the inter-connection point. The Commission apportions the capital cost on machineries, land and civil works at 85% and 15% respectively.

11.3. Plant Load Factor:

11.3.1 The plant load factor of a Bagasse based power generation depends on number of factors like availability of fuel, vintage of the plant, etc. The Commission retained the existing PLF of 55 % in Order No. 7 of 2012, dated 31-07-2012.

11.3.2 TANGEDCO concurred with the proposal of the Commission for a PLF of 55%.

11.3.3 The Director of Sugar, Department of Sugar, Tamil Nadu has accepted the PLF of 55%.

11.3.4 SISMA has accepted the PLF of 55%. SISMA has stated that the proposed incentive of 18.1 paise per unit in the first year declining to 16.3 paise for the 20th year would be less than the incentive of the conventional power plants in Tamil Nadu. This has to be revised to 50 paise per unit following CERC norms.

11.3.5. It has been stated that a sugar mill may generate below the normative PLF in situations where the crop has not been good or the availability of cane is less or the season is otherwise curtailed or even due to failure or interrupted evacuation of power and thereupon the sugar mill would not realize the fixed costs for that year. There are uncontrollable factors. The principle and approach underlying the CERC provisions is that both the risk and rewards arising out of such situations are to the account of the sugar mill. That is a more equitable and fair approach. Therefore, the

same rate needs to be fixed irrespective whether the generation is below or over the normative PLF.

11.3.6. In their submission's SISMA has also stated that alternatively and in any case, the incentive ought to be fixed at not less than Re.1/- per unit for the generation above the normative PLF and requested to confirm that the variable cost would also be paid in addition to the incentive.

11.3.7The PLF adopted in the Orders of other Commissions:

CERC	Karnataka	Maharashtra	Gujarat	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 25-01-2016	Order dated 08-08-2013	Order dated 05.08.2014 (existing plants)	Order dated 01-04-2013
60% for Tamil Nadu	60%	60%	60%	55%	53%

11.3.8 Commission would like to continue with the PLF of 55% on annual basis.

11.3.9. In some cases, generation may go beyond 55% PLF. The annual fixed charges or the capital cost recovery corresponding to this year in respect of the whole plant including the portion that is used for sugar production process 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.

11.3.10. In R.A. No. 3 of 2014, Commission has clarified the matter of PLF. The extracts 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".

11.3.11. In the present order also, Commission maintains status quo on adoption of the same methodology.

11.4. Debt – Equity Ratio:

11.4.1. A Debt-equity ratio of 70:30 is prescribed by the Tariff Policy for power projects. In the Commission's Order No.7 of 2012, dated 31-07-2012, the Commission had also adopted the Debt: Equity ratio of 70:30.

11.4.2. TANGEDCO concurred with the proposal of the Commission for a Debt Equity ratio of 70: 30.

11.4.3. The Director of Sugar, Department of Sugar, and Tamil Nadu proposed for Debt Equity ratio of 90:10.

11.4.4 SISMA has stated that the Debt-equity ratio of 70:30 is acceptable.

11.4.5. Commission in the present order also decides to retain the same Debt-Equity ratio of 70:30.

11.5. Term of Loan:

11.5.1 The Commission in its Order No.7, dated 31-07-2012 has adopted the term of the loan as 10 years with a moratorium of one year.

11.5.2. TANGEDCO concurred with the proposal of the Commission for loan period of 10 years with one year moratorium.

11.5.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for term of loan as 10 year with a moratorium of three years.

11.5.4. SISMA requested the Commission to consider a tenor of 10 years with 2 years moratorium instead of 1 year moratorium.

11.5.5. The Commission decides to adopt the term of loan as 10 years with a moratorium of one year as per the existing procedure.

11.6. Interest rate for loan:

11.6.1. In Commission's Order No.7 dated 31-07-2012, the Commission considered the interest rate of IREDA and adopted an interest rate of 12.25% p.a. The CERC in its Order dated 15-05-2014, adopted the average State Bank of India (SBI) Base rate prevalent during the first six months of the previous year plus 300 basis points. The rate of interest considered by CERC is 12.70 %(9.70% plus 300 basis points).

11.6.2.TANGEDCO has stated that the IREDA notified revised rate of interest from 12-06-2014. The rate of interest varies from 12% to 12.65% (Grade I to Grade IV) depending on the risk of loan repayment. Considering the loan availability, the interest to term loan of 12% may be considered.

11.6.3.The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for interest on loan as 12% p.a.

11.6.4.SISMA has stated that the Commission needs to recognize the CERC methodology i.e. the order for a year would be given before the start of the year, i.e. during the second 6 months of the previous years. The principle being the latest available 6 month weighted average base rate at the time of making the order is taken. Further, requested not to consider the old rate of interest which is stale by now.

11.6.5. SISMA has also stated that the SBI base rate has been 10% since 07-11-2013 and this has to be taken as basis and accordingly the interest rate should be 13% (10%+3%). The interest rate is not controllable and it is dependent on the guidelines and directions of a different statutory regulator (RBI) as implemented by the banks. It is necessary to have a mechanism to review the interest rate periodically and adjust the tariff according to the rates prevailing.

11.6.6. The present rate of interest available in the IREDA website in respect of Co-generation plants from 01-11-2015 onwards is 10.50% to 11.70%.

11.6.7.The rate of interest adopted in the Orders of other Commissions:

CERC	Karnataka	Maharashtra	Gujarat	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 25-01-2016	Order dated 08-08-2013	Order dated 05.08.2014 (existing plants)	Order dated 01-04-2013
13.00%	12.50%	13.00%	12.86%	-	13%

11.6.8. CERC in its Order dated 31-03-2015 has adopted 13.00% for calculating interest for the term loan. In line with CERC, Commission decides to adopt 13.00% p.a. for calculation of Interest on Debt.

