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 27-10-2014)

1. Introduction

The generating capacity connected to TANGEDCO's grid including the allocation from Central Generating Station is 12909.10 MW as on 31-05-2014 comprising 4660 MW from TANGEDCO's four thermal stations, 516 MW from four gas turbine stations, 2284 MW from hydro stations, 1154 MW from private generating stations, 68 MW as contribution to Tamil Nadu grid by sale of electricity from captive generating and biomass plants, 4177.10 MW as Tamil Nadu's share from central generating stations and 50 MW as external assistance.

Generating capacity from privately owned wind farms is 7262.355 MW as on 31-05-2014. The installed capacity of cogeneration plants is 659.4 MW and biomass power project is 215.4 MW. The installed capacity of Solar PV power project is 104.77 MW.

The average power availability during the first quarter of 2014 was around 11,500 MW. The unrestricted peak varies from 12,500 MW to around 14,000 MW. The restriction and control in electricity supply has been lifted from 01-06-2014 in the State by the Government of Tamil Nadu.

Among the various sources of Non-Conventional Energy Sources (NCES) in Tamil Nadu , energy is generated from Biomass which generally includes crops, plants , agriculture produce, forest products, sawdust and agro industrial wastes . Therefore, the Commission after analyzing various factors effecting the power sourced from biomass proposes to issue the fourth tariff order on Biomass.

1.1 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.

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

1.2.1. The Commission has so far issued three 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

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

As the control period of 2 years is expiring on 31-07-2014, the Commission is issuing this concept 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 211 MW as on 31-03-2014.

The year-wise capacity addition in Tamil Nadu over the past 12 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	33.6
Total as on 31-03-2014	***211.00***

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 (1) (e) ,among other functions of the State Commission stipulates to "promote cogenerationand 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 relating to NCES:

3.3.2. *Clause 5(3) (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."*

3.3.3. 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."

3.3.4. 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 such sources, taking into account availability of such resources in the region and its impact on retail tariffs. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the SERCs latest by April 1, 2006……..

……" It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission."."

3.3.5. Clause 6.4(2): "Such procurement by distribution licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources. In the long-term, these technologies would need to compete with other sources in terms of full costs."

4. Promotion of New and Renewable Sources of Energy

4.1 In order to promote the New and Renewable sources 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. The scope of 'Obligated entity' is a subject matter of a Writ Petition in the Hon'ble High Court of Madras.

5. Applicability of the Order

5.1 The Tariff Order No.8 of 2012 dated 31-07-2012 for Biomass based Power Plants is valid till 31-07-2014 . This Order shall come into force from the date of its issue. The tariff fixed in this order shall be applicable to all biomass power plants commissioned during the control period of this Order. As the control period is for a period of 2 years, the ensuing tariff order would also be applicable for a period of 2 years from the date of issue of the tariff order. The open access charges and other terms and conditions specified in this Order shall be applicable to all the Biomass energy generators, irrespective of their date of commissioning.

5.2 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".

7.1 Market Determined Pricing

In a market, where there is adequate competition among various players, the price for long term, medium term and short term could be determined by the market mechanism. However, the current market is not developed as demand for power always outstrips the supply due to which no competitive price can be discovered.

In view of this, the Commission continues with the Cost Plus Tariff determination in this Order.

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. 8 of 2012 dated 31-07-2012 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 Cr / MW)

CERC	***ANDHRA PRADESH***	***RAJASTHAN***	***KARNATAKA***	***MAHARASHTRA***	***MADHYA PRADESH***	***MNRE***	***GUJARAT***
15-05-2014	***12-09-2011 & ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014***	***03-05-2013***	***Website***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
Rs 5.44 Crs to Rs 6.35 Crs / MW depending upon the type of condenser and / or type of fuel	Rs 4 Cr / MW	a) Water cooled : Rs 5.26 Crs/MW b) Air cooled : Rs 5.61/MW	Rs 4.87 Crs/MW	Rs 4.81 Cr / MW	Rs 4.63 Crs / MW	Rs 4.5 to Rs 5 Crore/MW depending upon boiler pressure and capacity	a) Water cooled : Rs 4.68 Crs/MW b) Air cooled : Rs 4.98/MW

