Manipur Renewable Energy Development Agency
(MANIREDA),

An autonomous Govt. Agency under the Deptt.of Power, Manipur,
2nd Floor, South Block, Secured Office Complex, Near 2nd M.R Gate,
Imphal –Dimapur Road, Imphal – 795001, Manipur
Ph.:0385- 2421594, e-mail: manireda99@yahoo.com

Expression of Interest
EOI No.5/SPP/RT/MANIREDA/2018-19
10th August, 2018

For

Empanelment of Firms

For

Supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of grid interactive
rooftop solar PV power plant of various capacities in Manipur

EOI NO:5/SPP/RT/MANIREDA/2018-19

Particulars of Work

Eligible and prospective Bidders may quote their offers as per details mentioned below:

Particulars of work	Supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of grid interactive rooftop solar PV power plant of various capacities in the State of Manipur
Cost of bid document (Non-refundable)	Rs.1,500/- (Rupees One Thousand Five Hundred only in the form of DD favouring Director, MANIREDA) Bid submitted without cost of bid will be rejected.
Earnest Money Deposit	Rs. 3,00,000.00 (Rupees Three Lakh) only.
Period of Empanelment	One year
Date of commencement for Issue of bid documents	10-08-2018 (Bid document to be downloaded from www.manireda.com)
Pre-Bid discussion held on	28-07-2018 at 11.00 AM
Last date & time of submission of bids document	01-09-2018 upto 12.00 Noon (bid received after the due date/time will not be entertained)
Date & time of opening Technical bid - Part-I	01-09-2018 at 2.00 PM
Date & time of opening Financial bid - Part-II	Will inform to successful bidders in the Technical bid (Part-I)
Place of submission of bid documents and address for communication.	Manipur Renewable Energy Development Agency (MANIREDA) 2nd Floor, South Block, Secured Office Complex, Near 2nd M.R Gate, Imphal-Dimapur Road,

	Imphal – 795001, Manipur. E-mail: manireda99@yahoo.com

A. BACKGROUND

The Government of India launched the National Action Plan for Climate Change (NAPCC) in 2008 to promote ecologically sustainable growth while addressing India's energy security challenge. The Jawaharlal Nehru National Solar Mission (JNNSM) is one of the initiatives to mitigate emissions from fossil fuels in the energy sector by promoting solar power. The aim of the Mission is to focus on setting up an enabling environment for solar technology penetration in the country both at a centralized and decentralized level by way of focusing on promoting Off grid/ Grid Connected Solar Power Generation including hybrid systems to meet/supplement power, heating and cooling energy requirements. These systems still require interventions to bring down costs but the key challenge is to provide an enabling framework and support for entrepreneurs to develop markets. In order to create a sustained interest within the investor community, Ministry of New & Renewable Energy (MNRE), Govt of India has given the details of various promotional activities on the website of MNRE www.mnre.gov.in.

Under this scheme, individuals, residential/ Institutional/ Social Sectors /Govt. building owners are eligible to set up Solar Power Plant within the prescribed capacity limit of upto 500 kW at one site. Capital subsidy upto maximum 70% of the benchmark cost of the system as per the latest notification of MNRE or upto maximum 70% of the actual cost arrived through competitive bidding process, whichever is lower, is admissible from (MNRE), Government of India for all rooftops other than for industrial and commercial buildings and Government Buildings. The Ministry revised rate of CFA from time to time.

MANIREDA has been given a target of 50 MW Grid Interactive Rooftop solar power plants under this scheme by 2022 and 5MW for the current year 2018-19.

In order to provide technical assistance and determination of the competitive cost and fixation of CFA of the solar power project to be installed at various premises/organizations under the Manipur grid interactive rooftop solar PV power plant scheme, MANIREDA invites bids for empanelment of firms for supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of Grid Interactive Rooftop Solar Power Plants of capacities upto 500 kWp in the State of Manipur from the various Channel Partners of MNRE and New Enterpreneurs who have experience in the field.

B. Scope of Work :

Work for installation of rooftop grid connected solar power plants shall involve;

(i) Identification and motivation of prospective beneficiaries.

(ii) Obtaining no objection certificate (NOC) from concerned DISCOM for grid connectivity.

(iii) Supply, installation, commissioning and maintenance for 5 Years of roof top SPV grid connected Power Plant as per schedule given. Maintenance of Solar Photovoltaic Power Plant would include wear and tear, overhauling, machine breakdown, insurance, and replacement of defective modules, invertors / Power Conditioning Unit (PCU), Energy meters (for NET/GROSS connection), spares, consumables & other parts for a period of 5 years. Replacement of parts free of cost shall be against manufacturing defect only. Anti-theft Nut & Bolts must be used for fixing the PV modules.

(iv) Establishing "After sales service centres" in concerned area to cater the maintenance needs of beneficiaries.

(v) MANIREDA will empanel those firms who are successful in this empanelment process and wish to provide their services on the lowest quoted prices which are received under this offer.

(vi) The selected firms will have to execute the selected projects for which the sites can either be identified by the firms or on the sites allocated by MANIREDA under the Grid Interactive Roof top Solar Power Plants in accordance with technical specification and various other requirements as per latest directives / guidelines of MNRE under JNNSM. The various group of size / capacity of the grid interactive rooftop solar power plant shall be as under:

Sl. No	Group of sizes/Capacity	Location
1	1 to 4 KWp	Anywhere in the State of Manipur
2	Above 4 to 10 kWp	
3	Above 10 to 100 KWp	
6	Above 100 to 500 KWp	

(vii) The successful empanelled firms may approach the applicants registered by MANIREDA for receiving the orders on the rates approved by MANIREDA for Turnkey Execution of the Solar PV Plants. MANIREDA will not be responsible in case any empanelled firm does not get any work order from the registered applicants under the Grid Interactive Roof Top Solar PV Power Plants Scheme. The registered applicants under this scheme shall be free to install their projects by procuring components from any manufacturers subject to the condition that project shall have to be installed/commissioned as per the MNRE and MANIREDA guidelines.

(viii) The empanelled firms will supply, erect, test and commission the Solar Power Plant and shall make all necessary arrangement for evacuation and injection of power/surplus power to the MSPDCL grid at the interconnection point. The admissible CFA released by the MNRE, GoI shall be released to registered applicant after successful commissioning of the plant and verification of the plant by MANIREDA.

(ix) If any of the persons/technicians from the empanelled firms fails to heed to the suggestion and observation within stipulated time period and thus compromising the quality of workmanship, the applicable subsidy will be withheld till such shortcomings are rectified. Repeated failure may lead to eventual de-empanelled the firm from the channel partnership of MANIREDA.

C. SITE / PROJECT LOCATION

It may be noted that under "Grid Interactive Roof Top Solar PV Power Plant Scheme", projects of varying capacities shall be allotted. The project installation may differ from site to site. The following types may be considered:

- Flat Roof Top
- Inclined Roofs
- Any feasible elevated part of building

The bidders shall submit the price based on slanted tin roof with height upto G+2. Additional payments above quoted rates for other strcutures shall be admissible as per mutual understanding between the firm and promoter/beneficiary.

D. INFORMATION TO THE FIRM/BIDDER

1. Bid submission by the bidder.

1.1 Each bidder should submit financial bid based on **"Slanted Tin Roof with height upto G+2"** as per the annexed Format.

1.2 The firm/bidder should submit their offer in two separate sealed envelopes i.e.

Part-I TECHNICAL PARTICULARS
(along with the cost of the document and Earnest Money & complete EOI document duly signed on each page excluding financial offer) and

PART- II FINANCIAL OFFER BASED ON Slanted Tin ROOF(Height upto G+2)
Both these envelops should be put and sealed in another envelope addressed to
The Director,
Manipur Renewable Energy Development Agency (MANIREDA)
2nd Floor, South Block, Secured Office Complex, A.T.Line,
Near Imphal Hotel, Imphal – 795001,

subscribed with the following :-
a. EOI No. 5/SPP/RT/MANIREDA/2018-19
b. Offer for installation of Solar Power Plant under
"Grid Connected Rooftop Solar and Small Power Plant Scheme"
c. Name and address of the firm.

