

Before

UTTARAKHAND ELECTRICITY REGULATORY COMMISSION

Misc. Application No. 97 of 2018 (Suo-Motu)

Draft Order

In the matter of:

Review of the Benchmark Capital Cost for Solar PV, Solar Thermal and Grid Interactive Rooftop & Small Solar PV Plants to be applicable for FY 2019-20 and onwards till reviewed/revised by the Commission.

CORAM

Shri Subhash Kumar Chairman

Date of Order: December 07, 2018

1. The Commission in exercise of powers vested in it under Section 61(h), 86(1)(e) read with Section 181(2)(zd) of the Electricity Act, 2003, notified the UERC (Tariff and Other Terms for Supply of Electricity from Renewable Energy Sources and non-fossil fuel based Co-generating Stations) Regulations, 2018 (hereinafter referred to as "RE Regulations, 2018") on 06.09.2018 which came into force from the date of notification and shall remain in force for a period of 5 years from the date of commencement until and unless reviewed earlier or extended by the Commission.
2. Regulation 11 of the RE Regulations, 2018 specifies as under:

"11. Control Period or Review Period

The Control Period or Review Period under these Regulations shall be of five years, of which the first year shall be the financial year 2018-19.

Provided that the benchmark capital cost of Solar PV, Canal Bank & Canal Top Solar PV, Solar Thermal, Municipal Solid Waste based power projects, Refuse Derived Fuel based power projects and Grid interactive Roof Top and Small Solar PV projects may be reviewed annually by the Commission.

Provided further that the tariff determined as per these Regulations for the RE projects commissioned during the Control Period, shall continue to be applicable for the entire Tariff Period."

6. The Commission in its RE Regulations, 2018 issued on 06.09.2018 had specified the slab wise capital cost and tariff for the Grid interactive Rooftop & Small Solar PV projects considering the

fact that mostly such plants are of smaller capacity. The Commission had specified the benchmark capital cost and levelled tariff for solar energy based power projects for FY 2018-19 which are as follows:

S. No.	Project	Benchmark Capital cost	Gross levelled tariff	Levelled tariff with Accelerated Depreciation benefit.
1.	Grid Interactive Rooftop & Small Solar PV Plants			
	Slabs	Rs./kW	Rs./kWh	Rs./kWh
(a)	Upto 10 kW	47,153	5.93	5.62
(b)	>10 kW & upto 100 kW	43,224	5.37	5.09
(c)	>100 kW & upto 500 kW	40,612	4.99	4.72
(d)	>500 kW & upto 1 MW	39,135	4.77	4.51
		Rs. Lakh/MW	Rs./kW	Rs./kW
2.	Solar PV Plants	388.19	4.73	4.48
3.	Solar Thermal Plants	1200	14.04	13.26

7. Having due consideration of the fact that with the passage of time and up-gradation of technologies in respect of the aforesaid solar projects, change in capital cost has been observed. Moreover, in discharge of the requirement of Regulation 11 of the RE Regulations, 2018, the Commission has decided to determine the benchmark capital cost norm for the Solar PV, Solar Thermal and Grid connected Rooftop & Small Solar PV projects and in turn the generic tariffs for the projects to be commissioned during FY 2019-20 as elaborated in Annexure- A enclosed herewith.
8. Comments/suggestions of the stakeholders on the draft proposal are invited latest by 12.01.2019.

(Subhash Kumar)
Chairman

A. Normative benchmark capital cost for Solar PV, Solar Thermal technologies and Grid Interactive Rooftop & Small Solar PV Plants to be commissioned during FY 2019-20

1. In accordance with Regulation 33, 35 & 36 of the RE Regulations, 2018 the normative capital cost for Solar PV, Solar Thermal and Grid Interactive Rooftop & Small Solar PV Plants is inclusive of all capital works including plant and machinery, civil works, erection and commissioning, financing and interest during construction etc., and evacuation infrastructure upto the interconnection point.
2. Regulation 11 of the RE Regulations, 2018 specifies that the benchmark capital cost for Solar PV and Solar Thermal Power Plants and Grid Interactive Rooftop & Small Solar PV Plants may be reviewed annually by the Commission.
3. The proposed benchmark capital cost for the above referred solar technologies for FY 2019-20 and onwards are discussed below:

