

KARNATAKA ELECTRICITY REGULATORY COMMISSION

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M.G. Road, Bangalore-560 001

Present:	Shri. M.K. Shankaralinge Gowda	Chairman
	Shri. H.D. Arun Kumar	Member
	Shri. D.B. Manival Raju	Member

In the matter of:

**Determination of tariff and other norms for Solar Rooftop and
Small Photovoltaic Power Plants.**

ORDER

S/03/1

Date: **2nd May, 2016**

1. Preamble:

The Commission in its Tariff Order dated 10th October, 2013 had determined the tariff for grid connected solar photovoltaic, solar thermal power plants and rooftop solar photovoltaic and other small solar power plants. The tariff determined in this Order based on the prevalent capital cost and other parameters was applicable for the projects entering into power purchase agreement on or after 1st April, 2013 and upto 31st March, 2018 but excluding those projects in respect of which the tariff is discovered through competitive bidding process.

The Commission, in its Order dated 30th July, 2015 has revised the tariff applicable to megawatt scale Solar Photovoltaic and Solar Thermal power plants taking into account the significant reduction in capital cost especially of utility scale Solar Photovoltaic plants. The tariff determined in respect of

rooftop solar Photovoltaic and other small solar power plants were left undisturbed as no significant reduction in their capital cost was observed.

However, in view of the subsequent discovery of substantially lower tariff in respect of solar plants wherever bidding / tendering was adopted by procurers and also the need to revise certain norms specified earlier, the Commission had issued a discussion paper for re-determination of tariff for Grid-Interactive Rooftop and Small kilowatt scale solar photovoltaic plants, based on revised capital cost and other parameters and also for revision of other norms relating to such plants on 16th November, 2015 inviting comments / suggestions from the stakeholders, to be submitted to the Commission on or before 16th December, 2015. In response to the said discussion paper, various stakeholders, including some of the ESCOMs have submitted their written comments / suggestions.

The Commission also held a public hearing on 20th April, 2016 wherein, stakeholders made their oral submissions.

The List of the stakeholders who have made oral submissions in the public hearing is given in the Annexure to this Order.

The Commission proceeds to examine all the relevant facts and issues concerning the matter.

2. Initiatives by the Government to promote solar power generation:

For the reasons well known to all, the State and Central Governments have been taking initiatives to promote and sustain solar power projects. The Government of Karnataka (GoK) has notified the Karnataka Solar Policy 2014-2021 on 22nd May, 2014 which, envisages achieving of a minimum of 400 MW of grid connected solar rooftop plants and 1600 MW of grid connected utility scale solar projects in the State by 2018.

Minimum program targets (MW):

Year	2014-15	2015-16	2016-17	2017-18
Roof-top (grid connected and off-grid)	100	100	100	100

The Government of India (GoI), vide Resolution dated 1st July, 2015, has revised the National Solar Mission targets from 20,000 MW to 1, 00,000 MW to be achieved by the year 2021-22. This targeted capacity is proposed to be achieved through deployment of 40,000 MW of Rooftop solar projects and 60,000 MW of large and medium-scale solar projects.

The year-wise revised targets of rooftop-solar power plants proposed to be achieved under the National Solar Mission to accomplish the scaled-up target of 40,000MW is as under:

Category	Year-wise target (MW)							
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Total
Roof-top Solar	200	4,800	5,000	6,000	7,000	8,000	9,000	40,000

The targeted capacity of rooftop-solar power plants proposed to be achieved by Karnataka under the National Solar Mission is as under:

Category	Year-wise target (MW)							
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Total
Roof-top Solar	10	275	290	344	403	460	518	2300

Further, the Ministry of New and Renewable Energy (MNRE) in its guidelines dated 26th June, 2014 on grid interactive Rooftop and small Solar Power Plants, has given emphasis to capacity addition of solar power ranging from 1KWp to

500KWp rooftop and small solar power plants. The guidelines suggest that net metering and tariff determination by regulators such that, the tariffs are attractive to investors and also do not put too much burden on the ESCOMs. The MNRE would provide incentives which, includes 15% subsidy for selected categories, accelerated depreciation benefits for industrial and commercial buildings, bank loans at interest rate of housing loan from public sector Banks, Customs Duty concessions and Excise Duty exemptions etc.

