

## **TAMIL NADU ELECTRICITY REGULATORY COMMISSION**

### **Consultative Paper for issue of Tariff order for Solar power and related issues**

(Comments/Suggestions are invited on or before 23.03.2018)

#### **1.0 Overview**

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

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

1.3 The total capacity of renewable power in the state is 10745.12 MW of which solar power constitutes 1865 MW. The Government of India has fixed a target of 175,000 MW of renewable capacity by 2022. The target fixed for solar power by Government of India is 100,000 MW through deployment of 40,000 MW of rooftop solar projects and 60,000 MW of large and medium scale solar projects. The targeted capacity for this state is 8971 MW by 2022. Commission issued the last tariff order on solar power on 28.3.2017 vide Order No.2 of 2017.

The control period of this Order No.2 of 2017 on solar power expires on 31.3.2018.

1.4 Preferential tariffs played a major role in promoting solar power at the initial stage. Internationally and at the National level there is a shift from the feed in tariff regime to tariff based competitive bidding and reverse auctions. Competitive tariffs have been obtained through auctions. Opinions exist in support of and against feed in tariff mechanism and competitive biddings. Rapid fall in prices of solar modules changed the process of procurement from preferential tariff rates to competitive bidding. The price of solar power which constantly was in a downward trend saw a raise in the auctions held in Gujarat and Karnataka after it fell to Rs.2.44 (in the auction in May 2017 for Bhadla Solar park, Rajasthan) to Rs.2.65 and Rs.2.94 per unit respectively. This consultative paper discusses on the need for a feed in tariff in the state, the tariff components and other related issues. Comments are invited from stakeholders on the issues discussed herein.

## **2.0 Need for a feed in tariff**

2.1 The state has an installed capacity of 1865 MW of solar power which is inclusive of solar rooftop generation through net metering. Commission has so far issued 6 tariff orders for procurement of solar power by the Distribution licensee. The first three tariff orders for solar power were issued in the years 2008,2010(two nos.), under the generation based incentive scheme launched by MNRE and the Jawaharlal Nehru National Solar Mission that promoted grid and off grid connected solar power generation. The next three tariff orders

determining preferential tariff were issued vide Order No. 7 of 2014 dt.12.9.2014, Order No. 2 of 2016 dt.28.3.2016, Order No.2 of 2017 dt.28.3.2017 for promoting solar power in the state in accordance with the provisions of the Electricity Act, 2003, the Electricity policies issued by the Government of India and the Commission's Power Procurement from New and Renewable Sources of Energy Regulations, 2008.

2.2 In the Order No.2 of 2016, Commission permitted the distribution licensee to procure solar power through competitive bidding following Government of India guidelines if better rates than that determined by the Commission could be realized. Subsequently, Commission accorded approval to the Distribution licensee to proceed with reverse bidding fixing the preferential tariff as the ceiling prices. In the last tariff order of 2017, Commission observed as follows:

“1.3.4 The Government of India has given a huge thrust to promote renewable energy especially solar power. In line with the mandate of the Act for promotion of renewable energy and the various policies to promote clean energy, Commission decides to have a feed in tariff in place for the next control period that would serve as a benchmark price. In case the utility is not able to generate enough capacity through bidding process, as a fall back it can contract the necessary balance capacity at this feed in tariff. This would also serve as the applicable tariff for developers of projects who have signed energy purchase

agreements under earlier tariff orders which could not be commissioned within the last control period.”

2.3 Consequent to the issue of the Tariff orders in 2016 and 2017, Commission has accorded approval to the Distribution licensee to proceed with reverse bidding fixing the preferential tariff as the ceiling prices and the Distribution licensee has contracted capacities of around 1500 MW at tariffs less than the preferential tariff determined in the orders of 2016 and 2017. The last bidding by the distribution licensee fetched a tariff of Rs.3.47 per unit.

2.4 The country has witnessed numerous competitive biddings, reverse auctions in the solar power sector and it is common knowledge that tariffs for solar power have steeply reduced. The biddings have witnessed tariff reductions as low as Rs.2.44 per unit.

2.5 Karnataka Electricity Regulatory Commission for the purpose of solar auction in the state, fixed a benchmark price equivalent to the APPC of the DISCOMS at Rs.3.57 per unit. The auctions in Karnataka have lead to a price of Rs.2.94 per unit for solar power. Over the past few months, global factors that caused variations in the cost of solar panels and the proposed anti dumping duties have resulted in fluctuations in the cost of solar power.

