eTendering System Government of Kerala

Kerala Tenders

Tender Details

Date : 12-Apr-2023 06:51 PM

Print

Basic Details

Organisation Chain	ANERT		
Tender Reference Number	ANERT-TECH/99/2022-T2		
Tender ID	2023_ANERT_571678_1		
Tender Type	Open Tender	**Form of contract**	EPC Contract
Tender Category	Works	**No. of Covers**	2
General Technical Evaluation Allowed	No	**ItemWise Technical Evaluation Allowed**	No
Payment Mode	Not Applicable	**Is Multi Currency Allowed For BOQ**	No
Is Multi Currency Allowed For Fee	No	**Allow Two Stage Bidding**	No

Cover Details, No. Of Covers - 2

Cover No	Cover	Document Type	Description
1	Fee/PreQual/Technical	.pdf	Technical Bid
		.pdf	Pre Agreement
		.pdf	PQ Documents
2	Finance	.xls	Financial Bid
		.pdf	Financial Bid

Tender Fee Details, [Total Fee in ₹ * - 0.00]

Tender Fee in ₹	0.00		
Fee Payable To	Nil	**Fee Payable At**	Nil
Tender Fee Exemption Allowed	No		

EMD Fee Details

EMD Amount in ₹	0.00	**EMD through BG/ST or EMD Exemption Allowed**	No
EMD Fee Type	fixed	**EMD Percentage**	NA
EMD Payable To	Nil	**EMD Payable At**	Nil

Work /Item(s)

Title	Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd.				
Work Description	Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram				
Pre Qualification Details	Please refer Tender documents.				
Independent External Monitor/Remarks	NA				
Tender Value in ₹	NA	**Product Category**	Solar Power Plants	**Sub category**	NA
Contract Type	Tender	**Bid Validity(Days)**	90	**Period Of Work(Days)**	45
Location	Travancore Titanium Products Ltd., Kochuveli, Thir	**Pincode**	695021	**Pre Bid Meeting Place**	NA
Pre Bid Meeting Address	NA	**Pre Bid Meeting Date**	NA	**Bid Opening Place**	Onlin
Should Allow NDA Tender	No	**Allow Preferential Bidder**	No		

Critical Dates

Publish Date	12-Apr-2023 04:00 PM	**Bid Opening Date**	27-Apr-2023 04:00 PM
Document Download / Sale Start Date	12-Apr-2023 04:00 PM	**Document Download / Sale End Date**	26-Apr-2023 03:00 PM

Clarification Start Date	NA	**Clarification End Date**	NA
Bid Submission Start Date	12-Apr-2023 04:00 PM	**Bid Submission End Date**	26-Apr-2023 03:00 PM

Tender Documents

NIT Document

S.No	Document Name	Description	Document Size (in KB)
1	Tendernotice_1.pdf	NIT and Abstract	247.88

Work Item Documents

S.No	Document Type	Document Name	Description	Document Size (in KB)
1	Tender Documents	TenderDoc.pdf	Tender Document	957.89
2	BOQ	BOQ_843978.xls	Financial Bid	351.50

Tender Inviting Authority

Name	CEO ANERT
Address	Office of CEO, ANERT Law College Road, Vikas Bhavan. PO, Thiruvananthapuram - 695 033

AGENCY FOR NEW & RENEWABLE ENERGY RESEARCH AND TECHNOLOGY (ANERT)
Department of Power, Government of Kerala
Thiruvananthapuram, Kerala – 695 033;
www.anert.gov.in , projects@anert.in

E-TENDER DOCUMENT

Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

Ref. No.: ANERT-TECH/99/2022-T2

Date of Publishing of Bids : - 12/04/2023

Last Date of Submission of Bids : - 26/04/2023

CONTENTS

AGENCY FOR NEW & RENEWABLE ENERGY RESEARCH AND TECHNOLOGY (ANERT)
Department of Power, Government of Kerala
Thiruvananthapuram, Kerala – 695 033;
www.anert.gov.in , projects@anert.in

E-TENDER DOCUMENT

Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

Ref. No.: ANERT-TECH/99/2022-T2

VOL – 1: GENERAL CONDITIONS

Date of Publishing of Bids : - 12/04/2023

Last Date of Submission of Bids : - 26/04/2023

E-TENDER NOTICE

Competitive e-tenders in two cover system with Earnest Money Deposit (EMD) and Price Bid are invited from experience and eligible bidders to participate in the ***Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd***. The e-tender documents can be downloaded from the e-tendering website of Govt. of Kerala. Tender form will not be available in any other form.

Bid documents which include Eligibility criteria, "Technical Specifications", various conditions of contract, formats, etc. can be downloaded from website www.etenders.kerala.gov.in. Any amendment (s)/corrigendum/clarifications with respect to this Bid shall be uploaded on the above website only. The Bidder should regularly follow up for any Amendment/Corrigendum/Clarification on the above website.

Thiruvananthapuram CEO

12/04/2023

TENDER ABSTRACT

Ref. No.	**ANERT-TECH/99/2022-T2**
Document Description	**Implementation of 2 MWp Grid Connected Solar PV Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram**
Name of Work	**Design, Supply, Engineering, Erection Testing, Commissioning of SPV Power Plant of cumulative capacity of 1 MWp with Grid connectivity along with 10 years of Operation & Maintenance at various**
Site	**Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram**
Download of Tender Form	http://www.etenders.kerala.gov.in
Last date of submission of Tender	26/04/2023 @ 03.00 PM
Date and Time of Bid opening (Techno-Commercial)	27/04/2023 @ 03.30 PM
Cost of Tender form	**Rs. 11,800/- (Including GST)**
EMD	**Rs. 2,00,000/-**
Warranty period	10-year warranty and complete Operation & Maintenance. Minimum guaranteed PR and CUF of the plant as specified in the Technical Specification to be maintained.
Availability of Tender Forms	Website http://www.etenders.kerala.gov.in
Place of opening of tender	Office of CEO, ANERT Law College Road, Vikas Bhavan. PO, Thiruvananthapuram – 695 033, Kerala
Thiruvananthapuram 12/04/2023	Sd/- CEO

Important Note: Prospective Bidders are requested to remain updated for any notices/amendments/clarifications etc. to the RFS document through the website www.anert.gov.in/www.etenders.kerala.gov.in. No separate notifications will be issued for such notices/amendments/clarification etc. in the print media or individually.