11.7. Return on Equity:

11.7.1. In the Commission's Order No. 7 of 2012, dated 31-07-2012, the Commission adopted 19.85% (pre-tax) as Return on Equity without linking to Minimum Alternate TAX (MAT) or Income Tax.

11.7.2. TANGEDCO concurred with the proposal of the Commission for 20%(pre-tax) per annum without linking it to MAT and IT.

11.7.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for ROE at 19.85%.

11.7.4. SISMA requested the Commission to allow 24% Return on Equity after 10 years of operation considering that the effective tax rates are higher after the period of 10 years of exemption.

11.7.5. The Return on Equity adopted by the other Commissions are as follows:

Return on Equity considered in the Orders of other Commissions:

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 05.08.2014 (existing plants)	Order dated 01-04-2013
20 % for 1st 10 years 24% from 11th year onwards	16%	14% (MAT 20.008% for 1st 10 years and Corporate tax 32.445% for next 10 years)	RoE for 1st 10 years @ 16% grossing up with MAT rate of 21.34% and RoE after first 10 years @ 16% grossing up with Income Tax rate of 34.61%	16% with MAT/IT as pass through	At 20% pre-tax

11.7.6. While CERC proposes a Return on Equity of 20% p.a. for the first 10 years with an increase to 24% from the 11th year onwards, majority of the Commissions are retaining the Return on Equity at 16%.

11.7.7. The Tariff Regulations of the Commission stipulates 14% (post tax) RoE for conventional fuel based generating stations. With the objective of promoting renewable energy, Commission in its New and Renewable Energy Tariff Orders issued during 2009 considered 19.85% (pre-tax) RoE, wherein the RoE was adopted linking it to Minimum Alternate Tax and Income Tax(IT). Since these factors are

changing frequently, the Commission in its Orders issued in 2012 relating to determination of tariff for NCES power (including the Bagasse based Co-gen plants Order No.7 of 2012, dated 31-07-2012), adopted a RoE of 19.85% (pre-tax) without linking to MAT and Income Tax. Hon'ble APTEL in its order dated 24-05-2013 in Appeal No. 197, 198, 200, 201 and 208 of 2012 and 6 of 2013 upheld the same.

11.7.8. In the present Order Commission decides to adopt a RoE of 20% (pre-tax) per annum for Bagasse based Cogenerating Plants without linking it to MAT and Income Tax.

11.8.Life of plant and machinery:

11.8.1.Generally the project life of a plant is considered as 20 years for tariff determination process.

11.8.2 TANGEDCO and the Director of Sugar, Department of Sugar, Tamil Nadu concurred with the proposal of the Commission for a life of plant as 20 years.

11.8.3 Therefore Commission considers the useful life of the plant as 20 years for this Order.

11.9. Depreciation:

11.9.1. The rate of Depreciation adopted by the Commission in Order No.7 of 2012, dated 31-07-2012 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. The rate of depreciation adopted by other Commissions' is as follows:

11.9.2.Depreciation considered in the Orders of other Commissions':

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 05.08.2014 (existing plants)	Order dated 01-04-2013
5.83% for 1st 12 years and 2.51% from 13th year onwards	5.83% for first 12 years and balance spread over the life of the plant	6% for 1st 10 years and 3% from 11th year to 20th year	5.83% for first 12 years and at 2.50% thereafter for the remaining useful life of 8 years	7.84% for 1st 8 years, 7.28% for the 9th year and further depreciation of 20% spread over evenly in the balance 11 years	7% p.a. for 1st 10 years and balance 20% to be depreciated in next 10 years as for the 1st 10 years in order to pay loan the rate of depreciation of 7% was allowed

11.9.2. TANGEDCO concurred with the views of the Commission for 4.5% per annum SLM 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.

11.9.3 The Director of Sugar, Department of Sugar has submitted a proposal for 4.5% per annum SLM on plant and machinery by reckoning 85% of the capital cost.

11.9.4 SISMA has stated that the depreciation has to be allowed for civil works also. As the co-generation plants are invariably co-located with the sugar mill on land that is already available, the capital cost does not include the cost of land. Depreciation is to be allowed on the entire capital cost and requested to follow the CERC methodology which is 5.83% for the first 12 years and 2.51% from the 13th year onwards.

11.9.5. The Commission decides to continue the existing methodology of depreciation as in its earlier Order dated 31-07-2012 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.

11.10. Operation and Maintenance (O & M) Expenses:

11.10.1. The rate of O & M expenses approved by the Commission in Order No.7 of 2012, dated 31-07-2012 is 3% with annual escalation of 5% from second year as O & M expenses on 100% of capital cost.

11.10.2. TANGEDCO concurred with the proposal of the Commission for O & M expenses including insurance at 3% of the capital cost with an annual escalation of 5.72% from the second year onwards.

11.10.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed the O & M charges for Machinery on 85% of Capital Investment at 4.50% with escalation of 5% from 2nd year. In respect of O & M charges for Land and Civil work on 15% of Capital Investment, a depreciation of 0.90% with escalation of 5% from 2nd year has been requested.

11.10.4. SISMA requested to allow the O & M at not less than 4.1% of the capital cost with a year-on-year escalation. It has stated that the constant escalation rate adopted for a period of 20 years is unreasonable. SISMA, further requested to evolve a mechanism by which the escalation rate is periodically adjusted on the basis of the changes in the weighted average WPI and CPI indices taken in the proportion of 60:40.

11.10.5. O & M Expenses adopted in the Orders of other Commissions':

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 05.08.2014 (existing plants)	Order dated 01-04-2013
Rs.18.91 Lakh/MW with an escalation at 5.72% p.a.	3.0% of Capital Cost with an escalation of 5.72% p.a.	3% of Capital Cost with an escalation at 5.72%	Rs.17.31 lakh/MW with an escalation of 5.72%	4% of Capital Cost with an escalation at 6.69%	3% of Capital Cost with an escalation at 5.00%

11.10.6. The O & M charges notified by CERC in its Order dated 31-03-2015 is Rs.18.91 lakhs per MW.

11.10.7. Commission decides to adopt the O & M charges of Rs.18.91 lakhs per MW in the present order. From second year onwards Commission considers an annual escalation of 5.72%.