3. Renewable Purchase Obligation (RPO):

The revised Tariff Policy has been notified by the Ministry of Power, Government of India on 28th January, 2016. As per this revised Tariff Policy the State Regulatory Commissions are required to reserve a minimum percentage for purchase of solar energy such that it reaches 8% of the total consumption of the State by March, 2022 or as notified by the Central Government from time to time. In this regard, the Ministry of New and Renewable Energy (MNRE) in its letter dated 30th March, 2016 has proposed the following targets of solar installed capacity in MW for next five years:

<i>Figures in MW</i>					
2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
1311	2204	3102	4301	5641	6671

The Commission clarifies here that in this Order the issue of RPO is not being dealt and the references made to the RPO are only for the purpose of underlining need for encouraging rapid investments in solar power plants in the State. Following is the data of the PPAs, approved for large megawatt scale solar plants and Solar rooftop PV plants of above 500kW category:

- Megawatt scale Solar Plants: 994 MW
- Solar rooftop PV Plants (above 500kW and upto 1MW): 538 MW
- Solar rooftop PV Plants (below 500kW): 787MW

The present installed capacity of MW scale plants in the State is 134 MW as on 31st March, 2016(Source: KREDL Website).

4. Need for midcourse revision of tariff:

As per the Commission's Order dated 10th October, 2013, the tariff determined therein shall be applicable to all solar rooftop and small solar plants entering into Power Purchase Agreements (PPAs) on or after 1st April, 2013 and upto 31st March, 2018 i.e for the control period of five years commencing from 1st of April 2013. While the five-year control period was envisaged to ensure to the prospective investors Regulatory certainty through assured returns and adequate time to plan, design and commission the projects more efficiently and effectively, it was also to facilitate the ESCOMs concerned to procure adequate solar energy at the promotional Tariff so as to meet the Renewable Purchase Obligation (RPO) as specified by the Commission from time to time. It was assumed that the capital cost reckoned for determination of tariff would not vary substantially during the control period.

However, during FY14 & FY15, the Commission has noticed substantial decline in the prices of solar panels and allied equipment resulting in considerable reduction in cost of solar power generation leading to investors / developers offering to supply power from solar plants at rapidly declining rates. The growth of investments in renewable energy generation particularly in the solar generation has shown encouraging upward trend necessitating moderation of the promotional tariff offered earlier to attract investments. As a result of rapid solar capacity addition, most of the ESCOMs have been able to achieve the present RPO targets.

In view of these developments, the Commission, in order to protect the interest of the consumers and also to ensure financial stability of ESCOMs considers it necessary to take up mid-course revision of the tariff determined in 2013 in respect of solar rooftop and small Photovoltaic power plants.

The Commission also considers it necessary to ensure that only those diligent investors who take expeditious effective steps to commission projects benefit from fixed generic tariff regime during the control period and not those who

merely express their intention to do so without taking any effective steps for commissioning projects.

Under Clause 9 of the KERC (Procurement of Energy from Renewable Sources) Regulations, 2011, this Commission has been conferred with the power to modify the tariff anytime either suo-moto or on application filed by any of the generator or distribution licensee.

Therefore, as proposed in the discussion paper, the Commission deems it necessary to curtail the control period of the generic tariff determined for solar rooftop and small solar projects in the Order dated 10th October, 2013 and re-determine the tariff prospectively. While doing so, the Commission has also considered it necessary to ensure that, such an exercise does not cause undue hardship to those who have already committed to invest in solar projects based on the tariff determined in the Order dated 10th October, 2013, with projects being in advanced stage of implementation.

Now, in exercise of powers conferred under Section 62(1)(a) read with Section 64 and Section 86(1)(e), Clause 9 of the KERC (Procurement of Energy from Renewable Sources) Regulations, 2011 and other enabling provisions of the Electricity Act 2003, after duly considering the comments/suggestions of stakeholders, the Commission hereby passes the following Order

5. Applicability of the Order:

The Commission, in supersession of its Order dated 10th October, 2013, decides that the norms and tariff determined in this Order shall be applicable to all new grid connected solar rooftop and small solar photovoltaic power plants, entering into Power Purchase Agreement (PPA) and commissioned on or after 2nd May, 2016 and upto 31st March, 2018.

