

Discussion paper on Determination of tariff in respect of Solar Power Projects
(including Solar Rooftop Photovoltaic Projects) for FY22 to FY24

I. Introduction:

1. This discussion paper is being issued by the Karnataka Electricity Regulatory Commission, for the determination of tariff for the Solar Power projects, 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 the other powers enabling it, in this account.
2. Section 86(1)(e) of the Electricity Act, 2003, mandates the State Electricity Regulatory Commissions to promote generation of electricity from renewable sources of energy. Accordingly, the Karnataka Electricity Regulatory Commission has been promoting generation of power from renewable sources, by determining the feed-in-tariff (generic tariff) periodically, based on the normative operational and financial parameters for different control periods from the year 2005 onwards. This approach of the Commission has enabled creation of a favourable environment for investment in Renewable Energy (RE) projects in the State, ensuring the investors to get reasonable returns on their investments. As a result, the State has made substantial progress in Wind and Solar generation capacity addition.
3. The Commission, vide its Order dated 22.05.2020, extended the validity of the Tariff Order dated 01.08.2019 relating to solar power projects (including Solar Rooftop Photovoltaic Projects) for FY21, wherein, Commission determined a levelized tariff of Rs.3.08 per unit for Megawatt scale solar project, Rs.3.07 per unit for 1kW to 2000 kW scale solar rooftop photovoltaic projects and Rs. 3.99 per unit

for 1kW to 10kW for domestic consumer's solar rooftop photovoltaic projects, applicable for the life of the projects, i.e. for 25 years. These tariffs were applicable to all such new solar power projects for which PPAs are entered into and approved by the Commission, after the date of issue of the said Order and also those which achieved commercial operation on or after 01.04.2020. This Order will be in force till 31.03.2021.

4. The Commission notes that, the State had an installed Solar Power Generation capacity of 5769.35 MW in both Grid Connected ground mounted solar photovoltaic and rooftop solar photovoltaic plants as on 31.12.2020. However, it was noticed that, the investment in 'solar rooftop installations' is not encouraging as could be seen from the fact that, out of the above capacity, the current installed capacity of SRTPV plants is only 254.35 MW. Further, bulk of these projects pertain to large rooftop capacity projects, indicating that smaller consumers have not shown much interest in installing SRTPV units on their rooftops, even though the potential for installation of small capacity SRTPV units, especially by the domestic consumers, is substantial as the installation of SRTPV plants benefits both the consumers and the distribution licensees. It was also noted that, earlier the domestic consumers have actively supported the State Government's initiative in installation of solar water heaters across the State.
5. The Commission notes that, as per the revised National Solar Mission target 1,00,000 MW solar projects has to be achieved by the year 2021-22. As per the Government of Karnataka's Solar Policy 2014-21, it is envisaged to install a minimum of 6000MW solar power projects by March 2021, of which the share of grid connected SRTPV projects shall be 2400MW.

6. The Tariff Policy dated 28.01.2016, issued by the Government of India (Gol), envisages that, all the future procurements of renewable energy (except from waste to energy plants) shall be made only through competitive bidding, as per the bidding guidelines issued by the Gol. Pursuant to the said Policy, the Government of India had issued the Bidding Guidelines on 03rd August, 2017, duly prescribing the standard bidding documents along with Models for Request for Selection (RFS), Power Purchase Agreement (PPA), Power Sale Agreement (PSA) etc., to facilitate power procurement by the DISCOMs. Even prior to this, the Government of Karnataka has been procuring megawatt scale solar power through a transparent process of competitive bidding, using the Commission determined tariff, as a benchmark. The Commission also decided that all the future power procurements of RE shall be made through the process of competitive bidding, subject to the capacity limit, as may be fixed by the Government. In respect of power procurement from the small ground mounted solar projects of the capacity of less than 5 MW, which are not covered under competitive bidding and SRTPV projects of up to 2000kW, the Commission has to determine tariff effective from 01.04.2021.

