

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI

Petition No. 05/SM/2019

Coram:

Shri P. K. Pujari, Chairperson

Dr. M.K. Iyer, Member

Shri I. S. Jha, Member

Date of Order: 07.05.2019

In the matter of

Calculation of Average Power Purchase Cost (APPC) at the national level

ORDER

The Central Electricity Regulatory Commission, in discharge of its responsibilities under the Electricity Act, 2003, viz. “regulating inter-state transmission of electricity, specifying grid code, and specifying standards with respect to quality and reliability of service,” has notified the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Third Amendment) Regulations, 2015, and the Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) (Second Amendment) Regulations, 2015 to provide for the Framework on Forecasting, Scheduling and Imbalance Handling for Variable Renewable Energy Sources (Wind and Solar).

2. The above Regulations provide for a framework to enable forecasting and scheduling of wind and solar generating stations that are regional entities. The framework is aligned with the existing settlement mechanism applicable to conventional generating stations under the control of RLDCs, to the extent that the wind and solar generators are paid by beneficiaries as per schedule, and deviation from schedule is settled with the Regional DSM pool. The graded deviation settlement

band provides an incentive for improving accuracy of forecasting, and uses the PPA rate of generators in long-term PPAs as the 'fixed rate' for deviation settlement. The relevant provision of the DSM Regulations in this context (Regulation 5, clause 1, sub-clause v) is extracted below:

"... Where the Fixed Rate is the PPA rate as determined by the Commission under section 62 of the Act or adopted by the Commission under section 63 of the Act. In case of multiple PPAs, the weighted average of the PPA rates shall be taken as the Fixed Rate. ..."

3. However, this Fixed Rate is not available in respect of generators that do not have long-term PPAs, such as open access entities. In this context, it is stated:

"Fixed Rate for Open Access participants selling power which is not accounted for RPO compliance of the buyer, and the captive wind or solar plants shall be the Average Power Purchase Cost (APPC) rate at the National level, as may be determined by the Commission from time to time through a separate order. A copy of the order shall be endorsed to all RPCs."

This implies that for Open Access wind or solar sellers that are regional entities and selling power under REC framework, and for Captive plants where PPAs do not exist, settlement shall be done at APPC determined at the national level. In pursuance of this provision, the Commission is required to determine the national level APPC.

4. The Commission notified Order dated 25.1.2016 for 'Determination of Average Power Purchase Cost (APPC) at the national level' (Petition No. 15/SM/2015) and prescribed the National APPC as Rs 3.40 / kWh.

The above APPC value was applicable during the remaining months of FY 2015-16, as well as for FY 2016-17, for the purpose of deviation settlement in respect of open access and captive wind and solar generators fulfilling the requirement of regional entities.

5. Subsequently, the Commission notified Order dated 31.8.2017 for 'Determination of Average Power Purchase Cost (APPC) at the national level' (Petition No. 11/SM/2017) and prescribed the National APPC as Rs 3.48 / kWh.

The above APPC value was applicable during FY 2017-18 and until further orders, for the purpose of deviation settlement in respect of the open access and captive wind and solar generators that are regional entities.

6. Further, the Commission notified Order dated 21.6.2018 for 'Determination of Average Power Purchase Cost (APPC) at the national level' (Petition No. 4/SM/2018) and prescribed the National APPC as Rs 3.53 / kWh.

The above APPC value was applicable during FY 2018-19 and until further orders, for the purpose of deviation settlement in respect of the open access and captive wind and solar generators that are regional entities.

7. In this context, it would be pertinent to mention that Regulation 5(c) of Central Electricity Regulatory Commission (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations, 2010 defines Average Power Purchase Cost (APPC) as follows:

"for the purpose of these regulations 'Pooled Cost of Purchase' means the weighted average pooled price at which the distribution licensee has purchased the electricity including cost of self generation, if any, in the previous year from all the energy suppliers long-term and short-term, but excluding those based on renewable energy sources, as the case may be."