The Commission in Order No.8 of 2012 dated 31-07-2012 had assumed Rs.4.45 Crores / MW as the capital investment based on the capital cost specified by CERC

CERC in its latest Order on NCES have made a differentiation in capital cost between water cooled and air cooled condensers and also based on the type of fuel. Rajasthan and Gujarat have also arrived at capital cost based on the type of condensers. MNRE in its website have indicated that the capital cost can be in the range of Rs 4.5 to Rs 5 Crore/MW depending upon boiler pressure and capacity

Considering the general increase in capital cost , the Commission assumes the capital cost at ***Rs 4.80 Crs / MW .*** 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*	*MNRE*	*GUJARAT*
15-05-2014	*12-09-2011& ATE Order dated 20-12-2012*	*Draft Order 27.5.14*	*11-12-2009*	*MERC RE Regulations 2010*	*02-03-2012*	*Website*	*08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)*
a) During stabilization (6 mts) : 60% b) During remaining period of the 1st year (after stabilization) : 70% c) Second year onwards : 80%	80%	a) During stabilization (6 mts) : 60% b) During remaining period of the 1st year (after stabilization) : 70% c) Second year onwards : 75%	75%	a) During stabilization : 60% b) During remaining period of the 1st year (after stabilization) : 70% c) Second year onwards : 80%	a) During stabilization (6 mts) : 60% b) During remaining period of the 1st year (after stabilization) : 70% c) Second year onwards : 80%	70% - 75%	a) Water cooled : 70% for 1st year and 80% from 2nd year onwards b) Air cooled : : 70% for 1st year and 80% from 2nd year onwards

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. 8 of 2012 dated 31-07-2012.

On the same logic, the Commission now also 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*	*MNRE / IREDA*	*GUJARAT*
15-05-2014	***12-09-2011& ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***22-03-2013 / MERC RE Regulations 2010***	***02-03-2012***	***Website***	***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	NA	70:30

The Commission in the previous Tariff Orders on Biomass dated 15-05-2006 and 31-07-2012 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. 8 of 2012 dated 31-07-2012, 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 12 years in CERC, it is assumed at 10 years in Maharashtra and Gujarat.

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***	***IREDA***	***GUJARAT***
15-05-2014	***12-09-2011& ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014***	***02-03-2012***	***Website***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
Weighted average of base rate of SBI prevalent during the first six months (9.7%) plus 300 basis points (equivalent to interest rate of 12.7%)	12%	12.71%	11.75%	12.78%	12%	12.5% - 13.25% for loan against securitization of future cash flows	12.86%

The Commission in its Order 8 of 2012 dated 31-07-2012 adopted an interest rate on term loan of 12.5% p.a which was based on the views of the stakeholders and the market conditions prevalent at that time.

While the interest rates specified by all the Commissions as stated above are in the range of 12 – 13%, IREDA have specified the financing norm of 12.5% - 13.25%. CERC has considered rate equivalent to weighted average of base rate of SBI prevalent during the first six months plus 300 basis points, which works out to 12.7%.

Considering the fact that interest rates have increased in the market , the Commission proposes to adopt the interest rate of ***12.7%*** as specified by CERC for the next control period .

8.1.6. Return on Equity

Orders of other Commissions on RoE

CERC	***ANDHRA PRADESH***	***RAJASTHAN***	***KARNATAKA***	***MAHARASHTRA***	***MADHYA PRADESH***	***GUJARAT***
15-05-2014	***12-09-2011& ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***22-03-2013 / MERC RE Regulations 2010***	***03-05-2013***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
20% per annum for the first 10 years and 24% per annum from the 11th year onwards	16% with MAT / income tax as pass through	16%	16%	For first 10 years : 19% After the first 10 years : 24%	20% pre-tax	14%

While CERC proposes an RoE 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 RoE at 16%.