I. Solar PV Power Plants

4. With the increasing demand for power from highly diversified generation sources, there is rapid development in solar power sector in terms of investments, technology and innovations. The benign policies of the Central Government and the State Governments have made it possible for local, national and international players to participate in the Indian power markets. This trend is largely visible in the last five years both in manufacturing of solar cells/panels and commissioning of solar power plants. Such positive developments in Solar power market have resulted in healthy competition resulting in drastic reduction in the cost of solar power generation. Thereby the end consumers of electricity stand to benefit by cheaper and environmentally friendly source of power generation.
5. As per Section 61 of the Electricity Act, 2003 (the Act), the appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for the determination of tariff. Accordingly, taking cognizance of the potential of Solar Power Plant growth available in the State and in accordance with the Section 61 of the Act, the Commission has followed the similar principles as had been considered in previous Orders for determination of benchmark capital cost.

Capital Cost

6. The Commission, in its RE Regulation, 2018 notified on 06.09.2018, had specified the

benchmark capital cost of Rs. 388.19 Lakh/MW for solar PV plants commissioned or likely to be commissioned in FY 2018-19 as against Rs. 415.63 Lakh/MW determined for FY 2017-18.

7. The Commission while specifying the benchmark capital cost in RE Regulations, 2018, had considered the average module cost of 0.317 US\$/Wp for determination of benchmark capital cost for FY 2018-19 and average exchange rate of Rs. 65.71/USD. Further, the Commission had considered a degradation of 0.50% on yearly basis, which was then applied to module cost to arrive at yearly degradation cost, followed by discounting to arrive at the net present value of that degradation cost. Accordingly, considering the module cost, average exchange rate and annual degradation, the Commission had arrived at the module cost of Rs. 226.94 Lakh/MW.

The breakup of benchmark capital cost determined by the Commission for FY 2018-19 is as under:

Table 1: Benchmark Capital Cost of Solar PV Project for FY 2018-19

SI. No.	Particular	Capital cost Norm for Solar PV project (Rs. Lakh/MW)
1	PV Modules	226.94
2	Land Cost	50.00
3	Civil and General works	21.38
4	Mounting Structures	21.38
5	Power Conditioning Unit	21.38
6	Cables and Transformers	26.88
7	Preliminary and Pre-operative expenses IDC etc.	20.24
	Total	388.19

As per the PV Insight Report dated 28.03.2018 and dated 28.11.2018, the following are the module prices:

Table 2: Module prices as per PV Insight Report

Item	High USD/Watt	Low USD/Watt	Average USD/Watt
PV Insight Report dated 28.03.2018			
Silicon Solar Module	0.41	0.27	0.302
Thin Film Solar Module	0.42	0.29	0.323
PV Insight Report dated 28.11.2018			
Silicon Solar Module	0.33	0.19	0.217
Thin Film Solar Module	0.35	0.22	0.243

It can be seen from the above table that the average cost of module has come down from 0.302 USD/Wp and 0.323 USD/Wp to 0.217 USD/Wp and 0.243 USD/Wp for Silicon Solar Module and Thin Film Solar Module respectively. Accordingly, the Commission is of the

view to consider the current available cost of the solar modules for determination of the benchmark capital cost. Considering the average cost at 0.251 USD/W_p for Silicon and Thin Film Solar Module and an exchange rate of Rs. 71.126/USD based on the average of July, 2018 to November, 2018, the cost of Solar PV modules works out to Rs. 178.47 Lakh/MW. Further, it is to be noted that the Ministry of Finance vide notification dated 30.07.2018 has imposed safeguard duty on the Solar Cells whether or not assembled in modules or panels at the rate of 25% when imported between 30.07.2018 to 29.07.2019 and 20% when imported between 30.07.2019 to 29.01.2020 and 15% in case imported from 30.01.2019 to 29.07.2020. Accordingly, the Commission proposes to considered the weighted average rate of safeguard duty, i.e. 20.79% alongwith the GST @ 5.00% while determining the Solar module cost. Further, compensation on account of degradation works out to Rs. 9.291 Lakh/MW based on the methodology adopted by the Commission in the previous Benchmark Capital Cost Order. Accordingly, cost of Module works out to Rs. 235.65 Lakh/MW.

