

Before

# UTTARAKHAND ELECTRICITY REGULATORY COMMISSION

Misc. Application No. 19 of 2021 (Suo-Motu)

**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 2021-22 and onwards till reviewed/revised by the Commission.

**CORAM**

**Shri D.P. Gairola Member (Law) - Chairman (I/c)**

**Shri M.K. Jain Member (Technical)**

**Date of Order: July 30, 2021**

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."*

3. In exercise of power under Regulation 11 of aforesaid Regulations, the Commission, vide

Order dated 07.06.2019 in Suo-Motu Petition no. 18 of 2019, laid down the norms for the Benchmark Capital cost for the Financial Year 2019-20 for Solar PV, Solar Thermal and Grid connected Rooftop Solar PV Plants & Small Solar PV projects which is as follows:

S. No.	Project	Benchmark Capital cost	Gross levelled tariff	Levelling tariff with Accelerated Depreciation benefit.
1.	<b>Grid Interactive Rooftop &amp; Small Solar PV Plants</b>			
	<b>Slabs</b>	<b>Rs./kW</b>	<b>Rs./kWh</b>	<b>Rs./kWh</b>
(a)	Upto 10 kW	43,282	6.16	5.83
(b)	>10 kW & upto 100 kW	39,676	5.58	5.28
(c)	>100 kW & upto 500 kW	37,278	5.18	4.91
(d)	>500 kW & upto 1 MW	35,922	4.92	4.65
		<b>Rs. Lakh/MW</b>	<b>Rs./kWh</b>	<b>Rs./kWh</b>
2.	Solar PV Plants	356.27	4.49	4.25
3.	Solar Thermal Plants	1200	14.24	13.44

4. Subsequently, the Commission, vide Suo-moto Order dated 11.05.2020, in exercise of its powers provided under Regulation 51 and 52 of RE Regulations, 2018, taking cognizance of the ongoing COVID pandemic which had affected the global supply chain of solar modules, extended the levelled generic tariff issued by the Commission vide Suo-moto Order dated 07.06.2019 in Petition no. 18 of 2019 till 30.09.2020 which was further extended till 31.03.2021 vide Suo-moto Order dated 30.09.2020.
5. 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 lay down the norm for the benchmark capital cost 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 2021-22 as elaborated in **Annexure-A** enclosed herewith.
6. Comments/suggestions of the stakeholders on the draft proposal are invited latest by **23.08.2021**.

**(M.K. Jain)**  
Member (Technical)

**(D.P. Gairola)**  
Member (Law)-Chairman (I/c)

**A. Normative benchmark capital cost for Solar PV, Solar Thermal technologies and Grid Interactive Rooftop & Small Solar PV Plants to be commissioned during FY 2021-22**

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 2021-22 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 vide its suo-moto Order dated 07.06.2019 in Petition no. 18 of 2019 had

specified the benchmark capital cost of Rs. 356.27 Lakh/MW for Solar PV plants commissioned or likely to be commissioned in FY 2019-20 as against Rs. 388.19 Lakh/MW determined for FY 2018-19.

7. The Commission while specifying the benchmark capital cost in suo-moto Order dated 07.06.2019, had considered the average module cost of 0.241 USD/Wp for determination of benchmark capital cost for FY 2019-20 and average exchange rate of Rs. 70.735/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. 224.85 Lakh/MW for FY 2019-20.

The breakup of benchmark capital cost determined by the Commission for FY 2019-20 is as under:

**Table 1: Benchmark Capital Cost of Solar PV Project for FY 2019-20**

SI. No.	Particular	Capital cost Norm for Solar PV project (Rs. Lakh/MW)
1	PV Modules	224.85
2	Land Cost	50.00
3	Civil and General works	14.22
4	Mounting Structures	14.93
5	Power Conditioning Unit	14.93
6	Cables and Transformers	18.77
7	Preliminary and Pre-operative expenses IDC etc.	18.57
	<b>Total</b>	<b>356.27</b>

As per the PV Insight Report dated 01.01.2020 and dated 23.06.2021, 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
<b>PV Insight Report dated 01.01.2020</b>			
Silicon Solar Module	0.24	0.18	0.192
Thin Film Solar Module	0.33	0.23	0.235
<b>PV Insight Report dated 28.07.2021</b>			
Silicon Solar Module	0.20	0.19	0.193
Thin Film Solar Module	0.31	0.22	0.225