2.6 While competitive biddings always remain an option to the distribution licensee for power procurement, a feed in tariff will serve as an additional support mechanism. The feed in tariff may serve as a ceiling price for future

biddings by the licensee and may also help the projects that have not been able to commission in the previous control periods. In a recent communication dt.12.1.2018, the Ministry of New and Renewable Energy has clarified that the States/UTs can consider procuring power from solar and wind projects of less than the defined threshold prescribed (25 MW for wind and 5 MW for solar) in the competitive bidding guidelines through feed in tariff to be determined by concerned State Electricity Regulatory Commissions.

### **3.0 Legal framework:**

#### **3.1 Related Provisions of Electricity Act, 2003**

##### **3.1.1 Relevant provisions of Electricity Act, 2003 are reproduced below:**

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

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

.....  
*(h) the promotion of cogeneration and generation of electricity from renewable sources of energy;*

*(i) the National Electricity Policy and tariff policy:*

*Section 62(1): The Appropriate Commission shall determine the tariff in accordance with the provisions of this Act for –*

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

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

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

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

*Section 86(1)(e): The State Commission shall 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 National Electricity Policy**

#### **3.2.1 Relevant provisions of National Electricity Policy are reproduced below:**

*“Section 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.*

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

*sources, the Commission may determine an appropriate differential in prices to promote these technologies.”*

### 3.3. Related Provisions of Tariff Policy

#### 3.3.1 Relevant provisions of Tariff Policy, 2016 are reproduced below:

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

.....

*(i) Within the percentage so made applicable, to start with, the SERCs shall also reserve a minimum percentage for purchase of solar energy from the date of notification of this policy which shall be such that it reaches 8% of total consumption of energy, excluding Hydro Power, by March 2022 or as notified by the Central Government from time to time.*

.....

*(iii) It is desirable that purchase of energy from renewable sources of energy takes place more or less in the same proportion in different States. To achieve this objective in the current scenario of large availability of such resources only in certain parts of the country, an appropriate mechanism such as Renewable Energy Certificate (REC) would need to be promoted. Through such a mechanism, the renewable energy based generation companies can sell the electricity to local distribution licensee at the rates for conventional power and can recover the balance cost by selling certificates to other distribution companies and obligated entities enabling the latter to meet their renewable power purchase obligations. The REC mechanism should also have a solar specific REC.*

*(iv) Appropriate Commission may also provide for a suitable regulatory framework for encouraging such other emerging renewable energy technologies by prescribing separate technology based REC multiplier (i.e. granting higher or lower number of RECs to such emerging technologies for the same level of generation). Similarly, considering the change in prices of renewable energy technologies with passage of time, the Appropriate*

*Commission may prescribe vintage based REC multiplier(i.e granting higher or lower number of RECs for the same level of generation based on year of commissioning of plant).*

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

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

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

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

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

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

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

**3.5** The preamble of the Electricity Act,2003 promotes competition in the power sector. The National Electricity Policy 2005 also promotes procurement of energy from renewable energy sources and promotes purchase of renewable energy by the distribution companies through competitive bidding process. The National Electricity Policy and the Tariff Policy 2006 reconciled to the fact that it will take some time for the nonconventional energy sources to compete with conventional

sources of energy and hence recommended procurement from such sources by distribution companies at preferential tariffs to be determined by the Commissions. The Tariff Policy 2016 has reckoned that to keep the tariff low, states have to endeavour to procure power from renewable energy sources, except waste to energy plants, through competitive bidding and the Distribution licensee shall procure power from renewable energy sources from projects above the notified capacity, through competitive bidding process, from the date to be notified by the Central Government.

3.6 Commission's regulations on Power Procurement from New and Renewable Sources of Energy provides for determination of tariff by generic or specific order and to adopt a tariff if the tariff has been determined by a transparent process following guidelines issued by Central Government.

3.7 The Central Electricity Regulatory Commission in its Regulations on Tariff determination for renewable energy sources issued on 17.4.2017 has not fixed any generic tariff for wind and solar power for the reason that setting generic tariff based on norms may not provide the right price signals. However, the Central Commission has set financial and operational norms that would serve as ceiling norms for determination of project specific tariff.

