

RAJASTHAN ELECTRICITY REGULATORY COMMISSION**JAIPUR**

In the matter of determination of benchmark capital cost for solar PV and solar thermal power projects applicable during FY 2017-18 and resultant generic levelled tariff.

Coram :

Shri Vishvanath Hiremath, Chairman

Shri Rajendra Prasad Barwar, Member

Shri Suresh Chandra Dinkar, Member

Date of Order:

9.10.2017

ORDER

1. In accordance with Section 61 & 62 read with Section 181(2) of the Electricity Act, 2003 and National Tariff Policy notified by Govt. of India (GoI), the Commission has notified RERC (Terms and Conditions for Determination of Tariff for Renewable Energy Sources- Wind and Solar Energy) Regulations, 2014 on 24.02.2014 (hereinafter called as the 'RERC RE Tariff Regulations, 2014').

2. The regulation 3 of the RE Tariff Regulations 2014 reads as under:

"3. Scope of Regulations and extent of application

(1) *These Regulations shall apply in cases where generic tariff for generating plants based on Wind, Solar PV and Solar Thermal sources of energy, is to be determined by the Commission under Section 62 read with Section 86 of the Act:*

Provided that in case of Wind, Solar PV and Solar Thermal power plants, these Regulations shall apply subject to the fulfilment of eligibility criteria specified in regulation 4 of these Regulations.

(2) *Notwithstanding anything contained in these Regulations, the Commission shall adopt the tariff, if such tariff has been determined through a transparent process of bidding in accordance with the guidelines issued by the Central Government, as envisaged under Section 63 of the Act".*

3. Further, as per regulation 7(1) of the RERC RE Tariff Regulations, 2014, the Commission may determine generic tariff for solar power plants on Suo-Motu basis at the beginning of each year of the control period for which principles and norms have been specified under these Regulations.
4. The National Tariff Policy, 2016 notified on 28.01.2016 by the Ministry of Power, has specific guidance on purchase of power generated from renewable energy sources. As per para 6.4(2) of the Tariff Policy, *“States shall endeavor to procure power from renewable energy sources through competitive bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from renewable energy sources, from projects above the notified capacity, shall be done through competitive bidding process, from the date to be notified by the Central Government.*

However, till such notification, any such procurement of power from renewable energy sources projects, may be done under Section 62 of the Electricity Act, 2003....”

5. With the competitive bidding guidelines envisaged under Section 63 of the Electricity Act, 2003 yet to be notified by Gol, the Commission earlier issued a draft tariff order on 08.03.2017, wherein based on the benchmark capital cost proposed for solar power projects and performance parameters contained in the RERC RE Tariff Regulations, 2014, Commission has proposed to determine the generic tariff for MW scale solar power plants where PPA is signed on or before 31.03.2018, and which are to be commissioned on or before 31.03.2019 in the case of solar PV plants and those which are to be commissioned on or before 31.03.2020 in the case of solar thermal plants.

6. In a recent development, Gol under Section 63 of the Electricity Act,2003 has issued "*Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Solar PV Power Projects*" (hereinafter referred to as the 'Bidding Guidelines') on 03.08.2017 for long term procurement of electricity by procurers from grid-connected solar PV power Projects having size of 5 MW and above, through competitive bidding.
7. It is observed that from the para 6.3 of the Bidding Guidelines, the Standard Bidding Documents (SBDs) shall be prepared by the procurer in consonance with the said guidelines. As per the para 4.3.1 of the Bidding Guidelines, one of the bidding parameter could be the tariff quoted by the bidder and the procurer shall specify that the tariff quoted by the bidder cannot be more than the tariff for grid connected solar PV power plants, notified by the Appropriate Commission, if any, for the financial year for which the bids are invited.
8. It is observed that the solar PV technology has become sustainable and well accepted technology over the time as evidenced by the bids quoted under ₹ 3/kWh in the recent bidding process. However, the Levellised Cost of Electricity (LCOE) of solar thermal technology is still over ₹ 10/kWh and therefore, such technology still to see the economies of scale and mature further. The procurement of cheaper electricity generated from the solar PV technology by the Distribution Licensees would also reduce their solar RPO compliance cost. Therefore, Commission is of the view that the solar PV technology needs to be encouraged further.
9. It is observed that the long term procurement of power from solar PV plants having size 5 MW and more shall be done by the State

Discoms in accordance with Bidding Guidelines issued by Gol. However, keeping in view the spirit of para 4.3.1 of the Bidding Guidelines, the generic tariff for such solar PV plants is to be notified by this Commission. Further, it is noticed that the Bidding Guidelines are not applicable to the small solar PV plants (size < 5 MW).

10. In view of the above, the Commission considers it appropriate to proceed with determination of generic tariff for solar PV power plants in accordance with Regulation 7(1) of the RERC RE Tariff Regulations, 2014 for FY 2017-18 in this order. However, for power plants based on solar thermal technology, the Commission shall determine generic tariff for such technologies as and when need arises.
11. The Commission has issued draft tariff order on 08.03.2017 where based on the proposed benchmark capital cost for solar power projects and performance parameters contained in the RERC RE Tariff Regulations, 2014, the Commission has determined the generic tariff for MW scale solar PV power plants where PPA is signed on or before 31.03.2018, and which are to be commissioned on or before 31.03.2019.
12. Public Notices were issued in the following newspapers on the dates mentioned against each inviting comments/suggestions from the Stakeholders on the draft tariff order circulated:

Rajasthan Patrika	:	09.03.2017
Rashtrdoot	:	09.03.2017
The Times of India	:	10.03.2017

Public notices alongwith draft tariff order were also placed on the Commission's website.