8. Accordingly, APPC at the national level for FY 2019-20 is proposed to be determined by computing the average of APPC of all States and Union Territories, weighted by volume of conventional power purchased by the respective State/UT.
9. Data for approved purchase cost and volume of power for FY 2018-19, from the respective FY 2018-19 Tariff Orders of the States have been considered. Data used for calculation of APPC in respect of all States and UTs, exceptions as well as the calculations are given in the Annexure to this Order.
10. The total cost of power purchase considered for computation of APPC excludes cost of generation or procurement from renewable energy sources and transmission charges. Exclusion of cost of generation or procurement from renewable sources is in alignment with the objective of determining APPC, which is to ascertain the average cost of power from conventional sources of electricity.

Furthermore, with a view to consider energy costs only, transmission charges have been excluded from these calculations.

11. Based on the tariff orders issued by the SERCs/JERCs for FY 2018-19, the APPC at the National level has been worked out as **Rs. 3.60/kWh**. It is proposed that APPC shall be applicable during FY 2019-20 and until further orders for the purpose of deviation settlement in respect of the open access and captive wind and solar generators fulfilling the requirement of regional entities.

12. The Commission invites comments of stakeholders on the proposed determination of APPC as per the Annexure to the Order, by 28.05.2019.

Sd/-

**(I.S. Jha)
MEMBER**

Sd/-

**(M. K. Iyer)
MEMBER**

Sd/-

**(P.K. Pujari)
CHAIRPERSON**

DETERMINATION OF APPC AT THE NATIONAL LEVEL

1. Regulation 5(c) of Central Electricity Regulatory Commission (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations, 2010 defines Average Power Purchase Cost (APPC) as follows:

“for the purpose of these regulations ‘Pooled Cost of Purchase’ means the weighted average pooled price at which the distribution licensee has purchased the electricity including cost of self generation, if any, in the previous year from all the energy suppliers long-term and short-term, but excluding those based on renewable energy sources, as the case may be.”

2. Thus, Average Power Purchase Cost (APPC) at the national level has been obtained by computing the average of APPC of all States and Union Territories, weighted by volume of conventional power purchased by the respective State/UT.
3. Data for approved purchase cost and volume of power for FY 2018-19 was obtained from the respective FY 2018-19 Tariff Orders of the States/UTs. Links to these tariff orders can be found in Table-II below. In case there were separate tariff orders for different utilities, they have been listed separately.
4. Exceptions to this dataset are as follows:
 - a. For Jharkhand, Tariff Order for FY 2019-20 has been considered for JBVNL as it has approved values for FY 2018-19 after Annual Performance Review. For JUSCO & TSL, Tariff Order for FY 2017-18 has been considered.
 - b. For Kerala, Tariff Order for FY 2017-18 has been considered.
 - c. For Tripura, FY 2014-15 Tariff Order has been considered, as the SERC has not issued tariff order for FY 2015-16 upto FY 2018-19.
 - d. For West Bengal, Tariff Order of FY 2017-18 has been considered for WBSEDCL and CESC, For DPL and DVC, latest available Tariff Orders have been considered.

In addition, for States viz. Andaman & Nicobar Islands, Gujarat, Jammu & Kashmir, Lakshadweep and Tamil Nadu, quantum and cost of power purchase for FY 2018-19 has been taken from respective MYT Orders as applicable.

5. In case of multiple utilities operating in a State, average of power purchase cost weighted by power quantum of respective utilities was computed to derive APPC for entire state.

Illustration:

$X_i, X_{ii}, X_{iii}, \dots, X_n$ denoting average per unit power purchase cost for respective utilities in a state (excluding cost of renewables).

$Q_i, Q_{ii}, Q_{iii}, \dots, Q_n$ denoting power quantum purchased (excluding renewable power).

Then,

$$APPC(\text{state}) = (\sum_{n=1}^n X_n Q_n) / \sum_{n=1}^n Q_n$$

6. The total cost of power purchase considered excludes cost of generation or procurement from renewable energy sources. In orders where renewable energy cost and quantum has been mentioned in total power purchase summary, it has been subtracted from the totals to obtain values corresponding to conventional sources.

$$\text{Power Quantum}_{(\text{Conventional Sources})} = \text{Power Quantum}_{(\text{Total})} - \text{Power Quantum}_{(\text{Renewable Sources})}$$

$$\text{Purchase Cost}_{(\text{Conventional Sources})} = \text{Purchase Cost}_{(\text{Total})} - \text{Purchase Cost}_{(\text{Renewable Sources})}$$

7. Furthermore, with a view to consider energy costs only, transmission charges have been excluded from these calculations.
8. Thus, if $APPC_1, APPC_2, \dots, APPC_N$ are state level APPCs, and Q_1, Q_2, \dots, Q_N are volumes of non-RE power procured by the States respectively, then, APPC at the national level is computed as follows:

$$APPC_{(\text{national})} = (\sum_{i=1}^N APPC_i Q_i) / \sum_{i=1}^N Q_i$$

9. Data for each State is given in Table- I. Table – II gives links to the respective tariff orders from which data was extracted.