DISCLAIMER

1. Though adequate care has been taken while preparing the NIT document, the Bidders shall satisfy themselves that the document is complete in all respect. Intimation regarding any discrepancy shall be given to this office immediately. If no intimation is received from any Bidder within Ten (10) days from the date of notification of NIT / issuance of e-Tender documents, it shall be considered that the document is complete in all respect and has been received / acknowledged by the Bidder(s).
2. Agency for New and Renewable Energy Research and Technology (ANERT) reserves the right to modify, amend or supplement this document.
3. While this tender document has been prepared in good faith, neither ANERT nor their employees or advisors make any representation or warranty, express or implied, or accept any responsibility or liability, whatsoever, in respect of any statements or omissions herein, or the accuracy, completeness or reliability of information, and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of this document, even if any loss or damage is caused by any act or omission on their part.

GENERAL TERMS AND CONDITIONS FOR E-PROCUREMENT

This e-Tender is being published as the Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd. The tender is invited in two cover system from experienced manufacturers / EPC contractors through e-procurement portal of Government of Kerala (www.etenders.kerala.gov.in). Prospective bidders willing to participate in this tender shall necessarily register themselves with above mentioned e-procurement portal.

The tender timeline is available in the critical date section of this tender published in www.etenders.kerala.gov.in

1. ONLINE BIDDER REGISTRATION PROCESS:

1.1 Bidders should have a Class III or above Digital Signature Certificate (DSC) to be procured from any Registration Authorities (RA) under the Certifying Agency of India. Details of RAs will be available on www.cca.gov.in. Once, the DSC is obtained, bidders have to register on www.etenders.kerala.gov.in website for participating in this tender. Website registration is a one-time process without any registration fees. However, bidders have to procure DSC at their own cost.

1.2 Bidders may contact e-Procurement support desk of Kerala State IT Mission over telephone at 0471- 2577088, 2577188, 2577388 or 0484 – 2336006, 2332262 - through email: helpetender@gmail.com/etendershelp@kerala.gov.in for assistance in this regard

2. ONLINE TENDER PROCESS:

The tender process shall consist of the following stages:

i. Downloading of tender document: Tender document will be available for free download on www.etenders.kerala.gov.in. However, tender document fees shall be payable at the time of bid submission as stipulated in this tender document.

ii. Publishing of Corrigendum: All corrigenda shall be published on www.etenders.kerala.gov.in and shall not be available elsewhere.

iii. Bid submission: Bidders have to submit their bids along with supporting documents to support their eligibility, as required in this tender document on www.etenders.kerala.gov.in. No manual submission of bid is allowed and manual bids shall not be accepted under any circumstances.

iv. In case bidder encounters any technical issues pertaining to e-Procurement system while acting on the tender, computer screen shot of the error message with date & time stamp on the web-browser along with the query shall be e-mailed by the bidder to the help desk **(helpetender@gmail.com/ etendershelp@kerala.gov.in)**, for resolution of the problem. At the same time, problem must be intimated to the concerned Tender Inviting Authority via email.

v. The time taken to ascertain, evaluate and suggest a solution for the problem reported by bidder may vary from case to case. Hence bidders are advised to submit the bid **at least 2 working days before the due date** and time of bid submission to avoid any last-minute issues that may come up.

vi. Opening of Bid and Bidder short-listing: The single cover bids will be opened, evaluated and shortlisted as per the eligibility. Failure to submit the required documents online will attract disqualification. Price bids of the qualified bidders will open on the day to be intimated to all bidders and the work will be awarded.

3. DOCUMENTS COMPRISING BID:

3.1 The 2-cover bid shall contain the scanned copies of the following documents which every bidder has to upload:

i. The tender document duly signed and sealed downloaded from the website.

ii. Pre-Agreement in the prescribed format (Annexure A) on Govt. of Kerala stamp paper worth Rs. 200/-

iii. Copy of Registration Certificate of the bidder firm

iv. Copy of PAN card

v. The bidder must have an experience of successful commissioning of at least 5 MW SPV Power Plants in India.

vi. Documentary evidence to support the bidders experience in any completed or ongoing SPV contract with a Govt. Department / Govt. undertaking / PSU / Private sector for having a single plant capacity not less than 1 MW. The plant shall be in operation at least 3 months before the date of opening of this bid proposal.

vii. Documents to prove the annual Turnover of the bidder (audited statement)

viii. Certifications required for proving technical compliance

ix. Summary of bidders Technical Information (Annexure B)

x. Declaration by the Bidder (format as in Annexure C)

xi. Declaration of relationship with ANERT employee (format as in Annexure D)

xii. The Price Schedule as per BOQ in Excel format for this tender to be downloaded from e-tender website, duly digitally signed by the tenderer/authorized signatory of the tender.

xiii. Bill of Material

3.2 The department doesn't take any responsibility for any technical snag or failure that has taken place during document upload.

3.3 The Bidder shall complete the Price bid as per format given for download along with this tender.

Note: The blank price bid should be downloaded and saved on bidder's computer without changing file-name otherwise price bid will not get uploaded. The bidder should fill in the details in the same file and upload the same back to the website.

4. TENDER DOCUMENT FEES AND EARNEST MONEY DEPOSIT (EMD)

4.1 The Bidder shall pay, a tender document fee of Rs. 17,850/- and Earnest Money Deposit or Bid Security or Bid Bond of Rs. 2,00,000/-. The Bid security is required to protect the purchaser against risk of Bidder's conduct, which would warrant the forfeiture of security.

4.2 Online Payment modes: The tender document fees and EMD can be paid in through e-Payment facility provided by the e-Procurement system. Bidders can make payment only via Internet banking facility

State Bank of India Multi Option Payment System (SBI MOPS Gateway): Bidders are required to avail Internet Banking Facility in any of below banks for making tender remittances in eProcurement System.

