
TAMIL NADU ELECTRICITY REGULATORY COMMISSION

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

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

1.0 Overview

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

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

1.3 The total capacity of renewable power in the State is 10745.12 MW of which Biomass power constitutes 236.50 MW. The last generic Tariff Order of the Commission in the case of Biomass Power was issued on 31-03-2016 vide order No.5 of 2016. The control period of this order No.5 of 2016 on Biomass energy expires on 31-03-2018.

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

In accordance to 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, the Commission notified the "Power Procurement from New and Renewable Sources of Energy Regulations 2008" on 08-02-2008 which have been subsequently amended from time to time, as required. Clause 6 of the said Regulations state that while the tariff determined by the Commission would be in force for the time period mentioned in the Tariff Order, the control period would ordinarily be two years.

1.5 Commission's order on NCES based generation and allied Issues

1.5.1. The Commission has so far issued four tariff orders in respect of Biomass. While the first Order No. 3 of 2006 dated 15-05-2006 was a comprehensive order for Wind Energy Generators (WEGs), Biomass based generators and Bagasse based co-generators, the second Order No.2 of 2009 dated 27-04-2009 was issued exclusively for Biomass based power plants and valid upto 31-03-2011 and further extended till 30-06-2012 by way of Tariff Order No. 5 of 2011 dated 21-12-2011. The third Order on Biomass No. 8 of 2012 dated 31-07-2012 was issued with validity for the control period of 2 years till 31-07-2014, which was extended vide Order No.5 of 2014 dt. 28-07-2014 upto the date of issue of next Tariff Order. The fourth Order on Biomass No.5 of 2016 dated 31-03-2016 was issued with validity for the control period of 2 years till 31-03-2018.

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

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

2. Biomass based Power Scenario in Tamil Nadu

The installed capacity of Biomass based Power Plants in Tamil Nadu is 236.50 MW as on 31-01-2018.

The year-wise capacity addition in Tamil Nadu over the past 17 years is furnished below:

Year	Capacity Addition in MW
upto 2002	18.00
2002-03	1.60
2003-04	0.00
2004-05	1.50
2005-06	7.75
2006-07	17.50
2007-08	26.50
2008-09	36.70
2009-10	27.50
2010-11	6.95
2011-12	25.00
2012-13	8.40
2013-14	33.60

2014-15	19.00
2015-16	0.00
2016-17	0.00
2017-18	6.50
Total as on 31-01-2018	236.50

3. Legal Provisions

3.1 Related Provisions of the Electricity Act, 2003:

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

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

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

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

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

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

(e) the principles rewarding efficiency in performance;

(f) multi year tariff principles;

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

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

(i) the National Electricity Policy and Tariff Policy:"

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

3.1.4. **Section 86 (1) (e)**, "promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;"

3.2 Related Provisions of the National Electricity Policy:

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

3.2.2. **Clause 5.2.20:** "Feasible potential of non-conventional energy resources, mainly small hydro, wind and bio-mass would also need to be exploited fully to create additional power generation capacity. With a view to increase the overall share of non-conventional energy sources in the electricity mix, efforts will be made to

encourage private sector participation through suitable promotional measures.”

3.2.3. Clause 5.12.1: *“Non-conventional sources of energy being the most environment friendly, there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose, efforts need to be made to reduce the capital cost of projects based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time, adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources.”*

3.2.4. Clause 5.12.2: *“The Electricity Act 2003 provides that power and generation of electricity from non-conventional sources would be promoted by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the share of electricity from non-conventional sources would need to be increased as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies.”*

3.3 Related Provisions in the Tariff Policy

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

3.3.2. **Second Proviso to Clause 5.2:** *"Provided also that the State Government can notify a policy to encourage investment in the State by allowing setting up of generating plants, including from renewable energy sources out of which a maximum of 35% of the installed capacity can be procured by the Distribution Licensees of that State for which the tariff may be determined under Section 62 of the Electricity Act, 2003."*

3.3.3. **Clause 5.11(i):** *"Tariff fixation for all electricity projects (generation, transmission and distribution) that result in lower Green House Gas (GHG) emissions than the relevant base line should take into account the benefits obtained from the Clean Development Mechanism (CDM) into consideration, in a manner so as to provide adequate incentive to the project developers."*

3.3.4. **Clause 6.0:** *"Accelerated growth of the generation capacity sector is essential to meet the estimated growth in demand. Adequacy of generation is also essential for efficient functioning of power markets. At the same time, it is to be ensured that new capacity addition should deliver electricity at most efficient rates to protect the interests of consumers...."*

3.3.5. **Clause 6.4 (1):** *"Pursuant to provisions of section 86(l)(e) of the Act, the Appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account*

availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy shall be taken into account while determining tariff by SERCs. Long term growth trajectory of renewable purchase obligations (RPOs) will be prescribed by the Ministry of Power in consultation with MNRE.

