

Form I

BEFORE THE JOINT ELECTRICITY REGULATORY COMMISSION FOR THE STATES OF MANIPUR AND MIZORAM, AIZAWL

Case No.

IN THE MATTER OF

Petition under Section 62 (1) (a) and 86(1) (e) of the ‘Electricity Act 2003’ read with Section 8 of Joint Electricity Regulatory Commission for Manipur and Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 dated 31.05.2010 and the Joint Electricity Regulatory Commission for Manipur and Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment Regulation, 2014) dated 08.08.2014 for determination of tariff for Solar Rooftop and Small Solar Power Plants in Manipur state for FY 2018-19

AND

IN THE MATTER OF THE APPLICANT

Manipur Renewable Energy Development Agency (MANIREDA)

2nd Floor, South Block, Secured Office Complex
Near 2nd M.R. Gate, Imphal –Dimapur Road, Imphal 795001

Through its Director Mr

Versus

Manipur State Power Distribution Company Limited
Secure Office Complex, 3rd Floor, Near Hotel Imphal, North AOC
Manipur, Imphal -795001

----- Respondent

Form II

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2nd Floor, South Block, Secured Office Complex
Near 2nd M.R. Gate, Imphal –Dimapur Road, Imphal 795001

Through its Director Mr

Versus

1. Manipur State Power Distribution Company Limited
Secure Office Complex, 3rd Floor, Near Hotel Imphal, North AOC
Manipur, Imphal -795001

----- Respondent

Affidavit

I, son of agedresiding at do hereby solemnly affirm and state as follows:

I am a Director / Secretary / of Ltd., the petitioner in the above matter and am duly authorized by the said petitioner to make this affidavit on its behalf.

Note: This paragraph is to be included in cases where the petitioner is the Company.

1. The statements made in paragraphs of the petition herein now shown to me and marked with the letter 'A' are true to my knowledge and the statements made in paragraphs are based on information received from (based on the records of) and I believe them to be true.

Deponent

Verification:

I, the deponent above named do hereby verify that the contents of my above affidavit are true to my knowledge; no part of it is false and nothing material has been concealed therefrom

Verified at on the day of

Place: Imphal

Deponent:

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ABBREVIATIONS

Abbreviation	Full form
JERC	Joint Electricity Regulatory Commission (Manipur & Mizoram)
CERC	Central Electricity Regulatory Commission
SERC	State Electricity Regulatory Commission
MNRE	Ministry of New & Renewable Energy
GoI	Government of India
MANIREDA	Manipur Renewable Energy Development Agency
MSPDCL	Manipur State Power Distribution Corporation Ltd.
SECI	Solar Energy Corporation of India
NGO	Non-Governmental Organisation
PSU	Public Sector Unit
CFA	Central Finance Assistance
CEA	Central Electricity Authority
BIS	Bureau of Indian Standards
GCRTS	Grid Connected Roof Top Solar
SPV	Solar Photovoltaic
CUF	Capacity Utilization Factor
EPC	Engineering, Procurement and Construction
WACC	Weighted Average Cost of Capital

BACKGROUND

1 Provisions under “Manipur Grid Interactive Rooftop Solar Photo-voltaic (SPV) Power Policy 2014”

- 1.1. Government of Manipur has notified “Manipur Grid Interactive Rooftop Solar Photovoltaic (SPV) Power Policy 2014” according to which the eligible consumers of the distribution licensee, who are having sufficient space on the rooftop of their buildings, shall be entitled to install solar rooftop projects either under gross metering arrangements or net metering arrangement.
- 1.2. Provided that eligible consumers availing net metering shall not be allowed to apply for Gross metering with the same premises
- 1.3. The eligible consumers are allowed to set up solar rooftop projects capacity of minimum 1 KW upto maximum of 500 KW with/without battery back-up support.
- 1.4. The feed-in - tariff for the power generated from the Solar Power Plant will be decided by the JERC.
- 1.5. The Ministry of New and Renewable Energy (MNRE) GOI is providing Central Financial Assistance (CFA) up to 30% of benchmark cost for all types of residential buildings for General categories states and up to 70% for North Eastern states. Similar CFA is also available for schools, health institutions including municipal colleges and hospitals, universities educational institutions and other social sectors such as welfare homes, NGOs, training institutions, orphanages, etc.
Besides , MNRE also provides achievement linked CFA for Govt./PSU buildings, Govt. institutions, private / commercial / industrial buildings.
- 1.6. Metering System: All the equipment to be installed like solar PV panels, inverters, synchronizers, MPPT, batteries, transformers, cables, junction boxes, etc. shall be as per specified Indian / IEC standards. MSPDCL shall install / seal tested bidirectional (export / import) or separate export and import energy meters for all solar PV projects. The same could be purchased by plant owner or provided by MSPDCL at pre-notified rates. The meters should be as per CEA and BIS specifications only
- 1.7. The Policy allows solar installation owned by consumer as well as Solar installations owned, operated and maintained by third party.