11.11. Station Heat Rate (SHR):

11.11.1.In Order No.7 of 2012, dated 31-07-2012, the Commission adopted a Station Heat Rate of 3700 kCal/kWh. Co-gen plants are generally of higher size unlike biomass plants and therefore, they enjoy economies of scale, Co-gen plants also undertake works using advanced technological developments. Therefore, considering the technological development in the co-gen plants and the economies of scale, the Commission proposed a Station Heat Rate of 3600 kCal/kWh in the Consultative Paper.

11.11.2. TANGEDCO concurred with the proposal of the Commission for a Station Heat Rate of 3600 Kcal/kWh. It was with respect to the capital cost of

Rs.4.41 Crores / MW for the related boiler configuration proposed in the Consultative Paper for the same.

11.11.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed a SHR of 3840 Kcal/kWh.

11.11.4. SISMA has stated that the SHR of 3600 kcal/kWh can only be related to the operation of the power plant in the condensing mode using bagasse as fuel without any extraction of steam. If the co-generation plant is operated in extraction mode, with steam being extracted for process, the SHR would be about 4700 kcal/kWh. Further, SISMA has requested the Commission to consider the parameters either in the condensing mode or in the extraction mode.

11.11.5. The Station Heat Rate adopted in the Orders of other Commissions is as follows:

Station Heat Rate adopted by other Commissions:

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 16-05-2014	Order dated 01-04-2013
3600 kCal/kWh	3600 kCal/kWh	3600 kCal/kWh	3600 kCal/kWh	3600 kCal/kWh	3600 kCal/kWh

11.11.6.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 the originally conceived one which changes the performance of the plant as such. Increased capital cost is being admitted to accommodate the latest technological advancements in terms of enhanced rating of the BTG. By changing the

configuration of the project from 64 ata/400^{o} C to around 110 ata 540^{o} 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.

In the said order Commission adopted a Station Heat Rate of 3240 Kcal/kWhr. In the present Order Commission is considering a capital cost of Rs.5.25 Crores per MW which is related to higher boiler configuration. Hence the Commission in the present order also adopts a Station Heat Rate of 3240 Kcal/ kWhr.

11.12. Gross Calorific Value (GCV) of the fuel:

11.12.1. In Order No.7 of 2012, dated 31-07-2012, the Commission adopted a Gross Calorific Value (GCV) of 2300 kCal /kg.

11.12.2. TANGEDCO has stated that taking into consideration of the quality of sugarcane available in the state, the Commission fixed the GCV at 2300Kcal/Kg in Order No.7 of 2012 and requested to continue with the same calorific.

11.12.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for a Calorific Value of fuel at 2300Kcal/kg.

11.12.4. SISMA has stated that the GCV of 2250 kcal/kg is reasonable and acceptable.

11.12.5.The GCV adopted by other Commissions in their respective Orders is as follows:

GCV considered by other Commissions:

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 16-05-2014	Order dated 01-04-2013
2250 kCal/kg	2250 kCal/kg	2250 kCal/kg	2250 kCal/kg	2250 kCal/kg	2250 kCal/kg

11.12.6. In the present order Commission decides to adopt a GCV of 2300 kCal /kg as adopted in its 2012 Order.

11.13. Specific Fuel Consumption (SFC) :

11.13.1. Specific fuel consumption is the resultant of Station Heat Rate and Gross Calorific Value of fuel.

11.13.2. TANGEDCO, in its comments requested that, taking in to account the Station Heat Rate of 3600Kcal/Kw and GCV of 2300 Kcal/Kg, the specific fuel consumption of 1.565Kg/ Kwhr may be considered. This was with reference to the Capital Cost at Rs.4.41 Crores/MW proposed in the Consultative paper for the boiler configuration relatable to that cost.

11.13.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for a Specific fuel consumption of 1.67Kg/kWh.

11.13.4. SISMA has stated that the SFC of 1.60 kg/kWh derived from the SHR of 3600 kcal/kWh and GCV of 2250kcal/kg is reasonable and acceptable if the normative parameters are for operation of power plant in condensing mode without any extraction of process steam.

11.13.5. It was suggested however, if the power plant is operated for co-generation in extraction mode with steam being extracted for process, the SFC would necessarily have to be taken as 2.09 kg/kWh derived from an SHR of 4700 kcal/kWh and GCV of 2250 kcal/kg.

11.13.6. It was stated by Thiru.V.Krishnamoorthy, one of a stakeholders, that the specific fuel consumption should not be applied theoretically as GCV directly proportional to the moisture content in the fuel.

11.13.7.The Specific fuel consumption adopted by other Commissions in their respective Order's is as follows:

Specific Fuel Consumption considered by other Commission:

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 16-05-2014	Order dated 01-04-2013
1.60 kg/kWh	1.60 kg/kWh	1.60 kg/kWh	1.60 kg/kWh	1.60 kg/kWh	1.60 kg/kWh

11.13.8. With the above Station Heat Rate at 3240kCal/kWh and GCV at 2300 kCal/kg the resultant consumption works out to 1.41 kg/kWh and the Commission decides to adopt the same in the present order.

11.14. Fuel Cost:

11.14.1. In the Commission's Order No.7 of 2012, dated 31-07-2012, the cane price with transport cost was considered and 50% of this cost was adopted as fuel cost for determining the variable cost at Rs.1050/- PMT.