3.8 Government of India has issued guidelines for tariff based competitive bidding process for procurement of power from grid connected solar power projects vide resolution No. 23/27/2017-R&R.-1 dt.3.8.2017.

3.9 The tariff determined for solar power in the last tariff order of 2017 dt.28.3.2017 was Rs.4.50 per unit without accelerated depreciation and Rs.4.41 per unit with accelerated depreciation. A combination of factors of low module prices, loans with cheap rates of interest, location of projects, have lead to low tariff rates to the extent of Rs.2.44 per unit, in the auctions held for solar power. Since the issue of the last solar tariff order on 28.3.2017, prices of solar modules have reduced by 20%. Therefore, there is a need to have a new preferential tariff in place.

#### **4.0 Tariff methodology**

4.1 Commission adopted the methodology of cost plus, single part, levellised tariff while determining the tariff for solar power in all its earlier orders issued in 2014, 2016 and the latest Order No.2 of 2017 dt.28.3.2017. Commission proposes to adopt the same methodology in this tariff order also.

#### **5.0 Tariff components**

5.1 The Commission has carried out a detailed analysis of the existing policies/procedures and commercial mechanisms in respect of solar power generation. The tariff determined in a cost plus scenario, would depend significantly on the following operating and financial parameters:

1. Capital cost
2. Capacity Utilization Factor

3. Operation and Maintenance expenses
4. Insurance cost
5. Debt-Equity ratio
6. Term of Loan and Interest
7. Life of plant and machinery
8. Return on Equity
9. Depreciation rate applicable
10. Interest and Components of Working Capital
11. Discount factor
12. Auxiliary consumption

## **5.2 Capital cost**

5.2.1 The cost of the equipments involved is an important factor in determination of overall cost of the plants. The main components of a photovoltaic power plant are the photo voltaic modules, inverters, module mounting structures, cables, control panels, switchyard etc. Apart from the above, erection of power plant involves cost of land, civil works and evacuation infrastructure.

5.2.2 Since the issue of the last tariff order on solar power in Order No.2 of 2017 dt.28.3.2017, market reports (pvXchange -EU spot market module price, PV spot market price index) indicate a decline in price of solar PV cells by 20%. Some of the solar PV installation cost analysis reports converge on a per MW capital cost of Rs.3 crores per MW. However, considering fluctuations in solar prices recently, Commission proposes a capital cost of Rs.3.5 crores per MW.

5.2.3 The capital costs adopted by other SERCs are as below:

Sl.No.	Order of State ERCs	Capital Cost per MW Rs. in Crores
1.	Karnataka ERC – Discussion paper dt.6.2.2018	3.5
2.	Maharashtra ERC Order dt.28.4.2017	4.2474
3.	Rajasthan ERC Order dt.9.10.2017	3.5836

5.2.4 The Capital cost as proposed is inclusive of all capital works i.e plant and machinery, auxiliaries, costs towards changing inverter during the life-time, land, civil work, erection and commissioning, financing and interest during construction, and evacuation infrastructure. The capital cost fixed for solar PV is inclusive of cost of module degradation. It is upto the developer to identify the appropriate land based on solar insolation and cost.

5.2.5 With cheaper availability of solar PV power and no investment in the Solar Thermal sector even after issue of three tariff orders, Commission proposes to do away with the determination of generic tariff for solar thermal power plants.

### 5.3 Capacity Utilisation Factor(CUF)

5.3.1 The CUF considered by other SERCs are as follows:

Sl.No.	Order of State ERCs	CUF
1.	Karnataka ERC – Discussion paper dt.6.2.2018	19%
2.	Maharashtra ERC Order dt.28.4.2017	19%

3.	Rajasthan ERC Order dt.9.10.2017	20%
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5.3.2 The CUF considered in the earlier tariff orders on Solar power issued by the Commission was 19% for Solar PV power plant. The Commission proposes to adopt the same in this order also. The normative CUF proposed in this paper is taking into account the deration of output.