In respect of plants for which PPAs that have been entered into prior to 1st May, 2016 and are commissioned within the period of time as stipulated by the ESCOMs concerned or the Commission prior to the date of issue of this Order,

the tariff as per the Commission's Order dated 10th October, 2013 shall be applicable. Such plants shall be eligible for the revised tariff as per this Order if they are not commissioned within the stipulated time period and there shall be no extension in time period for commissioning them after the effective date of this Order.

The Commission notes that even if it considers a liberal solar power capacity addition target for the State, the investments made in the solar power generation so far indicates that such target is almost achieved and hence it may not be prudent to allow further capacity addition. The Commission deems it necessary to specify that the tariff determined in this order shall be limited only to an aggregate capacity addition of 400 MW by all the ESCOMs in the State for the effective period of this Order. Further out of such 400MW capacity, 300MW capacity shall be reserved for domestic, hospital and educational institutions which would be eligible for gross metering, as detailed in the later part of this Order.

The tariff determined and other norms specified in this Order shall be applicable for the term of the PPAs entered into in respect of projects covered by this Order. The Commission would take up review of this Order, if deemed necessary, before the end of the effective period of this Order.

6. Determination of Tariff Solar rooftop and small Photovoltaic power plants:

The Comments / suggestions of the stakeholders and the decisions of the Commission on the capital cost, operational and financial parameters for determination of tariff, for solar rooftop and small photovoltaic power plants are discussed below:

i) Life of the Plant:

The Commission, in its discussion paper, had proposed to consider 25 years as the life of the plant, for the purpose of determination of tariff.

Some stakeholders are of the view that the life of the plant is dependent on not only the solar modules but also the other equipments associated with the plant.

Commission's Decision:

The Commission is also of the view that the life of the plant is to be assessed based on the life of the solar modules as well as the balance of system. However, for the present considering the life assured by the manufacturers/developers and the life considered by other Commissions in the country for the similar plants, **the Commission decides to retain the life of plant as 25 years, for the purpose of determination of tariff.**

ii) Term and Tariff design:

The Commission had proposed to continue with the levelized tariff for a period of 25 years, in order to ensure certainty of revenue streams to investors. The Commission has not received any comments on this aspect.

Commission's Decision:

The Commission notes that, owing to improvement in technology and change in market conditions, prices of the modules of the solar PV plants have significantly reduced over the years and such reduction in cost should be shared equitably with the consumers. To achieve this, the process of determination of tariff has been taken up by the Commission by cutting short the control period.

As discussed in the following paragraphs of this Order, the investments made in solar projects are proposed to be allowed to be recovered through tariff over a period of time. The debt recovery period is considered at 12 years. If the tariff period is reduced to less than 15 years, with the life of the plant being 25 years, the benefits of the investments made would not be completely absorbed. Further, reasonable returns for any investment needs to be allowed during the life of the plant.

Hence, the Commission decides to retain the levelized tariff for a period of 25 years.

iii) Capacity Utilisation factor:

The Commission had proposed capacity utilisation factor of 19% for solar rooftop and small solar photovoltaic power plants.

The stakeholders are of the view that, small scale solar PV plants linked to distribution network experience curtailment due to power cuts/outages on an average of 1-2 hours a day depending upon LT/HT circuit and that, this curtailment is not experienced by large-scale solar PV plants connected to grid. Further, due to urbanisation, increase in pollution and absence of professional cleaning of panels of residential SRTPV, the CUF of LT residential and LT commercial is less than utility scale solar power plants. Hence, a deration factor of 10% for the LT commercial and residential category consumers should be considered and CUF of 17.1% should be assumed. Further, some stakeholders have suggested adopting CUF of 16.25% to 17-18%.

Commission's Decision:

As per the data published, on the website of MNRE, the capacity utilization factor for solar PV plants considered by the CERC and most of the SERCs in the country is 19%. Since the Commission is determining the tariff on generic basis and not on location basis, the Commission, decides to adopt a single CUF for the entire State.

In the circumstances, the Commission decides to retain the CUF at 19% for Solar rooftop and small solar photovoltaic plants.

iv) Capital Cost:

The Commission had proposed to consider capital cost of Rs.75000 per Kw for Solar rooftop and small solar PV plants.

The BESCO has suggested capital cost of Rs. 65,000 per kW for plants above 100 kW, Rs.70,000 per kW for plants of 10 to 100 kW and Rs.75,000 per kW for plants of 1 to 10 kW.