8. The Commission had considered Rs. 50.00 Lakh/MW as cost of land for arriving at the capital cost of Solar PV projects for FY 2017-18 and FY 2018-19. The Commission proposes the same land cost, i.e. Rs. 50.00 Lakh/MW for FY 2019-20. The costs of other components have been adopted in the same proportion in which the respective costs were considered at the time of finalization of capital cost for Solar PV power projects for FY 2018-19.
9. In light of the above discussion, the Commission proposes the capital cost of Rs. 400.40 Lakh/MW for Solar PV projects to be commissioned on or after 01.04.2019. Detailed breakup of the capital cost approved by the Commission for FY 2018-19 and that proposed for FY 2019-20 is as follows:

Table 3: Benchmark Capital Cost of Solar PV Project Approved for FY 2018-19 and proposed for FY 2019-20

S. No.	Particulars	Approved Capital Cost for FY 2018-19 (Rs. Lakh/MW)	% of Total Cost	Proposed Capital Cost for FY 2019-20 (Rs. Lakh/MW)	% of Total Cost
1	PV Modules	226.94	58.48%	235.65	58.85%
2	Land Cost	50.00	12.86%	50.00	12.49%
3	Civil and General Works	21.38	5.51%	22.05	5.51%
4	Mounting Structures	21.38	5.51%	22.05	5.51%
5	Power Conditioning Unit	21.38	5.51%	22.05	5.51%
6	Evacuation cost upto interconnection point (Cables and Transformers)	26.88	6.92%	27.72	6.92%
7	Preliminary & Pre-operative expenses including IDC & contingency etc.	20.24	5.21%	20.87	5.21%
	Total Capital Cost	388.19	100.00%	400.40	100.00%

II. Solar Thermal Power Plants

10. The Commission proposes to adopt the benchmark Capital Cost as Rs. 1200.00 Lakh/MW for Solar Thermal Projects to be commissioned on or after 01.04.2019.

III. Grid Interactive Rooftop & Small Solar PV Plants

11. The Commission, while determining the Benchmark Capital Cost for Grid Interactive Rooftop & Small Solar PV Plants for FY 2017-18, in its Order dated 03.08.2017 was of the view that so far as the cost of module was concerned there was no difference between Solar PV Plants and Solar Rooftop & Small Solar PV plant. However, while determining the benchmark capital for Grid Interactive Rooftop & Small Solar PV plants for FY 2018-19, the Commission had decided to categorize the benchmark capital cost and other technical parameters for such plants having capacity upto 10 kW, above 10 kW to 100 kW, above 100 kW upto 500 kW and above 500 kW & upto 1 MW. Further, the Commission had kept the Solar Module cost for Grid Interactive Rooftop & Small Solar PV plants having capacity above 500 kW & up to 1 MW equivalent to the Solar Module cost determined for Solar PV plants and proportionately increased the capital cost for aforementioned slabs on the basis of Office Memorandum dated 15.06.2018 of MNRE which lays down the benchmark costs for off-grid Solar PV systems and grid connected rooftop solar Power plants. Accordingly, based on the methodology adopted by the Commission during determination of benchmark capital cost for different slab under Grid Interactive Rooftop & Small Solar PV plants, has been followed by the Commission for determination of Module cost for FY 2019-20.
12. Further, in case of Land, civil and general work, the Commission has considered the capital cost as approved by the Commission for determination of benchmark capital cost of the Grid Interactive Rooftop & Small solar PV Plants for FY 2018-19. With respect to the cost of power conditioning equipment including inverter, mounting structure and evacuation facility, the Commission had earlier decided to allow higher cost for such components. Accordingly, as considered in the Commission's previous Orders, the Commission proposes to allow 35% higher cost of above mentioned components for Rooftop Solar Plants as compared to the Solar PV Plants having capacity above 500 kW & upto 1 MW. In view of the above, details of the capital cost approved for FY 2018-19 and details of the capital cost proposed for FY 2019-20 for Grid-Connected Rooftop Solar PV based Plant are as follows:

**Table 4: Benchmark Capital Cost of Grid Interactive Rooftop & Small Solar PV Plants
Approved for FY 2018-19 vis-a-vis proposed for FY 2019-20**