1.3 The technical particulars shall be opened on due date and time. The financial offer of only technically short listed proposals shall be opened. The date of opening of the financial offer shall be communicated to the technically successful firms/bidders.

2. Earnest Money/Security Amount:-

2.1 Earnest money deposit @ Rs.3.00 lakhs is required to be deposited along with the bid without which the bid will not be accepted. No interest will be payable for the EMD amount under any circumstances.

2.2 Earnest money can be deposited in the form of Bank Guarantee / FDR / Demand Draft in favour of Director, MANIREDA , from any Nationalised Bank payable at Imphal and the document as proof should be enclosed.

2.3 For successful bidder(s), EMD submitted shall be taken as SD/PGF as detailed at clause 2.6 below.

2.4 **EMD would be forfeited in case of non-compliance of the work order by the successful bidder / non-performance of the work after empanelment as approved Firm of MANIREDA/deviation & compromise in quality of materials installed from the laid down specification.**

2.5 In case of claim for exemption from deposition of Earnest money, sufficient proof in support of claim for exemption of EMD as prescribed in Govt. of India Notification is to be attached with the bid.

2.6 Security Deposit/ Performance Guarantee Fees: The successful bidder must deposit the Security amount / Performance Guarantee fees @ Rs.3.00 lakhs after selection as empanelment in the form of Bank Guarantees valid from the date of acceptance till the completion of empanelment period. The said deposit would be forfeited; if the supplies are not made as per the Terms & Conditions of the work order and this bid **or not a single work order is implemented during the empanelment period.** Security deposit & PGF amount will be refunded after the expiry of the empanelment period subject to satisfactory execution / performance of the systems.

2.7 The earnest money of all unsuccessful bidders shall be released soon after selection of selected bidder(s) without any interest against submission of their written intimation regarding acceptance of work and deposition of security deposit amount.

3. Pre-Bid Discussion & Authority of Person Signing the Documents

3.1 A Pre-Bid Meeting was held at the Office of Director, MANIREDA, on dated 28th July 2018 for fixing of the price as per their work experience in the region. Altogether, sixteen members with representatives of the firms were present in the discussion.

3.2 In the Pre-Bid discussion, the following points were discussed:

a) Rates to be quoted based only on **slanted Tin rooftops (height upto G+2) of the buildings within the capacity range of 1-4 kWp shall be not above Rs. 65,000/- per kWp**.

b) For plants above 4 kWp, the rates **should not be more than the benchmark** cost of MNRE,

c) All firms should follow implementation technical specification as per Annexure prepared based on MNRE's specification, and its changes from time to time .

d) Smooth and in-time implementation of the project, etc.

e) However, **for structure/height other than slanted Tin rooftops(G+2), the additional cost has to be borne by the promoter/beneficiary at the mutually agreed cost arrived between the firm and the promoter/beneficiary. It should be reflected in the work order issued by the promoter.**

f) **Cost of Net Meter shall be extra of the quoted rate** and it should be convinced to the promoter. **Solar meter(to record overall solar generation) is compulsory** and its rate must be **included in the price quotation.**

4. Selection of Bidder:-

MANIREDA shall empanel more than one qualified bidder who agreed to execute the work at the minimum discovered rates and selection of work executing firm shall be done by the promoter/beneficiary on their preference.

5. How to quote Price Bid:

(i) The firm shall quote how much %(percentage) can they give as concession/rebate/discount to the fixed maximum price of Rs 65,000/- per kWp for slanted Tin rooftop for height upto G+2.

(ii) Similarly, for plant above 4kWp as per group/capacity category given in para B(vi) above, how concession can they give to the maximum price of benchmark cost of MNRE.

(iii) Price to be quoted as per format prescribed in Annexure-VII.

6. Duration of Empanelment:-

The selected firms/bidders will be empanelled initially for **one year or till superceded by an order of MANIREDA consequent to changes in Central subsidy rate or other factors**. Empanelment period may be extended on the basis of performance of the firm.

7. Eligibility criteria

7.1 The Bidder may either be an MNRE empanelled Channel Partner (the copy of certificate/letter issued by MNRE to the firm in this regard should be enclosed for rooftop grid connected solar power plants) or New Entrepreneur who have experience in the field or Off-Grid solar installations.

7.2 No price and purchase preference will be available on these projects.

7.3 Should have average turnover of Rs. 50.00 lakhs or more during the last three years. **For New Entrepreneur, it may be relaxed if the experience of work is found to be satisfactory.**

7.4 Should have experience of successful commissioning of minimum aggregate of 30 kWp capacity grid interactive solar power plant during last three years. For experience, supportive documents are to be enclosed. For New Entrepreneur, experience shall also count in successful installation of solar systems like, Solar street light, Home,Light,Power pack, Solar Pump,Off-grid SPV Power Plant etc and aggregate minimum installed capacity may be 10kWp.

7.5 The channel partners should have/willing to open adequate field service setup to provide good after sale services including necessary repair and maintenance in the state of Manipur within a month after empanelment preferably in Imphal. The service centre should be located at customer friendly area with minimum infrastructural requirements, maintenance of adequate spares with competent and trained/ qualified technicians.

7.6 Attested copies of valid Test Certificates & supporting documents of components of Solar PV Power Plant as specified and required in the Technical-Bid of this tender document should be submitted alongwith the bid.

7.7 The firms should fulfil all requirements as per provisions under JNNSM, MNRE, GOI.

7.8 All the components including power plant, software's and other components mentioned should be quoted as a single item. No partial quotes are accepted. For all the equipment the bidder should have an authorisation certificate from OEM(Original Equipment Manufacturer) or through its authorised dealers.

7.9 Valid GST registration certificate and GST Return Challan(Latest)

The above stated requirements are compulsory to be fulfilled by the tenderer and MANIREDA may also ask for any additional information as may be deemed necessary in public interest.

8. Target for Installation:

8.1. All the firms will be alloted a maximum target of 300kWp for installation within 31/03/2019.
8.2. New enterpreneurs/firms will be alloted a maximum target of 100kW within 31/03/2019.
8.3. The firm has to take approval of MANIREDA if Additional target is required and it would be given based on performance and capability.

9. Payments Terms :-

Empanelled firms will have to receive orders from the purchaser (registered with MANIREDA) on the rates not higher than the approved rate by MANIREDA and will get payments for **subsidy component** as under:-

9.1.70% amount of the applicable Central subsidy shall be paid to the purchaser after successful installation, commissioning of the Solar PV Power Plant and injection of surplus power (if any) into the MSPDCL grid confirming to technical specification as specified in this EoI and verification by MANIREDA, on submission of Application for payment with Invoice subject to release of applicable CFA by MNRE, GoI. In turn the beneficiary has to pay the same amount to the firm as soon as possible.

9.2. 30% amount of the applicable Central Subsidy shall be paid to the purchaser after 3 months from the date of installation and commissioning of Solar PV Power Plant at site subject to successfully passing the performance ratio test and release of CFA by MNRE, GoI.

9.3.Tax clearance certificates of the firm should be produced as and when insisted by MANIREDA.

For beneficiary component/share, it is left to the mutually agreed terms & condition between the promoter & Firm. The bidder shall have to submit annual performance & functionality report to Purchaser and MANIREDA for the release of annual payments. The beneficiary has to hold 5% of the work order value for payment of MPWC on yearly basis(1%) for 5years.

10. Bid evaluation:

10.1 The evaluation process comprises of the following steps:

Step I - Evaluation check of Bid as per the eligibility criteria
Step II – Evaluation of Technical Bid
Step III - Evaluation of Price Bid
Step IV - Selection of Bidders(s) for empanelment

10.2 **Responsiveness check of technical bid**

The evaluation check of Bid submitted by Bidders shall be scrutinized to establish responsiveness to the requirements laid down in the EoI.

a. Bids that are incomplete, i.e. not accompanied by any of the applicable formats inter alia covering letter, power of attorney, format for disclosure, valid Bid Bond etc.;
b. Bid not signed by Bidder in the manner indicated in this EoI;

c. Material inconsistencies in the information /documents submitted by the Bidder, affecting the Eligibility Criteria;
d. Information not submitted in the formats specified in this EOI;
e. Bid being conditional in nature;
f. Bid not received by the Bid deadline;
g. Bid having Conflict of Interest;
h. Bidder delaying in submission of additional information or clarifications sought by MANIREDA as applicable;
i. Bidder makes any misrepresentation.