13. The last date of submission of comments/suggestions by the Stakeholders/Public was 27.03.2017. Commission received comments/suggestions from four stakeholders and they have been considered in this order. The interested persons who offered their suggestions/comments are mentioned at **Annexure-I**.
14. Commission, through this order, is determining the tariff for solar power plants on Suo-Motu basis based on the parameters specified in the RERC RE Tariff Regulations, 2014 and duly taking note of the suggestions/comments received from the interested persons on the draft order circulated.
15. One of the comments/suggestions is received on parameters such as capacity utilisation factor (CUF), auxiliary consumption, module degradation. The above mentioned parameters/provisions are already incorporated in the RERC RE Tariff Regulations, 2014 and this order has to follow the provisions of Regulations in respect of above mentioned parameters. Commission has received other comments/suggestions such as facilitating capacity building of consumers groups, encouraging the employees working with generation, transmission and distribution nignams of power sector along with RRECL and Electrical Inspectorate to take interest in giving comments/suggestions as invited by the Commission. Commission has prepared the draft tariff order in accordance to the provisions of the said Regulations and for inviting comments/suggestions, the draft order has been widely publicised through newspapers and also placed on the Commission's website. It remained open to all interested persons, whether from power sector or other sectors, to offer their comments/suggestions. In addition to above, the suggestion seeking clarification whether the normative CUF of 20%

stipulated in the RE Tariff Regulations is also applicable to Roof Top Solar PV (RTSPV) projects as the same may have lower value of CUF depending upon their location and various other factors has also been received. The clarification requested is presently not the part of proceedings, therefore, the request in this regard is not accepted.

16. The issues raised in the comments/suggestions have broadly been grouped and summarized as under:
- (1) Capital cost;
 - (2) Deemed generation/Must Run provision;
 - (3) Return on Equity (RoE);
 - (4) Payment security mechanism; and
 - (5) Additional request-Impact of Goods and Service Tax (GST).

Consideration of the comments/suggestions of the stakeholders and Commission's view/decision on above issues:

(1) Capital cost:

Commission's proposal

17. Commission in the draft order has proposed capital cost for solar PV power plants as under:

Table- 1: Capital cost proposed in the draft tariff

S.No.	Particulars	Capital cost norm (₹ Lakh/MW)
1	PV Modules	202.09
2	Land cost	7.30
3	Civil and General Works	35
4	Mounting Structures	35
5	Power Conditioning Unit	35
6	Evacuation and Pre-Operative Expenses including IDC and Contingency	44
7	Preliminary and pre-Operative Expenses including IDC and Contingency (@5.21%)	20.52
8	Evacuation and Transmission cost including connectivity charges of ₹ 2 Lakh/MW	15
	Total Capital Cost	393.91

18. For arriving PV module price of ₹ 202.09 Lakh/MW, Commission has considered solar PV module price as \$ 0.30/W and the average exchange rate ₹/\$ as ₹ 67.36314 for the past six months (from 1st August 2016 to 31st January 2017) as per RBI.

Comments/suggestions received:

19. Commission has considered solar PV module price of \$0.30/W lower than the present average trend of module price. Efficiency of the low cost solar PV modules is comparatively very low which affects generation. Module price of \$0.366/W, therefore, may be considered for FY 2017-18.
20. Western side of Rajasthan is basically desert area where water source is a big problem. As per Council of Energy, Environment and Water (CEEW), the estimated water requirement for solar plants remains in between 7000 and 20000 litres per MW per wash in India, which is a challenging task. Dry cleaning is an alternative option. Commission is requested to consider additional cost for implementing dry cleaning option in desert area.
21. The following may be considered in respect of capital cost:
- (i) In the weekly PV module spot price, highest spot price may be considered as quality 'A' grade modules are not available at low and average price. Commission may consider average Q4 2016 polysilicon panel SP (based on data from *PVinsights* and *PVPulse*) and average Chinese panel prices at 39 cents/watt during 4th quarter as a benchmark module cost for FY 2017-18. In order to create a level playing field for Indian manufacturers and for providing protection against predatory pricing, it is requested to fix the Indian module price at 0.46-0.494/Watt_p.

- (ii) Commission may consider module requirement for 1 MW AC power @ 1.20-1.25 MW_p and arrive at the module cost accordingly for determination of benchmark capital cost for solar PV projects. Further, average exchange rate may be considered based on future market data. The exchange rate currency future for the month of October 2017 is ₹ 68.5500/US\$ and considering the cost of imported module of \$0.39/Watt for 1 MW AC project @1.20 MW_p, the total cost of PV modules may be considered as ₹ 320.81 Lakh/MW.
- (iii) Based on recent acquisition of private land for a 20 MW project in the region of Jodhpur district, Commission may consider land cost at ₹ 24 Lakh/MW (=6 Acres/MW x ₹ 4 Lakh/MW) based on DLC rate plus conversion charges plus other charges for determination of benchmark capital cost for solar PV projects.
- (iv) Considering above, Commission is requested to consider capital cost of ₹ 536.78/MW for solar PV power plants under the open category without solar tracker system and ₹ 597 Lakhs/MW for domestic modules. The capital cost break-up for solar PV power plants for FY 2017-18 may be considered as under:

Table-2: Suggested break-up of capital cost

S.No.	Particulars	RERC proposed Capital cost for FY 2017-18 (₹ Lakh /MW)	Suggested capital cost for FY 2017-18 (₹ Lakh /MW)
1	PV Modules	202.09	320.81
2	Land cost	7.30	24
3	Civil and General Works	35	35
4	Mounting Structures	35	35
5	Power Conditioning Unit	35	35
6	Evacuation and Pre-Operative Expenses including IDC and	44	44

S.No.	Particulars	RERC proposed Capital cost for FY 2017-18 (₹ Lakh /MW)	Suggested capital cost for FY 2017-18 (₹ Lakh /MW)
	Contingency		
7	Preliminary and pre-Operative Expenses including IDC and Contingency (@5.21%)	27.02	27.97
8	Evacuation and Transmission cost including connectivity charges of ₹ 2 Lakh/MW	15	15
	Total Capital Cost	393.91	536.78

Commission's views/decision:

22. Commission has considered the suggestions.
23. Commission in the draft order had proposed capital cost of ₹393.91 Lakh/MW for FY 2017-18 keeping in view the downward price trend in module prices and the tariff of ₹ 2.97/kWh that has been discovered in the bidding for 750 MW at REWA (M.P.). In a subsequent development, post draft order, in bidding conducted through reverse e-auction by the Solar Energy Corporation of India (SECI) for 250 MW capacity in Bhadla Phase-IV under National Solar Mission, Phase-II, Batch-IV on 09.05.2017, the lowest quoted tariff was ₹ 2.62/kWh. In an another reverse e-auction conducted by SECI for 500 MW capacity in Bhadla Phase-III under National Solar Mission, Phase-II, Batch-IV on 12.05.2017, lowest quoted tariff was ₹ 2.44/kWh. Further in a recent bids invited by Gujarat Urja Vikas Nigam (GUVNL) for 500 MW solar power, the lowest bid quoted is ₹ 2.65/kWh. It is observed from results of the bidding conducted during FY 2017 for solar PV that project developers are quoting tariff well below ₹ 3.0/kWh mark. The outcome of the above bidding process underlines a potential for the cost reduction and efficiency improvement by way of tariff reduction. It is needless to state

that low tariffs will translate into greater off-take of solar power by Discoms, consequently facilitating the complete fulfilment of solar RPO through solar capacity addition besides helping more solar developers.

24. The website *pvinfosights* reports the latest solar PV Module Weekly Spot Price accessed on 16.08.2017 and 26.09.2017 as under:

Table-3: Solar PV Module Weekly Spot Price

(Unit:USD/Watt)

Item	High	Low	Average	Avgchng	Avgchg%
Poly Silicon Solar Module	0.41	0.28	0.323	↓- 0.004	↓-1.22%
Thin Film Solar Module	0.42	0.29	0.342	↓- 0.004	↓-0.87%

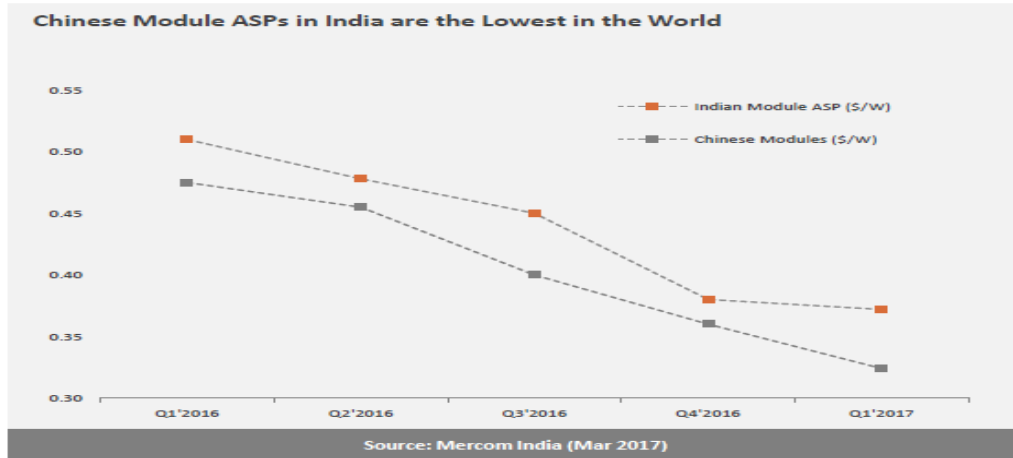
(Accessed on 16.08.2017)

Item	High	Low	Average	Avgchng	Avgchg%
Poly Silicon Solar Module	0.41	0.28	0.321	↓- 0.001	↓-0.31%
Thin Film Solar Module	0.42	0.29	0.340	↓- 0.001	↓-0.29%

(Accessed on 26.09.2017)

It is observed from above that downward trend in the prices of solar module is still continuing albeit at a lower rate.

25. As reported by the “Executive Summary India Solar Market Update- Q1 2017” from *mercomindia.com*, the Chinese module prices have now fallen by about 33 percent in the last 12 months enabling the recent low bids of ₹ 3.30/kWh and ₹ 3.15/kWh at Kadapa. The Chinese tier 1 module quotes for Q4 2017 was in the \$0.27-0.28 range.



26. In view of the recent bidding that has taken place, present prevailing market trends and competition expected to be generated due to Bidding Guidelines notified by GoI, the module prices are expected to exhibit a declining trend in near future as well. Further, the discovered spot prices are typically higher than bulk prices that are negotiated by companies for large MW scale projects.
27. In view of the above, Commission considers it module price of \$0.25/W as reasonable to be considered.
28. As regards considering exchange rate based on currency market futures, the currency future market is speculation driven and may lead to uncertainty in currency exchange rates. CERC has also followed the practice of considering average currency exchange rate of past six months for arriving at the module cost instead of considering the rate based on currency future market data of NSE. Further, the Commission is also consistently following the same practice. Therefore, Commission considers appropriate to continue with the same practice of considering average of daily exchange rates prevailing during the last six months for FY 2017-18 also.

29. As regards the suggestion of considering higher capacity of module for each 1 MW AC output, the solar cells, module and arrays are rated in terms of peak Watts (W_p). The performance of solar PV plant can be optimised for maximum generation vis-à-vis cost by suitable selection of DC capacity and inverter. Additional DC capacity, MW_p requirement for 1 MW AC output could vary from location to location. It is felt that there is no need to consider such additional cost as enough cushion is available in various parameter considered in overall capacity cost of solar PV power plants. Therefore, the suggestion of considering high DC capacity for AC output capacity is not accepted.
30. As regards the land cost, it is observed that land acquired for setting up of the utility scale solar power projects is mostly arid/barren or of no commercial use. Further, due to diversity across the districts of the State, the land cost may vary from place to place. In addition, the advancement in technology may lead to increase in solar PV module efficiency, due to which the land requirement will get reduced. Further, nothing on the record has been produced by stakeholders to show that the land cost is more than proposed in the draft order. Therefore, Commission considers appropriate to retain the land cost as the same as proposed in the draft order and no change is required.
31. CERC has notified CERC (Terms and Conditions for tariff determination from Renewable Energy Sources) Regulations, 2017 on 17.04.2017. In the said Regulations CERC has revised the norms such as Return on Equity (RoE), Depreciation, Interest and Finance charges etc. Commission has specified the RERC RE Tariff Regulations 2014 and to consider any other changes in the above parameters, even though have to be done as per changes that have come about in course of time, Regulations

need to be amended and till amendments are brought into effect Commission has to follow the existing Regulations. Further, the provision of procurement of Solar on competitive bidding process under bidding guidelines shall take care of the changes that have come about in prices. Therefore, Commission has continued to consider the norms as per the existing RERC RE Tariff Regulations 2014.