2 Hon’ble JERC order dated 02.11.2016 for determination of tariff for grid interactive rooftop solar plants in Manipur

2.1. The Commission in response to a petition filed by MANIREDA for determination of tariff for Solar Rooftop and Small Solar Power Plants in Manipur state issued tariff order on 02.11.2016 specifying the Levelled tariff (feed-in-tariff) for solar roof top projects of different capacities ranging from 1 KW up to 1 MW with and without subsidy as provided in following table;

Table 1: Levelled tariff for rooftop solar projects specified by the Commission

Sl. No.	Category	Unit	1 kW to 8 kW	Above 8 kW to 50 kW	Above 50 kW to 150 kW	Above 150 kW to 500 kW	Above 500 kW to 1 MW
1	Without Subsidy	Rs./kWh	9.39	9.11	8.77	8.53	8.15
2	With 70% Subsidy	Rs./kWh	5.35	5.21	5.04	4.92	4.73
3	With 30% Subsidy	Rs./kWh	7.66	7.44	7.17	6.99	6.68

2.2. **Capital Cost:** The Commission after studying the petitioner’s submission and the objections /suggestion received from the stakeholders during the public hearing had derived the capital cost for solar rooftop plants of different capacities based on own analysis of the capital cost. The capital cost benchmark approved by the Commission in tariff order dated 02.11.2016 are provided in following table

Table 2: Capital Cost benchmark specified in Tariff order dated 02.11.2016

SN	Plant Capacity	Capital cost (Rs/KW)
1	1 to 8 KW	82,500
2	Above 8 KW and upto 50 KW	79,600
3	Above 50 KW and upto 150 KW	76,100
4	Above 150 KW and upto 500 KW	73,700
5	Above 500 KW and upto 1000 KW	69,800

2.3. **Capacity Utilization Factor:** The Commission considered normative capacity utilization factor of 19% for entire state for tariff determination purpose

2.4. **Financial Parameters:** The Commission, while fixing the normative financial parameters for tariff determination purpose relied on the JERC (terms and conditions for determination of tariff from Renewable Energy sources) Regulations 2010 and 2014 as well as the CERC RE tariff Regulations in force. The financial parameters considered by the Commission are summarized in the table below:

Table 3: Normative Parameters considered by the Commission for Tariff determination

S no.	Parameter	Value	Unit
1.	Debt : Equity	70: 30	%
2.	Interest Rate on Debt	12.76	%
3.	Repayment Period	12	Years
4.	Depreciation - for first 12 years	5.83	%
	- for balance 13 years	1.54	
5.	Discount Rate	13.73	%
6.	O&M cost	1375	Rs/KW
7.	O&M Cost Escalation per annum	5.72%	%
8.	Return on Equity (1-10 years)	20	%
9.	Return on Equity (11-20 years)	24	%
10.	Interest on working capital	13.26	%
11.	Subsidy from MNRE	70	% of project cost

3 Hon'ble JERC order dated 02.11.2017 for determination of tariff for rooftop solar plants in Manipur

3.1. In response to a petition filed by Manipur State Distribution Company (MSPDCL) for revision of tariff on account of (i) consideration of subsidy on benchmark capital cost instead of project cost (ii) consideration of discount factor of 13.73% and (ii) re-computation of interest on loan, the Commission specified revised tariff order on 02.11.2017 specifying the tariff for rooftop solar plants in Manipur. The revised tariff specified by the Commission is given in table below:

Table 4: Revised tariff specified by the Commission vide order dated 02.11.2017

Sl. No.	Category	Unit	1 kW to 8 kW	Above 8 kW to 50 kW	Above 50 kW to 150 kW	Above 150 kW to 500 kW	Above 500 kW to 1 MW
1	Without Subsidy	Rs./kWh	9.39	9.11	8.77	8.53	8.15
2	With 70% Subsidy	Rs./kWh	3.73	3.65	3.55	3.48	3.36
3	With 30% Subsidy	Rs./kWh	6.97	6.77	6.53	6.36	6.10

- 3.2. Initially, the revised tariff determined by the Commission as given above was made applicable from the date of issue of original tariff order i.e. 02.11.2016. However, subsequently the JERC vide its corrigendum dated 16.05.2018, issue clarification that the revised tariff would become effective from 02.11.2017 i.e. the date of issue of revised tariff order.
- 3.3. It was made clear in the corrigendum that the revised tariff determined by the Commission shall remain in force till new solar rooftop tariff is determined by the Commission.
- 3.4. The Commission in the said order also clarified that fresh petition for feed-in-tariff for Rooftop Solar plant of different plant capacities shall require to be filed every year.

PETITIONER'S SUBMISSION FOR TARIFF DETERMINATION FOR FY 2018-19

4 Petitioner's Submission for determination of tariff for grid interactive Solar Rooftop and Small Solar Power Plants in Manipur state for FY 2018-19.