Each Bid shall be checked for compliance with the submission requirements set forth in this EoI before the evaluation of Bidder's fulfilment of Eligibility Criteria is taken up.

10.3 **Evaluation of bidder's fulfilment of eligibility criteria**

Evaluation of Bidder's eligibility will be carried out based on the information furnished by the Bidder as per the prescribed Formats and related documentary evidence in support of meeting the Eligibility Criteria. Non-availability of information and related documentary evidence for the satisfaction of Eligibility Criteria may cause the Bid to be non-responsive.

10.4 **Evaluation of Technical Bid**

Detailed Technical evaluation criteria:

a) The Bids shall be evaluated on the basis of the application and the supporting documents submitted by them.
b) The evaluation would be Quality and Cost based. The Technical Proposal would be evaluated first and points would be allotted to each of the bidders as follows:

Note: - Documents to be submitted in support of the above Criteria:-

1. Documentary Proof regarding being empanelled in MNRE as Empanelled Channel Partner or New Entrepreneur having experience in the field including off-grid.
2. For Experience of Projects installed & commissioned, a copy of the Completion certificate issued by the beneficiary should be enclosed.
3. CA certificate on letter head of CA regarding Average Turnover for last three years.
4. Copy of registration in Manipur- if applicable.

10.5 **Evaluation of price bid**

i) Price Bid (Envelope II) of the Qualified Bidders shall be opened in presence of the representatives of such Qualified Bidders, who wish to be present, on a date as may be intimated by MANIREDA to the Bidders through website or Email. The evaluation of Price Bid shall be carried out based on the information furnished in Envelope II (Price Bid).
ii) The Price Bid submitted by the Bidders shall be scrutinized to ensure conformity with the EOI. Any Bid not meeting any of the requirements of this EoI may cause the Bid to be considered "Non-responsive" at the sole decision of MANIREDA.
iii) The price quoted shall be revised on quarterly basis and the revised rates shall be uploaded accordingly to the website of MANIREDA.
iv) MANIREDA will prepare the list of rates offered by bidder(s) in Rupees per Kilowatt for each group of size/capacity as mentioned in the Bid. **L1 would be selected as approved rate of MANIREDA and every firm has to do work at this approved rate for specified/standardised components or its equivalents but conforming to MNRE/MANIREDA specification. Any costly component/brand over and above the approved components, extra cost would have to be borne by the beneficiary and the firm must convince the cost implication to the beneficiary before actual installation.**

10.6 **Selection of bidder(s) for empanelment**

i. Only the bidders who are technically qualified as per terms of MANIREDA will be considered for empanelment.
ii. The rates quoted by bidder for every group of size/capacity (kWp) will be taken as the offer rate of the firm.
iii. Empanelment of additional bidders may be considered for the firms after the date of advertisement of this EoI /who missed this EoI, subject to approval of MANIREDA.
iv. The list of the successful empanelled bidders / firms will be circulated to the registered applicants.

10.7 **Letter of Award**

i) The eligible registered applicant shall issue work order to any one of the empanelled firms as per his/her choice at the rate (in Rs/KW) not more than the approved rate by MANIREDA for the specified components.
ii) If any empanelled firm gets order from any of the purchaser, it shall complete supply, erection, testing & commissioning, storage, civil work, within the mutually agreed time period between the registered applicant and empanelled firm. However, the maximum time for the execution of the project shall be 2 months from the date of issue of work order.
iii) The registered applicant and the concerned empanelled firm shall enter into an agreement for successful installation/commissioning of the project. The draft agreement will be provided by MANIREDA.
iv) In case of breach of any terms of the agreement by any party, MANIREDA may forfeit the EMD/Security money of the concerned empanelled firm or may cancel the registered project of the applicant, as the case may be.

11. CFA disbursement

i) MANIREDA will disburse the applicable CFA to the registered applicant directly on completion of necessary formalities and procedures.
ii) The applicable CFA shall be calculated on the benchmark cost fixed by MNRE/ the rates finalized by MANIREDA through this EOI, whichever is lower is applicable.
iii) In case MNRE deducts applicable subsidy due to delay in project execution or any other reasons like revision of benchmark cost, percentage of applicable subsidy on benchmark cost etc, then the actual subsidy amount provided by MNRE shall be released to registered applicant.
iv) Total liability of MANIREDA under this contract shall be limited to release of subsidy after 3 months of successful commissioning and acceptance of project subject to fund is released by MNRE.
v) Joint inspection by MANIREDA shall be carried out before release of subsidy. Bidder should provide all the data and necessary proof of meeting the technical specifications as specified in the EoI.

12. MANIREDA's Right to accept any bid and to reject any or all bids

12.1 The MANIREDA reserves the right to accept or reject any bid, and to cancel the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders.

13. Signing of Contract

The successful Bidder(s) will sign a Memorandum of Aggreement on the terms of contract with MANIREDA within fifteen (15) days from the date of issue of empanelment letter.

14. TECHNICAL SPECIFICATION: As Annexure-X.

Annexure - I

FORMATS FOR SUBMITTING EoI

Covering Letter

Ref.No._____Date:_____

From: _____ (Insert name and address of Individual) _____ _____ Tel. #: Fax#: E-mail address#

To,
Director,
Manipur Renewable Energy Development Agency (MANIREDA)
2nd Floor, South Block, Secured Office Complex, Near 2nd M.R Gate,
Imphal-Dimapur Road, Imphal – 795001

Sub: EoI for the empanelment of the firms for "Supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of grid interactive rooftop solar PV power plant of various capacities in the State of Manipur

Dear Sir,

We, the undersigned….(insert name of the 'Bidder') having read, examined and understood in detail the EoI Document for Implementation of Grid connected Roof Top Solar PV System Scheme in Manipur State in India hereby submit our Bid comprising of Price Bid and Technical Bid.

1. We give our unconditional acceptance to the EoI no. ……..., dated……and EoI Documents attached thereto, issued by Manipur Renewable Energy Development Agency, as amended. As a token of our acceptance to the EoI Documents, the same have been initiated by us and enclosed to the Bid. We shall ensure that we execute such EoI Documents as per the provisions of the EOI and provisions of such EOI Documents shall be binding on us.

2. EMD/Security money
   We have enclosed a EMD/Security money of Rs…….(Insert Amount), in the form of bank guarantee no……..(Insert number of the bank guarantee) dated……(Insert date of bank guarantee) as per Format ……from ……..(Insert name of bank providing EMD/Security money) and valid up to …….in terms of Clause ……of this EoI

3. Acceptance
   I. We hereby unconditionally and irrevocably agree and accept that the decision made by Manipur Renewable Energy Development Agency in respect of any matter regarding or

arising out of the EoI shall be binding on us. We hereby expressly waive any and all claims in respect of Bid process.

II. We confirm that there are no litigations or disputes against us, which materially affect our ability to fulfil our obligations with regard to execution of projects.

4. Familiarity with Relevant Indian Laws & Regulations

We confirm that we have studied the provisions of the relevant Indian laws and regulations as required to enable us to submit this Bid and execute the EoI Documents, in the event of our selection as Successful Bidder. We further undertake and agree that all such factors as mentioned in EOI have been fully examined and considered while submitting the Bid.

5. Contact Person

Details of the contact person are furnished as under:

Name : ……
Address : ……..
Phone Nos. : ……
Fax Nos. : ……
E-mail address : ……..