#### 5.4 Operation and Maintenance(O&M) cost

5.4.1 The operation and maintenance cost considered by other SERCs are as follows:

Sl.No.	Order of State ERCs	O&M cost in Rs. per MW
1.	Karnataka ERC – Discussion paper dt.6.2.2018	3.5 Lakhs ;escalation at 5.72%
2.	Maharashtra ERC Order dt.28.4.2017	14.03 Lakhs; escalation at 4.85%
3.	Rajasthan ERC Order dt.9.10.2017	7.41 Lakhs; escalation at 5.85%

5.4.2 The Commission in its last three orders on Solar Power, adopted O&M expense of 1.4% of capital cost of solar projects with an escalation of 5.72% from the second year. The Commission proposes to adopt the same

## 5.5 Insurance cost

5.5.1 In the two tariff orders for Solar power issued by the Commission, 0.35% of net asset value as insurance cost was adopted by the Commission. The Commission proposes to adopt the same in the next order.

## 5.6 Debt and Equity

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

## 5.7 Term of loan and Rate of interest

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

Sl.No.	Order of State ERCs	Term and rate of interest
1.	Karnataka ERC – Discussion paper dt.6.2.2018	12 years,9%
2.	Maharashtra ERC Order dt.28.4.2017	12 years,11%
3.	Rajasthan ERC Order dt.9.10.2017	12 years,12.30%
4.	CERC in RE tariff regulation dt. 17.4.2017	13 years, normative interest rate of two hundred (200) basis points above the average State Bank of India MCLR (one year tenor) prevalent during the last available six months

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

## 5.8 Life of Plant and Machinery

5.8.1 Commission considers a life period of 25 years as adopted in its earlier orders for solar energy.

## 5.9 Return on Equity (RoE)

5.9.1 The Return on Equity considered by other SERCs:

Sl.No.	Order of State ERCs	RoE
1.	Karnataka ERC – Discussion paper dt.6.2.2018	14%
2.	Maharashtra ERC Order dt.28.4.2017	1 <sup>st</sup> 10 years - 20.34%;11 <sup>th</sup> year onwards 24.47%
3.	Rajasthan ERC Order dt.9.10.2017	16%
4.	CERC in RE tariff regulation dt. 17.4.2017	14% grossed up with prevailing MAT(20.26%) on 1 <sup>st</sup> of April of previous year.

5.9.2 Commission proposes to adopt normative RoE of 17.56% as adopted by CERC in its RE Regulations of 2017 and RE Tariff order for 2017-18.

## 5.10 Depreciation

5.10.1 The Depreciation considered by other ERCs:

Sl.No.	Order of State ERCs	Depreciation
1.	Karnataka ERC – Discussion paper dt.6.2.2018	1 <sup>st</sup> 12 years – 5.83% p.a; Balance spread over remaining years.
2.	Maharashtra ERC Order dt.28.4.2017	1 <sup>st</sup> 12 years - 5.83% p.a; Balance 1.54% p.a.
3.	Rajasthan ERC Order dt.9.10.2017	1 <sup>st</sup> 12 years - 5.83% p.a; Balance 1.54% p.a.
4.	CERC in RE tariff regulation dt 17.4.2017	5.28% per annum for first 13 years; Balance spread over remaining useful life.

5.10.2 The Commission in its Orders on Wind, Bio-mass and Bagasse based energy issued during the year 2012 has depreciated the value of plant and machinery to 90% of the initial value for the life period using the straight line method which translates to 3.6% per annum. The same method was adopted in the tariff orders issued for solar power. Depreciation was calculated on 95% of the capital investment in the last three orders on solar power. The Commission proposes to adopt the same method for the life period of 25 years.

## 5.11 Interest and Components of Working Capital

5.11.1 The interest and components considered by other SERCs :

Sl.No.	Order of State ERCs	Interest and Components
1.	Karnataka ERC – Discussion paper dt.6.2.2018	10%;receivables -1 month
2.	Maharashtra ERC Order dt.28.4.2017	11%; O&M – 1 month, maintenance spares-15%; receivables – 2 months
3.	Rajasthan ERC Order dt.9.10.2017	11.8%; O&M – 1 month, maintenance spares-15%; receivables – 1.5 months
4.	CERC in RE tariff regulation dt. 17.4.2017	O&M – 1 month, maintenance spares-15%; receivables – 2 months. Normative interest rate of three hundred (300) basis points above the average State Bank of India MCLR (one year tenor) prevalent during the last available six months

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

## 5.12 Auxiliary consumption

5.12.1 Auxiliary consumption considered to be negligible in Solar PV generation, Commission has not considered auxiliary consumption in Solar PV generation in its earlier orders and proposes to do the same in this order.