The Federation of Karnataka Chambers of Commerce and Industry (FKCCI) has suggested adopting capital cost of Rs. 85,000 per kW.

The HESCO has suggested that a capital cost of 75,000 per kW can be considered for projects of above 10kW capacity as the rates of PV panels are expected to reduce further. However, capital cost for projects between 1kW and 10kW capacity considering all other hidden expenditure is approximately Rs.1 Lakh/kWp.

The TERI has submitted that it is important to get performance data and life span of the low cost panels from the suppliers before considering the reduction in capital cost.

Karnataka Renewable Energy Systems Manufacturers Association and MicroSun Solar Tech Pvt. Ltd. have suggested that the capital cost for 1kW to 10kW SRTPV is around Rs. 85,000/kW and that for SRTPV system having capacity higher than 100 kW, the capital cost of Rs. 75,000/kW may be considered.

The PRDCL have suggested adopting following capital cost:

- i. Upto 5KW- Rs.1,00,000/-
- ii. Above 5KW upto 50kw- Rs.90,000/-
- iii. Above 50KW upto 100KW- Rs.80,000/-
- iv. Above 100KW- Rs.75,000/-

Commission's Decision:

The Commission in its Tariff Order dated 10th October, 2013 had considered capital cost of Rs.90000 per kW for solar rooftop and small solar PV plants.

The Commission in its Order dated 30th July, 2015 on megawatt scale solar PV plants had considered average capital cost for the period FY16 – FY18 at Rs.600.00 lakhs / MW.

It is observed that the CERC in its Order dated 23rd March, 2016, in the determination of benchmark capital cost norms for the Solar PV power projects and Solar Thermal power projects, has carried out a detailed analysis for evolving the benchmark capital cost norm for Solar PV Power Projects applicable during FY 2016-17. The breakup of capital cost is as under:

Break-up for capital cost considered by the CERC

Sl. No.	Particulars	Capital cost Norm for Solar PV project (Rs. Lakhs/MW)
1	PV Modules	328.39
2	Land Cost	25
3	Civil and General Works	35
4	Mounting Structures	35
5	Power Conditioning Unit	35
6	Cables and Transformers	44
7	Preliminary and Pre-operative expenses IDC etc.	27.63
8	Total Capital Cost	530.02

Thus excluding land cost, the cost of Solar photovoltaic plant per MW will be Rs.505.02 lakhs.

The Commission notes that, though the cost of solar modules used in rooftop and small solar plants would be on par with that used in megawatt scale plants, the cost of power conditioning units and balance of system are not be comparable with megawatt scale plants. Hence, the Commission is of the view that the above capital cost as per the CERC norms cannot be made applicable to such small SRTPV plants. However, The Commission takes note of the recent phenomenon of several players entering into the field of solar rooftop power generation and the competition therein, which is likely to result in significant reduction in the capital cost due to economy of scale.

Keeping in view the suggestions of the stakeholders, the benchmark cost of the CERC and size and nature of solar rooftop and small kilowatt scale solar PV plants, the Commission decides to adopt the following capital cost for determining generic tariff for solar rooftop and small solar photovoltaic power plants:

Capacity	Capital Cost in Rs. Per kW
1 to 10kW	75000
Above 10 kW and upto 50kW.	70000
Above 50kW and upto 100kW.	65000
Above 100kW and upto 500kW.	60000
Above 500kW and upto 1MW.	55000

v) Debt-Equity Ratio

The Commission had proposed to adopt a Debt Equity Ratio of 70:30. Based on the Tariff Policy and the Industry norm, **the Commission decides to continue with the same ratio for the present tariff determination process.**

vi) Operation & Maintenance Cost:

The operation and maintenance cost consists of employee cost, administrative and general expenses and Repairs & Maintenance expenses.

The Commission is of the view that it would be appropriate to consider a percentage of the capital cost as O & M expenses duly providing annual escalation to meet the inflationary costs. The Commission had sought views of the stakeholders.

The HESCOM has suggested that the annual maintenance contract which is approximately 5% should be considered while determining the O&M cost. The Federation of Karnataka Chambers of Commerce and Industry (FKCCI) has suggested retaining O&M expenses as per the Order dated 10th October, 2013.