4.1 Approach for determination of Benchmark Capital Cost for FY 2018-19

- 4.1.1. The Commission in the previous tariff order dated 2.11.2016 acknowledged the petitioner's submission that the capital cost for MW scale solar PV projects cannot apportion to the kW-scale rooftop solar PV plants. The cost of inverters and other equipment in kW scale solar plants is found to be on higher side than the utility scale solar projects. The Commission has also recognized the fact that Manipur is situated at difficult terrain and therefore the transportation cost in Manipur is significantly higher than the national average cost and such cost accounts for 10 to 15 % of the hardware cost.
- 4.1.2. The petitioner in the previous petition, projected component wise capital cost for PV module and balance of system. The Commission also, while fixing the benchmark capital cost in the previous tariff order analysed the component of the capital cost, like the cost of PV modules, invertors, mounting structures, balance of system etc. and approved the capital cost benchmark cost.
- 4.1.3. The petitioner in the present petition for determination of tariff for FY 2018-19 prefer to examine the reduction in the capital cost for rooftop and small solar plants over FY 2016-17 to FY 2018-19 (Q 2) mainly due to decline of the PV module cost in the international market. It has been noted that the cost of Non-Module component/ balance of system is not changed substantially and remain more or less same as approved by the Commission in 02.11.2016 tariff order.
- 4.1.4. The petitioner has examined the PV module cost trends for rooftop and small solar plants during FY 2016-17 to FY 2018-19 under (i) Market Approach (ii) Tender / Competitive bidding approach and compared results with the Benchmark Capital cost for rooftop solar plant specified by MNRE for FY 2018-19. The petitioner in the subsequent paragraph present the analysis of Capital cost in different approaches as mentioned above for three categories of rooftop solar PV and small solar plants viz. 1-10 kWp, > 10kWp to 100 kWp and >100kWp to 500 kWp.

i. **Market Approach:** Under the market Approach the petitioner analyses the PV module prices and cost trends provided in the leading solar market report /journals available on the internet, which are being referred by the SERCs while deriving for the capital cost benchmark for solar PV plants in India.

(A) MERCOM Capital Group

The Market Intelligence Report (Solar) for Q3 2018 dated 29 October 2018 reports the technology-wise PV module prices in September 2018 with changes over the previous month.

Table 5: PV module prices (€/Wp) in September 2018 reported by MERCOM

Overview of the Price Points in September 2018, by Technology, with Changes Over the Previous Month				
Module Class	Price (€/Wp)	Trend Since September 2018	Trend Since January 2018	Description
High Efficiency	0.35	-2.80 ↓	-27.10 ↓	Crystalline modules, 285 W and above with PERC, HIT, N-type, or back - contact cells or a combination thereof
All Black	0.36	-2.70 ↓	-23.40 ↓	Module types with black back sheets, black frames and a rated power between 200 W and 320 W
Mainstream	0.27	-6.90 ↓	-27.00 ↓	Modules typically with 60 cells, standard aluminum frame, white back sheet and 260-280 W, represents the majority of the modules in the market
Low Cost	0.2	-4.80 ↓	-23.10 ↓	Factory seconds, insolvency goods, used or low - output modules (Crysatline), products with limited or no warranty

Source: pvXchange

Mercom Capital Group

Above table shows the technology - wise PV module cost and its trend from January 2018. It has been noticed that the PV module cost is in declining mode since Jan 2018. The petitioner has considered the Mainstream module class which represent the majority of modules in the market for arriving at the cost of PV module during FY 2018-19. The cost of Mainstream module class is equal to 0.27 € /Wp ~ INR 22,600 /kWp (conversion rate 1€ =INR83.04). By considering PV module cost of Rs 22,600/kWp and assuming the cost of Non- module component (invertor, mounting structure, balance of system), transportation and insurance as approved by the commission in the previous tariff order dated 2.11.2016, the petitioner has worked out the Capital cost for rooftop solar and small solar plant for FY 2018-19 as given below:

Table 6: Capital cost for Rooftop and small solar plant as per Market report (MERCOT)

Particulars	1-10KW	10-100 KW	100-1000 KW
Solar Module	24481.77	23540.16	22600
Inverters	10000	8500	7000
Mounting structure	6000	5500	4500
Balance of system	6000	6000	6000
Installation	5000	5000	5000
Transportation at 15%	6972.265	6531.024	6015
Contingency (3%)	1394.453	1306.2048	1203
*Taxes at 5%	2324.088	2177.008	2005
TOTAL	62172.57	58554.39	54323

*Assumption : the developer /installer shall execute the project on turnkey basis

(B) PV insights

The website PV Insights (pvinsights.com) report the latest solar PV weekly price for PV modules. The market PV module price reported by PV Insights as on 30.10.2018 are provided in the table below:

Table 7: PV module spot prices (€/Wp) in October 2018 by PV insight

Solar PV Module Weekly Spot Price						
Item	High	Low	Average	AvgChg	AvgChg %	
Poly Solar Module	0.330	0.200	0.224	↓ -0.002	↓ -0.88%	
Poly Module in China	0.260	0.200	0.212	↓ -0.002	↓ -0.93%	
Poly High Eff / PERC Module	0.370	0.220	0.256	↓ -0.002	↓ -0.78%	
Mono High Eff / PERC Module	0.420	0.240	0.273	↓ -0.003	↓ -1.09%	
Mono High Eff / PERC Module in China	0.270	0.240	0.251	↓ -0.001	↓ -0.4%	
ThinFilm Solar Module	0.350	0.220	0.247	↓ -0.003	↓ -1.2%	

The petitioner has considered the cost of poly silicon Module for arriving the cost of PV module during FY 2018-19. PV module cost equal to 0.33\$ /Wp ~ INR 24,240 /kWp (conversion rate 1 \$ = 73.46 INR). By keeping the non PV module cost unchanged (as

approved by the Commission in previous order) the capital cost for rooftop solar and small solar plant can be projected as given below:

Table 8: Capital cost for Rooftop and small solar plant as per Market report (PV insight)

Particulars	1-10KW	10-100 KW	100-1000 KW
Solar Module	26258.32	25248.384	24240
Inverters	10000	8500	7000
Mounting structure	6000	5500	4500
Balance of system	6000	6000	6000
Installation	5000	5000	5000
Transportation at 15%	7238.748	6787.2576	6261
Contingency (3%)	1447.75	1357.45152	1252.2
*Taxes at 5%	2412.91	2262.41	2087
TOTAL	64357.73	60655.51	56340.20

*Assumption : the developer /installer shall execute the project on turnkey basis

ii. Capital cost discovered through tender/bidding route.

(A) MANIREDA EoI for empanelment of firms for rooftop solar plant implementation in phase III (FY 2018-19): MANIREDA has invited Expression of Interest for empanelment of firms for implementation of grid connected rooftop solar power plants in Manipur during FY 2018-19 (third phase) vide EoI No 5/SPP/RT/MANIREDA/2018-19 dated 09.08.2018. Subsequently, vide notice dated 09.10.2018, MANIREDA approved the rates for different capacities of roof top solar projects to be installed in Manipur during FY 2018-19 as given below :

Table 9: Capital Cost specified by MANIREDA for Solar Roof Top projects for FY2018-19

1-10 KW	>10 KW-100 KW	>100-500 KW
Rs 60,000/KWp	Rs 55,000/kWp	Rs 53,000/kWp

Total firms were qualified for implementation of rooftop solar power plants in during FY 2018-19 . The empaneled developers /installers have agreed for supply, erection, testing, commissioning including warrantee and 5 years' operation, maintenance for grid connected solar rooftop power projects in the state within the Cost specified in Table no. 9 above.

iii. MNRE Cost Benchmark for rooftop solar PV plant for FY 2018-19

The Ministry of New and Renewable Energy (MNRE) vide circular No. 318/38/2018-GCRT Date: 15 June 2018 specified the Benchmark costs for Off-grid Solar PV Systems and Grid Connected Rooftop Solar Power Plants for the Year 2018-19. The rates recommended by MNRE for grid connected rooftop solar plant are provided in table below:

Table 10: MNRE Benchmark cost for Grid connected rooftop solar Power plant for FY 2018-19

Above 1kW to 10 kW	Above 10kW up to 100 kW	Above 100 kW up to 1000 kW
Rs 60,000 /kWp	Rs 55,000 / kWp	Rs 53,000 /kWp

iv. Conclusion of the Analysis

The capital cost for rooftop solar power plant discovered in (i) Market approach (ii) Bidding /tender approach and (iii) MNRE benchmark capital cost for FY 2018-19 is presented in the following table:

Table 11: Capital cost for rooftop solar power plant for FY 2018-19

SN	Particulars	Rooftop solar plant Capacity		
		1-10 kW (Rs/kWp)	>10kW-100kW (Rs/kWp)	>100-500kW (Rs/kWp)
1	Market Approach (FY 2018-19)	63,265	59,600	55,300
2	MNRE bench mark (FY 2018-19)	60,000	55,000	53,000
3	MANIREDA EoI (FY 2018-19)	60,000	55,000	53,000

The above analysis shows that there is no substantial difference in the capital cost determined under market approach and MNRE benchmark cost specified for FY 2018-19, Moreover, the developer/installers have agreed to execute the solar rooftop projects as per the rates specified by MANIREDA /MNRE during phase III (FY 2018-19). The petitioner, therefore, feel it

appropriate to propose the benchmark cost as specified by MNRE for FY 2018-19 for tariff determination purpose.