## 5.13 Discount factor

5.13.1 A discount factor of 8.75% equal to the post tax weighted average cost of the capital on the basis of normative debt: equity ratio (70:30) is adopted for the purpose of levelled tariff computation.

## 6.0 Tariff Determinants

6.1 . The financial and operational parameters in respect of Solar Power projects proposed in the paper are tabulated below:

Tariff Components	Values
Capital cost	Rs. 3.5 Crores/MW
CUF	19%
Operation and maintenance expenses	1.4% of Capital cost with escalation at 5.72% p.a from second year
Insurance	0.35% of net asset value
Debt-Equity ratio	70:30
Life of plant and machinery	25 years
Return on Equity	17.56%(pre-tax)
Term of Loan	10 years with 1 year moratorium period
Interest on loan	9.95%
Depreciation	3.6% on 95% of Capital cost

Working Capital components	one month O&M cost and two months receivables
Interest on working capital	10.95%
Discount factor	8.75%

## 7.0 Solar Power Tariff

7.1 Solar power tariff is computed with reference to the determinants listed above. The tariff works out to Rs. 3.11 per unit without accelerated depreciation and Rs. 3.05 per unit with Accelerated Depreciation(AD). The tariff rates of other SERCs are tabulated below:

Sl.No.	Order of State ERCs	Tariff
1.	Karnataka ERC – Discussion paper dt.6.2.2018	Rs.2.79
2.	Maharashtra ERC Order dt.28.4.2017	Rs.5.13 without A.D; Rs.4.74 with A.D
3.	Rajasthan ERC Order dt.10.7.2017	Rs.3.93 without A.D; Rs.3.66 with A.D

## 8.0 Issues related to power purchase by Distribution licensee:

1. Quantum of power purchase by the Distribution licensee
2. Plant capacity limitations
3. CDM benefits
4. Billing and Payments
5. Energy Purchase Agreement
6. Control Period /Tariff Review Period

## **8.1 Quantum of power purchase by the Distribution licensee**

8.1.1 The distribution licensee can purchase solar power at the rate determined by the Commission from the Solar Power Generators (SPGs) 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.

## **8.2 Plant Capacity limitations**

8.2.1 The Commission in the last tariff order for solar power had limited the purchase by the distribution licensee from solar power plants of 1 MW capacity and above. The Commission proposes to adopt the same in this order also.

## **8.3 CDM benefits**

8.3.1 In the earlier orders issued on renewable energy, the Commission adopted the following formula for sharing of CDM benefits as suggested by the Forum of Regulators (FOR):

“The CDM benefits should be shared on gross basis starting from 100% to developers in the first year and thereafter reducing by 10% every year till the sharing becomes equal (50:50) between the developer and the consumer in the

sixth year. Thereafter, the sharing of CDM benefits will remain equal till such time the benefits accrue.”

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

#### **8.4 Billing and Payments**

8.4.1 When a solar generator sells power to the distribution licensee, the generator shall raise the bill every month for the net energy sold after deducting the charges for power drawn from distribution licensee, reactive power charges etc. The distribution licensee shall make payment to the generator in 60 days of receipt of the bill. Any delayed payment beyond 60 days is liable for interest at the rate of 1% per month.

#### **8.5 Energy Purchase Agreement (EPA)**

8.5.1. The format for Energy Purchase Agreement (EPA) shall be evolved as specified in the Commission’s “Power procurement from New and Renewable sources of energy Regulations 2008” and amended from time to time. The agreement shall be valid for 25 years or life of the plant specified in the respective tariff order. The distribution licensee shall execute the Energy Purchase Agreement or convey its decision in line with this order within a month

of receipt of the proposal from the generator for selling the power. The agreement fees are governed by the Commission's Fees and Fines regulation.

## **8.6 Control Period /Tariff Review Period**

8.6.1 Regulation 6 of the Power Procurement from New and Renewable Sources of Energy Regulations, 2008 of the Commission specifies that the tariff as determined by the Commission shall remain in force for such period as specified by the Commission in such tariff orders and the control period may ordinarily be two years.

8.6.2 As considered in the earlier orders of solar power, Commission proposes a control period of one year from the date of issue of the final order and tariff period is 25 years.