7. The Commission also notes that, one of the reasons for the poor response for installation of SRTPV units by the domestic consumers may be, lack of sufficient knowledge about the benefits from installing the SRTPV plants both financial and environmental. Hence, the Commission is of the considered view that, there is a need to promote smaller capacity solar rooftop power plants by the domestic consumers, in order to achieve the desired capacity addition in respect of SRTPV units, in the State.

8. In order to encourage installation of SRTPV units in the State, the following steps were taken by the Commission:
- a. The Commission, vide its order dated 22.05.2020 had extended the validity of the SRTPV Tariff Order dated 01.08.2019 by retaining the same tariff in respect of new solar rooftop photovoltaic units of 1kW to 10kW capacity installed by domestic consumers at Rs. 3.99 per unit (without subsidy) and Rs. 2.97 per unit (with capital subsidy) valid upto 31.03.2021.
 - b. The Commission, in its Order dated 18.05.2018, had allowed the installation of SRTPV plants on the Government buildings by the ESCOMs under Government funding scheme, with the energy generated from such plants being allowed to be utilised by the concerned office/institution and inject any surplus energy into the grid, on net metering basis with the tariff as indicated in the 22.05.2020 Order;
 - c. The Commission, in its Order dated 18.05.2018, has also allowed installation of multiple SRTPV units or single SRTPV unit with the combined installed capacity in a single premise not exceeding the total sanctioned load of all the consumers in that premises, at a tariff equal to 90% of the tariff as per Order dated 22.05.2020;
 - d. As per Regulation 13 of KERC (Implementation of Solar Rooftop Photovoltaic Power Plants) Regulations, 2016, the Commission has also allowed to install SRTPV plants up to the capacity of 2000 kW subject to further limit based on the sanctioned load of the consumer's installation, as may be specified by the Commission from time to time.
 - e. The Commission, vide its Order dated 09.12.2019 allowed third party investment on the Roof of the consumers building under various models and issued the guidelines there on for Solar Roof Top Photovoltaic plants,

- by approving the Tariff as per the prevailing Generic Tariff Order issued by the Commission from time to time.
9. The Commission notes that, the tariffs discovered through competitive bidding continue to show a significant downward trend as compared to the Feed In Tariff (FIT). The rapidly growing solar markets and increased competition along with reduction in capital costs has resulted in discovery of lower tariffs, which are far below the tariff determined by the Commission. In other States as well, there is a downward trend in the tariffs discovered through competitive bidding.
10. The Central Electricity Regulatory Commission (CERC), on 23.06.2020 has notified "CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2020", for determination of tariff in respect of Renewable energy sources. The following are the salient features of these Regulations:
- (1) The generic tariff shall be determined by the Commission on annual basis in accordance with these Regulations for the following types of renewable energy projects:
- a) Small hydro project;
 - b) Biomass power project with Rankine cycle technology;
 - c) Non-fossil fuel based co-generation project;
 - d) Biomass gasifier based power project; and
 - e) Biogas based power project

Provided that the generic tariff determined for the year, in which an RE project is commissioned, shall be applicable for such RE Project of same type and shall remain valid for the tariff period.

(2) Project specific tariff, on case to case basis, shall be determined by the Commission for the following types of renewable energy projects:

- i. Solar PV power projects, floating solar projects and solar thermal power projects;
- ii. Wind power projects (both on-shore and off-shore);
- iii. Biomass gasifier based power projects and biogas based power projects – if a project developer opts for project specific tariff;
- iv. Municipal solid waste based power projects and refuse derived fuel based power projects;
- v. Renewable hybrid energy projects;
- vi. Renewable energy with storage projects; and
- vii. Any other project based on new renewable energy sources or technologies approved by MNRE.

(3) Financial and operational norms specified in these regulations, except for capital cost shall be the ceiling norms while determining the project specific tariff.