Table 12: Capital cost for rooftop solar power plant proposed for FY 2018-19

SN	Particulars	Rooftop solar plant Capacity		
		1-10 kW (Rs/kWp)	>10kW-100kW (Rs/kWp)	>100-500kW (Rs/kWp)
1	Benchmark Cost (FY 2018-19)	60,000	55,000	53,000

4.2. Normative Capacity Utilization Factor

Capacity Utilization factor (CUF) represents important parameter that influence the economics of the solar roof top projects. Most of the State Electricity Regulatory Commissions, as well as the CERC has adopted a normative capacity utilization factor of 19% for tariff determination purpose. The Hon'ble JERC in the previous tariff order dated 2.11.2016 has also considered the normative CUF of 19% for tariff determination purpose.

In this context, the petitioner would like to submit following facts for kind consideration of the Commission

- i. The Solar Irradiance and number of sunny days as well as sunshine hours in a year are low in North East states especially in Manipur compare to rest part of India.
- ii. Frequent fluctuation in grid voltage/ unscheduled cut in most of the part of the state result in frequent interruption in inverter operation affecting the injection of electricity from rooftop solar plant into the grid. The inverter cannot operate when grid voltage and frequency is not within its threshold design limit
- iii. The accumulation of dust on the solar panel shall also affect the generation.

To arrive at the reasonable normative CUF for tariff determination, the petitioner has therefore analyzed the actual generation data of the grid connected roof top projects operational in the state of Manipur from last two years. Following methodology is adopted by the petitioner for arriving at normative CUF for tariff determination purpose for FY 2018-19.

Table 13: Methodology for calculation of normative CUF for tariff determination purpose.

1	Total number of rooftop solar plants operational in the state	106 Nos
2	Solar rooftop plants which have completed minimum 12 months of operation	42 Nos
3	Average CUF of the 42 numbers of operational solar rooftop plants	12.62%

Table 14: Analysis of actual electricity generation and CUF for operational solar rooftop plants as per MANIREDA records.

S l	Name	District	Applica nt Type	Capa city (Kw)	Date of Comple tion	Generatio n Data since commissi oning (kWh)	Date of Collect ion of Data	No. of Days	CUF
1	THOKCHOM JOTIN SINGH	Imphal East	Domesti c	5	12/6/2016	9188	17/10/2018	680	11.26
2	ORIENTAL VISION	Imphal West	Commer cial	20	12/28/2016	46470	19/10/2018	660	14.67
3	NGANGBAM ROBEN SINGH	Imphal West	Domesti c	5	2/7/2017	9005	17/10/2018	617	12.16
4	IMPHAL COLLEGE	Imphal West	Institutio ns	10	3/1/2017	15239	18/10/2018	596	10.65
5	SAGOLSHEM RANJEET	Imphal East	Domesti c	5	3/31/2017	8677	13/10/2018	561	12.89
6	THINGUJAM	Imphal West	Domesti c	5	4/7/2017	8841	17/10/2018	558	13.20
7	KEISHAM ROMABATI DEVI	Imphal West	Domesti c	5	4/13/2017	9593	13/10/2018	548	14.59
8	LOUREMBAM MANGLEM	Imphal East	Domesti c	3	4/28/2017	5462	19/10/2018	539	14.07
9	OKRAM EDDIESON	Imphal West	Domesti c	10	5/2/2017	13661	13/10/2018	529	10.76
10	SANABAM DHANABIR	Imphal East	Domesti c	2	5/9/2017	3365	14/10/2018	523	13.40
11	THOUDAM TILAK RAJ	Imphal East	Domesti c	2	5/20/2017	2621	19/10/2018	517	10.56
12	SANASAM NEPOLIAN	Thoubal	Domesti c	2	5/27/2017	3564	18/10/2018	509	14.59
13	THANGJAM SATISHKUMAR	Imphal West	Domesti c	4	5/29/2017	7111	19/10/2018	508	14.58