Table I: State-wise Power procurement Volume/Cost / Average Cost per Unit for FY 2018-19				
S No.	State	Volume of Power procured from Non-RE Sources (Estimated) "X" (MUs)	Cost of Power procured from Non-RE Sources "Y" (INR Crores)	Average Cost of Non RE Power "Y*10/X" (INR)
1	Andaman & Nicobar Islands *	305.77	350.69	11.47
2	Andhra Pradesh	48,220.20	18,456.47	3.83
3	Arunachal Pradesh	654.07	171.59	2.62
4	Assam	9,925.37	3,626.91	3.65
5	Bihar	28,728.72	11,822.69	4.12
6	Chandigarh	1,954.94	659.55	3.37
7	Chhattisgarh	25,083.76	7,282.34	2.90
8	Dadra & Nagar Haveli	6,232.89	2,265.97	3.64
9	Daman & Diu	2,508.94	794.36	3.17
10	Delhi	33,285.00	12,979.70	3.90
11	Goa	3,851.64	1,032.20	2.68
12	Gujarat **	91,450.96	36,409.20	3.98
13	Haryana	54,702.13	20,343.00	3.72
14	Himachal Pradesh	9,633.00	2,201.18	2.29
15	Jammu & Kashmir ^	12,490.00	3,598.00	2.88
16	Jharkhand ^^	16,221.83	6,473.80	3.99
17	Karnataka	58,859.56	20,609.45	3.50
18	Kerala \$	25,150.45	7,407.25	2.95
19	Lakshadweep \$\$	65.83	79.94	12.14
20	Madhya Pradesh	59,809.64	16,949.15	2.83
21	Maharashtra	1,26,717.87	46,750.08	3.69
22	Manipur	1,058.32	376.00	3.55
23	Meghalaya	2,992.23	997.69	3.33
24	Mizoram	572.88	190.48	3.32
25	Nagaland	933.85	316.72	3.39
26	Orissa	25,990.00	7,190.34	2.77
27	Puducherry	2,928.43	1,023.27	3.49
28	Punjab	41,856.15	16,795.32	4.01
29	Rajasthan	63,272.00	21,926.00	3.47
30	Sikkim	944.87	215.41	2.28
31	Tamil Nadu #	95,370.33	35,545.48	3.73
32	Telangana	52,431.61	20,570.73	3.92
33	Tripura ##	1,933.87	541.68	2.80
34	Uttar Pradesh	1,22,159.37	45,578.63	3.73
35	Uttarakhand	13,389.39	4,422.17	3.30
36	West Bengal ###	51,244.41	18,210.90	3.55
	ALL INDIA	10,92,930.28	3,94,164.33	3.60