6. We are enclosing herewith the Technical Bid (Envelope I) and Price Bid (Envelope II) containing duly signed formats, each one duly sealed separately, in one (1) original as desired by you in the EoI for your consideration.
7. It is confirmed that our Bid is consistent with all the requirements of submission as stated in the EoI and subsequent communications from Manipur Renewable Energy Development Agency.
8. The information submitted in our Bid is complete, strictly as per the requirements stipulated in the EOI and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our Bid.
9. We confirm that all the terms and conditions of our Bid are valid for acceptance for a period of ……..from the Bid Deadline.
10. We confirm that we have not taken any deviation so as to be deemed non-responsive.

Dated the_____day of_____,20….

Thanking you,

Yours faithfully,

(Signature of Authorised signatory/Propreitor)
Name
Designation

Name of firm:

Annexure - II

GENERAL PARTICULARS OF THE BIDDER

1. Name of Bidder / Firm:

2. Address for correspondence:

3. Telephone No., E-mail address and Fax No.

4. Name and Designation of the Authorized Representative of the bidder to whom all the references shall be made:

5. Amount and reference of cost of tender Bid document (Drawn on Bank & D.D. No.& date)

6. Amount and reference of E.M.D. Deposited drawn on Bank & D.D. No.& date)

7. Financial capability of the contractor/ Firm for carrying out the work:

8. Has the firm ever been debarred by any Govt. Deptt/Agency/ organization for undertaking any work:

9. Details of offer (Mention No of pages):

10. Reference of any other information attached by the Bidder:

11. Authorized representative for any correspondence

12. Whether service center for after sales service set

up in the state, give details & address

(Signature of Bidder)
with designation

Annexure - III

EXPERIENCE OF THE BIDDER

Please fill in the information about the similar projects undertaken over the last three years

Name of organization by whom work was awarded. Please give Project wise detail of projects installed/ commissioned:-

1. Name and location of the works.
2. Total amount of Contract.
3. Year of Award.
4. Detail of involvement in work as
   an individual or as a company.
5. Was the work completed satisfactorily
   and within the stipulated time period.
6. Particulars of evidence enclosed in token of above
7. Whether list of past supplies enclosed as per Annexure V
8. Whether past performance obtained from MANIREDA / utilities enclosed

(Signature of Bidder)
with designation

Annexure - IV

DECLARATION BY THE BIDDER

I/We_____ (herein after referred to as the bidder) being desirous of bidding for the supply, erection, testing , installation and commissioning of SPV power plants up to 500 kWp in different parts of Manipur including warranty period of 5 years as shown in scope of bid specification . We have fully understood the nature of the work and carefully noted all the terms and conditions, specifications etc. as mentioned in the bid documents, hereby declare that:-

1. The bidder is fully aware of all the requirements of the bid documents and agrees with all the provisions of the bid documents.
2. The bidder is capable of executing and completing the work as required in the bid.
3. The bidder accepts all risks and responsibilities directly or indirectly connected with the performance of the bid.
4. The bidder is financially solvent and sound to execute the bid.
5. The bidder is sufficiently experienced and competent to perform the contract to the satisfaction of MANIREDA.
6. The information and statements submitted with the bid are true.
7. The bidder has not been debarred from similar type of work by any Govt Dept./Agency/Organization.
8. This offer will remain valid for acceptance for 12 (twelve) months from the date of opening of the bid/empanellment.
9. The bidder gives the assurance to execute the bidded work as per the specifications, terms and conditions and in exact configuration of the sample submitted on award of the work.

(Signature of Bidder)

with designation

Annexure - V

SCHEDULE OF PAST WORKS ACCOMPLISHED IN LAST THREE YEARS

Sl. No	Description	Work order No. and date	Name of Agency	Date of work completion as per order	Actual date of work completion/ commissioning

(Signature of Bidder)
with designation

Note:- Performance certificate from the concerned utilities along with their communication address, email and FAX No. is required for authentication of certificates.

Annexure VI

PROFORMA FOR BANK GUARANTEE FOR EMD/Security money

(On Non-Judicial stamp paper of appropriate value)

Ref.: **Date:**

Bank Guarantee No.:

To,
The Director,
Manipur Renewable Energy Development Agency (MANIREDA)
2nd Floor, South Block, Secured Office Complex, Near 2nd M.R Gate,
Imphal-Dimapur Road, Imphal – 795001

Dear Sir,

In accordance with Invitation of Bids under Bid document No…… M/S…… having its Registered/ Head Office at ……..(hereinafter called the ''Bidder'') who wishes to participate in the said tender for implementation of Grid connected Roof Top Solar PV System Scheme in Manipur State as per tender specification.

We, the …….. (Name & Address of the bank) ……. and having our Head Office at ……(#)…….…… Guarantee and undertake to pay immediately on demand by …… (Manipur Renewable Energy Development Agency) hereinafter called the 'MANIREDA' …… the amount of ……(*)….. without any reservation, protest, demand and recourse to the extent of the said sum of Rs..... (Rupees……..only). Any such demand made by the 'MANIREDA' shall be conclusive and binding on us irrespective of any dispute or difference raised by the Bidder. This guarantee shall be irrevocable and shall remain valid up to …… (as per clause 2.1 of the EoI) . If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instructions from M/s…… (Bidder's name) …… on whose behalf this guarantee is issued.

In witness whereof the Bank, through its authorized officer, has set its hand and stamp on this …… day of …… 20 …… at …….

Witness: ……
(Signature)
……
(Signature)
(Name)……
……
(Name) (Designation with Bank)

Seal)……
(Official Address)

Stamp……..
Attorney as per Power of No……
Date……

Note:

1. (*) the amount shall be as specified in the Bid document. (#) Complete mailing address of the Head Office of the Bank to be given.
2. The Bank Guarantee shall be from a Bank as defined in Clause 2.1 of the Bid document.
3. The Stamp Paper of appropriate value shall be purchased in the name of guarantee issuing Bidder/bank issuing the guarantee.

Annexure VII

Financial Bid
(The Format should be on the Letter Head of the firm)

Date : _____
From : _____(Insert name and address of firm)
_____
_____

Tel.#: Fax#: E-mail address#

To,
Director,
Manipur Renewable Energy Development Agency (MANIREDA)
2nd Floor, South Block, Secured Office Complex, near 2nd M.R Gate,
Imphal- Dimapur Road, Imphal – 795001

Name of Work: Empanelment of the experienced firms for "Supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of grid interactive rooftop solar PV power plant in the State of Manipur.

We give our unconditional financial rates in response of this EoI Document issued by MANIREDA based on **SLANTED TIN ROOF(height upto G+2)**:

			Quoted rate		**Cost break up**			
Sl No	**Capacity and configuration of SPV power plant**	**Bench Mark price per Kwp(Rs)**	**Below the bench mark quoted price in %(percentage)**	**Offered discount /rebate(in Rs) per kWp**	**System cost Per kWp**	**Cost of Installation & commissioning Per kWp**	**Rates for 5 years comprehensive maintenance Per Kwp**	**Total cost Per Kwp**
1	1 to 4 KWp	65,000						
2	Above 4 to	60,000						

	10 kWp							
3	Above 10 to 100 KWp	55,000						
4	Above 100 to 500 KWp	53,000						

Note: The above rates are quoted in INR per KW and are inclusive of all the taxes and duties

Signature
Name
Designation with Seal

Annexure-VIII

Documents to be enclosed in Completion Report:

1. Work Order issued by Promoter/Beneficiary
2. Memorandum of Agreement (MOA) signed between Promoter/Beneficiary and Firm
3. Completion report submitted by Beneficiary
4. Details of Equipment:
   a) SPV Modules
   b) Inverter
   c) Bi-directional Meter
   d) Solar Meter
   e) DCDB
   f) ACDB
   g) Earthing

5. Test Report/Certificates of the following Equipment:
   a) PV modules (IV curve)
   b) Inverter
   c) Bi-directional Meter
   6. Warranty Certificates of the following
   a) PV modules
   b) Inverter
   c) Bi-directional meter

7. Single Line diagram
8. Colour photograph of the Solar Power plant along with photos of each component
9. Manual on Working, Performance, Operation & Maintenance of Solar power plant

Annexure-IX

APPLICATION FOR PAYMENT OF SUBSIDY

Ref. No.: _____ Date: _____

To,

The Director
Manipur Renewable Energy Development Agency (MANIREDA),
2nd Floor, South Block, Secured Office Complex, Near 2nd M.R. Gate,
Imphal - Dimapur Road,
Imphal-795001.