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

3.3.6. Clause 6.4(2): *“States shall endeavour to procure power from renewable energy sources through competitive bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from renewable energy sources from projects above the notified capacity, shall be done through competitive bidding process, from the date to be notified by the Central Government.*

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

4. Promotion of New and Renewable Source of Energy

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

5. Applicability of the Order

5.1 The Tariff Order No.5 of 2016 dated 31-03-2016 for Biomass based Power Plants is valid till 31-03-2018. The Order shall come into force on expiry of the control period of Order No.5 of 2016 dated 31-03-2016.

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

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

6. Tariff Determination Process

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

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

- (a) *"initiating the process of fixing the tariff either suo motu on expiry of control period and on expiry of the extended validity period of the earlier order or on an application filed by the distribution licensee or by the generator."*
- (b) *"inviting public response on the suo motu proceedings or on the application filed by the distribution licensee or by the generator."*
- (c) *- (omitted)*
- (d) *"issuing general / specific tariff Order for purchase of power from new and renewable sources based generators."*

7. Tariff / Pricing Methodology

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

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

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

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

Provided where the tariff has been determined by following transparent process of bidding in accordance with the guidelines issued by the Central Government, as provided under section 63 of the Act, the Commission shall adopt such tariff.

(4) While determining the tariff, the Commission may, to the extent possible consider to permit an allowance / disincentive based on technology, fuel, market risk, environmental benefits and social impact etc., of each type of new and renewable source.

(5) While determining the tariff, the Commission shall adopt appropriate financial and operational parameters.

(6) While determining the tariff, the Commission may adopt appropriate tariff methodology”.

7.2 Cost-Plus Tariff Determination

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

7.3 Single Part vs. Two Part Tariff

7.3.1. Whenever the fuel cost varies from time to time and the

fuel cost is considered as a pass through, the “Cost Plus Two Part Tariff” is adopted. In these cases, the variable component of the tariff would account for any price escalation. The Commission in its Order No.5 of 2016 dated 31-03-2016 adopted the “Cost Plus Two Part Tariff” as the stakeholders were of the view that the two part tariff was convenient to accommodate the fuel cost escalation appropriately. Accordingly, the same approach is proposed for this Order too.

8.0 Issues Relating to Tariff and allied matters:

The Power Procurement from New and Renewable Sources Energy Regulation, 2008, of the Commission specifies that while determining the tariff, the Commission shall adopt appropriate financial and operational parameters for the tariff determined in a cost-plus scenario.

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

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

1. Capital cost per MW
2. Plant Load Factor (PLF)
3. Debt – Equity ratio
4. Term of loan
5. Interest rate for the loan
6. Return on Equity
7. Life of plant and machinery
8. Depreciation

9. O & M Expenses
10. Station Heat rate
11. Gross calorific value of the fuel
12. Specific fuel consumption
13. Fuel cost
14. Components of working capital
15. Interest on working capital
16. Auxiliary consumption

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

8.1.1. Capital cost per MW:

Orders of other Commissions on Capital Cost:

(Rs. in Cr/MW)

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT	MNRE
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)	Frequently Asked Questions (FAQ) No.(9)
Rs.5.59 Crs. to Rs.6.52 Crs. / MW depending upon the type of condenser and / or type of fuel	Rs. 4 Cr. / MW	a) <u>Water cooled</u> : Rs. 5.28 Crs./ MW b) <u>Air cooled</u> : Rs.5.62 Cr. / MW	Rs.5.70 Crs./ MW	Rs. 4.88 Cr./ MW	Rs. 4.63336 Crs./ MW	a) <u>Water cooled</u> : Rs 4.68 Crs/MW b) <u>Air cooled</u> : Rs 4.98/MW	Rs.4.50 to 5.00 Crore/MW, depending upon boiler pressure and capacity

The Commission in Order No.5 of 2016 dated 31-03-2016 had considered Rs.5.50 Crores / MW as the capital cost.

CERC has adopted a Capital Cost of Rs.5.58 Crore/MW to Rs.6.51 Crore/MW as capital cost based on the type of condensers and / or type of fuel for 2016-17. CERC in its RE Regulations of 2017 has marginally

increased the Capital cost by about Rupees one lakh which is negligible. CERC has also kept the Capital Cost at the same level for the entire control period of 3 years i.e. 2017-20. Hence, the Commission assumes the capital cost at Rs.5.50 Crs./MW as adopted by it in the previous order. The capital cost includes evacuation cost up to inter-connection point. The Commission also apportions the capital cost on machineries, land and civil works at 85% and 15% respectively.