## **9.0 Issues related to open access:**

1. Open access charges – Transmission and Wheeling, and Line losses
2. Cross subsidy surcharge
3. Reactive power charges
4. Grid availability charges
5. Energy Accounting and Billing Procedure
6. Energy wheeling agreement and fees
7. Security Deposit
8. Power factor disincentive
9. Metering
10. Connectivity and evacuation of power
11. Harmonics
12. Parallel Operation charges

## **9.1 Open access charges and line losses**

9.1.1 Transmission, Wheeling and Scheduling & System Operation charges are generally regulated by the Commission's Tariff regulations, Open access regulations and Commission's order on open access charges issued from time to time. However, as a promotional measure, under section 86(1) (e) of the Act, the Commission in the last three tariff orders adopted 30% in each of the transmission, wheeling and scheduling and system operation charges as applicable to the conventional power to the Solar power.

9.1.2 The price of solar power has reached grid parity and is even less than the coal fueled power plants. The concessions granted are being subsidized by other users of the network and ultimately borne by the consumers.

9.1.3 In the case of 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.

9.1.4 Commission proposes to withdraw the incentives in phases every year by reducing the same by 10% every year. Transmission, Wheeling and Scheduling & System Operation charges are proposed at 40% of that applicable for conventional power plants notified by the Commission from time to time.

9.1.5 In respect of the plants availing Renewable Energy Certificates (REC), 100% of the respective charges as specified in the relevant orders shall apply.

9.1.6 Apart from these charges, the SPGs shall have to bear the actual line losses in kind as specified in the respective orders of the Commission and as amended from time to time.

## **9.2 Cross subsidy surcharge**

9.2.1 The Commission in its other tariff orders related to different renewable power and in the orders for solar power, has ordered to levy 50% of the cross subsidy surcharge for third party open access consumers. However, in this order, Commission proposes to withdraw the incentives in phases every year by reducing the same by 10% every year. Commission proposes levy of 60% of cross subsidy surcharge applicable to conventional power.

## **9.3 Reactive Power Charges**

9.3.1 Commission proposes to adopt the reactive power charges as specified in its Order on Open Access charges issued from time to time.

## **9.4 Grid Availability Charges**

### **9.4.1 Charges for the start-up power supplied by the distribution licensee**

9.4.1.1 The question of start up power does not arise for Solar PV generators.

#### **9.4.2 Stand by charges**

9.4.2.1 If the drawal by the captive user or third party buyer exceeds generation, the energy charges and demand charges shall be regulated as per the Commission's Open Access regulation and Commission's regulations on Deviation Settlement Mechanism(DSM) and other relevant orders.

#### **9.5 Energy Accounting and Billing Procedure**

9.5.1 The energy accounting shall be regulated by the Commission's Regulations on open access, DSM and Order on open access. Till such time the DSM is implemented in the State, if a solar power generator utilizes 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 billing period for the net energy supplied. The licensee shall record the slot wise generation and consumption during the billing period. Slot wise adjustment shall be for the billing period. Peak hour generation can be adjusted to normal hour or off peak hour consumption of the billing period and normal hour generation can be adjusted to off peak hour consumption of the billing period. Excess consumption will be charged at the tariff applicable to the consumer subject to the terms and conditions of supply.

9.5.2 When DSM is implemented, the licensee shall record the time block wise generation and consumption during the billing period. Time block wise adjustment shall be made for the billing period. Excess consumption

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

9.5.3 After the billing period, the balance energy may be sold at the rate of 75% of the respective solar tariff fixed by the Commission in the respective orders to the generators.

## **9.6 Energy Wheeling Agreement and fees**

9.6.1 The format for Energy Wheeling Agreement, application and agreement fees, procedure and terms & conditions shall be governed by Commission's following regulations in force and as amended from time to time:

1. Tamil Nadu Electricity Regulatory Commission's Grid Connectivity and Intra State Open Access Regulations, 2014
2. Power Procurement from New and Renewable Sources of Energy Regulations, 2008.

## **9.7 Security deposit**

9.7.1 As regards the security deposit to be paid by captive /third party user, the Commission proposes to retain the present arrangements i.e., charges corresponding to two times the maximum net energy supplied by the distribution licensee in any month in the preceding financial year shall be taken as the basis for the payment of security deposit.