32. The average exchange rate Rs/\$ for the past six months as per RBI is ₹ 67.36314 (from 1st August 2016 to 31st January 2017). Considering this as exchange rate and module price of \$ 0.25/W, the total module cost works out to be ₹168.41Lakh/MW. This module cost has been considered in this order. Further, Commission considers it reasonable to consider the non-module cost for FY 2017-18 at the same level as specified for FY 2016-17 as per the draft.
33. Accordingly, the capital cost for solar PV power plants works out as under:

Table- 4 : Capital Cost break-up for Solar PV power plants for FY 2017-18

S.No.	Particulars	Capital cost norm (₹ Lakh/MW)
1	PV Modules	168.41
2	Land cost	7.30
3	Civil and General Works	35
4	Mounting Structures	35
5	Power Conditioning Unit	35
6	Evacuation and Pre-Operative Expenses including IDC and Contingency	44
7	Preliminary and pre-Operative Expenses including IDC and Contingency (@5.21%)	18.67
8	Evacuation and Transmission cost including connectivity charges of ₹ 2 Lakh/MW	15
	Total Capital Cost	358.36

(2) Deemed Generation/Must Run Provision:

Comments/suggestions received:

34. Solar developers are facing a major issue of backing down/curtailment and facing huge loss on continuous basis. The applicable tariff of solar power projects is based on single part tariff and, therefore, backing down/curtailment of such power directly impacts the revenue of the solar power plant. MNRE vide letter dated 2.08.2016 addressed to CERC has also mentioned that solar power plants should not be given instructions to back down and solar power plant be treated as a 'MUST RUN' as per IEGC. It is requested that any generation loss due to grid unavailability or backing down instruction may be treated as the deemed generation and payment of such deemed generation may be made at tariff in accordance with PPA.

Commission's views/decision:

35. In accordance to the Electricity Act, 2003 the State Load Despatch Centre (SLDC), as the apex body, is to ensure integrated operation of the power system in a State. The SLDC is mandated to exercise supervision and control over the intra-State transmission system. Further, it is observed that the extant Regulations do not provide for deemed generation. Therefore, the request for considering deemed generation is not accepted.
36. So far as 'Must Run' status is concerned, Commission considers it appropriate that their 'Must Run' status shall continue and not to be subjected to merit order dispatch principle. However, the same shall not apply in the case of a system operational constraint.

(3) Return on Equity (RoE):

Commission's proposal:

37. In the draft order after 10 years, Commission has considered a tax rate of 25.75% (=25% tax rate + 3% education cess) in view of the Corporate tax rate of 25% proposed in the Union Budget 2017 for the companies with Annual turnover upto ₹ 50 Crore.

Comments/suggestions received:

38. In case of solar power developer ₹ 50 Crore turnover is very small. The applicable tax rate of 34.608% (=30% tax rate + 12% surcharge + 3% education cess) may be considered instead of 25.75%.

Commission's views/decision:

39. The present exercise is for determination of generic tariff for solar power projects and covers both small as well as large scale projects. Further, the large scale solar projects also have the advantages in terms of the economies of scale. Commission is of the view that considering a specific category of projects in a generic tariff determination exercise would not be appropriate. Therefore, the suggestion in this regard is not accepted.

(4) Payment security mechanism:

Comments/suggestions received:

40. RE Generators are facing problem of delay in payments in last two years in the State of Rajasthan. To safeguard this, the timely payment mechanism needs to be evolved wherein RE generators shall be given priority over other sources. Commission is requested to ensure that the payments be made by obligated entities/ procurers in a timely manner.

41. Commission is requested to introduce payment security mechanism through letter of credit backed by credible Escrow

mechanism which will help in assets not getting converted into Non Performing Assets (NPAs) if timely paid by the utilities or back by the payment mechanism.

Commission's views/decision:

42. In case of payment of any bill gets delayed beyond a period of 45 days from the date of presentation of bill, the RERC RE Tariff Regulations, 2014 already provide for levy of a late payment surcharge. As provision to ensure timely payment is already provided in the Regulations, the request for further change in this respect in Regulations is not accepted.

(5) Additional request-Impact of Goods and Service Tax (GST):

Comments/suggestions received:

43. As per the MNRE report "Implication of GST on delivered cost of renewable energy"- GST likely to be introduced by 1 July, 2017, is going to impact RE sector adversely with increase in input costs as any of the exemptions available to the industry are to be subsumed under the Act and will increase the Levellised Cost of Electricity (LCOE) of wind and solar projects. The report suggests that the introduction of GST would increase the levellised tariff of 12-15% in case of solar and 12-14% in case of wind power plants. Either the present process may be put on hold till clarity on the slab in which different items are categorised, gets finalised or build a sufficient mechanism to address concerns if any that may arise from promulgation of such legislation.

Commission's views/decision:

44. Commission has considered the suggestion. Commission is of the view that that in absence of detailed data regarding impact of GST on solar power projects, to quantify its impact on cost incurred on generic basis at this stage is very difficult. Therefore,

at present, no change is considered in the capital cost on this account in this order.

Benchmark capital cost norm for Solar PV plants for FY 2017-18:

45. The RERC RE Tariff Regulations 2014 at Regulation 26(2) and 29(2) specify that capital cost norm for Solar PV power plants shall be determined by the Commission for each year by a separate order.
46. Commission has finalised the capital cost for solar PV power plants in the earlier paras and accordingly, the benchmark capital cost norm for solar PV power plants applicable for FY 2017-18 shall be ₹ 358.36 Lakh/MW.