11.14.2. The Director of sugar has stated that the actual bagasse cost as per the recent sales realized by Tamil Nadu Co-operative Sugar Federation (TNCSF) is Rs.2240/ per MT. In respect of their projects, the cost of production comes to Rs.6.77 per unit if fuel cost is taken as Rs.2240/- per MT. It was further stated that the Commission while finalizing the Order No.3/2007, dated 06-05-2009, has considered the fuel cost as Rs.1000/- per MT based on TNCSF tender rate. They

requested that the last year tender rate of Rs.2240/- per MT may be taken as the fuel cost i.e. Rs.2240/- per MT based on the TNCSF tender rate.

11.14.3. The Director of Sugar, Department of Sugar has stated that the landing cost of imported coal is around Rs.7,000/- per ton and the raw material cost itself comes to Rs.5.93 per unit whereas the present power tariff payable to sugar mills for export of power during off season operation using coal is Rs.3.01 per unit. Hence, the cost of operating the co-gen plants during off season arrives at Rs.8.74 per unit. The fuel cost per unit is Rs.5.93 and the conversion cost is Rs.0.87 per unit.

11.14.4. The licensee, M/s. TANGEDCO has stated that the Commission in its order No.7 of 2012, dated 31-07-2012 has considered the fuel cost of Rs.1050/- per MT which was 50% of sugar cane price of Rs.2,100/-. The sugar cane price for the year 2013-14 is Rs.2,650/-. Hence, fuel cost of Rs.1,325/- (50% of sugar cane price) may be considered.

11.14.5 SISMA has stated that the average cost of bagasse on the equivalent heat value method is Rs.2575/-MT during 2013-14. This has to be escalated by atleast 10% to arrive at the equivalent heat value for 2014-15 having regard to the realistic increase in the price of the imported coal. Thus, the fuel cost on the equivalent heat value method for 2014-15 is to be taken as Rs.2833/- MT.

11.14.6.Further, SISMA has stated that the price of Bagasse for 2013-14 as fixed by the Tamil Nadu Co-operative Sugar Federation of the basis of e-tender and open auction is Rs.2240/- per MT. Considering that the price of bagasse in similar tenders/auctions increased by about 11% over the previous year in 2012-13 and 40% in 2013-14, it is reasonable to consider a price increase of 15% for 2014-15

over the price for 2013-14. The market price for bagasse would thereby be Rs.2576/- per MT for 2013-14. Comparing the CERC's escalation over price of fuel by indexation formula by 7.15% for 2013-14 over 2012-13 and by 10.91% for 2014-15 over 2013-14. SISMA finally requested to fix the escalation at 10% year-on-year. Hence, the fuel cost for 2014-15 has to be considered at Rs.2833/-PMT.

11.14.7. The fuel cost considered by the other Commissions in their respective order is as follows:

Fuel cost considered by other Commissions:

Parameter	CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
	Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 16-05-2014	Order dated 01-04-2013
Fuel Cost	Rs.1788.32/ PMT (As per Fuel price indexation mechanism)	Rs.1600/ PMT	Rs.1804/PMT for bagasse and Rs.2912/PMT for coal	Rs.2326.84/MT	Rs.1551/PMT(base rate for 2014-15)	Rs.1583/PMT(base year 2013-14)

11.14.8. It has been explained by the Commission in its order dated 23-02-2016 in R. A. No. 3 of 2014, that the contention of M/s. SISMA as to fixation of fuel cost based on the cost of coal procured by one of its member M/s. Ponni Sugars is not tenable in a generic order applicable to all the developers who are setting up co-generation plant using bagasse as fuel and any parameter that specifically applies to a particular generator cannot be regarded as the parameter that will apply to all other generators as it will distort the process of determination of various elements of costs involved in fixing the generic tariff and adopted the Fuel cot at Rs.1408/- per MT as fixed by CERC in respect of the State of Tamil Nadu which is based on Equivalent Heat Value method.

11.14.9. The CERC in its Order dated 31-03-2015 has determined the Bagasse Price per MT for various States and in respect of Tamil Nadu after applying the equivalent heat value approach has determined Rs.1788/MT as Bagasse Price.

11.14.10. Hence, in respect of fuel cost, Commission adopts the Bagasse Price as fixed by CERC Rs.1788/MT with an escalation of 5% p.a. from 2nd year onwards.

11.15. Components of working capital:

11.15.1. The Commission in its Order No.7 of 2012, dated 31-07-2012, 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

11.15.2. TANGEDCO and the Director of Sugar, Department of Sugar, Tamil Nadu concurred with the proposal of the Commission for Working Capital at one month O & M Charges, one month Fuel Stock and one month Receivables.

11.15.3. SISMA has stated that in the consultative paper Commission proposed 1 month fuel stock, 1 month O & M charges and 1 month receivables. Further, in para 12.2.8 of the consultative paper provides for a rebate of 1% if the licensee makes payment within a period of 1 month of presentation of bills. The reasoning in the consultative paper is that the bill amount is due only after one month and interest rate of 13.2% has been allowed for one month's receivables. It should be recognized that the generation and supply of power are continuous even during the billing month and the average carrying cost for 15 days is already borne during the billing month itself which is not being considered while computing the tariff. After

the end of billing month there would be up to 5 days for presenting the bill being the time taken for certifying the meter readings, preparing the bill and presenting the same for payment. During this period also there is no carrying cost allowed in the tariff. The bill is due on the 30th day and if the payment is made by the licensee on 29th day, the carrying cost for the period up to then is already incurred and it cannot be reasonable to require a rebate of 1% to be given for that thereby wiping out even the 1 month carrying cost allowed in the tariff and actually incurred by the sugar mills. Therefore, if only 1 month receivables is considered in fixing the tariff, there should be no provision for any rebate whatsoever for payment within 1 month.

Hon'ble Commission ought to allow 2 months' receivables in computing the working capital. If payment is made within one month of presentation, a rebate of 1% may be allowed.