Commission's Decision:

The Commission in its order dated 10th October, 2013 has considered O & M expenses of Rs.1800 / KW (2% of the capital cost) with an annual escalation of 5.72%.

It is noted that the CERC has considered O & M expenses of Rs.7.00 lakhs / MW for solar PV plants for FY 2016-17 with an annual escalation of 5.72%. The O&M expenses adopted by the GERC are Rs.1000 per kW.

Some of the stakeholders have suggested 1.5% of capital cost as annual O & M expenses, with an escalation of 5.72% for solar thermal and solar PV plants.

The Commission notes that the O & M expenses considered by the CERC appear to be very reasonable as it is based on the recent trends in the industry. However, considering the size of the plants in SRTPV category, the Commission is of the view that the O&M expenses would be very marginal and therefore 1% of the capital cost would be adequate to meet the annual expenses.

Hence, the Commission decides to allow O & M expenses equivalent to 1% of the capital cost for solar rooftop and small solar PV plants for FY 2016-17 with an annual escalation of 5.72%.

ix) Tenure of Debt and rate of Interest:

The Commission had proposed to consider normative tenure of long term debts as 12 years. The Commission in its Order dated 30th July, 2015 on megawatt scale solar PV plants has considered interest on debt at 12.30%. The MNRE has advised Banks to include capital cost of solar rooftop PV plant as part of the home loan. Many Banks have already initiated action and as such loans are available at lower interest rates. The Commission, in its discussion paper had proposed to review the interest allowable on debt based on the prevailing interest rates applicable for solar power projects.

Some stakeholders had expressed difficulties in getting financial support for investing in the SRTPV and suggested that the third party investments be allowed.

Commission's Decision:

The Commission notes that as per its Order dated 1st January, 2015 on determination of tariff from renewable sources other than solar, the tenure of loans has been fixed at 12 years. The CERC has also considered debt repayment period as 12 years. The Commission is of the view that 12 years is appropriate period for debt repayment.

The Commission therefore decides to consider loan repayment tenure of 12 years for the purpose of determination of tariff.

As regards the allowable rate of interest on loan, the Commission notes that interest rate at 12.5% on loan has been allowed to the other renewable sources of energy in the Order dated 1st January, 2015. Considering the present SBI base rate in the range of 8.95 to 9.70% effective from 22nd April, 2016, **the Commission decides to allow 12% as interest on loan which is 230 basis points more than the present base rate to cover the additional rate that investors of SRTPV projects may have to bear.**

x) Working Capital and Interest on working capital:

The Commission, in its tariff Order dated 10th October, 2013 had considered two months' receivables as the working capital.

The Federation of Karnataka Chambers of Commerce and Industry (FKCCI) has suggested adopting two months' receivables plus one month O&M and 15% of O&M expenses towards maintenance spares for computing working capital. Sri. Venkata Subbarao, Former Director (Tech), BESCOM has suggested not to consider working capital as SRTPV requires least maintenance.

Commission's Decision:

The Commission notes that a reasonable working capital has to be allowed for enabling the investor to sustain his operations. Also, the payment for the energy generated in a month by the generator is effectively paid in the subsequent month by the distribution licensees.

The Commission therefore decides to allow one month's receivables as working capital which would be sufficient for sustaining the operational performance of the generator.

As regards the interest on working capital, the Commission notes that, the term of working capital loans being short, the interest rate would be at a higher rate than the interest rate chargeable for long term loans. The Commission, as per its Order dated 1st January, 2015 had allowed 13.25% as interest on working capital for other renewable sources of generation. **In view of the declining trend in base rate and interest rates, the Commission decides to allow 12.50% as interest on the working capital in respect of solar rooftop and small solar PV projects.**

xi) Depreciation:

The Commission had proposed 70% of the capital cost to be financed by debt component with the tenure of debt at 12 years. Also, the Commission had proposed annual depreciation at 5.83% for first 12 years to provide adequate depreciation to meet the loan repayment and annual depreciation at 1.54% for the balance period of 13 years.

Commission's Decision:

The Commission notes that the depreciation of 5.83% for the first 12 years has been allowed by it for all other renewable sources of energy. Similar depreciation has also been considered by the CERC. **Hence, considering that it has reckoned debt tenure at 12 years, the Commission decides to allow depreciation at 5.83% for the first 12 years and 1.54% for the balance 13 years on the capital cost of the plant.**

xii) Return on Equity:

The Commission, in its Tariff Orders in respect of other renewable sources of energy, has allowed RoE of 16% and the actual tax component as a pass through. The Commission had proposed to continue with the same for solar rooftop and small solar PV plants.