11. As per Section 61(a) of the Electricity Act, 2003, the Commission is guided by the Regulations issued by the CERC in the matter of transmission and generation tariffs. Under this provision, the Commission shall determine the tariff for the supply of electricity by a generating company to a distribution licensee.

12. Government of India has notified the (Rights of Consumers) Rules, 2020 in the Gazette of India, Extraordinary, Part-II, Section 3, Sub-section (i), Wherein Net metering for loads upto 10 kW and Gross metering for capacity above 10 kW of SRTPV plants are provided.

13. In order to determine Solar Power Tariff, which reflects the latest market trend and price, the Commission is issuing this Discussion Paper in the matter for the control period FY22 to FY24.

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

i) Life of the Plant:

The Commission notes that till date there is no established life of the Solar Plants in the country. Generally manufacturers of Photovoltaic modules provide a warranty of 25 years. Since, the 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 as being considered in its earlier Solar Tariff Orders 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.

iii) Capacity Utilisation Factor:

The Commission, in its earlier tariff Orders had considered CUF of 19% for solar photovoltaic plants. In the CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2020, notified on 23.06.2020 has allowed the minimum CUF for Solar PV Power Projects as 21%. The Commission notes that the CUF of Solar Plants would vary based on the irradiation profile and other parameters of their locations. It is safe to assume that solar power projects are taken up based on the initial studies of specific locations and their economic viability. Selection of locations with higher CUF would benefit the grid and also the investor. Commissioning of the Solar Power Plants in suboptimal locations, there by resulting in a lower CUF is not in the interest of the stakeholders including the investors/developers. In any case while determining generic tariff, locational disadvantages of a few plants cannot be factored.

Hence, Commission as considered in its earlier Solar Tariff Orders proposes to continue to consider a CUF of 19% of Solar Power Plants.

iv) Debt Equity Ratio:

For determination of Generic Tariff, this Commission in its earlier Solar Tariff Orders and the CERC has considered 70:30 as the Debt Equity ratio. The Commission proposes to continue to consider the debt equity ratio of 70:30 for Solar Power Plants.

v) Capital Cost:

The Commission, in its earlier Solar Tariff Orders had considered the Capital Cost of:

- i. 1kw to 10kW (domestic consumer) at Rs. 45,000 per kW;
- ii. 1kW to 2000kW-at Rs. 32,800 per kW for SRTPV plants (other than SRTPV consumer covered under (i)) and;
- iii. Rs.340 lakhs per MW for MW scale and ground mounted solar power plants.

The Commission proposes to consider the following latest market rates as compared to the capital cost as considered in its earlier Tariff Order as above:

- i. 1kw to 10kW (domestic consumer) at Rs. 43,760per kW;
- ii. 1kW to 2000kW-at Rs. 30,218 per kW for SRTPV plants (other than SRTPV consumer covered under (i)) and;
- iii. Rs.327.18 lakhs per MW for MW scale and ground mounted solar power plants.

vi) Operation & Maintenance Cost:

The operation and maintenance cost consists of employee cost, administrative & general expenses and Repairs & Maintenance expenses (O&M). The Commission, in its earlier Orders, had considered O&M expenses at Rs.600/kW for SRTPV units and at Rs.4.50 lakh/MW for ground mounted Megawatt Scale solar plants, with an annual escalation of 5.72%. The Commission proposes to consider O&M expenses at Rs.670/kW for SRTPV units and at Rs.5.03 lakh/MW for ground mounted Megawatt Scale solar plants.

vii) Interest and Tenure of Debt:

The Commission, in its earlier Orders, had allowed 10.50% per annum as interest on capital loan and considered the tenure of loan as 13 years.

CERC in its CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2020, has proposed normative interest rate (MCLR) plus two hundred (200) basis points above the average State Bank of India MCLR (One-year Tenor) prevalent during the last available six months.