A) Internet Banking Options (Retail)			
1	Allahabad Bank	32	Kotak Mahindra Bank
2	Axis Bank	33	Lakshmi Vilas Bank
3	Andhra Bank	34	Mehsana Urban Co-op Bank
4	Bandan Bank	35	NKGSB Co-operative Bank
5	Bank of Bahrain and Kuwait	36	Oriental Bank of Commerce
6	Bank of Baroda	37	Punjab and Maharashtra Cooperative Bank
7	Bank of India	38	Punjab National Bank
8	Bank of Maharashtra	39	Punjab and Sind Bank
9	Bassein Catholic Co-operative Bank	40	RBL Bank
10	BNP Paribas	41	Saraswat Cooperative Bank
11	Canara Bank	42	Shamrao Vithal Cooperative Bank
12	Catholic Syrian Bank	43	South Indian Bank
13	Central Bank of India	44	Standard Chartered Bank
14	City Union Bank	45	State Bank of India
15	Corporation Bank	46	Syndicate Bank
16	Cosmos Bank	47	Tamil Nadu Mercantile Bank
17	DCB Bank	48	Tamil Nadu Cooperative Bank
18	Dena Bank	49	The Kalyan Janata Sahakari Bank
19	Deutsche Bank	50	TJSB Bank
20	Dhanalaxmi Bank	51	UCO Bank
21	Federal Bank	52	Union Bank of India
22	HDFC Bank	53	United Bank of India
23	ICICI Bank	54	Vijaya Bank

24	IDBI Bank	55	YES Bank
25	Indian Bank		
26	Indian Overseas Bank		
27	IndusInd Bank		
28	Jammu & Kashmir Bank		
29	Janata Sahakari Bank		
30	Karnataka Bank		
31	Karur Vysya Bank		
B) Internet Banking Options (Corporate)			
1	Bank of Baroda	21	Laxmi Vilas Bank
2	Bank of India	22	Oriental Bank of Commerce
3	Bank of Maharashtra	23	Punjab & Maharashtra Coop Bank
4	BNP Paribas	24	Punjab & Sind Bank
5	Canara Bank	25	Punjab National Bank
6	Catholic Syrian Bank	26	RBL Bank
7	City Union Bank	27	Shamrao Vitthal Co-operative Bank
8	Corporation Bank	28	South Indian Bank
9	Cosmos Bank	29	State Bank of India
10	Deutsche Bank	30	Syndicate Bank
11	Development Credit Bank	31	UCO Bank
12	Dhanalaxmi Bank	32	Union Bank of India
13	Federal Bank	33	UPPCL
14	HDFC Bank	34	Vijaya Bank
15	ICICI Bank	35	Axis Bank
16	Indian Overseas Bank		
17	Janta Sahakari Bank		
18	Jammu & Kashmir Bank		
19	Karur Vysya Bank		
20	Kotak Bank		

During the online bid submission process, bidder shall select ***SBI MOPS*** option and submit the page, to view the ***Terms and Conditions*** page. On further submitting the same, the e-Procurement system will re-direct the bidder to MOPS Gateway, where two options namely ***SBI*** and ***Other Banks****** will be shown. Here, Bidder may proceed as per below:

a) *SBI Account Holders* shall click ***SBI*** option to with its Net Banking Facility., where bidder can enter their internet banking credentials and transfer the Tender Fee and EMD amount.

b) *Other Bank Account Holders* may click ***Other Banks*** option to view the bank selection page. Here, bidders can select from any of the 54 Banks to proceed with its Net Banking Facility, for remitting tender payments.

**Transaction Charges for Other Banks vide SBI Letter No. LHO/TVM/AC/2016-17/47 – 1% of transaction value subject to a minimum of Rs. 50/- and maximum of Rs. 150/-*

** Bidders who are using Other Banks option under SBI MOPS Payment Gateway, are advised by SBI to make online payment 72 hours in advance before tender closing time.*

5. SUBMISSION PROCESS:

5.1 For submission of bids, all interested bidders have to register online as explained above in this document. After registration, bidders shall submit their Technical bid and Financial bid online on www.etenders.kerala.gov.in along with online payment of tender document fees and EMD.

5.2 For page-by-page instructions on bid submission process, please visit www.etenders.kerala.gov.in and click "Bidders Manual Kit" link on the home page.

5.3 It is necessary to click on "Freeze bid" link/ icon to complete the process of bid submission otherwise the bid will not get submitted online and the same shall not be available for viewing/ opening during bid opening process.

6. VALIDITY

6.1 The tender offer shall be kept valid for acceptance for a period of 3 months from the date of opening of offers. The offers with lower validity period are liable for rejection.

6.2 Further, the tenderer may extend the validity of the Bids without altering the substance and prices of their Bid for further periods, if so required

7. DEVIATIONS

7.1 The offers of the bidders with Deviations in Commercial terms and Technical Terms of the Tender Document are liable for rejection.

8. BLACK LIST

8.1 All the intending tenderers shall agree that in the event of the documents furnished with the offer being found to be bogus or the documents contain false particulars, they shall be blacklisted for future tenders/ association with ANERT and EMD shall be forfeited against any losses incurred by ANERT.

9. BIDDER'S LOCATION

9.1 The tenderers are requested to furnish the exact location of their factories/godown with detailed postal address and pin code, telephone and fax nos. etc. in their tenders to arrange inspection by ANERT, if considered necessary.

9.2 All communication shall be made to the registered email of the bidder in the e-tendering systems and ANERT shall not be responsible for non-receipt or delay of any such communication.

CONDITIONS OF CONTRACT

10. GENERAL CONDITIONS

10.1 The tenders should be submitted online at www.etenders.kerala.gov.in.

10.2 The tenders should be as per the prescribed form which should be downloaded from the e-tender website. The cost of tender forms should be paid online, and once paid will not be refunded. Tender forms are not transferable. Tenders that are not in the prescribed form are liable to be rejected.

10.3 Intending tenderers should submit their tenders on or before the due date and time mentioned in the tender abstract. Late tender will not be accepted.

10.4 The rates quoted should be only in Indian currency. Tenders in any other currency are liable to rejection. The rates quoted should be for the unit specified in the schedule attached.

10.5 The tenderer shall submit a copy of PAN card of the authorised signatory along with tender.

10.6 Tenders subject to conditions will not be considered. They are liable to be rejected on that sole ground.

10.7 The tenders will be opened on the specified day and time in the office of the CEO, ANERT in the presence of such of those tenderer's representatives who may be present with proper authorisation issued by the tenderer.

10.8 Every tenderer should send along with his tender an Earnest Money Deposit. This may be paid online at the e-tenders website.