8.1.2. Plant Load Factor:

Orders of other Commissions on PLF:

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT	MNRE
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)	Frequently Asked Questions (FAQ) No.(9)
a) During stabilization (6 mths) : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 80%	80%	a) During stabilization (6 mths) : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 75%	75%	a) During stabilization : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 80%	a) During stabilization (6 mths) : 60% b) During remaining period of the 1 st year (after stabilization) : 70% c) Second year onwards : 80%	1 st year : 70% 2 nd year onwards : 80%	70% - 75%.

The plant load factor of a Biomass based power generation depends on number of factors like availability of fuel, vintage of the plant, etc. The Commission had assumed the PLF at 80% in Order No.5 of 2016 dated 31-03-2016.

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

8.1.3. Debt - Equity Ratio:

Orders of other Commissions on Debt-Equity Ratio :

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
70:30	70:30	70:30	70:30	70:30	70:30	70:30

The Commission in Order No.5 of 2016 dated 31-03-2016 had specified the ratio as 70:30.

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

8.1.4. Term of loan

In its Order No.5 of 2016 dated 31-03-2016, the Commission had fixed the tenure of the term loans at 10 years with a moratorium of one year on the consideration that financial institutions generally sanction loans for this time period. While the loan tenor is 13 years in CERC, it is assumed at 12 years in Maharashtra.

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

8.1.5. Interest rate for the loan

Orders of other Commissions on Interest rate for Term Loan:

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT	IREDA
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)	01-11-2015
10.66%	12.00%	12.30%	12.50%	11.00%	12.00%	12.86%	Grade I : 10.60% Grade II : 11.25% Grade III : 11.65% Grade IV : 11.90%

The Commission in its Order No.5 of 2016 dated 31-03-2016 adopted an interest rate on term loan of 13.00% p.a., as specified by CERC.

While the interest rate specified by CERC is at 10.66%, Rajasthan and Maharashtra have adopted the interest rate at 12.30% and 11.00% respectively.

Considering the fact that the interest rates have declined in the market, the Commission proposes to adopt the interest rate of 9.95%, which is 200 basis points above the average State Bank of India Marginal Cost of Funds based Lending Rate (MCLR) (one year tenor) prevalent during the last available six months, for the next control period.

8.1.6. Return on Equity (RoE)

Orders of other Commissions on RoE

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
17.56%	16% (MAT / income tax pass through)	16%	16% (income tax on RoE pass through)	For first 10 years : 20.34% After 10 years : 24.47%	20% pre-tax	14%

ROE adopted by Rajasthan is 16% and Maharashtra is 20.34% (pre-tax) for the first 10 years and 24.47% (pre-tax) after 10 years.

The Commission in its Order No.5 of 2016 dated 31-03-2016 adopted a RoE of 20% (pre-tax) per annum without linking it to MAT and IT.

Now, the Commission proposes to adopt a RoE of 17.56% p.a. (pre-tax) as adopted by CERC in its RE Regulations of 2017 and RE Tariff Order for 2017-18.

8.1.7. Life of plant and machinery

Orders of other Commissions on life of plant & machinery

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT	MNRE
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)	Frequently Asked Questions (FAQ) No.(12)
20 years	20 years	20 years	20 years	20 years	20 years	20 years	20 years. It is possible to extend the lifetime by another 10 years by major rehabilitation.

For tariff determination process, the project life of a plant is considered as 20 years. The Commission had adopted 20 years as life of the Plant and Machinery in its Order No. 5 of 2016 dated 31-03-2016.

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

8.1.8. Depreciation

Orders of other Commissions on Depreciation:

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
First 13 years : 5.28%.	First 8 years : 7.84%	First 12 years : 5.83%	First 12 years : 5.83%	First 12 years : 5.83%	First 10 years : 7%	6% (upto 10 years)
14 th year onwards : 3.051%	9 th year : 7.28% 10-20 years : 1.82%	Balance 8 years : 2.505%/year	Balance 8 years : 2.50%/year	13 th year onwards : 2.505%	11-20 th year: 2% p.a.	3% (11 to 20 years)

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

The Commission in its Order No. 5 of 2016 dated 31-03-2016 adopted the rate of Depreciation as 4.5% p.a. SLM on Plant and Machinery by considering 85% of the capital cost while the accumulated depreciation would be limited to 90% of the plant and machinery.

Therefore, the Commission would continue the depreciation rate of 4.5% p.a. SLM on Plant and Machinery by considering 85% of the capital cost while the accumulated depreciation would be limited to 90% of the plant and machinery for the next control period also.