Considering the prevalent lending rate being the Marginal Cost of Funds-Based Lending Rate (MCLR) at which the bank prices all its loans, the Commission proposes to adopt the latest MCLR rate of 3 years of 7.30% notified by the State Bank of India plus 200 points which would be 9.30% p.a.

Therefore, the Commission proposes to consider interest on capital loan at the rate of 9.30 % per annum and consider the tenure of loans as 13 years.

viii) Working Capital and Interest on Working Capital:

The Commission, in its earlier Orders had allowed the working capital equivalent to one month's receivables for SRTPV Projects and Two Month's receivables for MW scales Ground Mounted Solar Projects and allowed interest on working capital at the rate of 11.50%.

The prevalent lending rate being the Marginal Cost of Funds-Based Lending Rate(MCLR) at which the bank prices all its loans. The Commission, in view of the massive reduction in the interest rates being charged on the loans by the banking sector, decides to adopt the latest MCLR rate of 1 year of 7.00% notified by the State Bank of India plus 300 points which will be 10.00% p.a.

Hence, Commission proposes to consider 10.00% per annum as the interest rate for calculating the Interest on Working Capital, equal to one month's receivables for SRTPV Projects and Two Month's receivables for MW scales Ground Mounted Solar Projects.

ix) Depreciation:

The Commission, in its earlier order had considered the depreciation on 90% of the capital cost (excluding land cost) at rate at 5.81% for the ground mounted project and 5.38% for the SRTPV Projects for the first 13 years, and the remaining depreciation spread equally over the balance useful life of the ground mounted projects and SRTPV plants.

The Commission proposes to consider the depreciation on 90% of the capital cost (excluding land cost) at a rate of 5.83% for the first 13 years for the ground mounted projects and 5.38% for the SRTPV Projects for the first 13 years, and the remaining depreciation spread equally over the balance useful life of the ground mounted projects and SRTPV plants.

x) Return on Equity:

The Commission, in its earlier Orders had allowed RoE of 14%.The CERC, in its Regulations has also allowed normative RoE of 14%.

Hence, the Commission proposes to consider the RoE at 14 %.

xi) Discount Rate:

The Commission, in its earlier order had consider the discount factor of 11.55% Since the financing of capital cost is based on 70% debt and 30% equity, the Commission had proposed that it would be appropriate to reckon weighted average cost of capital (WACC) as the discount factor to arrive at the levelised tariff.

Hence the Commission proposes to consider the Discount Rate of 10.71%, based on WACC.

xii) Auxiliary consumption:

The Commission, as considered in its earlier Tariff Orders proposes to consider auxiliary consumption of 0.25% of the gross generation for MW scale projects and not allow any auxiliary consumption for SRTPV plants.

xiii) Other Issues for kW projects (SRTPV plants):

The Commission proposes to continue the following aspects for the control period FY22 to FY24:

- i. The Commission, in its earlier Order has allowed the consumers to install SRTPV units with capacity equivalent to the sanctioned load of the respective consumer's installation based on gross or net-metering under their own investments.
- ii. The Commission, in its Order dated 11.11.2016, has allowed installation of SRTPV plants on the Government buildings by the ESCOMs under funding from the Government, with the energy from such plants being allowed to be utilized by the concerned office/institution and inject any surplus energy into the grid on net metering basis with the tariff for any surplus energy injected as determined by the Commission
- iii. The Commission, in its Order dated 15.09.2017 has allowed installation of multiple SRTPV units or single SRTPV unit with the combined installed capacity in a single premise not exceeding the total sanctioned load of all the consumers in that premises at a tariff 90% of the tariff as determined by the Commission.