It can be seen from the above Table that the average cost of Silicon Solar Module has slightly increased from 0.192 USD/Wp to 0.193 USD/Wp whereas average cost of Thin Film Solar Module has come down from 0.235 USD/Wp to 0.225 USD/Wp. It is to be noted that

global supply of solar module was affected due to nationwide lockdown during first half of FY 2020-21 because of COVID-19 pandemic. Accordingly, the Commission has considered the current available cost of the solar modules from April, 2021 to July, 2021 for determination of the benchmark capital cost. Considering the average cost at 0.209 USD/Wp for Silicon and Thin Film Solar Module and an exchange rate of Rs. 73.842/USD based on the average of April, 2021 to July, 2021, the cost of Solar PV modules works out to Rs. 193.63 Lakh/MW. Further, it is to be noted that the Ministry of Finance vide notification dated 29.07.2020 has imposed safeguard duty on the Solar Cells whether or not assembled in modules or panels at the rate of 14.50%. Accordingly, the Commission proposes to consider the safeguard duty of 14.50% alongwith the GST @ 5.00% while determining the Solar module cost. Further, compensation on account of degradation works out to Rs. 7.67 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. 193.63 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 2018-19 and FY 2019-20. The Commission proposes the same land cost, i.e. Rs. 50.00 Lakh/MW for FY 2021-22. 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 2019-20. Further, the Commission has considered Steel and Cement Price Indexation alongwith Consumer Price Indexation
9. In light of the above discussion, the Commission proposes the capital cost of Rs. 303.16 Lakh/MW for Solar PV projects to be commissioned on or after 01.04.2021. Detailed breakup of the capital cost approved by the Commission for FY 2019-20 and that proposed for FY 2021-22 is as follows:

**Table 3: Benchmark Capital Cost of Solar PV Project Approved for FY 2019-20 and proposed for FY 2021-22**

S. No.	Particulars	Approved Capital Cost for FY 2019-20 (Rs. Lakh/MW)	% of Total Cost	Proposed Capital Cost for FY 2021-22 (Rs. Lakh/MW)	% of Total Cost
1	PV Modules	224.85	63.11%	193.631	60.14%
2	Land Cost	50.00	14.03%	50.00	15.53%
3	Civil and General Works	14.22	3.99%	13.93	4.33%
4	Mounting Structures	14.93	4.19%	14.62	4.54%
5	Power Conditioning Unit	14.93	4.19%	14.62	4.54%
6	Evacuation cost upto interconnection point (Cables and Transformers)	18.77	5.27%	18.38	5.71%
7	Preliminary & Pre-operative expenses including IDC & contingency etc.	18.57	5.21%	16.78	5.21%
	<b>Total Capital Cost</b>	<b>356.27</b>	<b>100.00%</b>	<b>321.96</b>	<b>100.00%</b>

## **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 01.04.2021.

## **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 2018-19 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 the 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, the same 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 2021-22.
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 2019-20. 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 alongwith escalation with the average increase of Whole Price Index (WPI) and Consumer Price Index (CPI) of Steel and Cement for immediately preceding three years by giving equal weightage 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 2019-20 and details of the capital cost proposed for FY 2021-22 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 2019-20 vis-a-vis proposed for FY 2021-22**

S. No.	Particulars	FY 2019-20				FY 2021-22			
		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	27,092	24,834	23,333	22,485	23,330	21,386	20,093	19,363
2	Land Cost, Civil and General Works	6,024	5,522	5,189	5,000	6,024	5,522	5,189	5,000
3	Mounting Structures	2,428	2,226	2,092	2,015	2,378	2,180	2,048	1,974
4	Power Conditioning Units	2,428	2,226	2,092	2,015	2,378	2,180	2,048	1,974
5	Evacuation cost upto interconnection point (Cables and Transformers)	3,053	2,798	2,629	2,534	2,990	2,741	2,575	2,482
6	Preliminary & Pre-operative expenses including IDC & contingency etc.	2,256	2,068	1,943	1,873	2,041	1,871	1,757	1,694
	<b>Total Capital Cost</b>	<b>43,282</b>	<b>39,676</b>	<b>37,278</b>	<b>35,922</b>	<b>39,142</b>	<b>35,880</b>	<b>33,712</b>	<b>32,486</b>

#### 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 2021-22. Proposed tariffs for FY 2021-22 along with the applicable generic tariff for FY 2019-20 and FY 2020-21 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 2019-20	FY 2021-22	FY 2019-20	FY 2021-22
Gross Tariff	4.49	4.04	14.24	13.69
Less : Acc Dep Benefit	0.24	0.16	0.80	0.76
<b>Net Tariff</b>	<b>4.25</b>	<b>3.88</b>	<b>13.44</b>	<b>12.93</b>