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(MAT) 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 Biomass Order No 8 of 2012 dated 31-07-2012) , adopted a RoE of 19.85% (pre-tax) without linking to MAT and IT.

Therefore, the Commission now proposes to adopt a RoE of ***20% (pre tax)*** per annum without linking it to MAT and IT.

8.1.7. Life of plant and machinery

Orders of other Commissions on life of plant & machinery

CERC	***RAJASTHAN***	***MAHARASHTRA***	***MADHYA PRADESH***	***MNRE***	***GUJARAT***
15-05-2014	***Draft Order 27.5.14***	***22-03-2013 / MERC RE Regulations 2010***	***02-03-2012***	***Website***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
20 years	20 years	20 years	20 years	20 years. It is possible to extend the lifetime by another 10 years by major rehabilitation	20 years

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. 8 of 2012 dated 31-07-2012.

All the other ERCs and MNRE have proposed 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 .

8.1.8. Depreciation

Orders of other Commissions on Depreciation:

CERC	***ANDHRA PRADESH***	***RAJASTHAN***	***KARNATAKA***	***MAHARASHTRA***	***MADHYA PRADESH***	***GUJARAT***
15-05-2014	***12-09-2011& ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014 / MERC RE Regulations 2010***	***02-03-2012***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
Rate of depreciation for 12 years :5.830%. Depreciation rate from 13th year onwards : 2.505%	Rate for first 8 years : 7.84% 9th year : 7.28% Further depreciation of 20% shall be spread equally over the next 11 years	Rate of depreciation for 12 years : 5.28% and remaining depreciable value has been spread over the balance useful life of the power project	7% under SLM	Rate for first 10 years : 7% 11th year onwards : 2%	Rate for first 10 years : 7% 11th year onwards : 2%	Rate for first 10 years : 6% From 11th year to 20th year : 3%

CERC in its Order has fixed the depreciation rate to 5.83% for the first 12 years with a reduction to 2.505% from the 13th year onwards . The depreciation rates of other ERCs are in the range of 6% to 7% for the first 10 years with a reduction to 2% - 3% from the 11th year onwards.

The Commission in its Order No. 8 of 2012 dated 31-07-2012 had 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% SLM*** 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 per year

Orders of other Commissions on O & M Expenses:

CERC	***ANDHRA PRADESH***	***RAJASTHAN***	***KARNATAKA***	***MAHARASHTRA***	***MADHYA PRADESH***	***GUJARAT***
15-05-2014	***12-09-2011& ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014***	***02-03-2012***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
Rs 0.42 Crs / MW	5.5% of the capital cost with annual escalation based on CAGR i.e 6.69%	a) Water cooled : Rs 0.33 Crs/MW b) Air cooled : Rs 0.35 Crs /MW	4% of capital cost including insurance with annual escalation of 5%	Rs 0.27 Crs / MW escalated @ 5.72% p.a over the tariff period	4% of the capital cost for the first year with an escalation of 5.72% per year	5% of the capital cost for the first year with an escalation of 5.72% per year

The Commission in its Order No.8 of 2012 dated 31-07-2012, allowed Operation and Maintenance expenditure including insurance at 4.5% with annual escalation of 5% (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 annual escalation of 5%.

CERC's O & M expenses as a percentage of the capital cost translates to 6.6% - 7.7% of the capital cost . Rajasthan's O & M expenses works out to 6.24% - 6.27% of the capital cost. Maharashtra's O & M expenses is calculated at 5.6% of the capital cost. Therefore, overall % of the capital cost among the ERCs is in the range of 4% - 7% . ERCs of Andhra Pradesh, Karnataka, Madhya Pradesh and Gujarat have proposed O & M expenses as a percentage of capital cost ranging between 4% - 5.5%.