Table II: Link of Tariff Orders referred for obtaining State-wise data related for power purchase quantum and cost for calculation of State APPCs			
S No.	State	Discoms	Tariff Order
1	A & N Islands *		http://jercuts.gov.in/writereaddata/UploadFile/mytani6416_1466.pdf
2	Andhra Pradesh		http://aperc.gov.in/admin/upload/TO2018-19.pdf
3	Arunachal Pradesh		http://www.apserc.nic.in/pdf/tariff_order_for_licencees/Tariff_Order_FY_2018-19_DOP,%20AP.pdf
4	Assam		http://www.aerc.gov.in/TariffOrder-APDCL-2019-20.pdf
5	Bihar	SBPDCL	https://berc.co.in/orders/tariff/distribution/sbpdcl/1444-tariff-order-of-sbpdcl-for-fy-2018-19
		NBPDCL	https://berc.co.in/orders/tariff/distribution/nbpdcl/1447-tariff-order-of-nbpdcl-for-fy-2018-19
6	Chandigarh		http://jercuts.gov.in/writereaddata/UploadFile/CEDTARIFF1819_1576.pdf
7	Chhattisgarh	CSPDCL	http://cserc.gov.in/pdf/Order%20in%202017/Tariff%20FY%202018-19-Final.pdf
8	Dadra & Nagar Haveli		http://jercuts.gov.in/writereaddata/UploadFile/DNHPDCL0Tariff%20Order0FY%202018-190Final_1354.pdf
9	Daman & Diu		http://jercuts.gov.in/writereaddata/UploadFile/FINALDDTARIFF1_1367.pdf
10	Delhi	TDDPL	http://www.derc.gov.in/ordersPetitions/orders/Tariff/Tariff%20Order/Tariff%20Order%20for%20FY%202018-19/Tariff%20Order/TPDDL%20Tariff%20Order%20FY%202018-19.pdf
		BYPL	http://www.derc.gov.in/ordersPetitions/orders/Tariff/Tariff%20Order/Tariff%20Order%20for%20FY%202018-19/Tariff%20Order/BYPLTariff%20Order%20FY%202018-19.pdf
		BRPL	http://www.derc.gov.in/ordersPetitions/orders/Tariff/Tariff%20Order/Tariff%20Order%20for%20FY%202018-19/Tariff%20Order/BRPL%20Tariff%20Order%20FY%202018-19.pdf
		NDMC	http://www.derc.gov.in/ordersPetitions/orders/Tariff/Tariff%20Order/Tariff%20Order%20for%20FY%202018-19/Tariff%20Order/NDMC%20Tariff%20Order%20FY%202018-19.pdf
11	Goa		http://jercuts.gov.in/writereaddata/UploadFile/EDGOAFINAL_1097.pdf
12	Gujarat **	4 State Discoms	http://www.gercin.org/uploaded/document/3667c615-84ea-44ff-9eb7-ee58fe742fd5.pdf
		Torrent Dahej	http://www.gercin.org/uploaded/document/69b37fe0-7d94-4405-80ac-3523b00c299d.pdf
		Torrent Ahmedabad and Surat	http://www.gercin.org/uploaded/document/8ae19e44-011c-4c6d-8cab-299984012bfd.pdf
13	Haryana		https://herc.gov.in/WriteReadData/Orders/O20181115a.pdf
14	Himachal Pradesh		http://hperc.org/File/to%20FY18-19.pdf
15	Jammu & Kashmir ^		http://www.jkserc.nic.in/FINAL%20JKPDD-D%20Order%202nd%20MYT_07%20Oct%202016_v4.pdf
16	Jharkhand ^^	TSL	http://jserc.org/pdf/tariff_order/tsl2018.pdf
		JUSCO	http://jserc.org/pdf/tariff_order/jusco2018.pdf
		JBVNL	http://jserc.org/pdf/tariff_order/jbvnl2019.pdf
17	Karnataka	All DISCOMs	https://www.karnataka.gov.in/kerccourtorders2018/Annexure%20-%20HESCOM.pdf
18	Kerala \$		http://www.erckerala.org/userFiles/636281120645520000_Chapter%201%20to%2016_18_4_2017-final%20CM-Final%20to%20web.pdf
19	Lakshadweep \$\$		http://jercuts.gov.in/writereaddata/UploadFile/mytlkd31316_1488.pdf
20	Madhya Pradesh	All DISCOMs	http://www.mperc.nic.in/030518-PNo-03-2018-Tariff.pdf
21	Maharashtra	MSEDCL	http://www.mercindia.org.in/pdf/Order%2058%2042/Order-195%20of%202017-12092018.pdf