11.15.4. Further, the Hon'ble APTEL in its Order dated 30-06-2014 in Review Petition No.13 of 2013 in Appeal No.199 of 2012 has directed to consider the CERC's Regulation allowing two month's receivable and rebate for payment within one month.

11.15.5. In line with the above directions of Hon'ble APTEL in R. A. No. 3 of 2014, dated 23-02-2016, Commission has adopted the following as components of working capital

a. Fuel stock of one month

b. O & M Expenses for one month

c. Receivables equivalent to two months

The Commission decides to continue the same norms for this order also.

11.16. Interest on Working Capital:

11.16.1. The rate of interest adopted by the Commission in Order No.7 of 2012, dated 31-07-2012 was 12.5% p.a. This rate was the upper limit of the interest rate charged by IREDA.

11.16.2. TANGEDCO has stated that the Interest on working capital would be 0.50% over and the above interest on term loan and hence, the interest on working capital at 12.5% may be considered by the Commission.

11.16.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for the rate of interest for interest on working capital at 12% p.a.

11.16.4. SISMA has stated that the SBI base rate has been 10% since 07-11-2013 and this has to be considered and accordingly the interest rate at 13.50% (i.e. 10%+3.50%). It has further stated that, it is required to have a mechanism to review the interest rate periodically and adjust the tariff according to the rates prevailing.

11.16.5. The rate of interest adopted by other Commissions for calculating the Interest on Working Capital is as follows:

Rate of Interest for calculating Interest on Working Capital considered by other Commissions:

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-2015	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 05.08.2014(existing plants)	Order dated 01-04-2013
13.50%	13.25%	12.86%	13.50%	12%	13.50%

11.16.6. The CERC has adopted an interest rate of 13.50% p.a. for calculation of Interest on Working Capital Commission adopts 13.50% p.a. as rate of interest.

11.17.Auxiliary Consumption:

11.17.1. The Commission in Order No.7 of 2012, dated 31-07-2012 adopted an auxiliary consumption of 9%.

11.17.2. TANGEDCO concurred with the proposal of the Commission for Auxiliary Consumption at 8.50%.

11.17.3. The Director of Sugar, Department of Sugar, Tamil Nadu has proposed for 10% Auxiliary Consumption.

11.17.4. SISMA has stated that in respect of condensation mode of operation without any extraction of steam, the auxiliary consumption at 9% is more reasonable. For high pressure boilers the auxiliary consumption requires to be taken as 9.50% due to increased feed pump consumption.

11.17.5. In respect of auxiliary consumption for operation in extraction mode, with steam being extracted for process, an auxiliary consumption of 12% has to be considered.

11.17.6. Auxiliary consumption adopted by other Commissions in their respective orders is as follows:

Auxiliary Consumption adopted in the Orders of other Commissions:

CERC	Karnataka	Gujarat	Maharashtra	Andhra Pradesh	Madhya Pradesh
Order dated 31-03-2015	Order dated 01-01-201	Order dated 08-08-2013	Order dated 25-01-2016	Order dated 16-05-2014	Order dated 01-04-2013
8.50%	9.00%	8.50%	8.50%	9.00%	8.50%

11.17.7. Auxiliary consumption adopted by other Commissions is generally at 8.5%. Further, CERC in Order dated 31-03-2015 has adopted an auxiliary

consumption of 8.50%. Commission decides to adopt auxiliary consumption at 8.50%.

12. Related issues

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

1. Transmission and Wheeling Charges& Scheduling and System Operation Charges
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. Tariff review period / Control period

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.

12.1 Transmission and Wheeling Charges& Scheduling and System Operation Charges:

12.1.1. The Commission in its Order No. 7 of 2012, dated 31-07-2012 as a promotional measure under section 86 (1)(e) of the Electricity Act, 2003, has adopted 60% of the transmission charges and 60% of the wheeling charges of conventional power to bagasse based Co-gen projects.

12.1.2. TANGEDCO concurred with the proposal of the Commission for 60% of the Transmission Charges and Wheeling Chares and requested for 100% of the Scheduling and System Operation Charges applicable for the conventional power as considered by the Commission in Order No. 7 of 2012, dated 31-07-2012.

121.3. Commission decides to continue the existing norms in respect of the transmission charges and wheeling charges for this control period also.

12.1.4. With regard to scheduling and system operation charges, the Commission decides to adopt 60% of the applicable conventional power charges. 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 deductible in kind 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.

12.2.Cross Subsidy Surcharge:

12.2.1. The Commission in its Order No.7 of 2012, dated 31-07-2012 as a promotional measure for renewable energy, adopted 50% of the applicable Cross Subsidy Surcharge for Bagasse based co-generation projects.

12.2.2. TANGEDCO concurred with the proposal of the Commission for levy of 50% of the Cross Subsidy Surcharge.

12.2.3. It is decided to continue the existing Cross Subsidy Surcharge rate of 50% for this control period also.

12.3. CDM Benefits:

12.3.1. The Commission in its Order No. 7 of 2012, dated 31-07-2012 had stated that as recommended 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.

12.3.2. TANGEDCO concurred with the proposal of the Commission for the above sharing formula of Forum of Regulators (FOR).

12.3.3. The Commission decided to adopt the same formula for this Order also. The Distribution Licensee shall account for the CDM receipts in the next ARR filing.

12.4. Reactive Power Charges:

12.4.1. Reactive Power Charges are specified in the Order on Open Access Charges.

12.4.2. TANGEDCO concurred with the proposal of the Commission for adoption of Reactive Power Charges as specified in the Order for .Open Access Charges

12.4.3. Commission decides 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.

12.5. Grid availability charges:

12.5.1. TANGEDCO concurred with the proposal of the Commission.

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

12.5.3. 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.

12.6. Adjustment of energy generated:

12.6.1.The Commission in Order No.7 of 2012, dated 31-07-2012, decided that the adjustment of energy shall be as per the Commission's Open Access Regulations in force.

