

Date:6<sup>th</sup> February,2018

## **DISCUSSION PAPER**

### **“Determination of tariff and other norms in respect of new Solar Power Projects”**

#### **(Ground mounted and Solar Rooftop Photovoltaic Units)**

#### **1. Introduction:**

- i. This discussion paper is being issued by the Karnataka Electricity Regulatory Commission (KERC), for the determination of tariff and other norms for new Solar power projects that get commissioned from 1<sup>st</sup> of April, 2018 onwards, in exercise of the powers conferred under Sections 3 (1), 61 (h), 62 (1) (a) and 86(1)(e) of The Electricity Act, 2003 and the provisions of the National Electricity Policy and all other powers enabling it on this account.
- ii. The Electricity Act, 2003 mandates the State Electricity Regulatory Commissions to promote generation of electricity from renewable sources of energy. Accordingly, the KERC has been promoting the generation of power from renewable sources, by determining the feed-in-tariff (generic tariff) periodically, based on the normative financial and operational parameters for the control period as stipulated from time to time. This approach where the developer/investor is offered firm and reasonable returns has enabled creation of suitable environment for investment in RE projects and the State has been able to achieve substantial capacity addition of Solar and Wind Power generation.
- iii. The Commission determined, for megawatt scale solar projects (ground mounted) in its Order dated 12<sup>th</sup> April, 2017, a levellised tariff of Rs.4.36 per unit, for the life of the projects, i.e. for 25 years. The tariff determined in this Order was valid for projects entering into Power Purchase Agreement (PPA) (with the State's Distribution Licensees) on or after 1<sup>st</sup> April, 2017 but before 1<sup>st</sup> April, 2018, and also for those projects for which the PPA was entered into before 1<sup>st</sup> April, 2017, but are not commissioned within the

Scheduled Commercial Operation Date and get commissioned during the period from 1<sup>st</sup> April, 2017 to 31<sup>st</sup> March, 2018.

- iv. In respect of Solar Rooftop Photovoltaic Plants (SRTPV Plants) and small solar power projects, the Commission, in its Order dated 2<sup>nd</sup> May, 2016, determined the generic tariff for such projects entering into PPA and commissioned on or after 2<sup>nd</sup> May, 2016 and upto 31<sup>st</sup> March, 2018, depending on the installed capacity and subsidy availed by the developer, as indicated below:

<b>Capacity of Solar Rooftop PV and small solar power plants</b>	<b>Approved Tariff in Rs/Unit (Without Capital Subsidy)</b>	<b>Approved Tariff in Rs/Unit (With Capital Subsidy of 15%)</b>
1 to 10kW	7.08	6.03
Above 10kW and upto 50kW	6.61	5.63
Above 50kW and upto 100kW.	6.14	5.23
Above 100kW and upto 500kW.	5.67	4.83
Above 500kW and upto 1MW.	5.20	4.43

- v. The above tariff were also made applicable to those projects for which the PPA was entered into before 2<sup>nd</sup> May, 2016, but not commissioned within the Scheduled Commercial Operation Date and get commissioned during the period from 2<sup>nd</sup> May, 2016 to 31<sup>st</sup> March, 2018. The SRTPV plants coming under the above Orders were entitled for net metering facility, with consumers under domestic, hospital and educational institution categories entitled for gross metering facility. Further, the installed capacity of the SRTPV plants was limited to 150% of the sanctioned load of the respective consumer's installation.
- vi. The Commission, subsequently, in its Order dated 19<sup>th</sup> September, 2016, allowed one time irrevocable option of either gross or net metering for consumers under Domestic, Hospital and Educational institution categories at the time of signing of PPA. It also decided to limit the installed capacity of the SRTPV plants to 100% of the sanctioned load of the respective consumer's installation.

- vii. In respect of SRTPV plants installed by the distribution licensees on the roof tops of Government buildings under Government funding, the Commission in its Order dated 11<sup>th</sup> November, 2016 has allowed the offices and institutions located in the buildings to utilise the energy generated by such SRTPV plants and inject any surplus energy into the grid without any actual payment by the concerned ESCOM.
  
- viii. Further, the Commission in its Order dated 15<sup>th</sup> September, 2017 allowed installation of a single or multiple SRTPV Plants on a common roof top by the consumers with the combined installed capacity of the plant/plants not exceeding the sanctioned load based on all the installations in the building, on gross or net-metering as the case may be. Further, the Commission has allowed installation of the SRTPV units on the basis of combined sanctioned load of all the installations in the premises with the attendant benefit of solar power generation made available equitably to all the consumers.
  
- ix. The new Tariff Policy issued on 28<sup>th</sup> January, 2016, envisages future procurement of renewable energy (except from waste to energy plants) only through competitive bidding, as per the bidding guidelines issued by the Government of India.
  