10.9 If any tenderer withdraws from his e-tender before the expiry of the period fixed for keeping the rates firm for acceptance, the earnest money if any, deposited by him, will be forfeited.

10.10 The final acceptance/rejection of the tenders rests entirely with CEO, ANERT who do not bind themselves to accept the lowest or any tender.

10.11 In the case of materials of technical nature, the successful tenderer should be prepared to guarantee satisfactory performance for a period of guarantee under a definite penalty. Communication of acceptance of the e-tender normally constitutes a concluded contract. Nevertheless, the successful tenderer shall also

execute an agreement for the due fulfilment of the contract within the period to be specified in the letter of acceptance. The contractor shall have to pay all stamp duty, Lawyer's charges and other expenses incidental to the execution of the agreement. Failure to execute the agreement within the period specified will entail the penalties set out below:

10.11.1 The successful tenderer shall **a) deposit a sum @ 3% of the contract till the completion of Installation works. The deposit shall be in the form of a BG which shall be returned after COD (Commercial Operation Date).** There will be no exemption for MSE's in depositing this security amount. If the successful bidder fails to deposit the security and execute the agreement as stated above, the earnest money deposited by him will be forfeited to ANERT; and contract arranged elsewhere at the defaulter's risk and any loss incurred by ANERT on account of the purchase will be recovered from the defaulter who will however not be entitled to any gain accruing thereby.

10.11.2 In cases where a successful tenderer, after having made partial supplies fails to fulfil the contracts in full, all or any of the materials not supplied may at the discretion of the Purchasing Officer be purchased by means of another tender/quotation or by negotiation or from the next higher tenderer who had offered to supply already, and the loss if any caused to ANERT shall thereby together with such sums as may be fixed by ANERT towards damages be recovered from the defaulting tenderer.

10.12 Return the Security deposit shall, subject to the conditions specified herein to the contractor within three months after the expiration of the contract. But in the event of any dispute arising between ANERT and the contractor, ANERT shall be entitled to deduct out of the deposits or the balance thereof, until such dispute is determined the amount of such damages, costs, charges and expenses as may be claimed. The same may also be deducted from any other sum, which may be due at any time from ANERT to the contractor. In all cases where there are guarantee for the goods supplied, the security deposit will be released only after the expiry of the guarantee period.

(a) All payments to the contractors will be made by CEO ANERT in due course by NEFT transfer only

(b) All incidental expenses incurred by ANERT for making payments outside the State in which the claim arises shall be borne by the contractor.

10.13 The contractor shall not assign or make over the contract on the benefits or burdens thereof to any other person or body corporate. The contractor shall not underlet or sublet to any person or persons or body corporate the execution of the contract or any part thereof without the consent in writing of the purchasing officer who shall have absolute power to refuse such consent or to rescind such consent (if given) at any time if he is not satisfied with the manner in which the contract is being executed and no allowance or compensation shall be made to the contractor or the subcontractor upon such rescission. Provided always that if such consent be given at any time, the contractor shall not be relieved from any obligation, duty or responsibility under this contract.

10.14 In case the contractor becomes insolvent or goes into liquidation, or makes or proposes to make any assignment for the benefit of his creditors or proposes any composition with his creditors for the settlement of his debts, carries on his business or the contract under inspection or behalf of or his creditors or in case any receiving order(s) for the administration of his estate are made against him or in case the contractor shall commit any act of insolvency or in case in which under any clause or clauses any act of insolvency or in case in which under any clause(s) of this contract the contractor shall have rendered himself liable to damages amounting to the whole of his security deposits, the contract shall, thereupon, after notice given by the Purchasing Officer to the contractor, be determined and ANERT may complete the contract in such time and manner and by such persons as ANERT shall think fit. But such determination of the contract shall be without any prejudice to any right or remedy of ANERT against the contractor or his sureties in respect of any breach of contract committed by the contractor. All expenses and damages caused to ANERT by any breach of contract by the contractor shall be paid by the contractor to ANERT and may be recovered from him under the provisions of the Revenue Recovery Act in force in the State.

10.15 Any sum of money due and payable to the contractor (including security deposit returnable to him) under this contract may be appropriated by the CEO or any other person authorised by ANERT and set off against any claim of ANERT for the payment of a sum of money arising out of or under any other contract made by the contractor with ANERT or any other person authorised by ANERT. Any sum of money due and payable to the successful tenderer or contractor from ANERT shall be adjusted against any sum of money due to ANERT from him under any other contracts.

10.16 Every notice hereby required or authorised to be given may be either given to the contractor personally or left at his residence or last known place of abode or business, or may be handed over to his agent personally, or may be addressed to the contractor by post at his usual or last known place of abode or business and if so addressed and posted, shall be deemed to have been served on the contractor on the date on which in the ordinary course of post, a letter so addressed and posted would reach his place of abode or business.

10.17 The tenderer shall undertake the installation and commissioning of the system according to the standards and specification.

10.18 No representation for enhancement of rate once accepted will be considered.

10.19 Special conditions, if any, of the tenderers attached with the tenders will not be applicable to the contract unless they are expressly accepted in writing by the purchaser.

10.20 The tenderer should send along with this tender an agreement executed and signed in Kerala Stamp Paper of value Rs.200/-. A specimen form of agreement is given as Annexure A to this tender. Tenders without the agreement in stamped paper will be rejected outright.

10.21 Conditions in the technical document, technical specifications and special conditions of this tender document would override these general conditions, wherever applicable.

10.22 ANERT, by notice sent to the Supplier, may terminate the contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination be for ANERT's convenience, the extent to which performance of the

Supplier under the contract is terminated, and the date upon which such termination becomes effective.

10.23 The E-tender shall be opened at the time and date announced in the tender notice, and the price bid will be evaluated as intimated vide auto generated email only.

10.24 In case any difference or dispute arises in connection with the contract, all legal proceedings relating to the matter shall be instituted in the Court within whose jurisdiction the CEO, ANERT voluntarily resides.

10.25 The Courts situated at the place where the headquarters of ANERT is situated viz, Thiruvananthapuram alone will have jurisdiction to entertain civil suits and all other legal pertaining to this contract.

11. SPECIAL CONDITIONS

11.1 Each bidder should submit only one (1) bid. Any bidder who submits/participates in more than one bid for the work shall be disqualified.