The proposed generic levelled generation tariff for solar PV power plants for 2017-18.

47. The proposed levelled generic tariff for solar PV power plants for FY 2017-18 has been discussed below:

Useful Life

48. The regulation 2(22) of the RERC RE Tariff Regulations, 2014 provides for a useful life of 25 years for solar power plants and accordingly, for computation of generic tariff, a useful life of 25 years has been considered.

Tariff Period

49. The RERC RE Tariff Regulations, 2014 at Regulation 5 specify that the tariff determined for solar power plants getting commissioned during the control period shall continue to be applicable for entire duration of the tariff period as stipulated in Regulation 6 of the Regulations, which is 25 years for solar power plants.

Tariff Structure, Tariff Design and Levellised Tariff

50. As per regulation 8 of the RERC RE Tariff Regulations, 2014, the tariff for solar power plants shall be a single part tariff consisting of following fixed cost components:
- (a) Operation and Maintenance (O&M) Expenses;
 - (b) Depreciation;
 - (c) Interest on long-term loans;
 - (d) Interest on working capital; and
 - (e) Return on Equity.
51. As per regulation 9 of the RERC RE Tariff Regulations 2014, the generic tariff for solar power plants shall be determined on levellised basis for the tariff period. For the purpose of levellised tariff determination, the discount factor has been considered as equivalent to post tax weighted average cost of capital as per the RERC (Terms and Conditions for Determination of Tariff for Renewable Energy Sources-Wind and Solar Energy) (First Amendment) Regulations, 2015. Accordingly, the discount factor of 11.04% has been considered. The computation for discount factor is available at **Annexure-II**.

Capital Cost

52. Commission, as discussed earlier, has decided the capital cost for solar PV power plants as ₹ 358.36 Lakh/MW where PPA is signed on or before 31.03.2018 and to be commissioned on or before 31.03.2019. Accordingly, the above capital cost has been considered in the tariff computations.

Debt-Equity Ratio

53. The Debt-Equity ratio of 70:30 as specified at regulation 12 of the RERC RE Tariff Regulations, 2014 has been considered to arrive at the debt and equity components of normative capital cost for determination of levellised generic tariff.

Capacity Utilisation Factor (CUF) & de-ration in CUF

54. Regulation 27 of the RERC RE Tariff Regulations, 2014 provides for CUF of 20% with deration factor of 0.50% of CUF for every year after second year for Solar PV power plants.
55. Accordingly, above CUF along with de-ration have been taken for determination of tariff for solar power plants.

Operation & Maintenance (O&M) Expenses

56. CERC, in its fifth amendment in CERC RE Tariff Regulations, 2012 finalised on 30.03.2016, has observed that capital cost for solar PV plants has seen a steep decline over the years due to various factors. However, the O&M cost determined by CERC has shown an increasing trend in absolute value as well as in terms of percentage. CERC has also referred to the TNERC consultation paper in this respect. As per the SOR finalising the said Amendment, based on industry sources, CERC has observed that O&M services are now available on contract to Solar PV developers at a much reduced cost. Typical O&M contract, depending on size and location of the plant, costs between ₹ 5-7 Lakh/MW. Considering above, CERC, while rationalising and aligning the O&M cost with the market trends, has specified it to be ₹ 7.0 Lakh/MW for FY 2016-17 vide its Notification dated 30.03.2016. The Commission, considering this figure as reasonable, specified normative O&M expenses as ₹ 7.0 Lakh/MW for Solar PV power plants for FY 2016-17. When these O&M expenses (FY 2016-17) escalated at the rate of 5.85%, the O&M expenses work out to be ₹ 7.41/MW for FY 2017-18. Accordingly, O&M expenses of ₹ 7.41/MW have been considered for FY 2017-18. Further, in accordance with Regulation 28(2) of the RERC RE Tariff Regulations, 2014, these O&M Expenses have been escalated at the rate of 5.85% per

annum over the tariff period for computation of the levelled tariff.

Depreciation

57. In accordance with regulation 14 of the RERC RE Tariff Regulations, 2014, the rate of the depreciation for the first 12 years has been considered as 5.83% of the capital cost per annum and from 13th year onwards, the remaining depreciable value has been spread over the balance useful life of the solar power plants.

Interest Rate on Long Term Loan

58. In accordance with sub-regulation (1) of regulation 13 of the RERC RE Tariff Regulations, 2014, the loan tenure of 12 years has been considered for the purpose of determination of generic tariff for solar power plants. Sub-regulation (2) of regulation 13 of the said regulations further provides for the interest rate on long term loans as 300 basis points higher than the average State Bank of India (SBI) base rate prevalent during first six months of the year previous to the relevant year.

59. The average SBI base rate prevalent during first six months of the FY 2016-17 obtained from the official website of SBI is 9.30% and the same has been considered for computation of applicable interest rate.

60. In terms of the above, the applicable interest rate works out as 12.30% (=9.30%+3.00%) and the same has been used for computation of interest on long term loan in generic tariff computations for FY 2017-18 treating loan as 70% of the capital cost as finalised in the earlier paras.

Interest on Working Capital Requirement

61. For the purpose of working out interest on working capital requirement, the composition of working capital has been taken as per regulation 16(1) of the RERC RE Tariff Regulations, 2014.
62. In accordance with regulation 16(2) of the RERC RE Tariff Regulations, 2014, the interest rate on working capital for power plants has been taken as 250 basis points higher than the average of SBI Base rate prevalent during first six months of FY 2016-17, which works out to be 11.80% (=9.30%+2.50%). Accordingly, a rate of 11.80% has been taken as the interest rate on working capital requirement for solar power plants for FY 2017-18.