8.1.9. Operation and Maintenance Expenses

Orders of other Commissions on O & M Expenses:

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
Rs.0.40 Crs. / MW with an escalation of 5.72% per year	5.50% of the capital cost with an escalation of 6.69%	a) <u>Water cooled</u> : Rs. 0.3993 crs./MW with an escalation of 5.85% per year b) <u>Air cooled</u> : Rs.0.4258 Crs /MW with an escalation of 5.85% per year	Rs. 0.30 Crs / MW with an escalation of 5.72% per year	Rs. 0.2630 Crs / MW for FY 2015-16 and Rs.0.2839 Crs./MW for FY 2017-18 with an escalation of 4.85% per year	4% of the capital cost for the first year with an escalation of 5.72% per year	<u>First year</u> : 5% of the project <u>2nd year onwards</u> : 5.72% escalation

The Commission in its Order No. 5 of 2016 dated 31-03-2016, allowed Operation and Maintenance expenditure (including insurance) at 5%

with annual escalation of 5.72% (from second year) on plant and machinery by reckoning 85% of the capital cost as the cost of plant and machinery. With regard to land and civil works, which constitutes 15% of capital investment, 0.90% of 15% was allowed as Operation and Maintenance expenditure every year with an annual escalation of 5.72%.

Therefore, the Commission proposes to follow the procedure as adopted in its 2016 order for the next control period also.

8.1.10. Station Heat Rate

Orders of other Commissions on Station Heat Rate

(In Kcal / Kwhr)

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
4200	4200	a) <u>Water cooled</u> i) During stabilization : 4300 ii) After stabilization : 4200 b) <u>Air cooled</u> : i) During stabilization : 4540 ii) After stabilization : 4440	4000	4200	3800	a) <u>Water cooled</u> : 3800 b) <u>Air cooled</u> : 3950

The Commission in its Order No. 5 of 2016 dated 31-03-2016 fixed the station heat rate at 3840 Kcal / Kwhr.

The Commission proposes to retain the SHR at 3840 Kcal/Kwhr as

followed in its order in 2016 for the next control period also.

8.1.11. Gross calorific value of the fuel

Orders of other Commissions on Gross calorific value of the fuel

(In Kcal/Kg)

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
3100	3100	3400	3300	3611	3600	3400

Most of the ERCs including CERC have fixed the Gross Calorific Value in the range of 3100 – 3600 Kcal/Kwhr. The Commission in its Order No. 5 of 2016 dated 31-03-2016 adopted Gross Calorific value of 3200 Kcal / Kw hr.

Therefore, the Commission proposes to retain the same GCV of 3200 Kcal/Kg for the next control period also as adopted in its 2016 order.

8.1.12. Specific fuel consumption

Orders of other Commissions on Specific fuel consumption:

(in Kg/Kwhr)

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
1.35	1.35	Water Cooled: 1.23 Air Cooled: 1.30	1.21	1.16	1.05	a) <u>Water cooled</u> : 1.12 b) <u>Air cooled</u> : 1.16

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

8.1.13. Fuel Cost:

Orders of other Commissions on fuel cost :

(in Rs. /MT)

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 13-03-2017	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
2826.05 with 5% escalation	FY 2017-18 2930.3 with 0.95% escalation	2875 with 5% escalation	2100 with 5.72% escalation	3896.21	FY 2013-14 2653 with 5% escalation	2726 with 5% escalation

The Commission in its Order No.5 of 2016 dated 31-03-2016 adopted Fuel cost as prescribed by CERC at Rs.2892.03/MT with 5% escalation p.a. during the control period as per CERC norms. Currently, CERC in its RE Regulations dt. 17-04-2017 has considered fuel cost of Rs.2826.05/MT (for 2017-18) with 5% escalation in respect of Tamil Nadu. Therefore, the fuel cost for 2018-19 works out to Rs.2967.35/MT.

The Commission proposes the fuel cost at Rs.2967.35/MT (for 2018-19) as adopted by CERC for the next control period with 5% escalation p.a.

8.1.14. Components of working capital

Orders of Other Commissions on Components of Working Capital

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
O&M charges : 1 month Maintenance spares :15% of O&M expenses Receivables for Debtors : 2 months Fuel stock : 4 months	Fuel cost : 1 month at threshold PLF O&M expenses : 1 month Receivables : 2 months at threshold PLF Maintenance spares :1% of project cost	O&M expenses : 1 month Maintenance spares :20% of O&M expenses Receivables for Debtors : 1.5 months Fuel Stock : 4 months	Receivables: 2 months Variable Costs : 2 months	O&M expenses : 1 month Maintenance spares :15% of O&M expenses Receivables for Debtors : 2 months Fuel stock : 4 months	O&M expenses : 1 month Maintenance spares :15% of O&M expenses Receivables: 2 months of energy charges based on normative PLF Fuel stock : 4 months	Fuel stock : 30 days Receivables : 1 month O&M expenses : 1 month Maintenance spares :1% on capital cost

As per the last Tariff Order No.5 of 2016 dated 31-03-2016, the working capital is based on the following norms:

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

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

8.1.15. Interest on working capital**Orders of Other Commissions on Interest on Working Capital**

(in % p.a.)