11.2 The tenders will be opened at the date and time advised in the Bidding Document. If the due date for receiving and opening the tender happens to be declared holiday, then the tender will be received and opened on the very next day, for which no prior intimation will be given.

11.3 If the bidder has NOT submitted the requisite EMD OR Agreement, OR if the price bid is not submitted along with the tender, such tenders will be summarily rejected.

11.4 During the tender evaluation, ANERT may seek more clarifications/details from any or all of the tenderers, if felt necessary.

11.5 The price bids of the tenderers, which submitted the required documents only will be opened and the L1 bidder will be awarded the work of supply and installation of items after fulfilling all the requirements.

11.6 If found essential, ANERT reserves the right, in the interest of completion of work within the time limit, to award portion/portions of the Work order to next higher bidders, called for negotiation in the increasing order of their price offers, if they agree to supply at the L1 price.

11.7 **The rate quoted should be all-inclusive including delivery of materials at the location to be specified, and the cost of materials and labour for the civil works, installation and commissioning, Warranties, Application fees, O&M charges, GST and all other expenses.**

11.8 The tender offer shall be kept valid for acceptance for a period of 6 months from the date of opening of bid. The offers with lower validity period are liable for rejection.

11.9 The evaluation of the price bid will be based on the grand total of all-inclusive amount quoted excluding GST.

AGENCY FOR NEW & RENEWABLE ENERGY RESEARCH AND TECHNOLOGY (ANERT)
Department of Power, Government of Kerala
Thiruvananthapuram, Kerala – 695 033;
www.anert.gov.in , projects@anert.in

E-TENDER DOCUMENT

Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

Ref. No.: ANERT-TECH/99/2022-T2

VOL – 2: SCHEDULE AND SCOPE OF WORKS

Date of Publishing of Bids : - 12/04/2023

Last Date of Submission of Bids : - 26/04/2023

REQUEST FOR SELECTION (RFS)

FOR

12. Implementation of 2 MWp Grid Connected Solar PV System to be installed at multiple locations within the Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram

12.1 ANERT, therefore, invites bids from eligible bidders to participate in the Request for Selection in the e-tendering platform for Design, Manufacture, Supply, Erection, Testing and Commissioning including Warranty, Operation and Maintenance of Solar PV Power System at proposed location.

12.2 For the implementation of above-mentioned work, Bidders should submit their bid proposal online complete in all aspect on or before Last date of Bid Submission.

12.3 Bid documents, which include Eligibility Criteria, Technical Specifications, various Conditions of Contract, and Formats etc., can be downloaded from website www.anert.gov.in. It is mandatory to download official copy of E-TENDER Document from Kerala Tenders Portal. Any amendment(s)/corrigendum/clarification(s) with respect to this Bid shall be uploaded on www.etenders.kerala.gov.in. The Bidder should regularly check for any Amendment(s)/Corrigendum/Clarification(s) on the above website only.

12.4 The scope of work includes:

12.4.1 Design, Engineering, Manufacture, Supply, Storage, Civil work, Erection, Testing & Commissioning of the Grid connected PV Project including Power evacuation, Operation and Maintenance (O & M) of the project for a period of 10 years for after commissioning of project.

13. DEFINITIONS & ABBREVIATIONS

a) In this "Bid / RFS Document" the following words and expression will have the meaning as herein defined where the context so admits:

13.1 **"Affiliate"** shall mean a company that either directly or indirectly

a. controls or

b. is controlled by or

c. is under common control with

13.2 A Bidding Company and **"control"** means ownership by one company of at least twenty-six percent (26%) of the voting rights of the other company.

13.3 **"B.I.S"** shall mean specifications of Bureau of Indian Standards (BIS);

13.4 **"Bid"** shall mean the Techno Commercial and Price Bid submitted by the Bidder along with all documents/credentials/attachments annexure etc., in response to this RFS, in accordance with the terms and conditions hereof.

13.5 **"Bidder/Bidding Company"** shall mean Bidding Company submitting the Bid. Any reference to the Bidder includes Bidding Company / including its successors, executors and permitted assigns as the context may require;

13.6 **"Bid Deadline"** shall mean the last date and time for submission of Bid in response to this RFS as specified in the Tender Abstract;

13.7 **"Bid Capacity"** shall mean capacity offered by the bidder in his Bid.

13.8 **"CEA"** shall mean Central Electricity Authority.

13.9 **"Chartered Accountant"** shall mean a person practicing in India or a firm whereof all the partners practicing in India as a Chartered Accountant(s) within the meaning of the Chartered Accountants Act, 1949;

13.10 **"Competent Authority''** shall mean (Designation of Competent Authority) of [Name of the Organization] himself and/or a person or group of persons nominated by MD for the mentioned purpose herein;

13.11 **"Commissioning,"** means Successful operation of the Project / Works by the Contractor, for carrying out Performance Test(s) as defined in RFS.

13.12 **"Company"** shall mean a body incorporated in India under the Companies Act, 1956 or Companies Act, 2013 including any amendment thereto;

13.13 **Commercial Operation Date**: The date of successful conducting field acceptance tests and injection of power at delivery point shall be the "Commercial Operation Date"

13.14 **"Capacity Utilization Factor" (CUF)** shall mean the ratio of actual energy generated by SPV project over the year to the equivalent energy output at its

rated capacity over the yearly period.

$$CUF = \frac{actual\ annual\ energy\ generated\ from\ the\ plant\ in\ kWh}{(installed\ plant\ capacity\ in\ kW * 365 * 24)}$$

13.15 **"Eligibility Criteria"** shall mean the Eligibility Criteria as set forth in Clause 16 of this RFS;

13.16 **"Financially Evaluated Entity"** shall mean the company which has been evaluated for the satisfaction of the Financial Eligibility Criteria set forth in Clause 16.3 hereof;

13.17 **"IEC"** shall mean specifications of International Electro-Technical Commission;

13.18 **"kWp"** shall mean kilo-Watt Peak;

13.19 **"kWh"** shall mean kilo-Watt-hour;

13.20 **"MNRE"** shall mean Ministry of New and Renewable Energy, Government of India;

13.21 **"O&M"** shall mean Operation & Maintenance of Solar PV system for PPA period.