		BEST	http://www.mercindia.org.in/pdf/Order%2058%2042/Order-203%20of%202017-12092018.pdf
		R Infra	http://www.mercindia.org.in/pdf/Order%2058%2042/Order-200%20of%202017-12092018.pdf
		Tata Power Company	http://www.mercindia.org.in/pdf/Order%2058%2042/Order-69%20of%202018-12092018.pdf
22	Manipur		https://jerc.mizoram.gov.in/uploads/attachments/165a60997a9d8b0ce254abe58113a009/tariff-order-true-up-for-fy-2016-17-review-for-fy-2017-18-and-determination-of-arr-myt-period-fy-2018-2019-to-2022-2023-retail-tariff-for-fy-2018-19-for-mspdcl-16-03-18.doc
23	Meghalaya		http://mserc.gov.in/orders/TariffOrders_2018/MePDCL_Tariff_2018-19.pdf
24	Mizoram		https://jerc.mizoram.gov.in/uploads/attachments/29dea0755c8637a421ccd46a4cce3b33/tariff-order-true-up-for-fy-2016-17-review-for-fy-2017-18-and-determination-of-arr-for-myt-period-fy-2018-2019-to-fy-2022-2023-tariff-for-fy-2018-19-for-p-ed-16-03-2018-.doc
25	Nagaland		http://www.nerc.org.in/images/nercdoc/NERCTariff2018.pdf
26	Orissa	All DISCOMs	http://www.orierc.org/DISCOMs_Tariff_Order_FY_2018-19.pdf
27	Puducherry		http://jercuts.gov.in/writereaddata/UploadFile/PEDFINAL_1499.pdf
28	Punjab		http://www.pserc.in/pages/Tariff%20Order%20PSPCL%20for%20FY%202018-19.pdf
29	Rajasthan		http://rerc.rajasthan.gov.in/TariffOrders/Order291.pdf
30	Sikkim		http://www.sserc.in/sites/default/files/TARIFF%20ORDER%20-%202018-19%20FINAL%20%28website%29.pdf
31	Tamil Nadu#		http://www.tnerc.gov.in/orders/Tariff%20Order%202009/2017/TariffOrder/TANGEDCO-11-08-2017.pdf
32	Telangana		http://www.tserc.gov.in/file_upload/uploads/Tariff%20Orders/Current%20Year%20Orders/2018-19/RSTFY2018-19.pdf
33	Tripura ##		http://terc.nic.in/pdf/Tariff_Order_2014-15_in_PDF_form.pdf
34	Uttar Pradesh	State Discoms	http://www.uperc.org/App_File/TariffOrder-StateDiscom(22-01-2019)-rar122201951731PM.rar
		NPCL	http://www.uperc.org/App_File/TariffOrderFY2018-19NPCL22-1-2019-rar122201960124PM.rar
35	Uttarakhand		http://www.uerc.gov.in/ordersPetitions/orders/Tariff/Tariff%20Order/2018-19/Tariff%20Orders%20for%20FY%202018-19/Tariff%20Order%20of%20UPCL%20for%20FY%202018-19.pdf
36	West Bengal ###	WBSEDCL	http://www.wberc.gov.in/sites/default/files/WBSEDCL%202017-18.pdf
		CESC	http://www.wberc.gov.in/sites/default/files/CESC_17-18_1.pdf
		DVC	http://wberc.gov.in/sites/default/files/Tariff%20Order_DVC_2014-2017_pdf%20%281%29.pdf
		DPL	http://wberc.gov.in/sites/default/files/DPL_MYT_14-15%20TO%2016-17%20WITH%20CORRIGENDUM%20NEW.pdf

Legend

- * **Andaman & Nicobar Islands** - Approved Power Purchase and Cost for 2018-19 from MYT Order for FY 2016-17 to FY 2018-19 dated 6th Apr 2016 considered
- ** **Gujarat** - Approved Power Purchase and Cost for 2018-19 from MYT Order for Control Period FY 2016-17 to FY 2019-20 considered
- ^ **Jammu & Kashmir** - Approved Power Purchase and Cost for 2018-19 from MYT Order for FY 2016-17 to FY 2020-21 dated 7th Oct 2016 considered
- ^^ **Jharkhand** - Approved Power Purchase and Cost for 2018-19 for JBVNL from Order dated 28th Feb 2019 considered
- Approved Power Purchase and Cost for 2017-18 for JUSCO & TSL from respective Orders considered
- \$ **Kerala** - Tariff Order issued in 2017-18 considered
- \$\$ **Lakshadweep** - Approved Power Purchase and Cost for 2018-19 from MYT Order for FY 2016-17 to FY 2018-19 dated 31st March 2016 considered
- # **Tamil Nadu** - Approved Power Purchase and Cost for 2018-19 from Order dated 11th August 2017 considered
- ## **Tripura** - Tariff Order issued in 2014-15 considered
- ### **West Bengal** - Tariff Order issued for WBSEDCL and CESC for FY2017-18 considered. For DVC and DPL, latest available Tariff Orders considered