Therefore, considering an increasing trend in the O & M expenses , the Commission proposes to increase the O & M expenses from 4.5% to ***5% of the capital cost with escalation of 5.72%*** (in line with the escalation rate in the Tariff Regulations 2005 of the

Commission) (from second year) on plant and machinery by considering 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% of capital cost would be allowed as Operation and Maintenance expenditure every year with annual escalation of 5.72% .

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***
15-05-2014	***16-05-2014***	***Draft Order 27.5.14***	***11-12-2009 & 18-01-2005***	***Draft Order dated 06-05-2014 / MERC RE Regulations 2010***	***03-05-2013***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
a) For projects using travelling grate boilers : 4200 b) For project using AFBC boilers : 4125	For both kind of boilers : 4200	a) Water cooled i) During stabilization : 4300 ii) After stabilization : 4200 b) Air cooled : i) During stabilization : 4540 ii) After stabilization : 4440	3700	3800	3800	a) Water cooled : 3800 b) Air cooled : : 3950

The Commission in its Order No.8 of 2012 dated 31-07-2012 had fixed the station heat rate at 3840 kcal / kwhr

Most of the ERCs have fixed the station heat rate in the range of 3700 – 4000 kcal/kwhr. CERC has differentiated the SHR based on the type of boilers in the range of 4125 – 4200 kcal/kwhr. Therefore, the Commission now decides to retain the SHR at ***3840 kcal/kwhr.***

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***
15-05-2014	***16-05-2014***	***Draft Order 27.5.14***	***11-12-2009 & 18-01-2005***	***Draft Order dated 06-05-2014 / MERC RE Regulations 2010***	***03-05-2013***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
3100	3100	3400	3200	3611	3600	3400

The Commission in its Order No.8 of 2012 dated 31-07-2012 adopted Gross Calorific value of 3200 kcal / kg. This parameter is quite close to the parameter set by CERC and Karnataka. Therefore, the Commission proposes to retain the same GCV of ***3200 kcal/kg*** for the next control period also.

8.1.12. Specific fuel consumption

As Specific fuel consumption is a function of SHR and GCV, the specific fuel consumption proposed for the next control period also works out to ***1.2 kg/kwh***

8.1.13. Fuel Cost:

Orders of other Commissions on fuel cost :

(in Rs. /MT)

CERC	***ANDHRA PRADESH***	***RAJASTHAN***	***KARNATAKA***	***MAHARASHTRA***	***MADHYA PRADESH***	***GUJARAT***
15-05-2014	***16-05-2014***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014 / MERC RE Regulations 2010***	***03-05-2013***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
2706.03 with 5% escalation	2843 with indicative rate of 6% escalation from FY 2015-16 onwards . Exact rate would be notified then	2450 with 5% escalation	1280 with 5% escalation	3318 with escalation of 5%	2653 with 5% escalation	2726 with 5% escalation

The Commission in its Order No.8 of 2012 dated 31-07-2012 adopted Fuel cost as prescribed by CERC at Rs.2277/MT with 5% escalation p.a. during the control period. Currently, CERC in its Order of 15-05-2014 has considered fuel cost of Rs 2706.03 with 5% escalation.

Therefore, considering that the fuel cost in the market has been on an increase, the Commission also considers the fuel cost at ***Rs 2706.03 / MT*** 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*
15-05-2014	***12-09-2011 & ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014 / MERC RE Regulations 2010***	***02-03-2012***	***08-08-2013***
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 :1% of project cost Receivables : 2 months of fixed and variable cost at threshold PLF Fuel stock : 1 month at threshold PLF of 80%	O&M expenses : 1 month Maintenance spares :20% of O&M expenses Receivables for Debtors : 1.5 months Fuel stock : 4 months	Receivables for Debtors : 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 for Debtors : 2 months of energy charges based on normative PLF Fuel stock : 4 months	O&M expenses : 1 month Maintenance spares :1% on capital cost with escalation @ 5% p.a after the first year Receivables : 1 month charges for sale of electricity Fuel stock : 30 days