Return on Equity (RoE)

63. Regulation 15(2) of the RERC RE Tariff Regulations, 2014 provides for RoE of 16% on equity base of 30% determined in accordance with Regulation 12 of the said Regulations. As per regulation 15(3) of the RERC RE Tariff Regulations, 2014, RoE has been computed by grossing up the base rate of 16% with tax rate equivalent to Minimum Alternate Tax (MAT) for first 10 years from COD and normal tax rate for remaining years of the project life. In line with the practice followed during the previous control period and also during the present control period, the MAT rate of 20.39% (= 18.50% MAT rate+ 7% surcharge + 3% education cess) has been considered for first year and a MAT rate of 19.06% (= 18.5% MAT rate + 3% education cess) has been considered for remaining 9 years of the first 10 years. The Govt in its Union Budget 2017 has proposed a corporate tax rate of 25% for the domestic companies with Annual turnover upto ₹ 50 Cr. Accordingly, for remaining 15 years of plant life (also equal to useful life), the

normal tax rate of 25.75% (= 25% tax rate + 3% education cess) has been applied for grossing up of the base rate of RoE.

Subsidy or Incentive by the Central Government, including Accelerated Depreciation

64. As per the regulation 21 of the RERC RE Tariff Regulations, 2014, the Commission shall take into consideration any incentive or subsidy or benefit available from Central or State Government, including Accelerated Depreciation (AD) benefit, if availed by the generating company, for the renewable energy power plants while determining the tariff under these regulations. Further, the Generation Based Incentive/Tariff Subsidy, if allowed by the Central/ State Govt., would be governed by the terms and conditions of such scheme.
65. For the purpose of determining the AD benefit, as dealt earlier, the depreciation as per the Regulations (5.83% for 12 years and 1.54% for the remaining useful life)(as also allowed under the Companies Act, 2013) has been compared with depreciation rate as per Income Tax Act, i.e., 40% of the written down value vide Gol Notification No.103/2016/F.No.370142/29/2016-TPL S.O. 3399(E) dated 07.11.2016.
66. Further, for the purpose of AD benefit admissible to solar power plants, in addition to allowed 40% depreciation, an additional depreciation of 20% is permitted to the new assets acquired by power generating companies in the initial year vide amendment in Section 32, sub-section(1) clause (iia) of the Income Tax Act, 1961, which has also been taken into account. Both these rates have been considered in computing income tax benefit.
67. Further, considering the capital cost of the solar power plants getting commissioned during their first year, as capitalized during

second half of the year (i.e., put to use for less than 180 days), an additional depreciation of 10% has been taken in the first year and balance 10% additional depreciation has been taken in the subsequent year as given at **Annexure-III**. In this computation, the energy available in the second half of the year has been taken as 50% of annual generation as has been considered in the earlier Tariff orders of the Control period 2009-2014 as well as during the present control period. The levelled generic tariff has been worked out considering both the situations, viz., if AD benefit is availed and if it is not availed.

Applicable Tariff for solar Power Plants

68. Considering the parameters discussed above, the generic tariff for Solar PV plants is being determined as ₹ 3.93/kWh as per calculation sheet placed at **Annexure-III**. This tariff is levelled tariff for 25 years and applicable for plants commissioned without availing AD benefit. The tariff would be lower by ₹ 0.27/kWh, i.e., ₹ 3.66/kWh, if AD benefit is availed. This tariff would be applicable for solar PV plants where PPA is signed on or before 31.03.2018 and which get commissioned on or before 31.03.2019.
69. The levelled tariff has been determined for the useful life of the Solar power plants, i.e., for 25 years. Therefore, PPA should be for 25 years.

Grid Connected Roof Top and Small Solar PV and Thermal Systems: Applicable Tariff

70. In order to encourage the Net Metering for solar roof top PV systems, Commission has notified RERC (Connectivity and Net Metering for Roof Top and Small Solar Grid Interactive Systems) Regulations, 2015 ('RERC Net Metering Regulations,2015'). For Roof top Solar PV systems covered under RERC Net Metering Regulations,2015, net excess energy (more than 50 units)

exported to the Grid by the consumer/generator would be payable at the Tariff of ₹ 3.93/kWh till the next tariff order is issued by the Commission. This tariff would be payable to all such systems set up under Net Metering during FY 2017-18 and earlier and would be irrespective of grant of capital subsidy and/or AD benefit being availed by them. Other Roof top and small solar power generation systems not covered under Net Metering Regulations would be paid the same tariff as determined for MW scale projects under this order for solar energy supplied by them to Discoms.

Guidelines for Metering, Billing and other Requirements

71. The guidelines laid down as per order dtd. 25.05.2010 as regards (i) Metering and Billing arrangement and (ii) General Terms and Conditions would be applicable. However, the grid connectivity of the roof top PV systems and small solar systems shall be governed by prevailing CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007, CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013 and REGC as amended from time to time.

Conclusion

72. The generic tariff levellised for 25 years for solar PV power plants and Roof Top and small solar PV plants is summarized as under:

Table- 5: Summary of Solar PV Tariffs

S. No.	Particulars	Tariff (₹/kWh) if AD benefit is not availed	Tariff (₹/kWh) if AD benefit is availed
1	2	3	4
1	Solar photo voltaic (PV) power plants commissioned by 31.03.2019	3.93	3.66
2	Roof Top Solar PV installations and other small solar PV power generation plants to be commissioned by 31.03.2019	3.93	3.66

73. Both the tariffs mentioned in the above table, i.e., with or without availing AD benefit, would be valid tariff for purchase of solar power by distribution licensees from solar power plants set up in Rajasthan.
74. The tariff for solar PV plants having size 5 MW and above to be set up in the State shall be in accordance with the regulation 3(2) of the RERC RE Tariff Regulation, where the tariff for such power plants shall be determined through a transparent process of bidding in accordance with the Bidding Guidelines issued by the Central Government, as envisaged under Section 63 of the Act. Now the Central Govt. has issued Bidding Guidelines under Section 63 of the Act, therefore, the State Discoms shall procure their solar power requirement in accordance with these guidelines. The generic tariff determined in this order shall be the ceiling tariff in terms of the requirement of para 4.3.1 of the Bidding Guidelines notified by the Central Govt.
75. For solar power plants claiming the higher tariff worked out as above and not availing AD benefit, Commission considers it appropriate to lay down modalities as under:
- (1) The PPA should include an undertaking of the solar power generator that AD benefit would not be availed for the generating plant/unit.
 - (2) The first bill raised by the solar power plant shall be accompanied by an undertaking that accelerated depreciation benefit shall not be claimed. Based on this, the applicable tariff would be allowed.
 - (3) The claims of energy charges as per applicable tariff may be entertained based on the said undertaking upto the due date of filing of Income Tax Return of the relevant Financial

Year. This would mean 30th September, 2018 for payment for the Financial Year 2017-18 and for the first six months (upto 30th September) of financial year 2018-19 and so on.