Some of the stakeholders have suggested that 16% returns is too high and returns commensurate with bank rate of interest would be sufficient.

Commission's Decision:

As considered for other renewable sources of energy, the Commission decides to continue with the 16% RoE. Any tax paid on the RoE is allowed as a pass through, limited to the amount of equity considered in this Order, which shall be claimed separately from the distribution licensees, duly furnishing proof of payment of such tax.

xiii) Discount Factor:

The discount factor is required to compute the time value of money. Since the financing of capital cost is based on 70% debt and 30% equity, the Commission had proposed that it would be appropriate to consider weighted average cost of capital (WACC) as the discount factor.

Commission's Decision:

The Commission notes that the financing of capital cost is in the debt equity ratio of 70:30 respectively. Considering the cost of debt and cost of equity, it is considered that the weighted average cost of the capital employed is appropriate for determining the discount factor. Since the Commission has allowed the actual tax paid by the generator as a pass through annually limited to the amount of equity considered in the Order, the computation of discount factor does not include the tax component. **Hence, considering 70%**

of the capital cost at 12% interest and 30% of equity at 16% of RoE, the Commission decides to allow discount factor of 13.20%.

xiv) Other issues:

(a) Gross metering and Net metering:

The Commission in its Order dated 10th October, 2013 had allowed power purchase by the distribution licensees from rooftop solar plants including small solar power plants by introducing the concept of net metering.

In the net -metering, the consumer is paid for the net energy i.e., the difference between energy generated from solar rooftop plant and consumed by his/her installation. This concept allows only surplus energy to be injected into the grid. The Commission had proposed to continue with net-metering concept for all consumers, other than domestic consumers.

In the case of domestic consumers, the Commission had proposed to adopt gross metering concept where the entire energy generated by the solar rooftop plant is allowed to be injected into the grid without reckoning the consumption by the domestic consumer's installation. This would allow sale of entire energy generated at the tariff being fixed by the Commission and incentivise domestic consumers to install rooftop solar plants because of higher and faster returns on their investments. This should also help the ESCOMs in procuring additional power at the points of consumption itself with low or negligible line losses and congestion.

Some stakeholders have sought extension of gross-metering concept for categories other than domestic while some for continuing net-metering concept for domestic category.

The Commission notes that even under gross metering, when we consider the average tariff of domestic category and the revised SRTPV tariff, the domestic consumers investing in SRTPV would get marginal revenue after paying for their

consumption. Hence, the Commission decides to allow gross metering for the domestic category. The Commission also considers that certain other categories like hospitals and educational institutions should have the benefits of such gross metering to encourage them to make use of idle rooftop space while helping them to earn marginal revenue to meet their expenditure, which is in the overall interest of the society. However, considering the average commercial and industrial retail supply tariff and the revised SRTPV tariff, the net metering would encourage commercial and industrial consumers to consume cheaper solar power and export surplus power, if any.

(b) Sanctioned Load and Installed capacity of the SRTPV and Small Solar PV plants:

The Commission had observed that many consumers are intending to install rooftop and other small solar photovoltaic power plants far in excess of their sanctioned load. This disparity between the sanctioned and the installed capacity is resulting in surplus energy being pumped into the grid disproportionately under the net-metering arrangement by the consumers installing rooftop solar power plants.

The Commission is of the view that this trend of consumers installing solar rooftop power plants of capacities far in excess of their sanctioned load should not be encouraged as the same is not in the larger interest of the distribution licensees and also the general consumers. There is a need to fix a cap on the generation capacity vis-a-vis the sanctioned load.

Considering the issues of grid stability and the financial health of distribution licensees, the Commission had proposed to limit the allowable capacity of SRTPV and small solar PV plants to the sanctioned load.

Some of the stakeholders have suggested not to impose restrictions on installed capacity based on with the sanctioned load while a few others have suggested allowing such capacity commensurate with the rooftop area available to encourage investments.

The Commission is of the view that rooftop and small solar power plants are intended to encourage utilising of the energy at the point of generation. Rooftop solar generation enables reduction in network losses. But at the same time, the interest of distribution licensee and the general consumers needs to be safeguarded.