12.6.2. TANGEDCO concurred with the proposal of the Commission.

12.6.3. The Commission decides to continue with the existing procedure.

12.7 Application Fees and Agreement Fees:

12.7.1. The Commission in its Order No.7 of 2012, dated 31-07-2012 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.

12.7.2 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.

12.7.3. 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 as per the above Open Access Regulations.

12.7.4. TANGEDCO concurred with the proposal of the Commission.

12.7.5. In the present order also, the Commission proposes to continue the same as in the Commission's Order No.7 of 2012, dated 31-07-2012.

12.8.Billing and payments:

12.8.1. SISMA has stated that the interest on delayed payment should be fixed at 2% per month, compounded monthly as the banks would do in accordance with the guidelines and directives in this behalf issued by the Reserve Bank of India.

12.8.2. TANGEDCO has stated that, in case of sale to TANGEDCO, the norms of levy of interest at the rate of 1% per month for the delayed payment beyond 30 days for the Distribution licensee may be withdrawn. The

surplus energy if any available after wheeling to captive/third party users may be treated as lapsed.

12.8.3. The Commission in its Order No.7 of 2012, dated 31-07-2012 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.

12.8.4. Commission decides to continue the above dispensation for this order also. The Commission also decides that 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.

12.8.5. 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.

12.9 Payment security and Security Deposit :

12.9.1. In Commission's Order No.7 of 2012, dated 31-07-2012, 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.

12.9.2. TANGEDCO has stated that levy of interest to the Distribution Licensee at 1% per month for the delayed payment beyond 30 days as proposed may be withdrawn. Further, TANGEDCO concurred with the proposal of the Commission that the security deposit of the consumer will be two times the maximum net energy supplied by the distribution licensee in any month in the preceding financial year.

12.9.3. 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.

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

12.10. Power factor:

12.10.1. It has been proposed in the Consultative Paper that the 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.

12.10.2. TANGEDCO concurred with proposal of the Commission.

12.10.3. The Commission decides to adopt the above.

12.11.Metering:

12.11.1 The Commission in its Order No.7 of 2012, dated 31-07-2012 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.

12.11.2. TANGEDCO concurred with the proposal of the Commission.

12.11.3. The Commission in its present Order also adopts the same.

12.12.Connectivity and Evacuation of energy:

12.12.1. The Commission in its Order No.7 of 2012, dated 31-07-2012 had ruled that the connectivity and power evacuation system shall be provided as per the Act, Codes, Regulations and Orders in force.

12.12.2. TANGEDCO concurred with the proposal of the Commission.

12.12.3. The Commission decides to continue the same as in the previous Order.

12.13. Energy Purchase and Wheeling Agreement:

12.13.1. The Commission in its Order No.7 of 2012, dated 31-07-2012 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.

12.13.2. 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.

12.13.3. TANGEDCO concurred with the proposal of the Commission.

12.13.4. Commission decides to continue the present procedure for this order also.

12.14. Scheduling of power generation:

12.14.1 The Commission in its Order No.7 of 2012, dated 31-07-2012 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.

12.14.2. The Commission, now in its present order also decides to adopt the same.

12.15. Tariff review period / Control period:

12.15.1. 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. Hence, the Commission decides that the control period of this Order shall be for two years from the date of issue of the Order and the tariff period is twenty years.

13. Tariff:

13.1. It was stated by Thiru. V. Krishnamoorthy, a stakeholder in his comments has stated that in respect of deduction of 20%, in fixed cost, it was requested to consider the other thermal plants, for condensation process they need very large cooling tower or Air cooled condenser which are more expensive and leads to raise in auxiliary power consumption. Since, the sugar industries are located in rural area it's hard to get such amount of water for condensation process. We are depending on the sugar process for condensation 40 % to 60%.

Requested Commission to neglect the profit derived through the steam usage in the sugar industry.

13.2. SISMA has stated that the inference sought to be drawn from extraction of 40% or more steam (mass) for process is incorrect and does not take into account the relevant factors.

13.3. The process steam required for sugar manufacture is only saturated steam at an pressure of less than 3 atta and this would only require a low pressure and low cost boiler. In order to gain the advantages of co-generation for power generation and better utilization of the available renewable energy resource, the configuration of the co-generation plant is scaled up substantially to include high pressure boiler, turbine, technological sophistication, power evacuation facilities and associated facilities with a far higher capital cost. The configuration of the plant is therefore determined by the needs of power generation.

13.4. The tariff determination for power generated by a co-generation plant can either be done on the basis of normative parameters considering condensation mode operation without extraction of steam or on different normative parameters considering extraction mode operation with extraction of steam. It is stated that the normative parameters of SHR (and consequently SFC) and Auxiliary Consumption would be different.

13.5. Condensation Mode:

13.5.1. In condensation mode of operation, there is no extraction of steam and the entire steam is considered to be used in power generation. Normative values of SHR of 3700kCal/kWh, SFC of 1.6kg/kWh and Auxiliary Consumption of

8.5% or 9% can only be applicable if the operation is considered in the condensation mode.

13.5.2. The fixed cost per unit determined on this basis takes all the fixed costs to the account of power generation. Once the tariff is determined on this basis, the licensee pays the per unit fixed cost only on the energy actually delivered and the sugar mill receives revenue only to that extent. To the extent that the generation is reduced by reason of actual extraction of steam, there is no generation to that effect and therefore the licensee does not pay for the fixed cost for that much of electricity. Therefore, the fixed cost realization of the sugar mill is less than the total fixed cost of operation. Such difference (short fall) of fixed cost realization then is the sugar mills' cost being the fixed cost borne by them for the process steam extracted. Thus this is a self-adjusting methodology for sharing of fixed costs between the power generation and the process steam.

Therefore, the question of making any deduction from fixed cost per unit for process steam extracted does not at all arise. If done, it would be double deduction on the same account.