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
11.66%	12.00%	11.80%	13.25%	11.00%	13.00%	12.86%

The Commission in its Order No.5 of 2016 dated 31-03-2016 adopted Interest on working capital at 13.50%.

The Commission proposes to adopt the interest rate of 10.95%, which is 300 basis points above the average State Bank of India Marginal Cost of Funds based Lending Rate (MCLR) (one year tenor) prevalent during the last available six months, for the next control period.

8.1.16. Auxiliary Consumption

Orders of other Commissions on Auxiliary Consumption:

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATAKA	MAHARASHTRA	MADHYA PRADESH	GUJARAT
18-04-2017	16-05-2014 & 19-07-2014	28-11-2017	01-01-2015	28-04-2017	02-03-2012 & 03-05-2013	08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)
a) Water cooled i) During 1 st year of operation : 11% ii) From 2 nd year onwards : 10% b) Air cooled : i) During 1 st year of operation : 13% ii) From 2 nd year onwards : 12%	10%	a) <u>Water cooled</u> : i) During stabilization : 10.50% ii) After stabilization : 10% b) <u>Air cooled</u> : i) During stabilization : 12.5% ii) After stabilization : 12%	10%	10%	10%	10%

The Commission in its last Tariff Order No. 5 of 2016 dated 31-03-2016 adopted Auxiliary Consumption at 10%. In other Commissions Orders, the auxiliary consumption adopted is in the range of 10% to 13%.

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

8.2 Related issues

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

1. 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 power
 13. Energy Purchase and Wheeling Agreement
 14. Scheduling of Power
 15. Tariff Review Period / Control Period

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

8.2.1.1 Transmission and wheeling charges

The Commission in its present Order No.5 of 2016 dated 31-03-2016 has adopted as a promotional measure under section 86 (1) (e) of the Electricity Act 2003, 50% of the transmission and 50% of the wheeling charges of conventional power to the Non-conventional energy sources of power. The concessions granted are being subsidized by other users of the network and ultimately borne by the consumers.

Commission proposes to withdraw the incentives in phases by reducing the same by 10% every two years. Commission proposes the transmission, wheeling charges at 60% of that applicable for conventional power, for the control period which is two years as notified by the Commission from time to time.

8.2.1.2 Scheduling and system operation charges and line losses

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

Commission proposes to withdraw the incentives in phases by reducing the same by 10% every two years. For this control period Commission proposes the scheduling and system operation charges at 60% of that applicable for conventional power.

Apart from these charges, actual line losses in kind as specified in the respective Order of the Commission and as amended from time to time are also payable for the captive use and third party sale.

For generators who are availing Renewable Energy Certificate (REC), normal transmission charges, wheeling charges and scheduling and system operation charges and line losses will apply.

8.2.2 Cross subsidy surcharge

The Commission in respect of Wind energy and Bagasse based Co-generation Plants proposes for withdrawal of incentives in phases by reducing 10% of the same every two years. The Commission proposes levy of 60% of cross subsidy surcharge applicable to conventional power.

8.2.3 CDM Benefits

The Commission in its present Order No.5 of 2016 dated 31-03-2016 has adopted the formula recommended by Forum of Regulator (FOR), which recommended that 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.

It is proposed to retain the existing norms for CDM benefits and sharing of CDM benefits.

8.2.4 Reactive power charges

Commission decides to adopt the reactive power charges for biomass power plants as specified in its Order on Open Access charges issued from time to time.

8.2.5. Grid availability charges

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

Similarly if adequate generation does not materialize or if drawl by the captive / third party consumer exceeds generation, the energy charges and demand charges shall be regulated as specified in the Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 in force.

8.2.6 . Adjustment of generated energy

The Commission in its previous Order No.5 of 2016 dated 31-03-2016 had ruled that the adjustment of generated energy would be as per Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 and related orders in force.

The Commission proposes to continue with the existing procedure.

8.2.7. Application fees and agreement fees

The Commission in its previous Order No.5 of 2016 dated 31-03-2016 had ruled that the application fees and agreement fees for the Energy Purchase and Energy Wheeling Agreements would be as specified in the Commission's Grid Connectivity and Intra-State Open Access Regulations, 2014 and Fees and Fines Regulations 2004 in force. It also ruled that the fees for EPA would be collected by the licensee and passed on to the Commission. Whenever the Commission revises the above fees, the revised fees would be payable by the Biomass based Power Generators.