14	CHANDRAMANI	Imphal West	Domestic	3	6/3/2017	4231	16/10/2018	500	11.75
15	MOIRANGTHEM KULAJIT	Imphal East	Domestic	3	6/4/2017	4489	14/10/2018	497	12.54
16	SURESH KUMAR JAIN	Imphal West	Domestic	10	6/13/2017	14390	16/10/2018	490	12.24
17	THE UTLOU JOINT	Bishnupur	Institutions	5	7/5/2017	6647	18/10/2018	470	11.79
18	MAISNAM JADUMANI	Imphal West	Domestic	6	7/6/2017	8599	12/10/2018	463	12.90
19	WAIKHOM PARESH SINGH	Imphal West	Domestic	4	7/7/2017	4770	05/07/2018	363	13.69
20	ANGOM JADHOV SINGH	Imphal West	Domestic	2	7/10/2017	2184	10/07/2018	365	12.47
21	KHUNDRAKPAM MOHORI	Imphal East	Domestic	4	7/10/2017	5907	09/09/2018	426	14.44
22	ATHOKPAM RAJIV	Imphal West	Domestic	6	7/11/2017	9278	12/10/2018	458	14.07
23	LANGPOKLAKPAM	Imphal West	Domestic	20	7/28/2017	27559	06/10/2018	435	13.20
24	GINSUANHAU	Churachandpur	Domestic	5	7/28/2017	4556	18/10/2018	447	8.49
25	LOYOLA SCHOOL	Bishnupur	Institutions	7	8/1/2017	9500	18/10/2018	443	12.76
26	SARANGTHEM DEVESWAR	Imphal East	Domestic	3	8/3/2017	3348	03/08/2018	365	12.74
27	KHOIROM RABITA DEVI	Imphal West	Domestic	5	8/3/2017	5248	05/10/2018	428	10.22
28	SERAM RAMANANDA	Imphal West	Domestic	5	8/3/2017	6226	05/10/2018	428	12.12
29	THINGBAIJAM	Imphal East	Domestic	2	8/15/2017	2809	17/10/2018	428	13.67
30	KSHETRIMAYUM	Imphal East	Domestic	2	8/18/2017	2293	18/08/2018	365	13.09
31	ARIBAM GOPAL SHARMA	Imphal East	Domestic	3	8/22/2017	4216	14/10/2018	418	14.01
32	NAMOIJAM RAJEN SINGH	Imphal West	Domestic	2	8/22/2017	3068	18/10/2018	422	15.15
33	NAMOIJAM TOMBA SINGH	Imphal West	Domestic	2	8/22/2017	3109	18/10/2018	422	15.35
34	LOITONGBAM KESHO	Imphal West	Domestic	5	8/23/2017	4980	22/08/2018	364	11.40
35	YOUTH GUIDANCE CLUB	Imphal East	Institutions/C	5	9/5/2017	6380	04/10/2018	394	13.49
36	MOIRANGTHEM DEEPAK	Imphal West	Domestic	5	9/8/2017	4435	05/10/2018	392	9.43
37	VICTORIA YENGHOM	Imphal East	Domestic	3	9/12/2017	3876	11/09/2018	364	14.79
38	LAISHRAM CHURCHIL	Imphal West	Domestic	2	9/13/2017	1965	17/10/2018	399	10.26
39	KHANGEMBAM JOHN	Imphal West	Domestic	5	9/14/2017	4124	14/09/2018	365	9.42

40	THE ARUNA ACADEMY OF	Imphal West	Institutions	5	9/14/2017	4100	14/10/2018	395	8.65
41	BRIGHTER ACADEMY	Imphal West	Institutions	8	9/15/2017	9730	16/10/2018	396	12.80
42	JIVAN HOSPITAL	Thoubal	Hospital	36	9/15/2017	52300	18/10/2018	398	15.21
								Average CUF	12.62

Based on above analysis the petitioner proposes normative CUF of 12.62% for determination of tariff for rooftop solar projects during FY 2018-19.

4.3. Financial Components proposed for tariff determination

- i. **Debt: Equity ratio:** As specified in JERC (terms and conditions for determination RE tariff) Regulations 2010, the petitioner has considered Debt: Equity ratio as 70:30.
- ii. **Loan Tenure:** The loan repayment period of 12 years is considered in line with the JERC (terms and conditions for determination RE tariff) first amendment, Regulations 2014.
- iii. **Interest on debt:** As specified in JERC (terms and conditions for determination RE tariff) first amendment, Regulations 2014, the petitioner has considered interest on debt as 300 basis points above the average SBI base rate prevalent during first six months of the previous year. It is coming as 11% per annum.
- iv. **Working capital and interest on working capital:** The petitioner has computed the working capital in accordance with the JERC (terms and conditions for determination RE tariff) Regulations 2010 comprising of (a) operation and maintenance cost for one month, (b) receivables equivalent to 2 months of net energy charges for the sale of electricity calculated on the normative CUF and (c) Maintenance spares @15% of operation and maintenance expenses. The JERC first amendment, Regulations 2014 allows interest on working capital as average SBI base rate prevalent during first six months plus 350 basis point. Accordingly, the petitioner has considered interest on working capital as 11.50 % per annum.

- v. **Return on equity:** JERC (terms and conditions for determination RE tariff) first amendment, Regulations 2014 allows 20% RoE for the first 10 years and 24% RoE 11th year onwards. The petitioner has considered the same.
- vi. **Life of plant and machinery:** As specified under clause 2 of JERC (terms and conditions for determination RE tariff) first amendment, Regulations 2014, the petitioner has considered 25 years as the useful life of the plant and machinery.
- vii. **Depreciation:** In line with JERC (terms and conditions for determination RE tariff) first amendment, Regulations 2014 the depreciation is computed at the rate of 5.83% per annum for the first 12 years of Tariff period and the remaining depreciation amount is spread over the remaining useful life of the project.
- viii. **Operation and maintenance:** The clause 11 of JERC (terms and conditions for determination RE tariff) first amendment, Regulations 2014 allows to escalate the O&M expenses of base year @ 5.72% per year. Accordingly, the petitioner has escalated the O&M cost approved by the Commission in previous tariff order dated 2.11.2016 by 5.72% and thus consider Rs 1454 /kW as O&M expense for determination of tariff during FY 2018-19.
- ix. **Discount Factor:** CERC (terms and conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012 has recommended post tax weighted average cost of capital (WACC) as discount rate for determination of Levellised tariff. JERC in previous tariff order 02.11.2016 has consider WACC as the addition of cost of debt and cost of equity. The cost of debt is calculated based on normative interest rate, while the cost of the equity is calculated based on the return on equity. Accordingly, the petitioner has considered the discount factor 12.50% to calculate the Levellized tariff.
- x. **Subsidy:** The petitioner has computed the tariff with and without subsidy. As per MNRE notification dated 4th March 2016, for north eastern state the subsidy benefit to an extent of 70% of benchmark capital cost is available for grid connected rooftop solar projects in residential, institutional and social sector.