- (4) After filing of Income Tax Return, a certificate from a Chartered Accountant (CA) that AD benefit has not been claimed would have to be submitted or, in the alternative, a copy of Income Tax Return filed with Income Tax Department wherein AD benefit has not been claimed along with verification of Tax Consultant may be furnished.
 - (5) As Income Tax Return is required to be filed in the next year, the payment of amount corresponding to non-availment of higher depreciation in respect of energy supplied in the month of October onwards of the financial year following the financial year of commissioning of the plant would be made only after the said certificate/copy of Income Tax Return is furnished.
 - (6) For the energy supplied in the months of October onwards, the methodology as given in sub-paras (4) & (5) above be followed.
76. Commission also considers it appropriate that in the PPA, an undertaking of the solar power generator should be furnished saying that benefit of AD would not be claimed and that in case it is found that benefit of accelerated depreciation has been claimed as per third proviso to Regulation 21 of the RERC RE Tariff Regulations, 2014, the distribution licensee shall be entitled to recover the amount wrongly claimed by power generator along with penal charges @ 1.50% per month calculated on daily basis.
77. Similarly, an annual undertaking would need to be furnished if CDM benefit is not availed. However, if CDM benefit is availed, it would have to be shared between the distribution licensee and

generating company as specified in Regulation 20 of the RERC RE Tariff Regulations, 2014.

78. The metering arrangement for MW scale solar power plants shall be as per regulation 37 of the RERC RE Tariff Regulations, 2014.
79. The above tariff is applicable for solar PV power plants where PPA is signed on or before 31.03.2018 and which are to be commissioned on or before 31.03.2019.
80. The detailed calculations for determination of tariff are annexed as under:
 - (1) Calculation for Discount Factor considered for FY 2017 -18 -
Annexure-II.
 - (2) Detailed Tariff computations for solar PV power plants -
Annexure-III.

(Suresh Chandra Dinkar)
Member

(Rajendra Prasad Barwar)
Member

(Vishvanath Hiremath)
Chairman

List of Stakeholders who submitted their Suggestions / Comments:

S.No. Name of Stakeholder

1. M/s Samta Power.
2. M/s Mytrah Energy (India) Private Limited.
3. M/s ReNew Solar Energy Private Limited.
4. M/s Adani Green Energy Limited.

Annexure-II

Calculation of Discount Factor for FY 2017-18 as per the RERC (Terms and Conditions for Determination of Tariff for Renewable Energy Sources - Wind and Solar Energy) (First Amendment) Regulations, 2015:

$$\begin{aligned} \text{DF} &= (\text{IR} * \text{DC} * (1-\text{IT})) + (\text{ROE} * \text{EC}) \\ &= (12.30\% * 0.70 * (1 - 27.55\%)) + (16\% * 0.30) \\ &= 11.04\% \end{aligned}$$

Where,

DF = Discount Factor (%),

IR = Interest rate (%),

DC = Debt Component,

IT = Income tax rate(%),

ROE = Return on Equity (%),

EC = Equity Component

TARIFF DETERMINATION FOR SOLAR PHOTO VOLTAIC POWER PLANTS LOCATED IN RAJASTHAN FY 2017-18

			Levellised Tariff (₹/kWh) without AD	3.93	
			Accelerated Depreciation benefit (₹/kWh)	0.27	
			Levellised Tariff (₹/kWh) with AD	3.66	
S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Base Case (SPV)
1	Power Generation	Capacity	Installed Power Generation Capacity CUF Deration p.a. after 2nd year Tariff Period Life of Power Plant	MW % % Years Years	1 20.00% 0.50% 25 25
2	Project Cost	Capital Cost/MW	Including Land & Connectivity charges	₹ Lakh/MW	358.36
3	Sources of Fund	Debt: Equity	Debt Equity Total Debt Amount Total Equity Amout	% % ₹ Lakh ₹ Lakh	70.00% 30.00% 250.85 107.51
		Funding Options-1 (Domestic Loan Source-1)	Loan Amount Moratorium Period Repayment Period(incld Moratorium) Interest Rate	₹ Lakh years years %	250.85 0 12 12.30%
		Funding Options-2 (Equity Finance)	Equity amount Return on Equity Discount Rate (eq. WACC)	Rs Lakh % p.a	107.51 16.00% 11.04%
4	Financial Assumptions	Fiscal Assumptions	Income Tax (11th year onwards) MAT Rate (for yr-1) MAT Rate (for yr-2 to yr-10) 80 IA benefits	% % % Yes/No	25.75% 20.39% 19.06% Yes
		Depreciation	Depreciation Rate(upto 12-yrs) Depreciation Rate(after 12-yrs) Years for 5.83% SLM rate	% % years	5.83% 1.54% 12
5	Working Capital	For Fixed Charges O&M Charges Maintenance Spare Receivables for Debtors Interest On Working Capital	(% of O&M expenses)	Months % Months %	1 15.00% 1.5 11.80%
6	Operation & Maintenance Expenses	Power plant O & M Expenses Escalation	₹ Lakh/MW	₹ Lakh/MW %	7.41 5.85%