As per the current Order No.8 of 2012 dated 31-07-2012, the working capital is based on the following norms:

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

The Commission would like to ***continue with the same norm*** 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*
15-05-2014	***12-09-2011 & ATE Order dated 20-12-2012***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014/ MERC RE Regulations 2010***	***02-03-2012***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
13.2%	12%	12.21%	13.25%	Interest rate equivalent to average Base Rate of SBI during the previous year plus 350 basis points i.e 13.28% (9.78% + 350 basis points)	13%	12.86%

The Commission in its Order No.8 of 2012 dated 31-07-2012 had adopted Interest on working capital at 12.5%.

The interest rates adopted by other Commissions are in the range of 12% - 13.3%. Considering that the interest rates for finances in the market have increased , the Commission adopts the interest rate specified by CERC in ins Order of 15-05-2014 at ***13.2%*** 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*
15-05-2014	***16-05-2014***	***Draft Order 27.5.14***	***11-12-2009***	***Draft Order dated 06-05-2014 / MERC RE Regulations 2010***	***02-03-2012***	***08-08-2013 & 30-09-2013 (corrigendum to order dated 08-08-2013)***
a) For project using water cooled condenser i) During 1st year of operation : 11% ii) From 2nd year onwards : 10% b) For project using air cooled condenser i) During 1st year of operation : 13% ii) From 2nd year onwards : 12%	10%	a) Water cooled i) During stabilization : 10.5% ii) After stabilization : 10% b) Air cooled : i) During stabilization : 12.5% ii) After stabilization : 12%	9%	10%	10%	10%

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The Commission in its present Order No.8 of 2012 dated 31-07-2012 has adopted Auxiliary Consumption at 10%. In other Commissions also, auxiliary consumption is adopted at 10%. Therefore, the Commission would like 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 Transmission and wheeling charges & Scheduling and system operation charges

The Commission in its present Order No.8 of 2012 dated 31-07-2012 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 power. It is proposed to ***continue the existing norms*** for this control period also.

With regard to scheduling and system operation charges , the Commission ***now proposes to adopt 50% of 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 payable for the captive use and third party sale. For generators who are availing Renewable Energy Certificate (REC), normal transmission charges, wheeling charges and line losses will apply.

8.2.2 Cross subsidy surcharge

The Commission in its present Order No.8 of 2012 dated 31-07-2012 as a promotional measure for renewable energy, adopted 50% of the applicable Cross Subsidy Surcharge for Biomass based Power Generating Projects.

It is proposed to continue the existing Cross Subsidy Surcharge rate of ***50%*** during this control period also.

8.2.3 CDM Benefits

The Commission in its present Order No.8 of 2012 dated 31-07-2012 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 ***continue 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 start up 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 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.

8.2.6 . Adjustment of generated energy

The Commission in its previous Order dated 31-07-2012 had ruled that the adjustment of generated energy would be as per Commission's Open Access Regulations 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 dated 31-07-2012 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 Intra State Open Access Regulations 2005 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.8 of 2012 dated 31-07-2012 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 start up power and reactive power. As the interest at 13.2% had already been allowed for one month receivables in the working capital, the bill amount is due only after one month. Hence, 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 30 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. 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.

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 as per 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 proposes to ***continue with the existing procedure*** to this control period also.

8.2.9. Payment security and security deposit

The Commission in the previous Order 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 dated 31-07-2012, 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.8 of 2012 dated 31-07-2012 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 Intra State Open Access Regulations 2005

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

8.2.12 . Connectivity and Evacuation of energy

The Commission in its Tariff Order dated 31-07-2012 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.