In addition, as per MNRE circular no 03/88/2015-16 / GCRT dated 30.03.2017 achievement link incentive is available for government buildings in the following manner

The maximum incentive available if achievement is 80% and above	60% of benchmark cost or cost arrived through competitive bidding process whichever is lower
Achievement is below 80% and above 50% (including 50%)	36%
Achievement is below 50% and above 40% (including 40%)	24%

The petitioner has considered above possible cases and propose tariff

- i. Considering with and without 70% subsidy –consumers in residential, institutional and social sector
- ii. Considering 60%, 36% and 24% subsidy available for government buildings /institutions.
The Commission may approve the same

4.4 Input Parameters and Tariff computation for rooftop solar and small solar plant

The Technical and Financial parameters for computation of Tariff for FY 2018-19 is as follows:

Table 15: Technical Parameters (for 1-10kW)

No	Technical Parameters	Value	Unit
1	Capacity of the Power Project.	1-10 kW	kW
2	Capacity Utilization Factor (For the first year)	12.62%	%
3	Capacity Utilization Factor (From second year onwards)	12.62%	%
4	Annual Gross Generation (For the first year)	1105.51	kWh/kW
5	Annual Gross Generation (From second year onwards)	1105.51	kWh/kW
6	Auxiliary consumption	0.00%	%

7	Annual Net Generation (For the first year)	1105.51	kWh/kW
8	Annual Net Generation (From second year onwards)	1105.51	kWh/kW
9	Annual Deration (5 th Year Onwards)	0.50%	%
10	Life of Plant and Machinery / Project Life	25	years

Table 16: Financial Parameters (for 1-10kW)

No	Financial Parameters	Value	Unit
1	Capital Cost of Power Project	60.00	Rs Thousand
2	Non - Depreciable Amount / Salvage value	10.00%	% of Capital Cost
3	Depreciable Amount (Cap Cost Less non-depreciable Cost)	54.00	Rs Thousand
4	Debt Fraction	70.00%	%
5	Debt	42.00	Rs Thousand
6	Equity	18.00	Rs Thousand
7	TOTAL (Debt+Equity)	60.00	Rs Thousand
8	Interest Rate on Term Loan	11.00%	%
9	Repayment Period	12	years
10	Moratorium Period	0	years
11	Term loan period for principal payment	12	years
12	Depreciation for First 10 years(Straight Line Method)	5.83%	% p.a.
13	Depreciation for Next 15 years(Straight Line Method)	1.54%	% p.a.
14	Discount Rate	12.50%	%
15	O&M cost	1.454	Rs. Thousand
16	O&M Cost Escalation	5.72%	% p.a.
17	Insurance Cost	0.00%	%
18	Return on Equity (1-10 years)	20.00%	%

19	Return on Equity (11-20 years)	24.00%	%
20	Minimum Alternative Tax (First 10 years)	21.340%	%
21	Corporate Tax (Last 10 years)	34.61%	%
22	Interest on working capital	11.50%	%
23	MNRE Subsidy / CFA	70%, 60%,36%,24%	% of capital cost

Table 17: Technical Parameters (for >10kW-100kW)

No	Technical Parameters	Value	Unit
1	Capacity of the Power Project.	>10 kW-100kW	kW
2	Capacity Utilization Factor (For the first year)	12.62%	%
3	Capacity Utilization Factor (From second year onwards)	12.62%	%
4	Annual Gross Generation (For the first year)	1105.51	kWh/kW
5	Annual Gross Generation (From second year onwards)	1105.51	kWh/kW
6	Auxiliary consumption	0.00%	%
7	Annual Net Generation (For the first year)	1105.51	kWh/kW
8	Annual Net Generation (From second year onwards)	1105.51	kWh/kW
9	Annual Deration (5 th Year Onwards)	0.50%	%
10	Life of Plant and Machinery / Project Life	25	years

Table 18: Financial Parameters (for >10kW-100kW)

No	Financial Parameters	Value	Unit
1	Capital Cost of Power Project	56.00	Rs Thousand
2	Non - Depreciable Amount / Salvage value	10.00%	% of Capital Cost