Whenever there is change in the usage of energy from Biomass based Power Generators 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.

The Commission proposes to continue with the existing charges applicable to this control period also.

8.2.8. Billing and payments

The Commission in its present Order No.5 of 2016 dated 31-03-2016 adopted the following stand :

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. 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.

If a Biomass based 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 generation shall be adjusted against off peak consumption. Normal generation shall be adjusted against normal consumption. Peak, off-peak and normal hours shall be as defined in the Terms and Conditions for Determination of Tariff Regulation, 2005 as amended from time to time. Presently, Clause 11 (2) of the Terms and Conditions for determination of Tariff Regulations, 2005 defines Peak hour as "the time between 0600 hrs and 0900 hrs and between 1800 hrs and 2100 hours." Clause 11 (3) of the Terms and

Conditions for determination of Tariff Regulations, 2005 defines Off-peak hour as "the duration between 2200 hours and 0500 hrs. Balance hours are normal hours.

The Commission also prescribed in the Order No.5 of 2016 dated 31-03-2016 that the peak hour generation and normal hour generation can be adjusted against lower slot 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 consumer. The net amount recoverable from the consumer shall be raised in the bill as per their normal billing schedule.

The Commission proposes to continue with the existing procedure to this control period also.

8.2.9. Payment Security and Security Deposit

The Commission in the Order No.5 of 2016 dated 31-03-2016 ruled that the interest @ 1% per month would be payable by the licensee for the delayed payment

In the same Order, the Commission had decided that the security deposit of the consumer would be two times the maximum net energy supplied by the distribution licensee in any month in the preceding financial year.

The Commission proposes to continue with the existing procedure to this control period also.

8.2.10. Power factor

In the current Order No.5 of 2016 dated 31-03-2016, the Commission ruled that as per the Retail Tariff Order in force, Power Factor disincentive is applicable to a consumer as a percentage of current consumption charges. The average power factor recorded by the meter shall be the reference for calculation of disincentive. On the same analogy, captive / third party consumers of Biomass Plants shall be liable for disincentive based on the average power factor recorded by the meter.

The Commission proposes to adopt the above procedure for this control period.

8.2.11. Metering

The Commission in its present Order No.5 of 2016 dated 31-03-2016 ruled that metering and communication would be in accordance with the following:

- (1) Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006
- (2) Tamil Nadu Electricity Distribution Code, 2004
- (3) Tamil Nadu Grid Code, 2004
- (4) Tamil Nadu Electricity Grid Connectivity and Intra-State Open Access Regulations, 2014

The Commission proposes to adopt the above procedure for this control period also.

8.2.12 . Connectivity and Evacuation of energy

The Commission in its Tariff Order No.5 of 2016 dated 31-03-2016 for Biomass had ruled that the connectivity and power evacuation system would be as provided as per the Act, Codes, Regulations and Orders in force.

The Commission proposes to adopt the above procedure for this control period also.

8.2.13. Energy purchase and wheeling agreement

The Commission in its Order No.5 of 2016 dated 31-03-2016, stated the format of the Energy Purchase Agreement (EPA) shall be evolved as specified in the Commission's New and Renewable Sources of Energy Regulation in force. The agreement shall be valid for a minimum period of 20 years and the distribution licensee shall execute the Energy Purchase Agreement within a month of receipt of application from the generator. The parties to the agreement shall be given the option of exiting in case of violation after serving a three months notice to the other party.

The Order also stated that the format of the Energy Wheeling Agreement (EWA) shall be evolved as specified in the Commission's New and Renewable Sources of Energy Regulation in force and that the period of agreement and other terms and conditions shall be as per the terms of Tamil Nadu Electricity Grid Connectivity and Intra-State Open Access Regulations, 2014 issued by the Commission.

The Commission proposes to continue with the same procedure for this Order also.

8.2.14. Scheduling of power

The Commission in its previous Order No.5 of 2016 dated 31-03-2016 had decided 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.

The Commission proposes to continue with the same procedure for this Order also.

8.2.15 Tariff Review Period / Control Period

In the previous Order No.5 of 2016 dated 31-03-2016, based on the views of the majority of the stakeholders, the Commission had agreed for the continuance of 2 years as the control period and tariff period as 20 years.

Clause 6 of the Power Procurement from New and Renewable Sources of Energy Regulations, 2008 of the Commission also 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, in continuation to the stand taken in the previous Order, the Commission proposes that the control period of this Order shall also be two years from the date of issuance of the Order and the tariff period is for 20 years.