Discussion paper on Determination of tariff in respect of Solar Power Projects (including Solar Rooftop Photovoltaic Projects) for FY22-FY24

- iv. The Commission, in its Order dated 09.12.2019 has allowed various models on the third party investments for installing SRTPV on the Consumers' building with the tariff as determined by the Commission.
- v. The Commission, as provided under (Rights of Consumers) Rules, 2020, notified by the GoI, proposes to allow net metering for installing SRTPV for the capacity of 1kW to 10kW and gross metering for installing SRTPV for the capacity exceeding 10kW for the above schemes.
- vi. The Commission proposes Timelines for various activities involved in implementation of SRTPV projects as detailed below:

Activity	Responsibility	Timeline
Submission of Application	Consumer	Zero Date
Acknowledgment of Application by distribution licensee (ESCOM)	ESCOM	Within 03 (three) working days from zero date
Site Verification / Technical Feasibility & issuance of Letter of Approval / Rejection of application.	ESCOM	Within 10 (ten) working days from the date of acknowledging the application
Execution of PPA (including countersignature by the controlling officer for less than 500 kW SRTPV projects)	ESCOM & Consumer	Within 5 (five) working days from the date of issuance of Letter of Approval .
Submission for approval of the PPA for the Commission(For more than 500kW)	ESCOM	Within 07 (Seven) working days from the date of execution of PPA
Submission of Work Completion Report by the Consumer	Consumer	150 (one hundred and fifty) days from the date of execution of PPA.
Inspection by ESCOM officials for commissioning the project, after receipt of work completion report from the consumer.	ESCOM	Within 5 (five) working days from the receipt of work completion report.
Commissioning of Rooftop Solar System	Consumer/ ESCOM	Within six months from the date of approval or deemed approval of PPA .
Billing Process	ESCOM	30 days from the date of commissioning of the Solar plant.

Discussion paper on Determination of tariff in respect of Solar Power Projects (including Solar Rooftop Photovoltaic Projects) for FY22-FY24

xiv) With the above parameters considered, the applicable tariff works out as follows:

(a) kW scale SRTPV projects (1kW to 2000kW and 1kW to 10kW):

Parameters for Kilowatt scale		
Cost/kW- in Rs.	1kW to 10kW-43,760	1kW to 2000kW-30,218
Useful life of the plant in years	25	25
Debt: Equity Ratio	70:30	70:30
Debt- in Rs.	30632	21152.60
Interest Rate on Debt-%	9.30	9.30
Debt Repayment in Yrs.	13	13
CUF in %	19	19
Equity- in Rs.	13128	9065.40
ROE-%	14	14
Auxiliary consumption	-	-
O & M expenses in Rs. /kW	670	670
O & M Escalation p.a.	5.72	5.72
WC interest (one month's receivables)	10.00	10.00
Depreciation in %	5.38%p.a for first 13 years and remaining depreciation spread equally over balance years of the plant's useful life.	5.38%p.a for first 13 years and remaining depreciation spread equally over balance years of the plant's useful life.
Tariff (Rs/unit)	3.82	2.84

(b) MW scale Solar Power Projects (Ground mounted)

Parameters for Megawatt scale solar projects	
Cost/MW- Rs. Lakhs	327.18
Useful life of the plant in years	25
Debt: Equity Ratio	70:30
Debt-Rs. Lakhs	229.03
Interest Rate on Debt-%	9.30
Debt Repayment in Yrs.	13
CUF	19
Equity- Rs. lakhs	98.15
ROE-%	14
Auxiliary consumption	0.25%
O & M expenses in Rs. Lakhs/MW	5.03
O & M Escalation p.a.	5.72
WC interest (two months' receivables)	10.00
Depreciation in %	5.83%p.a for first 13 years and remaining depreciation spread equally over balance years of the plant useful life.
Tariff (Rs/unit)	2.87

Discussion paper on Determination of tariff in respect of Solar Power Projects (including Solar Rooftop Photovoltaic Projects) for FY22-FY24

The Commission hereby invites suggestions/Comments/Views from the stakeholders/ interested persons. The Comments/ suggestions/ views may be submitted to the Secretary, KERC, No-16, C-1, Millers Tank Bed area, Vasanthanagara, Bangalore-52 or by email kerc-ka@nic.in on or before 08.03.2021.


Secretary,
KERC