8.2.13. Energy purchase and wheeling agreement

The Commission in its Order No.8 of 2012 dated 31-07-2012, 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 Open Access Regulations 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 of 31-07-2012 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 of 31-07-2012, 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 decides 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***	***KARNATAKA***	***MAHARASHTRA***	***MADHYA PRADESH***	***MNRE***	***GUJARAT***
15-05-2014	***16-05-2014 & 22-06-2013***	***Draft Order 27.5.14***	***11-12-2009***	***06-05-2014***	***02-03-2012***	***Website***	***30-09-2013 (corrigendum to order dated 08-08-2013)***
Variable cost for FY 2014-15 : Rs 4.12/unit Levellized tariff : Rs 2.90/unit Applicable tariff : Rs 7.02/unit	As per Order dated 16-05-2014 : Variable cost for FY 2014-15 : Rs 4.28/unit 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	<u>For plants commenced during 2014-15</u> a) <u>Water cooled :</u> Variable cost : Rs 3.48/unit Levellized tariff : Rs 2.63/unit Applicable tariff : Rs 6.11/unit Higher depreciation : Rs 0.21/unit Net tariff : Rs 5.90/unit b) <u>Air cooled</u> : Variable cost : Rs 3.76/unit Levellised tariff : Rs 2.86/unit Applicable tariff : Rs 6.62/unit Higher depreciation : Rs 0.23/unit Net tariff : Rs 6.39/unit	Year wise tariff approved 1st year : Rs 3.66/unit 2nd year : Rs 3.69/unit 3rd year : Rs 3.72/unit 4th year : Rs 3.77/unit 5th year : Rs 3.81/unit 6th year : Rs 3.86/unit Until 10th year at Rs 4.13/unit	Levellised tariff (variable) : Rs 3.88/unit Levellised tariff (fixed) : Rs 2.24/unit Levellised tariff : Rs 6.12/unit	For plants commissioned during FY 2013-14 1st year : Rs 5.64/unit 2nd year : Rs 5.32/unit Until 20th year at Rs 9.88/unit	Cost of generation : Rs 3.50 to Rs 4.00/ unit	**a) <u>Water cooled</u>** <u>(i) Tariff without AD benefit</u> : Variable cost : Rs 3.55/unit Levellised tariff : Rs 1.77/unit <u>ii) Tariff with AD benefit :</u> Variable cost : Rs 3.55/unit Levellised tariff : Rs 1.49/unit **b) <u>Air cooled</u>** : <u>i) Tariff without AD benefit</u> : Variable cost : Rs 3.69/unit Levellised tariff : Rs 1.89/unit <u>ii) Tariff with AD benefit :</u> Variable cost : Rs 3.69/unit Levellised tariff : Rs 1.58/unit

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

9.2.1. Fixed costs

(Amount in Rs./unit)

Year	*FCC*		*Year*	*FCC*
1	1.86		11	1.55
2	1.89		12	1.52
3	1.84		13	1.57
4	1.80		14	1.61
5	1.76		15	1.66
6	1.72		16	1.71
7	1.68		17	1.76
8	1.65		18	1.82
9	1.61		19	1.88
10	1.58		20	1.94

9.2.2. Variable Costs

9.2.2.1 The variable cost for the financial year 2014-15 will be Rs.3.61 per unit and for the financial year 2015-16 will be Rs. 3.79 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 on or after the date of issuance of the Order and the variable cost specified in this Order will apply to all plants commissioned on or after 15-05-2006.

9.2.3 Total Cost

9.2.3.1 As the control period of the Order is two years, the total cost inclusive of fixed and variable charges for the 1st year is Rs 5.47/unit and for the 2nd year is Rs 5.67/unit

10. Tariff for the plants commissioned before 15-05-2006

10.1. Chief Engineer, NCES, TANGEDCO filed P.P.A.P. No. 3/2011 with a prayer to fix the tariff applicable to Bagasse based co-generation power plants and Biomass based power plants and biomass plants commissioned before 15-05-2006 and PPA entered before 15-05-2006 for the period from 01-04-2010. The petition was heard by the Commission on 11-07-2011 and TANGEDCO was directed to file separate petition for Bagasse based co-generation power plants and biomass based power plants individually. The Commission further directed the Bagasse based co-generators and Biomass based power producers and TANGEDCO to file their views / comments before 31-07-2011. Accordingly, the TANGEDCO filed a petition for Biomass based power plants in P.P.A.P. No. 9 of 2011.