13.5.3. Further, CERC, which took the same normative values and determined the fixed cost per unit therefrom, has not made any deduction for process steam and stated that no other State Commission has made any such deduction.

13.6. Extraction Mode (with extraction of steam):

13.6.1. In this mode, there is an extraction of steam and the entire steam is considered to be used in power generation as well as in process. Normative values

that has to be considered for tariff determination in this mode of operation will be a SHR of 4700 kcal/kWh, SFC of 2.09 kg/kWh and an Auxiliary Consumption of 12%.

13.6.2.The fixed cost determined on this basis takes all the fixed costs to the account of both the energy generated as well as steam extracted. If the fixed cost is to be allocated for power generation and process steam, a careful consideration of the methodology to be adopted is required.

13.6.3. Approach – A (Electrical Energy basis):

13.6.3.1.This methodology shows that, as between electricity generated under operation without steam extraction and operation with steam extraction, the net power lost by the power plant supplying process steam to the sugar mill is 14.7% and applying this on the cost of boiler which is 45% of the capital cost the percentage of capital cost attributable to the extraction of steam is 6.62%(i.e. 14.7% of 45%). The boiler is itself configured to high pressure and high temperature with super-heater for and on consideration of power generation and therefore a 5% loading to power generation out of the 6.62% of the fixed cost is necessary and justified. Consequently, the percentage of capital cost attributable to process steam is only 1.62%. Thus, proportionally only 1.62% of the fixed cost can be considered to be attributable to the process steam extracted.

13.6.4.Approach – B (Heat Energy basis):

13.6.4.1. The methodology and calculations comprises of Case-1 and Case-2 calculations.

16.6.4.2. The useful heat energy for power generation under Condensation mode (without extraction of steam) is 26,999,734 kcal/hr(Case-1). The useful heat energy for power generation under extraction mode (with extraction of steam for

process) is 22,150,630 kcal/hr (Case-2). Hence, the loss of useful heat energy from power generation due to extraction of steam for process is 4,849,104 kcal/hr, which is 17.96% of the useful heat energy under Case-1.

Applying 17.96% to the 45% of the capital cost, the percentage of capital cost attributable to extraction of process steam is 8.08%. Adjusting 5% by way of configuration loading to power generation as stated supra, the percentage of capital cost attributable to extraction of process steam is only 3.08%.

13.6.4.3. SISMA has requested the Commission to consider, as the Act mandates the promotion of co-generation and doubly so from renewable energy. Hence, they requested the Commission not to make any deduction for fixed cost in the case of co-generation from bagasse.

13.6.4.4. The Director of Sugar, Department of Sugar has requested the Commission to fix affordable power tariff for bagasse based power (seasonal operation) and coal based power (off season operation) exclusively for Government Sector Cogen Projects being developed by TANGEDCO.

13.6.4.5. In R.A. No. 3 of 2014, dated 23-02-2016, Commission has decided not to deduct fixed cost for extraction of steam for sugar manufacturing. In the present Order, under the head Capital Cost, Commission has reiterated its stand as to allowing of fixed cost without deductions for consumption of steam for sugar manufacturing. As discussed earlier Commission is allowing fixed cost without any deductions.

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

13.6.4.7. Fixed Cost:

(Rs./unit)

Year	FCC	Year	FCC
1	**2.82**	11	**2.22**
2	**2.85**	12	**2.17**
3	**2.77**	13	**2.22**
4	**2.70**	14	**2.28**
5	**2.62**	15	**2.34**
6	**2.55**	16	**2.41**
7	**2.48**	17	**2.47**
8	**2.41**	18	**2.55**
9	**2.35**	19	**2.62**
10	**2.28**	20	**2.70**

13.7. Variable Cost:

13.7.1. The variable cost for the financial year 2016-17 will be Rs2.76 /- per unit and for the financial year 2017-18, the rate will be Rs2.89/- per unit as discussed supra.

13.7.2. The fixed capacity charges specified in this Order will be applicable with reference to the date of commissioning of the plant and the variable cost will be applicable with reference to the financial year. The fixed capacity charges specified above will continue to be applicable to the plants commissioned on or after the date of this order and the variable cost will apply for all plants commissioned on or after 15-05-2006.

13.8. Use of Fossil Fuel:

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

13.9. Monitoring Mechanism for the use of fossil fuel:

(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 tonne) for each fuel type (bagasse and fossil fuels) consumed and procured during the month for 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.

(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. Acknowledgement:

The Commission would like to place on record and acknowledge with thanks, the contributions by the officers and staff of the Commission and the valuable guidance provided by the experts and members of the State Advisory Committee. The Commission also appreciates the pain taken by the stakeholders in offering their suggestions. The Commission also recognizes the input of the TANGEDCO which have been helpful to the Commission in finalizing this Tariff Order.

Sd/-	Sd/-	Sd/-
(Dr.T. Prabhakara Rao)	(G. Rajagopal)	(S. Akshaya Kumar)
Member	Member	Chairman

(By Order of the Commission)

Sd/-
(S.Chinnarajalu)
Secretary

ANNEXURE – I

The list of stakeholders who submitted their written comments

1. Tamil Nadu Generation and Distribution Corporation Ltd. (TANGEDCO).
2. The Director of Sugar, Department of Sugar, Tamil Nadu.
3. The South Indian Sugar Mills Association (SISMA).
4. Thiru. V. Krishnamoorthy.