Subject: Application for payment of Subsidy for Grid Connected Rooftop Solar PV Plants installed under the provision of EOI No.5/SPP/RT/MANIREDA/2018-19, dated 10th August, 2018

Dear Sir,

I have the honour to state that a _____ KWp Grid Connected Rooftop Solar PV Plant has been installed and commissioned at my residence/institution/society by MANIREDA's empanelled firm under the MNRE CFA scheme(70% of MNRE Benchmark Cost) and State Subsidy, if any.

I am pleased to enclose herewith the Completion Report in triplicate submitted by the empanelled firm consisting of (i) Test Reports/Certificates of Components (ii) Work Order (iii) MOA (iv)Module Sl. Nos.(v) Inverter No.(vi) Consolidated Warrantee (vii) Photograph of Power Plant (viii)Grid Connection Certificate/Report as per requirement of availing subsidy. The details of the PV Plant and that of the Subsidy amount due to me are shared below:

1. SPV Plant Capacity :
2. Empanelled Channel Partner :
3. Work Order Value : Rs
4. Benchmark Cost : Rs……(65/60/55/53 per Watt)
5. Eligible MNRE Subsidy : Rs
6. Eligible State Subsidy : Rs
7. Total Eligible Subsidy : Rs…….(MNRE Subsidy + State Subsidy)
8. Date of PPA :
9. Date of Work Order :
10. Date of Installation :
11. Date of Commissioning :

It is, therefore, requested to release the above mentioned claimed amount to my bank account given below.

Name of A/c Holder :

Name of Bank :

Name of Branch :

A/c No. :

IFSC :

Encl:As stated

Yours faithfully,

Name : _____
Address : _____
Mobile No. : +91 _____
E-mail ID :

Annexure-X

General Technical specifications

1. SPV Modules

- Indigenously manufactured PV modules should be used.
- The PV module should have crystalline silicon solar cells and must have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 from an NABL or IECQ accredited Laboratory.
- The power output of the module(s) under STC should be a minimum of 100 Wp at a load voltage* of 16.4 ± 0.2 V. V_{nom} 12V.
- The open circuit voltage* of the PV modules under STC should be at least 21.0 Volts.
- The module efficiency should not be less than 14 %.
- The terminal box on the module should have provision for opening to replace the cable, if required.
- PV modules must be warranted for their output peak watt capacity which should not be less than 90 % at the end of 10 years and 80% at the end of 25 years.
- **Identification and Traceability**

➢ Each PV module used in any solar power project must use a RF identification tag. The following information must be mentioned in the RFID used on each module (This should be inside the laminate and must be able to withstand harsh environmental conditions.)

➢ Name of the Manufacturer of PV module
➢ Name of the manufacturer of Solar Cells.
➢ Month and year of the manufacture (separately for solar cells and module).
➢ Country of origin (separately for solar cells and module).
➢ I-V curve for the module.
➢ Peak wattage, Im ,Vm and FF for the module.
➢ Unique serial no and model no of the module.
➢ Date and year of obtaining IEC PV module qualification certificate.
➢ Name of test lab issuing IEC certificate
➢ Other relevant information on traceability of solar cells and module as per ISO 9000 series.

2. ARRAY STRUCTURE :-

- Hot dip galvanized MS mounting structures may be used for mounting the modules /panels/arrays. Minimum thickness of galvanization should be at least 120 microns.

- Each structure should have angle of inclination as per the site conditions to take maximum insolation. However to accommodate more capacity the angle inclination may be reduced until the plant meets the specified performance ratio requirements.
- The Mounting structure shall be so designed to withstand the speed for the wind zone of the location where a PV system is proposed to be installed (wind speed of 150 kM/ hour). It may be ensured that in case of capacity above 10kWp, the design has been certified by a recognized Lab/ Institution in this regard and submit wind loading calculation sheet to MANIREDA.
- Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed.
- The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.
- Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts.
- Aluminium structures also can be used which can withstand the wind speed of respective wind zone. Necessary protection towards rusting need to be provided either by coating or anodization.
- The fasteners used should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels.
- Regarding civil structures the EoI holder need to take care of the load bearing capacity of the roof and need arrange suitable structures based on the quality of roof.
- The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m2 . The minimum clearance of the structure from the roof level should be 300 mm.

Solar Array Fuse : The cables from the array strings to the solar grid inverters shall be provided with DC fuse protection. Fuses shall have a voltage rating and current rating as required. The fuse shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers.

Detailed specifications for the mounting structure:

Wind velocity withstanding capacity	150 km / hour
Structure material	Hot dip galvanised steel with a minimum galvanisation thickness of 120 microns or aluminium alloy.
Bolts, nuts, fasteners, panel mounting clamps	Stainless steel SS 304
Mounting arrangement for RCC-flat roofs	With removable concrete ballast made of pre-fabricated PCC (1:2:4), M15
Mounting arrangement for metal sheet roofs	Mounting directly on the sheet metal, ensuring stability and wind withstanding capacity, or penetrating the sheet metal and fixing to the substructure, ensuring that the roof remains water proof and ensuring stability and wind withstanding capacity
Mounting arrangement for elevated structures	The elevated structure has to be securely anchored to the supporting surface. Concrete foundations of appropriate weight and depth for elevated structures mounted directly on the ground; Bolted with anchor bolts of appropriate strength for elevated structures mounted on RCC surfaces.
Mounting arrangement for ground installations	With removable concrete ballast made of pre-fabricated PCC (1:2:4), M15; assuring enough ground clearance to prevent damage of the

	module through water, animals and other environmental factors.
Installation	The structures shall be designed for simple mechanical on-site installation. There shall be no requirement of welding or complex machinery at the installation site.
Minimum distance between roof edge and mounting structure	0.6m
Access for panel cleaning and maintenance	All solar panels must be accessible from the top for cleaning and from the bottom for access to the module junction box.
Panel tilt angle	North – south orientation with a fixed tilt angle of 22 – 24degrees (depending on location), south facing.

3. **JUNCTION BOXES (JBs)** :-

- The junction boxes are to be provided in the PV array for termination of connecting cables. The J. Boxes (JBs) shall be made of GRP / FRP / Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement. All wires / cables must be terminated through cable lugs. The JBs shall be such that input & output termination can be made through suitable cable glands.
- Copper bus bars/terminal blocks housed in the junction box with suitable termination threads Conforming to IP65 standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Single / double compression cable glands. Provision of earthings. It should be placed at 5 feet height or above for ease of accessibility.
- Each Junction Box shall have High quality Suitable capacity Metal Oxide Varistors (MOVs) / SPDs, suitable Reverse Blocking Diodes. The Junction Boxes shall have suitable arrangement monitoring and disconnection for each of the groups.
- Suitable markings shall be provided on the bus bar for easy identification and the cable ferrules must be fitted at the cable termination points for identification.
- All fuses shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers.

4. DC Combiner Box :

A DC Combiner Box shall be used to combine the DC cables of the solar module arrays with DC fuse protection for the outgoing DC cable(s) to the DC Distribution Box.

5. DC DISTRIBUTION BOARD/BOX :-

- The DC Distribution panel/boxis to receive the DC output from the array field. The DC distribution box shall be mounted close to the solar grid inverter. The DC distribution box shall be of the thermo-plastic IP65 DIN-rail mounting type and shall comprise the following components and cable terminations: − Incoming positive and negative DC cables from the DC Combiner Box; − DC circuit breaker, 2 pole (the cables from the DC Combiner Box will be connected to this circuit breaker on the incoming side); – DC surge protection device (SPD), class 2 as per IEC 60364-5-53; – Outgoing positive and negative DC cables to the solar grid inverter.
- As an alternative to the DC circuit breaker a DC isolator may be used inside the DC Distribution Box or in a separate external thermoplastic IP 65 enclosure adjacent to the DC Distribution Box. If a DC isolator is used instead of a DC circuit breaker, a DC fuse shall be installed inside the DC Distribution Box to protect the DC cable that runs from the DC Distribution Box to the Solar Grid Inverter.
- The bus bars are made of copper of desired size. Suitable capacity MCBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

6. PCU / ARRAY SIZE RATIO :-

• The combined wattage of all inverters should not be less than rated capacity of power plant under STC.
• Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.