13.22 **"Owner of the project"** shall mean MILMA Ernakulam Diary, shall mean anyone who has ownership (including lease ownership also) of the land / roof and is the legal owner of all equipments of the project. Owner of the project can enter into a PPA with the consumer (s) of power for supply of solar power for agreed time (years) from the date of Commissioning of project.

13.23 **"Project Cost / Project Price" shall** mean the price offered by the Bidder for the Scope of work as per RFS document for the site.

13.24 **"Project capacity"** means Capacity in kWp offered by the Bidder. The project capacity specified is on "DC" output Side only.

13.25 **"Performance Ratio" (PR) means**

"Performance Ratio" (PR) means the ratio of plant output versus installed plant capacity at any instance with respect to the radiation measured.

$$PR = \frac{\text{Measured output in kW}}{\text{Installed Plant capacity in kW} * (1000 / \text{Measured radiation intensity in W/m2})}$$

13.26 "**Parent"** shall mean a company, which holds more than 51% equity either directly or indirectly in the Bidding Company or Project Company or a Member in a Consortium developing the Project

13.27 **"Project Company"** shall mean Company incorporated by the bidder as per

Indian Laws in accordance with Clause no 16.1.

13.28 **"Price Bid"** shall mean BoQ, containing the Bidder's quoted Price as per the Volume- IV of this RFS;

13.29 **"Qualified Bidder"** shall mean the Bidder(s) who, after evaluation of their Techno Commercial Bid stand qualified for opening and evaluation of their Price Bid;

13.30 **"RFS"** shall mean Request for Selection (RFS)/Bid document/Tender document

13.31 **"Statutory Auditor"** shall mean the auditor of a Company appointed under the provisions of the Companies Act, 1956 or under the provisions of any other applicable governing law;

13.32 **"Successful Bidder(s) /Contractor/Project Developers(s)"** shall mean the Bidder(s) selected by Owner pursuant to this RFS for Implementation of Grid Connected Ground mounted Solar PV System as per the terms of the RFS Documents, and to whom an Allocation Letter has been issued;

13.33 "Site" shall mean the project location at the address mentioned below.

MILMA Ernakulam Dairy, Thrippunithura PO., Ernakulam-682 301

13.34 **"SNA"** shall mean State Nodal Agency, ANERT.

13.35 **"Tendered Capacity"** shall mean the Total aggregate capacity in MW proposed to be tendered by ANERT to the Successful Bidder through this bidding process as per terms and conditions specified therein;

13.36 **"Ultimate Parent"** shall mean a company, which owns at least more than fifty percent (51%) equity either directly or indirectly in the Parent and Affiliates.

13.37 **"Wp"** shall mean Watt Peak.

13.38 **2MWp** for the purpose of conversion in **kWp** shall be considered as 2000kWp.

b) INTERPRETATIONS

i. Words comprising the singular shall include the plural & vice versa

ii. An applicable law shall be construed as reference to such applicable law including its amendments or re-enactments from time to time.

iii. A time of day shall save as otherwise provided in any agreement or document be construed as a reference to Indian Standard Time.

iv. Different parts of this contract are to be taken as mutually explanatory and

supplementary to each other and if there is any differentiation between or among the parts of this contract, they shall be interpreted in a harmonious manner to give effect to each part.

v. The table of contents and any headings or sub headings in the contract has been inserted for case of reference only & shall not affect the interpretation of this agreement.

14. INTRODUCTION

14.1 ANERT, on behalf of Smart City Thiruvananthapuram Ltd, hereby invites interested companies to participate in the bidding process for the selection of Successful Bidder(s) for implementation of grid-connected Solar Photovoltaic Project under CAPEX model in Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram.

14.2 The Bidders are advised to read carefully all instructions and conditions appearing in this document and understand them fully. All information and documents required as per the bid document must be furnished. Failure to provide the information and / or documents as required may render the bid technically unacceptable.

14.3 The bidder shall be deemed to have examined the bid document, to have obtained his own information in all matters whatsoever that might affect the carrying out the works in line with the scope of work specified elsewhere in the document at the offered rates and to have satisfied himself to the sufficiency of his bid. The bidder shall be deemed to know the scope, nature and magnitude of the works and requirement of materials, equipment, tools and labour involved, wage structures and as to what all works, he has to complete in accordance with the bid documents irrespective of any defects, omissions or errors that may be found in the bid documents.

15. BID DETAILS

15.1 The bidding process under this RFS is for a 2 MWp cumulative capacity of SPV Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram. This includes 1.5 MWp installation to be done in Ground and 500 kWp in the Rooftop of various buildings within TTL campus.

BID QUALIFICATION REQUIREMENTS

16. ELIGIBILITY CRITERIA

16.1 General

i. The Bidder should be either a body incorporated in India under the Companies Act, 1956 or 2013 including any amendment thereto, Sole Proprietorship, Partnership company and engaged in the business of Solar Power.

ii. A copy of certificate of incorporation shall be furnished along with the bid in support of above.

16.2 Technical Eligibility Criteria:

The Bidder should have installed & commissioned Grid connected Solar PV Power Project having a capacity of single plant not less than 1 MW and cumulative capacity of above 5 MW, which should have been commissioned at least two months prior to Techno-Commercial Bid Opening date. The list of projects commissioned at least 2 months prior to Techno-Commercial Bid Opening date, indicating whether the project is grid connected, along with a copy of the Commissioning certificate and Work order / Contract / Agreement/ from the Client/Owner shall be submitted in support of Clause 16.2.

16.3 Financial eligibility criteria

The Bidder should have an Annual Turnover or Net worth as indicated below.

i. The Minimum Average Annual turnover of Rupees 8 Crores in any two of the last 5 financial years preceding the Bid Deadline subject to the condition that the Bidder should at least have completed two financial years.

OR

ii. Net worth equals to or greater than the value calculated at rate of Rs. 10 Crores. The Computation of Net worth shall be based on unconsolidated audited annual accounts of the last financial year immediately preceding the Bid Deadline. Share

premium can be included in the Net-worth calculation in case of listed companies in India only.

The formula of calculation of net-worth shall be as follows:

Net-worth = (Paid up share capital) + {(Free reserves - Share premium) +Share premium of listed companies)} - (Revaluation of reserves)- (Intangible assets) - (Miscellaneous expenditure to the extent not written off and carry forward losses).