9. Tariff

9.1 Orders of other Commissions on Tariff

CERC	ANDHRA PRADESH	RAJASTHAN	KARNATA KA	MAHARASHTRA	MADHYA PRADESH	MNRE	GUJARAT
18-04-2017	16-05-2014 & 13-03-2017	28-11-2017	01-01-2015	28-04-2017	02-03-2012	Website	30-09-2013 (corrigendum to order dated 08-08-2013)
<p>Biomass Power Projects [other than Rice Straw and Juliflora (plantation) based project] with Water Cooled Condenser and using Travelling Grate</p> <p>Variable cost for FY 2017-18 : Rs 4.30/unit</p> <p>Levellized tariff : Rs 2.68/unit</p> <p>Applicable tariff : Rs 6.98/unit</p>	<p>As per Order dated 13-03-2017 : Variable cost for FY 2017-18 : Rs 4.41/unit</p> <p>As per Order dated 22-06-2013 : Fixed cost varies from Rs 1.23/ unit to Rs 1.77/unit depending on the year of commencement since commencement of the unit</p>	<p><u>For plants commenced during 2017-18</u></p> <p>a) <u>Water cooled</u> :</p> <p>Variable cost : Rs 4.00/unit</p> <p>Levellized tariff : Rs 2.81/unit</p> <p>Applicable tariff : Rs 6.81/unit</p> <p>Accelerated depreciation : Rs 0.12/unit</p> <p>Net tariff : Rs 6.69/unit</p> <p>b) <u>Air cooled</u> :</p> <p>Variable cost : Rs.4.32/unit</p> <p>Levellised tariff : Rs 3.06/unit</p> <p>Applicable tariff : Rs.7.38/unit</p> <p>Accelerated depreciation : Rs 0.13/unit</p> <p>Net tariff : Rs 7.25/unit</p>	<p>Fixed cost Levelized for life of the Projects: Rs.2.37/unit</p> <p>Variable Cost (Rs./Unit) applicable to the relevant year : FY-15: Rs.2.82 (Base year) FY-16: Rs.2.98 FY-17: Rs.3.16 FY-18: Rs.3.34</p>	<p>Levellised tariff (variable) : Rs. 5.04/unit</p> <p>Levellised tariff (fixed) : Rs. 2.20/unit</p> <p>Levellised tariff : Rs.7.24/unit</p>	<p>For plants commissioned during FY 2013-14</p> <p>1st year : Rs 5.64/unit</p> <p>2nd year : Rs 5.32/unit</p> <p>Until 20th year at Rs 9.88/unit</p>	<p>Cost of generation : Rs 3.50 to Rs 4.00/unit</p>	<p>a) <u>Water cooled</u></p> <p>(i) <u>Tariff without AD benefit</u> :</p> <p>Variable cost : Rs 3.55/unit</p> <p>Levellised tariff : Rs 1.77/unit</p> <p>ii) <u>Tariff with AD benefit</u> :</p> <p>Variable cost : Rs 3.55/unit</p> <p>Levellised tariff : Rs 1.49/unit</p> <p>b) <u>Air cooled</u> :</p> <p>i) <u>Tariff without AD benefit</u> :</p> <p>Variable cost : Rs 3.69/unit</p> <p>Levellised tariff : Rs 1.89/unit</p> <p>ii) <u>Tariff with AD benefit</u> :</p> <p>Variable cost : Rs 3.69/unit</p> <p>Levellised tariff : Rs 1.58/unit</p>

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

9.2.1. Fixed costs

(Amount in Rs./unit)

<i>Year</i>	<i>FC</i>		<i>Year</i>	<i>FCC</i>
1	1.93		11	1.73
2	1.96		12	1.72
3	1.93		13	1.77
4	1.89		14	1.83
5	1.87		15	1.88
6	1.84		16	1.94
7	1.81		17	2.01
8	1.79		18	2.07
9	1.77		19	2.14
10	1.75		20	2.22

9.2.2. Variable Costs

9.2.2.1. The variable cost for the financial year 2018-19 will be Rs.3.96 per unit and for the financial year 2019-20 will be Rs.4.15 per unit.

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

9.2.2.3. The fixed charges specified in this Order will be applicable to the plants commissioned after the expiry of Order No. 5 of 2016, dated 31-03-2016 and the variable cost specified in this Order will apply to all plants commissioned on or after 15-05-2006.

9.2.3. Total Cost

As the control period of the Order is two years, the total cost inclusive of fixed and variable charges for the 1st year (2018-19) is Rs.5.89/unit and for the 2nd year is Rs.6.11/unit (2019-20).