The Commission therefore, decides to allow installed capacity of SRTPV and Small Solar PV plants upto 150% of the sanctioned load as these solar plants operate at a very low capacity utilisation factor.

Accordingly, the Commission proposes the following approach for implementation of the scheme of SRTPV and small Solar Plants:

Category of Consumers	Allowable Installed Capacity of rooftop and small solar PV plants	Billing
NET-METERING (Applicable to Industrial, Commercial and all categories of consumers other than Domestic, Hospital and Educational institution categories)		
HT Consumers (other than Residential, Hospital and Educational institution categories)	Equivalent to OR less than 150% of the Contract Demand/Sanctioned Load subject to a maximum of 1000KW (HT Power supply beyond 50KW).	Net metered energy is to be billed at tariff determined by the Commission. In case of installed capacity in excess of allowable capacity, the energy injected during any month, in excess of the allowable installed capacity shall be billed at Average Pooled Power Purchase cost notified by the Commission from time to time.
LT Consumers (other than Domestic, Hospital and Educational institution categories)	Equivalent to OR less than 150% of the Sanctioned Load subject to a maximum of 5KW on single phase supply and for above 5KW upto 50KW on three phase supply.	In case of installed capacity in excess of allowable capacity, the energy injected during any month, in excess of the allowable installed capacity shall be billed at Average Pooled Power Purchase cost notified by the Commission from time to time.

GROSS METERING		
(Applicable to only Domestic, Hospital and Educational institution Consumers)		
Domestic, Hospital and Educational institution Consumers	<p>HT Consumers- HT-4, HT 2 (C):</p> <p>Equivalent to OR less than 150% of the Contract Demand/Sanctioned Load subject to a maximum of 1000KW (HT Power supply beyond 50KW).</p>	<p>Gross energy generated by the Solar Rooftop plant will be allowed to be injected into the grid payable at the tariff to be fixed by the Commission based on the parameters discussed in this paper.</p>
	<p>LT Consumers - LT2(a) & LT2(b):</p> <p>Equivalent to OR less than 150% of the Sanctioned Load subject to a maximum of 5KW on single phase supply and for above 5KW upto 50KW on three phase supply.</p>	<p>The Consumer shall continue to pay his energy bills for the energy consumed at the prevailing applicable retail supply tariff.</p> <p>In case of installed capacity is in excess of allowable capacity, the energy injected in any month excess of the allowable installed capacity shall be billed at Average Pooled Power Purchase cost notified by the Commission from time to time.</p>

(c) Sharing of Clean Development Mechanism (CDM) benefits-

The Commission decides to continue with the following mechanism of sharing the CDM benefits between the generating company and the beneficiaries as follows:

- i. 100% of gross proceeds on account of CDM benefit are to be retained by the project developer in the first year, after the date of commercial operation of the generating station,
- ii. In the second year, the share of distribution licensees shall be 10%, which shall be progressively increased by 10% every year till it reaches 50% and thereafter, the proceeds shall be shared in equal proportion by the generating companies and the beneficiaries.

(d) Grid Connectivity:

The Commission decides that, the STU/Distribution Licensees shall arrange necessary facilities to evacuate power from the interconnection point. Further, STU/ Distribution Licensees shall not collect any network augmentation charges towards system augmentation beyond the interconnection point. The SRTPV/Small solar PV Plant owner shall be responsible for providing evacuation facility upto the interconnection point as defined in the PPA.

The grid connectivity shall be arranged by the distribution licensee in accordance with the prevailing CEA (Technical Standards for Connectivity to the Grid) Regulations 2007, CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2012 and any other related Regulations to be notified by CEA and KERC Grid Code as amended from time to time.

(e) Applicability of Wheeling and Banking Charges and Cross Subsidy Surcharge:

The Wheeling, Banking and Cross Subsidy surcharge shall be applicable as per Commission's Order dated 18th August, 2014.

(f) Third party Investments:

The Commission had sought the views of the stakeholders on allowing third party investment in SRTPV installations of installed capacity of above 500KW and upto 1MW on gross metering basis at the tariffs to be determined by the Commission.

The stakeholders have suggested that, implementation of solar power plants being capital intensive, third party investments are to be encouraged as many rooftop owners are not capable of funding on their own. Some of the stakeholders have also suggested allowing PPAs between developers/investors with ESCOMs.