For the purposes of meeting financial requirements, only unconsolidated audited annual accounts shall be used. Bidders shall furnish documentary evidence as per the Format - 5, duly certified by Authorized Signatory and the Statutory Auditor / Practising Chattered Accountant of the Bidding Company in support of their financial capability.

16.4 Bid submission by the bidder

16.4.1 The Bidder shall submit the information and/or documents as per the formats specified in Volume-IV.

16.4.2 Strict adherence to the formats wherever specified, is required. Wherever, information has been sought in specified formats, the Bidder shall refrain from referring to brochures /pamphlets. Non-adherence to formats and / or submission of incomplete information may be a ground for declaring the Bid as non-responsive. Each format has to be duly signed and stamped by the authorized signatory of the Bidder.

16.4.3 The Bidder shall furnish documentary evidence in support of meeting Eligibility Criteria as indicated in Clause no. 16.1, 16.2 and 16.3 to the satisfaction of ANERT. They shall also furnish unconsolidated/consolidated audited annual accounts in support of meeting financial requirement, which shall consist of balance sheet, profit and loss account, profit appropriation account, auditors report, etc., as the case may be of Bidding Company or Financially Evaluated Entity for any of the last three(3) financial years immediately preceding the Bid Deadline which are used by the bidder for the purpose of calculation of Annual Turnover or of last Financial Year in case of Net Worth.

16.4.4 In case the annual accounts for the latest financial year are not audited and therefore the bidder cannot make it available, the applicant shall give certificate to this effect from their CEOs. In such a case, the Applicant shall provide the Audited Annual Reports for 3 (Three) years preceding the year or from the date of incorporation if less than 3 years for which the Audited Annual Report is not being provided.

16.5 Amendments to RFS

16.5.1 At any time prior to the deadline for submission of Bids, ANERT may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the RFS document by issuing clarification(s) and/or amendment(s).

16.5.2 The clarification(s) / amendment(s) (if any) may be notified on Kerala Tenders website www.etenders.kerala.gov.in at least Two (2) days before the proposed date of submission of the Bid. If any amendment is required to be notified within Two (2) days of the proposed date of submission of the Bid, the Bid Deadline may be extended for a suitable period.

16.5.3 ANERT will not bear any responsibility or liability arising out of non-receipt of the information regarding Amendments in time or otherwise. Bidders must check the website for any such amendment before submitting their Bid.

16.5.4 In case any amendment is notified after submission of the Bid (prior to the opening of Techno-Commercial Bid.

16.5.5 All the notices related to this Bid which are required to be publicized shall be uploaded on website www.etenders.kerala.gov.in

16.6 Bidding process

16.6.1 Bid formats

The Bid shall comprise of the following:

(A) Cover I - Techno-Commercial documents

i. Covering Letter as per the prescribed Format-1

ii. Copy of PAN and TAN certificates of Bidding company

iii. Original power of attorney issued by the Bidding Company in favour of the authorized person signing the Bid, in the form attached hereto as Format-2 or standard power of attorney in favour of authorized person signing the Bid. (Power of Attorney must be supplemented by Board Resolution to above effect for the company). However, ANERT may accept general Power of Attorney executed in favour of Authorised signatory of the Bidder, if it shall conclusively establish that the signatory has been authorized by the Board of CEOs to execute all documents on behalf of the Bidding Company.

iv. General particulars of bidders as per Format-3

v. Document in support of meeting Eligibility Criteria as per Clause no. 16.1 & 16.2.

vi. Certificates of incorporation of Bidding company

viii. Details for meeting Financial Eligibility Criteria as per Clause no. 16.3 along with documentary evidence for the same as per Format -4

ix. Board resolution for Authorised signatory

x. Signed and stamped Copy of RFS Documents including amendments & clarifications by Authorised signatory on each page.

(B) Cover II- Price bid

The Bidder shall inter-alia take into account the following while preparing and submitting the Price Bid digitally signed by the authorized signatory. The Bidder shall submit Price Bid in excel BoQ file downloaded from the e-tender website.

16.7 Validity of Bid

16.7.1 The bid and the Price Schedule included shall remain valid for a period of 3 months from the date of techno-commercial bid opening, with bidder having no right to withdraw, revoke or cancel his offer or unilaterally vary the offer submitted or any terms thereof. In case of the bidder revoking or cancelling his offer or varying any term & conditions in regard thereof or not accepting letter of allocation, ANERT shall forfeit the Bid Bond furnished by him.

16.7.2 In exceptional circumstances when letter of acceptance is not issued, ANERT may solicit the Bidder's consent to an extension of the period of validity. The request and the responses thereto shall be made in writing. The EMD provided shall also be suitably extended. A Bidder may refuse the request without forfeiting its Bid Bond. A Bidder granting the request will neither be required nor permitted to modify its Bid in any manner.

16.8 Cost of bidding

The bidder shall bear all the costs associated with the preparation and submission of his offer, and ANERT will in no case be responsible or liable for those costs, under any conditions. The Bidder shall not be entitled to claim any costs, charges and expenses of and incidental to or incurred by him through or in connection with his submission of bid even though ANERT may elect to modify / withdraw the invitation of Bid.

16.9 Performance Security / Performance Bank Guarantee (PBG)

16.9.1 Within 30 days from the date of issue of Allocation letter, Successful Bidder shall furnish the Performance Security @ 3% of the total contract value.

16.9.2 The Performance Security shall be denominated in Indian Rupees and shall be in one of the following forms:

a. A demand draft, or a bank guarantee in the format given in Format-4 from any nationalised bank.

b. Be confirmed for payment by the branch of the bank giving the bank guarantee at Thiruvananthapuram.

16.9.3 The PBG shall be forfeited as follows without prejudice to the Bidder being liable for any further consequential loss or damage incurred to ANERT, if the Successful Bidder is not able to commission the projects to the satisfaction of ANERT.

16.9.4 The Performance Security shall be valid for a minimum period of 6 months from the date of issue of LoA

16.10 Right to withdraw the RFS and to reject any bid

16.10.1 This RFS may be withdrawn or cancelled by ANERT at any time without assigning any reasons thereof. ANERT further reserves the right, at its

complete discretion, to reject any or all of the Bids without assigning any reasons whatsoever and without incurring any liability on any account.