- x. Pursuant to the said Policy, the Bidding Guidelines have been issued on 3<sup>rd</sup> August, 2017, in respect of the standard bidding documents along with Models for Request For Selection (RFS), Power Purchase Agreement (PPA), Power Sale Agreement (PSA) etc.
  
- xi. Even prior to issue of Tariff Policy 2016, the ESCOMs in the State have been procuring solar power from Mega watt scale projects through a transparent process of competitive bidding. The tariffs discovered through competitive bidding have shown a substantial downward trend and are much lower than the feed in tariff, indicating the positive effect of the rapidly growing solar markets and increased competition along with reduction in capital cost. **There is a similar**

**downward trend in the tariffs discovered through competitive bidding in other States also and the rates discovered there in the recent biddings are as follows:**

<b>State</b>	<b>Rate Discovered in the Competitive bidding</b>
Rajasthan	Rs 2.44 per unit
Madhya Pradesh	Rs 2.97 per unit

2. The Commission notes that while all future procurement of solar power should be only through competitive bidding, there would be a need to determine the generic tariff that may have to be made applicable to those projects that fall outside such bidding process for various reasons and also as a reference rate for competitive bidding process, wherever necessary.

Hence, in order to determine the generic tariff for ground mounted solar projects and Solar Roof Top Photovoltaic Plants as applicable from 1<sup>st</sup> April, 2018 the Commission issues this discussion paper.

3. The various parameters considered for the tariff determination are as follows:

**i) Life of the Plant:**

The Commission notes that there is no established life of solar plants in the country. Generally manufacturers of Photovoltaic modules provide a warranty of 25 years. Since these modules form the core component of the solar power generation, the life of the plant could be linked to the life of the modules.

Hence for the present, the Commission proposes to consider the life of the plant at 25 years for the purpose of determination of tariff.

**ii) Term and Tariff design:**

Since the life of the plant is being considered at 25 years, the Commission proposes to adopt levelized tariff for a period of 25 years. The levelized tariff is considered to provide constant revenue flows duly taking into consideration the time value of money. The Commission also desires to know from the stake holders and interested persons, whether separate tariff should be determined for power plants availing the benefits of capital subsidy from MNRE, accelerated depreciation, etc.

**iii) Capacity Utilisation factor:**

The Commission in its Tariff Orders dated 02.05.2016 and 12.04.2017 had considered a CUF of 19% for solar power plants. The Commission proposes to continue to consider a CUF of 19% for solar power plants.

**iv) Capital Cost:**

The Commission proposes to adopt the latest market rates as under as compared to the capital costs considered in its Tariff Orders dated 02.05.2016 and 12.04.2017.

Parameter	For Kilowatt scale Projects	
	Existing as per Order dated 02.05.2016	Proposed(for SRTPV only)
Capital Cost-	1 to10 kW-Rs.75000 per kW Above 10 and upto50kW- Rs.70000 per kW Above 50 and upto100kW- Rs.65000 per kW Above 100 and upto500kW- Rs.60000 per kW Above 500 and upto1000kW- Rs.55000 per kW	1 to 1000kW-Rs 40,000 per kW
For Megawatt scale Projects		
	Existing as per Order dated 12.04.2017	Proposed( for all ground mounted solar power plants)
Capital Cost-	Rs.440 lakhs per MW	Rs.350 lakhs per MW

**v) Operation & Maintenance Cost:**

The operation and maintenance cost consists of employee cost, administrative and general expenses and Repairs & Maintenance expenses. The Commission in its earlier Orders had considered O & M expenses of 1% of the capital cost for kilowatt scale with an annual escalation of 5.72% and Rs 7.40 lakhs /MW for solar PV plants with an annual escalation of 5.72% .

The Commission is of the view that it would be appropriate to continue the existing 1% of the capital cost as O & M expenses duly providing annual escalation of 5.72% to meet the inflationary costs for both SRTPV and ground mounted MW scale projects.

**vi) Interest and Tenure of Debt:**

Considering the normative tenure of long term debts, the Commission proposes to consider the tenure of debts as 12 years. Considering the present interest rates, the Commission proposes to allow Interest on debt at 9% per annum.

**vii) Working Capital:**

The Commission in its earlier tariff Orders had considered one month's receivables as working capital for kilowatt scale projects and two months' receivables in respect of Mega Watt Scale projects. The Commission proposes to consider one month's receivables for both the projects.

**viii) Interest on Working Capital:**

As regards interest on working capital, the Commission in its earlier Orders had considered interest on working capital at 12.5% for kilowatt scale projects and 12% for Mega watt scale projects. Since the interest rates are on a declining trend, the Commission proposes to consider interest on working capital at 10%.