Commission's Decision:

The Commission notes that third party investments have come about only in larger capacity SRTPV plants intended to be installed in large rooftop areas like warehouses, poultry farms, polyhouses etc., and not in domestic category where smaller roof areas are available for the SRTPV installation. The Commission considers that, in view of limited financing capacity of domestic consumers, third party investment in this category needs to be encouraged. The ESCOMs shall permit the domestic consumers to install SRTPV with third party investment.

(g) Comments on other general issues:

During the public hearing held on 20th April, 2016, some of the stakeholders citing Government of Karnataka Orders sought applicability of the existing tariff in respect of applications pending with the distribution licensees for entering into PPA. Also the stakeholders had requested for extension of time for on-going projects due to funding/implementation issues. Further, the

stakeholders suggested that the SRTPV installations upto installed capacity of 50kW be exempted from availing separate approval from Government Electrical Inspectorate.

Commission’s Decision:

The Commission notes that the above comments, made by stakeholders mainly pertain to implementation and procedural aspects of the earlier Tariff Order. The applicability and the control period of the tariff now determined have been specified in this Order thereby addressing the concerns raised on these issues. As regards the other issues cited above, it does not fall under the scope of this Order.

The comments / suggestions on issues not relevant to the tariff determination process have not been discussed, as the same are beyond the scope of this Order.

7. Abstract of cost parameters approved by the Commission:

Based on the above decisions of the Commission, the following is the abstract of the parameters considered for determination of tariff:

Particulars	Capacity of Solar Rooftop and Small PV Plants in kW				
	1- 10	Above 10 and upto 50	Above 50 and upto 100	Above 100 and upto 500	Above 500 and upto 1000
Capital Cost/kW- Rs.	75000	70000	65000	60000	55000
Debt: Equity Ratio	70:30				
Debt-Rs. /kW	52500	49000	45500	42000	38500
Equity- Rs. /kW	22500	21000	19500	18000	16500
Debt Repayment Tenure in Yrs.	12				
Interest charges on Debt-%	12.00%				
Capacity Utilisation Factor (CUF)	19%				
ROE-%	16%				

Discount Factor -%	13.20%
O & M expenses	1% of the capital cost with annual escalation of 5.72%
Working Capital	Receivables equivalent to one month's revenue
Interest on Working Capital	12.50%
Depreciation for first 12 yrs	5.83%
Depreciation for next 13 yrs	1.54%

8. Tariff for grid connected Solar Rooftop and small PV power plants:

On the basis of the approved parameters, the Commission hereby approves the following tariff:

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%)
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

This Order is signed and issued by Karnataka Electricity Regulatory Commission on this 2nd day of May, 2016.

Sd/-
M.K.Shankaralinge Gowda
Chairman

Sd/-
H.D.Arun Kumar
Member

Sd/-
D.B.Manival Raju
Member

Anexure

**LIST OF STAKEHOLDERS WHO HAVE SUBMITTED ORAL COMMENTS / SUGGESTIONS
DURING PUBLIC HEARING HELD ON 20th APRIL, 2016**

1. Aameena Pasha Siddagi – Karnataka Rajya Raitha Sanga
2. Senthil Kumar. V (Sanpradhana Integrated Solutions)
3. Rajashekhar. S. Madagendra
4. T.V. Analazari – (Raitharu)
5. B.R. Urakant, Retd. Additional Director
6. Anupam Mathur.
7. S.M. Karanth
8. Rudragowda Patil
9. R.B. Patil.
10. Gurucharana. G.
11. Anil Sabaj, Turrasevee
12. Umesh S. Madivala
13. Krishna Shetty
14. Mohit
15. Ramesh
16. Ramappa S.STEBANI
17. K. Naveen Kumar
18. Harsha Kuntur
19. Siddartha Groups
20. Sangenjinad Patil
21. Phani Chandra
22. Shashikiran N.K.
23. B.S. Srinivasan

24. Nithyananda Reddy
25. R.V. Girish
26. Manandi Nagendra.
27. Mohan Murali
28. Inayathvilla Khan
29. Dinesh J Kagathi
30. Sessa prasanna
31. Krishna Revankar
32. Naveen
33. G.S. Raghavendra
34. Rajesh
35. K.L.H. Raya