7. Power Conditioning Unit (PCU)

The **PCU** should convert DC power produced by SPV modules, into AC power and adjust the voltage & frequency levels to suit the local grid conditions. The inverter shall interconnect and feed power to the LT power supply of the building and also shall have the provision to power critical loads.

Common Technical Specification :

- Control Type : Voltage source, microprocessor assisted , output regulation
- Output voltage : Single Phase, 230 V ac (+12.5 %, - 20 % V ac)
  - : 3 phase, 415 V ac (+12.5 %, - 20 % V ac)
- Frequency: 50 Hz (+3 Hz, -3 Hz)
- Total Harmonic Distortion : less than 3%
- Operating temperature Range : 0 to 55 deg C

Inverter standards :

Inverter should comply with IEC 61683/IS 61683 for efficiency and Measurements and should comply IEC 60068-2 (1, 2, 14, 30) / Equivalent BIS Standard for environmental testing. Inverter should supervise the grid condition continuously and in the event of grid failure (or) under voltage (or) over voltage, Solar System should be disconnected by the circuit Breaker / Auto switch provided in the inverter.

Power Control : MPPT

Other important Features/Protections required in the INVERTER:

- Automatic morning wake-up and nightly shutdown
- Mains (Grid) over-under voltage and frequency protection
- Fool proof protection against ISLANDING.
- Included authentic tracking of the solar array's maximum power operation voltage (MPPT).
- Array ground fault detection.
- LCD and piezoelectric keypad operator interface Menu driven
- Automatic fault conditions reset for all parameters like voltage, frequency and/or black out.
- Surge arresters on AC and DC terminals for over voltage protection from lightning-induced surges.
- INVERTER should be rated to operate at 0 –55 deg. Centigrade unless provision for air conditioning is included in INVERTER
- All parameters should be accessible through an industry standard communication link.
- Overload capacity (for 10 sec) should be 150 % of continuous rating
- Three phase PCU/ inverter shall be used with each power plant system (10kW and/or above) but in case of less than 10kW single phase inverter can be used.
- The output of power factor of PCU inverter is suitable for all voltage ranges or sink of reactive power, inverter should have internal protection arrangement against any sustainable fault in feeder line and against the lightning on feeder.
- **Anti-islanding (Protection against Islanding of grid):**

The PCU shall have anti islanding protection in conformity to IEEE 1547/UL 1741/ IEC 62116 or equivalent BIS standard.

a. Channel Partner shall be responsible for galvanic isolation of solar roof top power plant (>100kW) with electrical grid or LT panel.

b. In PCU/Inverter, there shall be a direct current isolation provided at the output by means of a suitable isolating transformer. If Isolation Transformer is not incorporated with PCU/Inverter, there shall be a **separate Isolation Transformer** of suitable rating provided at the output side of PCU/PCU units for capacity **more than 100 kW**.

- The MPPT units environmental testing should qualify IEC 60068-2 (1, 2, 14, 30)/ Equivalent BIS std.

Harmonics Standard :
As per the standard of IEEE 519, the permissible individual harmonics level shall be less than 3% (for both voltage and current harmonics) and Total Harmonics Distortion (THD) for both voltage and current harmonics of the system shall be less than 5%.

8. AC DISTRIBUTION BOX/BOARD :-

- An AC distribution box shall be mounted close to the solar grid inverter. The AC distribution box shall be of the thermo plastic IP65 DIN rail mounting type and shall comprise the following components and cable terminations:

  – Incoming 3-core / 5-core (single-phase/three-phase) cable from the solar grid inverter – AC circuit breaker, 2-pole / 4-pole – AC Surge Protection Device (SPD), class 2 as per IEC 60364-5-53 – Outgoing cable to the building electrical distribution board.
- AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.
- All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS 60947 part I, II and III.
- The changeover switches, cabling work should be undertaken by the EoI holder as part of the project.
- All the Panel's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz.The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.
- All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.
- Should conform to Indian Electricity Act and rules (till last amendment).
- All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions Variation in supply voltage +/- 10 % Variation in supply frequency +/- 3 Hz.

Technical and interconnection requirements

Overall conditions of service	**State Distribution/Supply Code**
Overall Grid Standards	Central Electricity Authority (Grid Standard) Regulations 2010
Equipment	BIS / IEC / IEEE
Meters	Central Electricity authority (Installation & operation of meters) Regulation 2006 as amended time to time
Safety and supply	Central Electricity Authority(measures of safety and electricity supply) Regulations, 2010

Harmonic Requirements Harmonic Current	IEEE 519 CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013
Synchronization	Photovoltaic system must be equipped with a grid frequency synchronization device. Every time the generating station is synchronized to the electricity system. It shall not cause voltage fluctuation greater than +/- 5% at point of connection.
Voltage	The voltage-operating window should minimize nuisance tripping and should be under operating range of 80% to 110% of the nominal connected voltage. Beyond a clearing time of 2 second, the photovoltaic system must isolate itself from the grid.
Flicker	Operation of Photovoltaic system should not cause
Frequency	When the Distribution system frequency deviates outside the specified conditions (50.5 Hz on upper side and 47.5 Hz on lower side), There should be over and under frequency trip functions with a clearing time of 0.2 seconds.
DC injection	Photovoltaic system should not inject DC power more than 0.5% of full rated output at the interconnection point or 1% of rated inverter output current into distribution system under any operating conditions.
Power Factor	The photovoltaic system in the event of fault, voltage or frequency variations must island/disconnect itself within IEC standard on stipulated period.
Overload and Overheat	The inverter should have the facility to automatically switch off in case of overload or overheating and should restart when normal conditions are restored.
Paralleling Device	Paralleling device of photovoltaic system shall be capable of withstanding 220% of the normal voltage at the interconnection point.

9. Connection to the Building Electrical System :

- The AC output of the solar grid inverter shall be connected to the building's electrical system after the service connection meter and main switch on the load side. The solar grid inverter output shall be connected to a dedicated module in the Main Distribution Board (MDB) of the building. It shall not be connected to a nearby load or socket point of the building. The connection to the electrical system of the building shall be done as shown in typical wiring diagram 1 in the Annexure I. For buildings or loads with diesel generator backup, the wiring of the solar grid inverter shall be such that the solar grid inverter cannot run in parallel with the diesel generator. This implies that the solar grid inverter must be connected to a distribution board on the grid side of the automatic or manual change-over switch as shown in typical wiring diagram 2 in the Annexure I.
- The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the Distribution Code/Supply Code of the State and amended from time to time. Following criteria have been suggested for selection of voltage level in the distribution system for ready reference of the solar suppliers.