Annexure - II

LIST OF STATE ADVISORY COMMITTEE MEMBERS WHO PARTICIPATED IN THE MEETING HELD ON17-03-2016

Sl. No.	Name of the Member
1.	Thiru. S. Akshaya Kumar, Chairman, TNERC
2.	Thiru. G. Rajagopal, Member, TNERC
3.	Dr. T. Prabhakara Rao, Member, TNERC
4.	Dr. M. Saikumar, I.A.S., CMD/ TNEB Ltd. & TANGEDCO Ltd. and Chairman, TANTRANSCO Ltd.
5.	R.K. Kulshreshta,IRSEE, Chief Electrical Engineer, Southern Railways.
6.	Dr. A.S. Kandasamy, Member, SAC
7.	T. Vijayarangan, Secretary, Anna Labour Union, Member, SAC
8.	Thiru. K. Alagu, Vice President, Tamil Nadu Chamber of Commerce and Industry, Member, SAC
9..	Thiru. Ramesh Kymal, Chairman, Confederation of Indian Industry (Tamil Nadu), Member, SAC
10.	Thiru. C. Muthusami, President, Tamil Nadu Small and Tiny Industries Association (TANSTIA), Member, SAC
11.	Thiru. G.S. Rajamani, Member, SAC
12.	Thiru. K. Kathirmathiyon, Secretary, Coimbatore Consumer Cause, Member, SAC

ANNEXURE – III

PARAMETERS ADOPTED FOR DETERMINATION OF TARIFF FOR 2016 ORDER

Sl. No.	PARAMETERS	VALUES
1.	Capital Cost	Rs.5.20 Crores/MW
2.	Plant Load Factor (PLF)	55%
3.	Debt Equity Ratio	70:30
4.	Term of Loan	10 years with one (1) year moratorium
5.	Interest on Loan	13.00%
6.	Return on Equity	20% pre-tax
7.	Life of Plant	20 years
8.	Depreciation on 85% of Capital Cost	4.5% per annum SLM on 85% of Capital Cost
9.	O & M Expenses	Rs. 18.91lakhs with an escalation of 5.72% from 2nd year onwards
10.	Station Heat Rate(SHR)	3240 kCal/kWh
11.	Gross Calorific Value (GCV)	2300 kCal/kg
12.	Specific fuel consumption (kg/kWhr)	1.41
13.	Fuel Cost (Rs. PMT)	Rs.1788/MT
14.	Working Capital components	a) One month Fuel Stock b) One month O & M Expenses c) Two months Receivables
15.	Interest on Working Capital	13.50% p.a.
16.	Auxiliary Consumption	8.50%

TNERC - 2016 ORDER

COMPONENTS OF BAGASSE BASED CO-GENERATION TARIFF

PARAMETERS	VALUES	
Capital Cost (in Rs.)		52000000
Debt - 70% (in Rs.)		36400000
Equity - 30% (in Rs.)		15600000
Interest on Debt		13%
Depreciation- SLM at 4.5% on 85% of Capital Cost - (in Rs.)		1989000
Interest on Working Capital		13.50%
Components of working capital		
Fuel Cost	1month	
O & M	1month	
Receivables	2 months	
Return on Equity	20% pre-tax	
O & M Expenses (after escalating @5.72% p.a. from 2012 onwards) - (in Rs.)	1890564	
Gross generation @ 55% PLF (in Units)	4818000	
Auxiliary	0.085	
Net Generation (in Units)	4408470	
Fuel Cost (Rs./MT)	1788	
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 consumptio	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	1890564	4732000	1989000	12146563	157547	1012214	4098217	5267978	711177	3120000	12442741	4408470	2.82	2.76	**5.58**
2	1998704	4732000	1989000	12753892	166559	1062824	4221579	5450962	735880	3120000	12575584	4408470	2.85	2.89	**5.75**
3	2113030	4258800	1989000	13391586	176086	1115966	4270562	5562613	750953	3120000	12231783	4408470	2.77		**2.77**
4	2233895	3785600	1989000	14061166	186158	1171764	4326169	5684091	767352	3120000	11895848	4408470	2.70		**2.70**
5	2361674	3312400	1989000	14764224	196806	1230352	4388741	5815899	785146	3120000	11568221	4408470	2.62		**2.62**
6	2496762	2839200	1989000	15502435	208064	1291870	4458634	5958567	804407	3120000	11249369	4408470	2.55		**2.55**
7	2639577	2366000	1989000	16277557	219965	1356463	4536224	6112651	825208	3120000	10939785	4408470	2.48		**2.48**
8	2790561	1892800	1989000	17091435	232547	1424286	4621904	6278737	847630	3120000	10639990	4408470	2.41		**2.41**
9	2950181	1419600	1989000	17946006	245848	1495501	4716090	6457439	871754	3120000	10350535	4408470	2.35		**2.35**
10	3118931	946400	1989000	18843307	259911	1570276	4819218	6649404	897670	3120000	10072001	4408470	2.28		**2.28**
11	3297334	473200	1989000	19785472	274778	1648789	4931746	6855313	925467	3120000	9805001	4408470	2.22		**2.22**
12	3485941		1989000	20774746	290495	1731229	5054155	7075879	955244	3120000	9550185	4408470	2.17		**2.17**
13	3685337		1989000	21813483	307111	1817790	5267635	7392537	997993	3120000	9792330	4408470	2.22		**2.22**
14	3896139		1989000	22904157	324678	1908680	5492037	7725395	1042928	3120000	10048067	4408470	2.28		**2.28**
15	4118998		1989000	24049365	343250	2004114	5727921	8075285	1090163	3120000	10318161	4408470	2.34		**2.34**
16	4354604		1989000	25251833	362884	2104319	5975875	8443079	1139816	3120000	10603420	4408470	2.41		**2.41**
17	4603688		1989000	26514425	383641	2209535	6236520	8829696	1192009	3120000	10904697	4408470	2.47		**2.47**
18	4867019		1989000	27840146	405585	2320012	6510506	9236103	1246874	3120000	11222893	4408470	2.55		**2.55**
19	5145412		1989000	29232153	428784	2436013	6798519	9663316	1304548	3120000	11558960	4408470	2.62		**2.62**
20	5439730		1989000	30693761	453311	2557813	7101277	10112402	1365174	3120000	11913904	4408470	2.70		**2.70**