10.2 As the data relating to the financial parameters were not furnished either by TANGEDCO or by the respective Biomass plants, it was proposed to determine the tariff for the plants commissioned prior to 15-05-2006 in a separate petition – PPAP No 9 of 2012 after separate hearing

10.3. Accordingly, the Commission has heard the concerned parties and reserved the judgment.

(By Order of the Commission)

(-Sd/-)
Secretary
Tamil Nadu Electricity Regulatory Commission

Annexure

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	Depreciation	Fuel cost	Working capital (Rs.)					ROE	Total FC	Units gen Less Aux consump	Fixed Cost	Variable Cost	Total
							O & M exp	Fuel	Receivables	Total WC	Int on WC						
1	2040000	64800	2104800	4267200	1836000	22756630	175400	1896386	2874798	4946584	652949	2880000	11740949	6307200	1.86	3.61	5.47
2	2156688	68507	2225195	4267200	1836000	23894461	185433	1991205	2981983	5158621	680938	2880000	11889333	6307200	1.89	3.79	5.67
3	2280051	72425	2352476	3840480	1836000	25089184	196040	2090765	3058645	5345450	705599	2880000	11614555	6307200	1.84		
4	2410469	76568	2487037	3413760	1836000	26343644	207253	2195304	3141016	5543573	731752	2880000	11348549	6307200	1.80		
5	2548348	80948	2629296	2987040	1836000	27660826	219108	2305069	3229386	5753563	759470	2880000	11091806	6307200	1.76		
6	2694114	85578	2779692	2560320	1836000	29043867	231641	2420322	3324059	5976023	788835	2880000	10844847	6307200	1.72		
7	2848217	90473	2938690	2133600	1836000	30496061	244891	2541338	3425357	6211586	819929	2880000	10608219	6307200	1.68		
8	3011135	95648	3106783	1706880	1836000	32020864	258899	2668405	3533614	6460918	852841	2880000	10382504	6307200	1.65		
9	3183372	101119	3284491	1280160	1836000	33621907	273708	2801826	3649185	6724718	887663	2880000	10168314	6307200	1.61		
10	3365461	106903	3472364	853440	1836000	35303002	289364	2941917	3772441	7003722	924491	2880000	9966295	6307200	1.58		
11	3557965	113018	3670983	426720	1836000	37068152	305915	3089013	3903774	7298702	963429	2880000	9777132	6307200	1.55		
12	3761481	119482	3880963		1836000	38921560	323414	3243463	4043592	7610469	1004582	2880000	9601545	6307200	1.52		
13	3976638	126317	4102954		1836000	40867638	341913	3405636	4228284	7975833	1052810	2880000	9871764	6307200	1.57		
14	4204101	133542	4337643		1836000	42911020	361470	3575918	4422346	8359734	1103485	2880000	10157128	6307200	1.61		
15	4444576	141181	4585757		1836000	45056571	382146	3754714	4626255	8763115	1156731	2880000	10458488	6307200	1.66		
16	4698806	149256	4848062		1836000	47309399	404005	3942450	4840512	9186967	1212680	2880000	10776741	6307200	1.71		
17	4967577	157794	5125371		1836000	49674869	427114	4139572	5065642	9632329	1271467	2880000	11112838	6307200	1.76		
18	5251723	166819	5418542		1836000	52158613	451545	4346551	5302199	10100296	1333239	2880000	11467781	6307200	1.82		
19	5552121	176362	5728483		1836000	54766543	477374	4563879	5550764	10592017	1398146	2880000	11842629	6307200	1.88		
20	5869703	186449	6056152		1836000	57504870	504679	4792073	5811948	11108699	1466348	2880000	12238500	6307200	1.94		