9.3. Use of Fossil Fuel

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

9.4 Quantum of power purchase by the Distribution Licensee

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

(By Order of the Commission)

Secretary
Tamil Nadu Electricity Regulatory Commission

CONSULTATIVE PAPER 2018 - COMPONENTS OF BIOMASS TARIFF

SI No	PARAMETERS	VALUES
1	Capital Investment	Rs.5.50 Cr / MW
2	Plant Load Factor	80%
3	Debt Equity Ratio	70 : 30
4	Term of Loan	10 years with one year moratorium
5	Interest on loan	9.95% p.a
6	Return on Equity	17.56% (Pre-tax)
7	Life of the plant	20 years
8	Depreciation on 85% of capital investment	4.5% p.a on SLM on 85% of capital cost
9	O & M charges for machinery on 85% of capital investment	5% with escalation of 5.72% from 2nd year on 85% of capital cost
10	O & M charges for land and civil works on 15% of capital investment	0.90% with escalation of 5.72% from 2nd year on 15% of capital cost
12	Station Heat Rate	3840 kcal/ kwh
13	Calorific value of fuel	3200 kcal / kg
14	Specific fuel consumption	1.20 kg / kwh
15	Fuel cost (FY 2018-19)	Rs.2967.35 / MT with 5% escalation from 2nd year onwards
16	Working capital components	One Month Fuel stock, One month O & M and Two months Receivables
17	Interest on working capital	10.95% p.a
18	Auxiliary consumption	10.00%

BIOMASS TARIFF CALCULATION

Year	O & M charges for machinery	O & M charges for land & civil works	Total O & M charges for machinery, land & civil works	Interest on loan	Dep	Fuel cost	Working Capital					ROE	Total FC	Units gen Less Aux consump	Fixed Cost	Variable Cost	Total
							O & M Expenses	Fuel	Receivables	Total WC	Int on WC						
1	2337500	74250	2411750	3830750	2103750	24954227	200979	2079519	6187521	8468019	927248	2897400	12170898	6307200	1.93	3.96	5.89
2	2471205	78497	2549702	3830750	2103750	26201938	212475	2183495	6424904	8820874	965886	2897400	12347488	6307200	1.96	4.15	6.11
3	2612558	82987	2695545	3447675	2103750	27512035	224629	2292670	6609294	9126593	999362	2897400	12143732	6307200	1.93		
4	2761996	87734	2849730	3064600	2103750	28887637	237478	2407303	6806336	9451116	1034897	2897400	11950377	6307200	1.89		
5	2919982	92752	3012735	2681525	2103750	30332018	251061	2527668	7016671	9795400	1072596	2897400	11768006	6307200	1.87		
6	3087005	98058	3185063	2298450	2103750	31848619	265422	2654052	7240975	10160449	1112569	2897400	11597232	6307200	1.84		
7	3263582	103667	3367249	1915375	2103750	33441050	280604	2786754	7479959	10547317	1154931	2897400	11438705	6307200	1.81		
8	3450259	109596	3559855	1532300	2103750	35113103	296655	2926092	7734369	10957115	1199804	2897400	11293110	6307200	1.79		
9	3647614	115865	3763479	1149225	2103750	36868758	313623	3072396	8004988	11391008	1247315	2897400	11161170	6307200	1.77		
10	3856257	122493	3978750	766150	2103750	38712196	331563	3226016	8292641	11850220	1297599	2897400	11043649	6307200	1.75		
11	4076835	129499	4206335	383075	2103750	40647806	350528	3387317	8598194	12336039	1350796	2897400	10941356	6307200	1.73		
12	4310030	136907	4446937		2103750	42680196	370578	3556683	8922556	12849817	1407055	2897400	10855142	6307200	1.72		
13	4556564	144738	4701302		2103750	44814206	391775	3734517	9331718	13458011	1473652	2897400	11176104	6307200	1.77		
14	4817199	153017	4970216		2103750	47054916	414185	3921243	9761652	14097080	1543630	2897400	11514997	6307200	1.83		
15	5092743	161769	5254513		2103750	49407662	437876	4117305	10213414	14768595	1617161	2897400	11872824	6307200	1.88		
16	5384048	171023	5555071		2103750	51878045	462923	4323170	10688115	15474208	1694426	2897400	12250647	6307200	1.94		
17	5692016	180805	5872821		2103750	54471947	489402	4539329	11186922	16215653	1775614	2897400	12649585	6307200	2.01		
18	6017599	191147	6208746		2103750	57195544	517396	4766295	11711061	16994752	1860925	2897400	13070822	6307200	2.07		
19	6361806	202081	6563887		2103750	60055322	546991	5004610	12261821	17813422	1950570	2897400	13515606	6307200	2.14		
20	6725701	213640	6939341		2103750	63058088	578278	5254841	12840558	18673677	2044768	2897400	13985258	6307200	2.22		