**ix) Depreciation:**

The Commission in its earlier tariff Orders had allowed depreciation at 5.83% for the first 12 years and 1.54% for the remaining 13 years on the capital cost of the plant. The Commission decides to continue with the same.

**x) Return on Equity:**

The Commission in its earlier tariff Orders had allowed RoE of 16% and the actual tax component as a pass through. As the interest rates have declined significantly, the Commission considers that allowing 14% return on equity would be most reasonable and a fair return.

**xi) Discount Rate:**

Since the financing of capital cost is based on 70% debt and 30% equity, the Commission considers that it would be appropriate to reckon weighted average cost of capital (WACC) as the discount factor to arrive at the levelled tariff.

**xii) Other Issues for kW projects(S RTPV):**

- a. The Commission had allowed to install SRTPV units with capacity equivalent to the sanctioned load of the respective consumers installation based on gross or net-metering as the case may be. The Commission now proposes to allow installation of SRTPV with capacity equivalent to 75% of the sanctioned load of the respective consumers installation based on gross or net-metering as the case may be.
- b. The Commission in its Order dated 11.11.2016 had allowed installation of SRTPV plants on the Government buildings under funding from the Government, with the energy from such plants allowed to be utilised by the concerned office/institution on net metering basis and to inject any surplus energy into the grid at APPPC to be adjusted by the ESCOM towards

maintenance of the SRTPV plants. This scheme is proposed to be continued but with the tariff as determined by the Commission instead of APPPC.

- c. The Commission, in its Order dated 15.09.2017 had allowed installation of multiple SRTPV units or single SRTPV unit with the combined installed capacity in a single premises not exceeding the total sanctioned load at a tariff equivalent to APPC or Rs.4 per unit, whichever is less. Now the Commission proposes to continue this scheme but with the tariff as determined instead of present rates.

4. With the above proposed parameters, the tariff proposed to be determined will be as follows:

**(a) MW scale Projects:**

Parameter	For Megawatt scale	
	Existing as per Order dated 12.04.2017	Proposed
Cost/MW- Rs. Lakhs	440	350
Debt: Equity	70:30	70:30
Debt-Rs. Lakhs	308	245
Interest charges on Debt-%	11.00%	9%
Debt Repayment in Yrs.	12	12
CUF	19%	19%
Equity- Rs. lakhs	132	105
ROE-%	16%	14%
Auxiliary consumption	0.25%	0.25%
O & M expenses in Rs. lakhs	7.40	3.5
O & M Escalation p.a.	5.72%	5.72%
WC interest	@12% on 2 months bill	@10% on 1 months bill
Depreciation p.a.for first 12yrs	5.83%	5.83%
Depreciation p.a.for next 13yrs	1.54%	1.54%
<b>Tariff (Rs/unit)</b>	<b>4.36</b>	<b>2.79</b>



**(b) KW scale Projects(SRTPV):**

Parameter	For Kilowatt scale				
	Existing as per Order dated 02.05.2016		Proposed(only for SRTPV)		
Capital Cost-	1 to10 kW-Rs.75000 per kW <b>Above 10 and upto50kW- Rs.70000 per kW</b> Above <b>50 and upto100kW- Rs.65000 per kW</b> Above <b>100 and upto500kW- Rs.60000 per kW</b> Above <b>500 and upto1000kW- Rs.55000 per kW</b>		1 to1000 kW-Rs.40000 per kW		
Debt: Equity ratio	70:30		70:30		
CUF in %	19%		19%		
Tenure of loan	12 years		12 years		
Working Capital [WC]	One Months' Receivables		One Months' Receivables		
RoE	16%		14%		
O & M Expenses	1% of capital cost		1% of capital cost		
Tenure of the PPA	25 years		25 years		
<b>Tariff in Rs/Unit based on the above proposed parameters for SRTPV plant</b>	Capacity of Solar Rooftop and small PV power plants	Approved Tariff in Rs/Unit (Without Capital Subsidy)	Approved Tariff in Rs/Unit (With Capital Subsidy of 15%)	Capacity of SRTPV	Tariff in Rs/Unit (Without Capital Subsidy)
	1 to 10kW	7.08	6.03	1 to 1000kW	3.27
	Above 10kW and upto 50kW	6.61	5.63		
	Above 50kW and upto 100kW.	6.14	5.23		
	Above 100kW and upto 500kW.	5.67	4.83		
	Above 500kW and upto 1MW.	5.20	4.43		

The Commission hereby seeks suggestions/comments/views from all the stakeholders / interested persons on the above proposals.

The Suggestions/Comments/Views from the stakeholders/ interested persons shall be submitted to the Secretary, KERC or by email (kerc-ka@nic.in) on or before 05.03.2018.

Sd/-

**SECRETARY**

**KERC, Bengaluru**