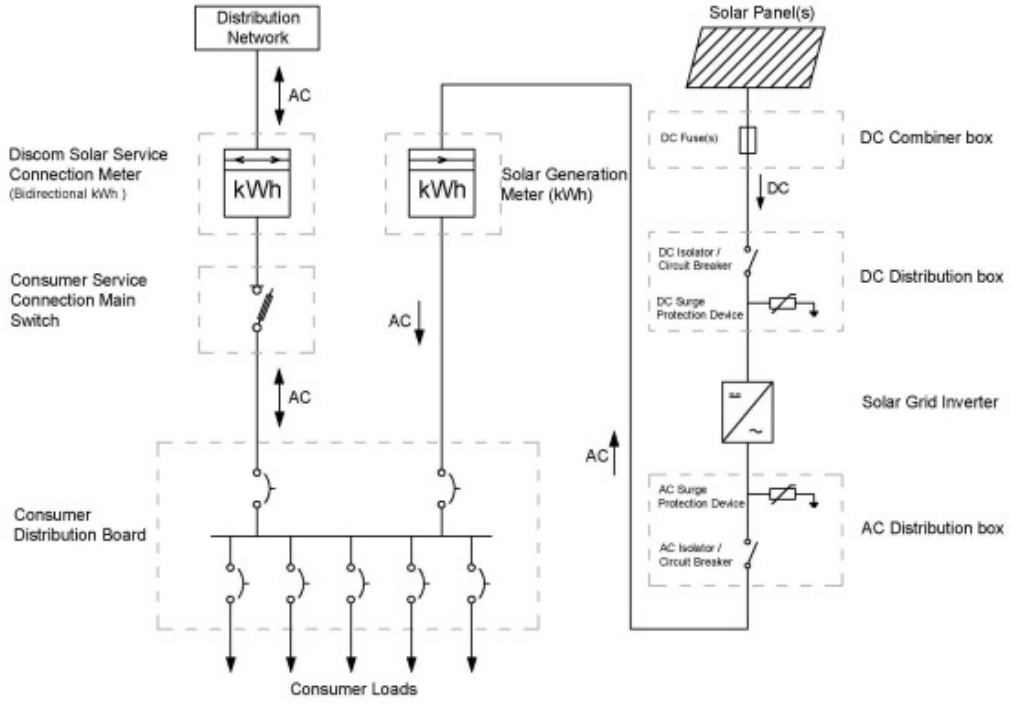
Plant Capacity	Connecting voltage
Up to 8 kW	240V-single phase or 415V-three phase at the option of the consumer
Above 8kW and up to 75 kW	415V – three phase
Above 75kW	At HT/EHT level (11kV/33kV/) as per DISCOM rules

a. The maximum permissible capacity for rooftop shall be 1 MW for a single net metering point.
b. Utilities may have voltage levels other than above, MSPDCL may be consulted before finalization of the voltage level and specification be made accordingly.

10. Meter Configuration options

The metering system for rooftop solar system, under net-metering arrangement, shall be as elaborated below which should be applicable till such time the Central Electricity Authority notifies the standards in this matter.

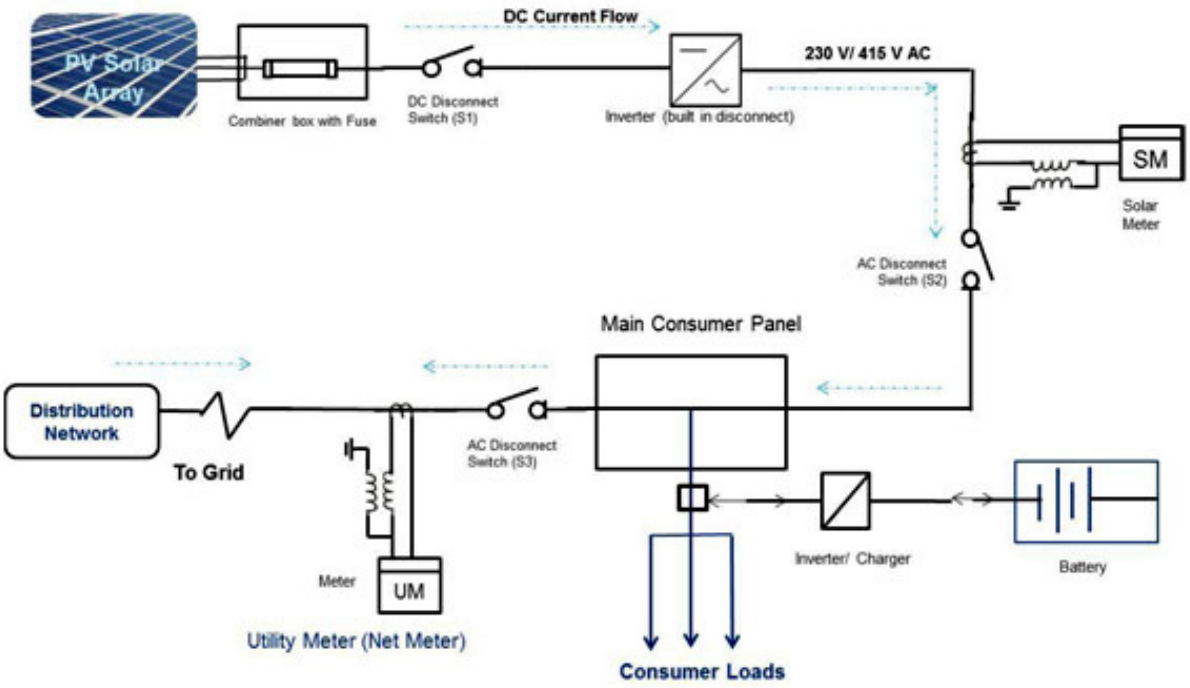
a) Two Meter Configuration without Storage: The metering protocol for 'Grid connected rooftop solar PV system without storage' and location of solar meter and consumer meter shall be in accordance with the schematic below:-



Note: The Solar Generation Meter shown above is mandatory for consumers who avail of a generation-based incentive (GBI) and is optional for others.

The utility meter (Net-meter) has to be bi-directional meter to register both import grid electricity amount as well as export solar electricity amount.

Two Meter Configuration with Storage : The metering protocol for 'Grid connected rooftop solar PV system with storage' and location of Solar Meter (SM) and Utility Meter (UM) shall be in accordance with the schematic below:-



The utility meter (Net-meter) has to be bi-directional meter to register both import grid electricity amount as well as export solar electricity amount.

11. TRANSFORMER "IF REQUIRED" &METERING :-

• Dry/oil type relevant kVA, 11kV/415V, 50 Hz Step up along with all protections, switchgears, Vacuum circuit breakers, cables etc. along with required civil work.

• The bidirectional electronic energy meter (0.5 S class) shall be installed for the measurement of Import/Export of energy.

• The Channel Partner must take approval/NOC from the MSPDCL for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network before commissioning of SPV plant.

• Reverse power relay shall be provided by Channel Partner (if necessary), as per the MSPDCL requirement.

12.PROTECTIONS :-

• The system should be provided with all necessary protections like earthing, Lightning, and grid islanding as follows:

SURGE PROTECTION :-

• Internal surge protection shall consist of three MOV type surge-arrestors connected from +ve and –ve terminals to earth (via Y arrangement).

Surge protection shall be provided on the DC side and the AC side of the solar system. The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter.

The AC SPDs shall be installed in the AC distribution box adjacent to the solar grid inverter.

The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system. The SPDs shall be of type 2 as per IEC 60364-5-53

EARTHING PROTECTION :-

• Each array structure of the PV yard should be grounded/ earthed properly as per IS:3043-1987. In addition the lighting arrester/masts should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representative of MANIREDA as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly. The use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth.

- Earth resistance shall not be more than 5 ohms. It shall be ensured that all the earthing points are bonded together to make them at the same potential.
- The PV module structure components shall be electrically interconnected and shall be grounded.
- Earthing shall be done in accordance with IS 3043-1986, provided that earthing conductors shall have a minimum size of 6.0 mm2 copper, 10 mm2 aluminium or 70 mm2 hot dip galvanised steel. Unprotected aluminium or copper-clad aluminium conductors shall not be used for final underground connections to earth electrodes.
- A minimum of two separate dedicated and interconnected earth electrodes must be used for the earthing of the solar PV system support structure with a total earth resistance not exceeding 5 Ohm.

The earth electrodes shall have a precast concrete enclosure with a removable lid for inspection and maintenance. The entire earthing system shall comprise non-corrosive components.

GRID ISLANDING :-

• In the event of a power failure on the electric grid, it is required that any independent power-producing inverters attached to the grid turn off in a short period of time. This prevents the DC-to-AC inverters from continuing to feed power into small sections of the grid, known as “Islands.” Powered Islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid(due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.