14. The Commission vide its suo-moto Order dated 07.06.2019 has also specified the tariffs for Grid connected Rooftop & Small Solar PV Plants corresponding to various level of subsidies such as 0%, 20%, 30%, 40%, 70% & 90% respectively. Subsequently, on the request of UPCL for determination of Tariff considering subsidy at the rate of 80% for the Solar Projects installed/to be installed under PM-Kusum Yojana, the Commission vide suo-moto Order dated 15.09.2020 issued the tariff for Rooftop & Small Solar PV Plants. Accordingly, the Commission has also worked out the tariffs for Grid connected Rooftop & Small Solar PV Plants considering the level of subsidy of 80%. Proposed tariffs for FY 2021-22 along with the applicable generic tariff

for FY 2019-20 are as follows:

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

Particulars	Upto 10 kW		Above 10 kW to 100 kW		Above 100 kW to 500 kW		Above 500 kW upto 1 MW	
	FY 19-20	FY 21-22	FY 19-20	FY 21-22	FY 19-20	FY 21-22	FY 19-20	FY 21-22
<b>Levelling Tariff considering nil Subsidy</b>								
Gross Tariff	5.50	5.04	4.98	4.58	4.63	4.26	4.52	4.07
Less: Acc Dep Benefit	0.29	0.19	0.27	0.18	0.25	0.16	0.24	0.16
Net Tariff	<b>5.21</b>	<b>4.85</b>	<b>4.72</b>	<b>4.40</b>	<b>4.38</b>	<b>4.10</b>	<b>4.28</b>	<b>3.91</b>
<b>Levelling Tariff considering 20% Subsidy</b>								
Gross Tariff	5.02	4.64	4.55	4.22	4.44	3.92	4.13	3.74
Less: Acc Dep Benefit	0.26	0.17	0.24	0.16	0.22	0.15	0.21	0.14
Net Tariff	<b>4.77</b>	<b>4.47</b>	<b>4.31</b>	<b>4.06</b>	<b>4.00</b>	<b>3.77</b>	<b>3.91</b>	<b>3.60</b>
<b>Levelling Tariff considering 30% Subsidy</b>								
Gross Tariff	4.97	4.45	4.33	4.03	4.02	3.75	3.93	3.58
Less: Acc Dep Benefit	0.24	0.16	0.22	0.15	0.21	0.14	0.20	0.13
Net Tariff	<b>4.55</b>	<b>4.28</b>	<b>4.11</b>	<b>3.89</b>	<b>3.81</b>	<b>3.61</b>	<b>3.73</b>	<b>3.44</b>
<b>Levelling Tariff considering 40% Subsidy</b>								
Gross Tariff	4.55	4.25	4.11	3.85	3.85	3.58	3.73	3.41
Less: Acc Dep Benefit	0.22	0.15	0.21	0.14	0.19	0.13	0.19	0.13
Net Tariff	<b>4.32</b>	<b>4.09</b>	<b>3.91</b>	<b>3.71</b>	<b>3.62</b>	<b>3.45</b>	<b>3.55</b>	<b>3.29</b>
<b>Levelling Tariff considering 70% Subsidy</b>								
Gross Tariff	3.85	3.66	3.47	3.31	3.21	3.08	3.15	2.93
Less: Acc Dep Benefit	0.17	0.12	0.16	0.11	0.15	0.10	0.14	0.10
Net Tariff	<b>3.68</b>	<b>3.54</b>	<b>3.32</b>	<b>3.20</b>	<b>3.06</b>	<b>2.97</b>	<b>3.01</b>	<b>2.83</b>
<b>Levelling Tariff considering 80% Subsidy</b>								
Gross Tariff	3.63	3.47	3.27	3.15	3.02	2.92	2.97	2.77
Less: Acc Dep Benefit	0.15	0.10	0.14	0.09	0.13	0.09	0.12	0.09
Net Tariff	<b>3.48</b>	<b>3.37</b>	<b>3.14</b>	<b>3.05</b>	<b>2.90</b>	<b>2.83</b>	<b>2.85</b>	<b>2.69</b>
<b>Levelling Tariff considering 90% Subsidy</b>								
Gross Tariff	3.45	3.32	3.11	3.01	2.87	2.79	2.82	2.65
Less: Acc Dep Benefit	0.12	0.09	0.11	0.08	0.11	0.07	0.10	0.07
Net Tariff	<b>3.35</b>	<b>3.24</b>	<b>3.00</b>	<b>2.93</b>	<b>2.77</b>	<b>2.71</b>	<b>2.72</b>	<b>2.58</b>

The proposed tariffs as mentioned above at Tables 5 & 6 shall be applicable on the projects commissioned on or after 01.04.2021 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.