## **9.8 Power Factor disincentive**

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

## **9.9 Metering**

9.9.1 The Commission proposes that metering and communication shall be in accordance with the following regulations in force and any specific orders of the Commission on metering and ABT whenever issued:

- (1) Central Electricity Authority (Installation and Operation of Meters) Regulations 2006 and as amended from time to time.
- (2) Tamil Nadu Electricity Distribution and Supply Codes
- (3) Tamil Nadu Electricity Grid Code
- (4) Tamil Nadu Electricity Regulatory Commission's Grid Connectivity and Intra State Open Access Regulations, 2014

## **9.10 Connectivity and Evacuation of power**

9.10.1 The provisions contained in Central Electricity Authority(Technical Standards for Connectivity to the Grid) Regulations,2007 and Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations,2013, and its amendments shall be complied with. The connectivity and power evacuation system shall be provided as per the Act/ Codes/ Regulations/orders in force.

## **9.11 Harmonics**

9.11.1 The SPGs shall follow the CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013 in respect of harmonics. It is the responsibility of the generator to provide adequate filtering mechanism to limit the harmonics within the stipulated norms. It shall be done before connecting the generator to the grid and the harmonics shall be measured by the respective distribution licensee during the commissioning. If the SPGs inject the harmonics beyond the stipulated limit, they shall pay a compensation of 15% of applicable generation tariff rate to the distribution licensee in whose area the plant is located till such time it is reduced within the stipulated limit. The distribution licensee is responsible for measurement of harmonics with standard meters and issue notices for payment of compensation charges if the harmonics is beyond the stipulated limit. A minimum of 15 days notice period shall be given for payment of compensation charges.

## **9.12 Parallel operation charges**

9.12.1 SPGs who consume power for their captive loads but wish to avail REC may opt for paralleling their generators with the grid without wheeling power. Such generators shall pay 40% of applicable parallel operation charges to the distribution licensee as specified in relevant regulations.

## **10.0 Applicability of this order**

10.1 This Order shall come into force on expiry of the control period of order No.2 of 2017 dt.28.3.2017. The tariff proposed to be fixed shall be applicable to all solar power plants commissioned during the control period of the Order. The tariff is applicable for purchase of solar power by Distribution Licensee from Solar Power Generators(SPGs). The open access charges and other terms and conditions specified shall be applicable to all the SPGs, irrespective of their date of commissioning.

(By order of Tamil Nadu Electricity Regulatory Commission)

(S.Chinnarajalu)  
Secretary  
Tamil Nadu Electricity Regulatory Commission





Tariff Details--- Solar.(P/A)													
1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400	1664400
12	13	14	15	16	17	18	19	20	21	22	23	24	25
1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800	1843800
1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000	1197000
76416	72226	68037	63847	59658	55468	51279	47089	42900	38710	34521	30331	26142	21952
903493	955173	1009809	1067570	1128635	1193193	1261443	1333598	1409880	1490525	1575783	1665917	1761208	1861949
83140	84503	85948	87481	89106	90828	92653	94587	96637	98807	101107	103542	106121	108853
<b>4103848</b>	<b>4152702</b>	<b>4204593</b>	<b>4259698</b>	<b>4318198</b>	<b>4380289</b>	<b>4446175</b>	<b>4516074</b>	<b>4590216</b>	<b>4668842</b>	<b>4752210</b>	<b>4840591</b>	<b>4934271</b>	<b>5033554</b>
<b>2.466</b>	<b>2.495</b>	<b>2.526</b>	<b>2.559</b>	<b>2.594</b>	<b>2.632</b>	<b>2.671</b>	<b>2.713</b>	<b>2.758</b>	<b>2.805</b>	<b>2.855</b>	<b>2.908</b>	<b>2.965</b>	<b>3.024</b>
75291	79598	84151	88964	94053	99433	105120	111133	117490	124210	131315	138826	146767	155162
683975	692117	700766	709950	719700	730048	741029	752679	765036	778140	792035	806765	822378	838926
759266	771715	784916	798914	813753	829481	846149	863812	882526	902351	923350	945592	969146	994088
83140	84503	85948	87481	89106	90828	92653	94587	96637	98807	101107	103542	106121	108853
0.40	0.37	0.34	0.31	0.28	0.26	0.24	0.22	0.20	0.19	0.17	0.16	0.15	0.13
<b>0.98</b>	<b>0.91</b>	<b>0.85</b>	<b>0.79</b>	<b>0.74</b>	<b>0.69</b>	<b>0.64</b>	<b>0.60</b>	<b>0.56</b>	<b>0.52</b>	<b>0.49</b>	<b>0.46</b>	<b>0.43</b>	<b>0.40</b>