• A manual disconnect 4-pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

13. CABLES :-

• Cables of appropriate size to be used in the system shall have the following characteristics:

a. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards
b. Temp. Range: –10oC to +80oC.
c. Voltage rating 660/1000V
d. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation
e. Flexible
f. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum (2%)
g. For the DC cabling, XLPE or, XLPO insulated and sheathed, UV stabilized single core multi-stranded flexible copper cables shall be used; Multi-core cables shall not be used.
h. For the AC cabling, PVC or, XLPE insulated and PVC sheathed single or, multi-core multi-stranded flexible copper cables shall be used; Outdoor AC cables shall have a UV-stabilized outer sheath.
i. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use. Outer sheath of cables shall be electron beam cross-linked XLPO type and black in colour.
j. The DC cables from the SPV module array shall run through a UV stabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.
k. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers.
l. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm; the minimum DC cable size shall be 4.0 mm2 copper; the minimum AC cable size shall be 4.0 mm2 copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires.
m. Cable Routing / Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified. In addition, cable drum no. / Batch no. to be embossed/ printed at every one meter.

n. Cable Jacket should also be electron beam cross-linked XLPO, flame retardant, UV resistant and black in colour.

o. All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions including High temperatures, UV radiation, rain, humidity, dirt, salt, burial and attack by moss and microbes **for 25 years and voltages as per latest IEC standards**. DC cables used from solar modules to array junction box shall be solar grade **copper (Cu) with XLPO insulation and rated for 1.1kV** as per relevant standards only.

p. The ratings given are approximate. EoI holder to indicate size and length as per system design requirement. All the cables required for the plant shall be provided by the EoI holder. Any change in cabling sizes if desired by the EoI holder shall be approved after citing appropriate reasons. All cable schedules/ layout drawings shall be approved prior to installation.

q. Multi Strand, Annealed high conductivity copper conductor PVC type 'A' pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection **Armoured cable for underground laying**. All cable trays including covers to be provided.

r.All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below: BoS item / component Standard Description Standard Number Cables General Test and Measuring Methods, PVC/XLPE insulated cables for working Voltage up to and including 1100 V, UV resistant for outdoor installation IS /IEC 69947.

s. The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%.

t. The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%.

u.The following colour coding shall be used for cable wires: – DC positive: red (the outer PVC sheath can be black with a red line marking) – DC negative: black – AC single phase: Phase: red; neutral: black − AC three phase: Phases: red, yellow, blue; neutral: black − Earth wires: green

v.Cables and conduits that have to pass through walls or ceilings shall be taken through a PVC pipe sleeve.

w. Cable conductors shall be terminated with tinned copper end-ferrules to prevent fraying and breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.

14. DATA ACQUISITION SYSTEM / PLANT MONITORING :-

• Data Acquisition System shall be provided for each of the solar PV plant above 10 kWp capacity.

• Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis with the high quality, suitable PC. Metering and Instrumentation for display of systems parameters and status indication to be provided.

• Temperature: Temperature probes for recording the Solar panel temperature and/or ambient temperature to be provided complete with readouts integrated with the data logging system.

• The following parameters are accessible via the operating interface display in real time separately for solar power plant:

a. AC Voltage.	b. AC Output current.	c. Output Power
d. Power factor.	e. DC Input Voltage.	f. DC Input Current.
g. Time Active.	h. Time disabled.	i. Time Idle.
j. Power produced	k. Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage.	

All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.

• PV array energy production: Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system provided. Energy meter along with CT/PT should be of 0.5 accuracy class.Computerized DC String/Array monitoring and AC output monitoring shall be provided as part of the inverter and/or string/array combiner box or separately.

• String and array DC Voltage, Current and Power, Inverter AC output voltage and current (All 3 phases and lines), AC power (Active, Reactive and Apparent), Power Factor and AC energy (All 3 phases and cumulative) and frequency shall be monitored.
• Computerized AC energy monitoring shall be in addition to the digital AC energy meter.
• The data shall be recorded in a common work sheet chronologically date wise. The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.
• All instantaneous data shall be shown on the computer screen.
• Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.
• Provision for instantaneous Internet monitoring and download of historical data shall be also incorporated.
Remote Server and Software for centralized Internet monitoring system shall be also provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and temperature monitoring system.
• Ambient / Solar PV module back surface temperature shall be also monitored on continuous basis.
• Simultaneous monitoring of DC and AC electrical voltage, current, power, energy and other data of the plant for correlation with solar and environment data shall be provided.
• Remote Monitoring and data acquisition through Remote Monitoring System software at the owner / MANIREDA location with latest software/hardware configuration and service connectivity for online / real time data monitoring / control complete to be supplied and operation and maintenance / control to be ensured by the EoI holder.

The empanelled channel Partner shall be obligated to push real-time plant monitoring data on a specified intervals (say 15 minute) through open protocol at receiver location (cloud server) in XML/JSON format, preferably. Suitable provision in this regard will be intimated to the Channel Partner.

15. TOOLS & TACKLES AND SPARES :-

• After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the EoI holder for maintenance purpose. List of tools and tackles to be supplied by the EoI holder for approval of specifications and make from MANIREDA.
• A list of requisite spares in case of PCU/inverter comprising of a set of control logic cards, IGBT driver cards etc. Junction Boxes. Fuses, MOVs / arrestors, MCCBs etc along with spare set of PV modules be indicated, which shall be supplied along with the equipment. A minimum set of spares shall be maintained in the plant itself for the entire period of warranty and Operation & Maintenance which upon its use shall be replenished.

The Installer shall keep ready stock of tools, tackles and essential spares that will be needed for the day-to-day maintenance of the solar PV system. This shall include but not be limited to, the following:

- Screw driver suitable for the junction boxes and combiner boxes;
- Screw driver and / or Allen key suitable for the connectors, power distribution blocks, circuit breaker terminals and surge arrestor terminals;
- Spanners / box spanners suitable for the removal of solar PV modules from the solar PV module support structure;
- Solar panel mounting clamps;
- Cleaning tools for the cleaning of the solar PV modules;
- Spare fuses.

16.DANGER BOARDS AND SIGNAGES :-

• Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date. Three signage shall be provided one each at battery –cum- control room, solar array area and main entry from administrative block. Text of the signage may be finalized in consultation with MANIREDA/ owner.

17.FIRE EXTINGUISHERS :-

• The firefighting system for the proposed power plant for fire protection shall be consisting of:
a. Portable fire extinguishers in the control room for fire caused by electrical short circuits.

b. Sand buckets in the control room.

c. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided in the control room housing PCUs as well as on the Roof or site where the PV arrays have been installed.

18.DRAWINGS& MANUALS :-

• Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. EoI holders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their EoI along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

• Approved ISI and reputed makes for equipment be used.

For complete electro-mechanical works, EoI holders shall supply complete design, details and drawings for approval to owners/MANIREDA before progressing with the installation work.

19.PLANNING AND DESIGNING:

• The EoI holder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labour. The EoI holder should submit the array layout drawings along with Shadow Analysis Report to owner for approval.

DRAWINGS TO BE FURNISHED BY CHANNEL PARTNER AFTER AWARD OF CONTRACT FROM BENEFICIARY:-

• The Contractor shall furnish the following drawings Award/Intent and obtain approval

• General arrangement and dimensioned layout.

• Schematic drawing showing the requirement of SV panel, Power conditioning inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.

• Structural drawing along with foundation details for the structure.

• Itemized bill of material for complete SV plant covering all the components and associated accessories.

• Layout of solar Power Array

• Shadow analysis of the roof

20.Quality and Workmanship

Solar PV modules are designed to last 25 years or more. It is therefore essential that all system components and parts, including the mounting structures, cables, junction boxes, distribution boxes and other parts also have a life cycle of at least 25 years. Therefore all works shall be undertaken with the highest levels of quality and workmanship. During inspection special attention will be given to neatness of work execution and conformity with quality and safety norms. Non-compliant works will have to be redone at the cost of the Installer.

21.DISPLAY BOARD :-

The EoI holder has to display a board at the project site (above 10 kWp) mentioning the following:

a. Plant Name, Capacity, Location, Type of Renewable Energy plant (Like solar wind etc.), Date of commissioning, details of tie-up with transmission and distribution companies, Power generation and Export FY wise.

b. Financial Assistance details from MANIREDA/MNRE/Any other financial institution apart from loan. This information shall not be limited to project site but also be displayed at site offices/head quarter offices of the successful EoI holder.

c. The size and type of board and display shall be appropriate.