TARIFF DETERMINATION FOR SOLAR PHOTO VOLTAIC POWER PLANTS LOCATED IN RAJASTHAN FY 2017-18

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Aux Consumption	%		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Deration factor	%	0.50%	1	1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	0.95	0.94	0.94	0.93	0.93	0.92	0.92	0.91	0.91	0.90	0.90	0.90	0.89
Generation	MU		1.75	1.75	1.74	1.73	1.73	1.72	1.71	1.70	1.69	1.68	1.67	1.67	1.66	1.65	1.64	1.63	1.63	1.62	1.61	1.60	1.59	1.58	1.58	1.57	1.56

Cost of generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
O&M Expenses	₹ Lakh		7.41	7.84	8.30	8.79	9.30	9.85	10.42	11.03	11.68	12.36	13.08	13.85	14.66	15.52	16.42	17.38	18.40	19.48	20.62	21.82	23.10	24.45	25.88	27.40	29.00	
Depreciation	₹ Lakh		20.90	20.90	20.90	20.90	20.90	20.90	20.90	20.90	20.90	20.90	20.90	20.90	20.90	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51
Interest on term loan	₹ Lakh		29.57	27.00	24.43	21.86	19.28	16.71	14.14	11.57	9.00	6.43	3.86	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	₹ Lakh		1.40	1.37	1.35	1.34	1.32	1.30	1.29	1.28	1.27	1.26	1.28	1.27	1.06	1.10	1.13	1.18	1.22	1.27	1.31	1.37	1.42	1.48	1.54	1.61	1.67	
Return on Equity	₹ Lakh		21.61	21.25	21.25	21.25	21.25	21.25	21.25	21.25	21.25	21.25	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17	23.17
Total Cost of generation	₹ Lakh		80.89	78.37	76.24	74.13	72.06	70.02	68.01	66.03	64.10	62.20	62.29	60.48	44.40	45.29	46.24	47.24	48.30	49.42	50.61	51.87	53.20	54.61	56.10	57.68	59.35	
Per unit Cost of generation	₹/kWh		4.62	4.47	4.37	4.27	4.18	4.08	3.98	3.88	3.79	3.70	3.72	3.63	2.68	2.75	2.82	2.89	2.97	3.06	3.15	3.24	3.34	3.45	3.56	3.68	3.80	

Levillised cost of generation (₹/kWh) (25 yrs) 3.93

Note(s):

1. Levellised tariff has been worked out by carrying out levelisation over 25 years and Discount Rate has been considered as 11.04% equivalent to post tax WACC.
2. Figures may not tally exactly on account of rounding off.

Determination of Accelerated Depreciation Benefit for Solar PV Power Projects FY 2017-18

Annexure-III...contd...

Annexure-II ..contd..

Depreciation amount	90%	
Book Depreciation rate	5.83%	
Tax Depreciation rate	40%	
Additional depreciation rate applicable during first year	20%	
Income Tax	27.55%	25.75%
Capital Cost	358.36	₹ Lakh/MW

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
Book Depreciation rate	%	2.92%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	1.54%	###	
Book Depreciation	₹ Lakh	10.45	20.89	20.89	20.89	20.89	20.89	20.89	20.89	20.89	20.89	20.89	20.89	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52

Accelerated Depreciation																												
Opening	%	100.00%	70.00%	35.00%	21.00%	12.60%	7.56%	4.54%	2.72%	1.63%	0.98%	0.59%	0.35%	0.21%	0.13%	0.08%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	###	
Allowed during the year	%	30%	35.00%	14.00%	8.40%	5.04%	3.02%	1.81%	1.09%	0.65%	0.39%	0.24%	0.14%	0.08%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	###	
Closing	%	70.00%	35.00%	21.00%	12.60%	7.56%	4.54%	2.72%	1.63%	0.98%	0.59%	0.35%	0.21%	0.13%	0.08%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	###		
Accelerated Deprn.	₹ Lakh	107.51	125.43	50.17	30.10	18.06	10.84	6.50	3.90	2.34	1.40	0.84	0.51	0.30	0.18	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00		

Net Depreciation Benefit	₹ Lakh	97.06	104.53	29.28	9.21	(2.83)	(10.06)	(14.39)	(16.99)	(18.55)	(19.49)	(20.05)	(20.39)	(5.22)	(5.34)	(5.42)	(5.46)	(5.48)	(5.50)	(5.51)	(5.52)	(5.52)	(5.52)	(5.52)	(5.52)	(5.52)	(5.52)
Tax Benefit	₹ Lakh	26.74	26.92	7.54	2.37	(0.73)	(2.59)	(3.71)	(4.38)	(4.78)	(5.02)	(5.16)	(5.25)	(1.34)	(1.38)	(1.39)	(1.41)	(1.41)	(1.42)	(1.42)	(1.42)	(1.42)	(1.42)	(1.42)	(1.42)	(1.42)	(1.42)
Energy generation	MU	0.88	1.75	1.74	1.73	1.73	1.72	1.71	1.70	1.69	1.68	1.67	1.67	1.66	1.65	1.64	1.63	1.63	1.62	1.61	1.60	1.59	1.58	1.58	1.57	1.56	
Per unit benefit	₹/Unit	3.05	1.54	0.43	0.14	(0.04)	(0.15)	(0.22)	(0.26)	(0.28)	(0.30)	(0.31)	(0.32)	(0.08)	(0.08)	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	
Discounting Factor,DF		1.00	0.90	0.81	0.73	0.66	0.59	0.53	0.48	0.43	0.39	0.35	0.32	0.28	0.26	0.23	0.21	0.19	0.17	0.15	0.14	0.12	0.11	0.10	0.09	0.08	
Applicable DF		1.00	0.95	0.86	0.77	0.69	0.63	0.56	0.51	0.46	0.41	0.37	0.33	0.30	0.27	0.24	0.22	0.20	0.18	0.16	0.14	0.13	0.12	0.11	0.09	0.09	

Levellised AD benefit 0.27 ₹/kWh

Note(s):

1. In the above calculations, depreciation for the first year has been considered as 30%(=50% of (40%+20%)) and for second year as 50%(=40%+50% of 20%) as per CERC methodology.
2. Generation for the first year has been considered as 50% of normative generation for second half of the financial year.
3. Figures may not tally exactly on account of rounding off.