3	Depreciable Amount (Cap Cost Less non-depreciable Cost)	50.40	Rs Thousand
4	Debt Fraction	70.00%	%
5	Debt	39.20	Rs Thousand
6	Equity	16.80	Rs Thousand
7	TOTAL (Debt+Equity)	56.00	Rs Thousand
8	Interest Rate on Term Loan	11.00%	%
9	Repayment Period	12	years
10	Moratorium Period	0	years
11	Term loan period for principal payment	12	years
12	Depreciation for First 10 years(Straight Line Method)	5.83%	% p.a.
13	Depreciation for Next 15 years(Straight Line Method)	1.54%	% p.a.
14	Discount Rate	12.50%	%
15	O&M cost	1.454	Rs. Thousand
16	O&M Cost Escalation	5.72%	% p.a.
17	Insurance Cost	0.00%	%
18	Return on Equity (1-10 years)	20.00%	%
19	Return on Equity (11-20 years)	24.00%	%
20	Minimum Alternative Tax (First 10 years)	21.340%	%
21	Corporate Tax (Last 10 years)	34.61%	%
22	Interest on working capital	11.50%	%
23	MNRE Subsidy / CFA	70%, 60%,36%,24%	% of capital cost

Table 19: Technical Parameters (for >100kW-500 kW)

No	Technical Parameters	Value	Unit
1	Capacity of the Power Project.	>100 kW-500kW	kW
2	Capacity Utilization Factor (For the first year)	12.62%	%

3	Capacity Utilization Factor (From second year onwards)	12.62%	%
4	Annual Gross Generation (For the first year)	1105.51	kWh/kW
5	Annual Gross Generation (From second year onwards)	1105.51	kWh/kW
6	Auxiliary consumption	0.00%	%
7	Annual Net Generation (For the first year)	1105.51	kWh/kW
8	Annual Net Generation (From second year onwards)	1105.51	kWh/kW
9	Annual Deration (5 th Year Onwards)	0.50%	%
10	Life of Plant and Machinery / Project Life	25	years

Table 20: Financial Parameters (for >100kW-500 kW)

No	Financial Parameters	Value	Unit
1	Capital Cost of Power Project	53.00	Rs Thousand
2	Non - Depreciable Amount / Salvage value	10.00%	% of Capital Cost
3	Depreciable Amount (Cap Cost Less non-depreciable Cost)	47.7	Rs Thousand
4	Debt Fraction	70.00%	%
5	Debt	37.10	Rs Thousand
6	Equity	15.90	Rs Thousand
7	TOTAL (Debt+Equity)	53.00	Rs Thousand
8	Interest Rate on Term Loan	11.00%	%
9	Repayment Period	12	years
10	Moratorium Period	0	years
11	Term loan period for principal payment	12	years
12	Depreciation for First 10 years(Straight Line Method)	5.83%	% p.a.
13	Depreciation for Next 15 years(Straight Line Method)	1.54%	% p.a.

14	Discount Rate	12.50%	%
15	O&M cost	1.454	Rs. Thousand
16	O&M Cost Escalation	5.72%	% p.a.
17	Insurance Cost	0.00%	%
18	Return on Equity (1-10 years)	20.00%	%
19	Return on Equity (11-20 years)	24.00%	%
20	Minimum Alternative Tax (First 10 years)	21.340%	%
21	Corporate Tax (Last 10 years)	34.61%	%
22	Interest on working capital	11.50%	%
23	MNRE Subsidy / CFA	70%, 60%,36%,24%	% of capital cost

4.5 . Proposed Tariff for different capacity range for grid interactive solar rooftop and small solar power plant in Manipur for FY 2018-19

Table 21: Proposed Tariff for Solar rooftop projects during FY 2018-19

Sr No	Particulars	Solar Rooftop project capacities		
		1-10 kW	>10-100kW	>100-500 kW
1	Capital cost /kW	60,000	55,000	53,000
2	Normative CUF	12.62%	12.62%	12.62%
3	Levelized Tariff (Rs/kWh) (without subsidy)	9.94	9.23	8.95
Levelized Tariff for Residential, institutional and Social sector (Rs/kWh)				
4	70% subsidy	4.02	3.80	3.72
Levelized Tariff for Government Institutions (Rs/kWh)- based on achievement				
5	60% subsidy	4.86	4.58	4.47
6	36% subsidy	6.89	6.44	6.26
7	24% subsidy	7.91	7.37	7.16

PRAYER

The petitioner respectfully requests the Hon'ble Commission to:

1. Admit this petition for determination of tariff for grid interactive rooftop solar and small scale solar plant for FY 2018-19.

2. It is further requested that the Hon'ble Commission shall determine feed-in-tariff for rooftop solar and small scale solar plants of size from 1kW to 10kW, > 10kW -100 kW, > 100kW to 500 kW for FY 2018-19 as per cost-plus methodology as proposed in the Table 21 of this petition.
3. Condone any inadvertent omission/errors/short comings and permit the petitioner to add/change/modify/alter this filing and make future submissions as may be required at a future date.