S. No.	Particulars	FY 2018-19				FY 2019-20			
		Approved Capital cost (Rs./kWh)				Proposed Capital cost (Rs./kWh)			
		Upto 10 kW	Above 10 kW to 100 kW	Above 100 kW to 500 kW	Above 500 kW & upto 1 MW	Upto 10 kW	Above 10 kW to 100 kW	Above 100 kW to 500 kW	Above 500 kW & upto 1 MW
1	PV Module inc. degradation	27,344.00	25,066.00	23,551.00	22,694.00	28,393.00	26,027.00	24,454.00	23,565.00
2	Land Cost, Civil and General Works	6,024.00	5,522.00	5,189.00	5,000.00	6,024.00	5,522.00	5,189.00	5,000.00
3	Mounting Structures	3,478.00	3,188.00	2,995.00	2,886.00	3,587.00	3,288.00	3,089.00	2,977.00
4	Power Conditioning Units	3,478.00	3,188.00	2,995.00	2,886.00	3,587.00	3,288.00	3,089.00	2,977.00
5	Evacuation cost upto interconnection point (Cables and Transformers)	4,372.00	4,007.00	3,765.00	3,628.00	4,509.00	4,133.00	3,884.00	3,742.00
6	Preliminary & Pre-operative expenses including IDC & contingency etc.	2,458.00	2,253.00	2,117.00	2,040.00	2,536.00	2,324.00	2,184.00	2,104.00
	Total Capital Cost	47,153	43,224	40,612	39,135	48,636.00	44,583.00	41,889.00	40,365.00

IV. Revised Tariff

13. Based on the benchmark capital cost, as proposed above, the Commission has determined the generic tariff to be applicable for projects to be commissioned in FY 2019-20. Proposed tariffs for FY 2019-20 along with the applicable generic tariff for FY 2018-19 for Solar PV and Solar Thermal Plants are as follows:

Table 5: Existing and Proposed Generic Tariffs for Solar PV Plants and Solar Thermal Plants

Particulars	Solar PV Plant (Rs./kWh)		Solar Thermal Plant (Rs./kWh)	
	FY 2018-19	FY 2019-20	FY 2018-19	FY 2019-20
Gross Tariff	4.73	4.89	14.04	14.18
Less : Acc Dep Benefit	0.25	0.27	0.79	0.80
Net Tariff	4.48	4.62	13.26	13.38

14. The Commission vide its RE Regulations, 2018 has also specified the tariffs for Grid connected Rooftop & Small Solar PV Plants corresponding to various level of subsidies such as 0%, 70% &

90% respectively. Accordingly, the Commission has also worked out the tariffs for Grid connected Rooftop & Small Solar PV Plants considering the level of subsidy ranging from 0% to 90%. Proposed tariffs for FY 2019-20 along with the applicable generic tariff for FY 2018-19 are as follows:

Table 6: Existing and Proposed Generic Tariffs for Grid connected Rooftop & Small Solar PV Plants (Rs./kWh)

Level of Subsidy	0%		30%		70%		90%	
	FY 2018-19	FY 2019-20	FY 2018-19	FY 2019-20	FY 2018-19	FY 2019-20	FY 2018-19	FY 2019-20
For Projects having capacity upto 10 kW								
Gross Tariff	5.93	6.16	5.18	5.37	4.18	4.32	3.76	3.88
Less : Acc Dep Benefit	0.31	0.32	0.26	0.27	0.18	0.19	0.13	0.14
Net Tariff	5.62	5.83	4.92	5.10	4.00	4.13	3.36	3.74
For Projects having capacity above 10 kW and upto 100 kW								
Gross Tariff	5.37	5.58	4.62	4.79	3.64	3.75	3.29	3.39
Less : Acc Dep Benefit	0.28	0.30	0.23	0.24	0.16	0.16	0.10	0.10
Net Tariff	5.09	5.28	4.39	4.55	3.48	3.59	3.19	3.29
For Projects having capacity above 100 kW & upto 500 kW								
Gross Tariff	4.99	5.18	4.35	4.50	3.49	3.60	3.13	3.23
Less : Acc Dep Benefit	0.27	0.28	0.22	0.23	0.16	0.16	0.11	0.12
Net Tariff	4.72	4.91	4.12	4.27	3.33	3.44	3.01	3.11
For Projects having capacity above 500 kW & upto 1 MW								
Gross Tariff	4.77	4.92	4.15	4.26	3.32	3.40	2.97	3.03
Less : Acc Dep Benefit	0.26	0.27	0.22	0.22	0.15	0.16	0.11	0.11
Net Tariff	4.51	4.65	3.93	4.04	3.17	3.24	2.86	2.92

The proposed tariffs as mentioned above at Tables 5 & 6 shall be applicable on the projects commissioned on or after 01.04.2019 and shall continue to be applicable till further reviewed by the Commission. Furthermore, the tariffs determined shall be the ceiling tariffs and procurement of power shall be done through competitive bidding route by distribution licensee.