16.10.2 ANERT reserve the right to interpret the Bid submitted by the Bidder in accordance with the provisions of the RFS and make its own judgment regarding the interpretation of the same. In this regard ANERT shall have no liability towards any Bidder and no Bidder shall have any recourse to ANERT with respect to the selection process. ANERT shall evaluate the Bids using the evaluation process specified in Volume - III, at its sole discretion. ANERT's decision in this regard shall be final and binding on the Bidders.

16.10.3 ANERT reserves its right to vary, modify, revise, amend or change any of the terms and conditions of the Bid before submission. The decision regarding acceptance or rejection of bid by ANERT will be final.

16.11 Zero Deviation

This is a ZERO Deviation Bidding Process. Bidder is to ensure compliance of all provisions of the Bid Document and submit their Bid accordingly. Tenders with any deviation to the bid conditions shall be liable for rejection.

16.12 Examination of Bid document

16.12.1 The Bidder is required to carefully examine the Technical Specification, terms and Conditions of Contract, and other details relating to supplies as given in the Bid Document.

16.12.2 The Bidder shall be deemed to have examined the bid document including the agreement/contract, to have obtained information on all matters whatsoever that might affect to execute the project activity and to have satisfied himself as to the adequacy of his bid. The bidder shall be deemed to have known the scope, nature and magnitude of the supplies and the requirements of material and labour involved etc. and as to all supplies he has to complete in accordance with the Bid document.

16.12.3 Bidder is advised to submit the bid on the basis of conditions stipulated in the Bid Document. Bidder's standard terms and conditions if any will not be considered. The cancellation / alteration / amendment / modification in Bid documents shall not be accepted by ANERT.

16.12.4 Bid not submitted as per the instructions to bidders is liable to be rejected. Bid shall confirm in all respects with requirements and conditions referred in this bid document.

SCOPE OF WORK

17. SCOPE OF WORKS

The scope includes the Supply, Installation, Testing and Commissioning of Rooftop On-Grid SPV power plants. All the necessary approvals from KSEBL/Electrical Inspectorate, feasibility study, necessary civil work, Mounting of Module Structures, PV Module Installation, Inverter Installation, DC/AC Cabling and interconnections, Installation of Lightning Arresters and Earthing System as per the standards, Arranging all the necessary inspections from KSEBL/Electrical Inspectorate/ANERT District Office as part of Pre-Commissioning, if any, Commissioning of the PV Power Plant along with warranty and Operation and Maintenance (O&M) of the project under CAPEX model for 10 years after Commercial Operation Date (COD) are coming under the scope of the bidder.

The total project comprises of 500 kWp Rooftop Solar Power plant and 1500 kWp Ground Mounted Solar Power plant. The successful bidder reserves the right to finalise the capacity being installed at these locations identified within the area available with due approval of ANERT/TTL authorities.

17.1 LOCATION DETAILS

The location of installation of the proposed 2 MWp Solar Power plant is at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram, Kerala.

Site Name	Travancore Titanium Products Ltd., Kochuveli
Area available	Rooftop (Various buildings as listed below) and Ground of area 13000 Sqm.
District	Thiruvananthapuram
State	Kerala
Latitude	8°29'57.73"N
Longitude	76°54'5.13"E
Nearest National Highway	NH-66
Nearest Village/Town	Veli

Nearest Railway Station	Kochuveli (3 km from the site)
Nearest Airport	Trivandrum International Airport (5 km from the site)
Nearest KSEB Substation	Within the Campus

The Proposed 1.5 MW Solar Power Plant is to be installed on the area marked below

The balance 500 kWp is to be installed at the Rooftops of Buildings listed below:

#	Name of Block / Building	Capacity (kW)
1	Canteen	200
2	Locker Room	75
3	CLSS	75
4	Lime Storage Area	50
5	Filter Press	50
6	Time Office	25
7	66 kV Substation	25
	TOTAL	**500**

The bidders are to quote the per kW cost for the successful Supply, Testing, Installation and Commissioning of the Power plants as per the capacity mentioned for Rooftop as well as Ground mounted system. The full work will be awarded to the lowest bidder for the 2000 kWp. The cost of O&M will not form part of the selection of the L1 bidder.

17.2 ADDITIONAL WORKS

i. The successful bidder is to borne the fee for KSEBL feasibility, Registration and all other expenses. The additional costs for site specific cabling works, earthing, mounting structure modifications, required civil works etc to meet the technical criteria as detailed in this document are under the scope of the bidder.

ii. The scope of enhancing load, phase conversion, changing of CTs, PT, modification of Panel boards, extension of bus bars, replacement of metering panel boards etc wherever necessary is under the scope of the bidder. The rates for the same are to be considered in the bid for each site.

iii. In case of installations to be made in sites with HT connection, the replacement of CTs (Class 0.2s), PT (Class 0.2) of rating is under the scope of the vendor. The rates for Supply of tested transformers & Replacement at the site of these items to be quoted along with the bid.

iv. It is mandatory that the bidders are to visit the sites and quote the rates considering all the requirements as mentioned in this tender document. No requests for revision of rates will be entertained. In case, the successful bidder is not undertaking the specific work, the work will be cancelled and disciplinary proceedings will be initiated against the bidder and all payments due will be withheld. Hence, Bidders are requested to visit the site before quoting and the rate for successful commissioning in all aspects is to be quoted.

v. The rate quoted should be all inclusive including delivery of materials, the cost of materials and labour for the civil works, Installation and Commissioning, 10-year Warranty, fee for approval from the KSEBL, Electrical Inspectorate if any, Solar Meter, Remote monitoring facility, Insurance, GST and all other expenses deemed necessary for the proper

implementation of the conditions and specification as in-corporated in the tender.

vi. **The Operation and Maintenance of the Power plant for the whole period of warranty will be duty of the vendor. The rates for O&M per year need to be quoted in the BoQ file provided.**

vii. The Component wise split up of the costs in percentage for each capacity is to be included as part of the technical bid (included as format 6).

viii. Any other work required for the successful commissioning of the power plant which are not mentioned in this document and are required as per prevailing laws & regulations in the country

17.3 SUBMITTALS

On commencement of the Project, the Contractor shall submit the following to ANERT:

a. Prior to the technical submittals, the contractor shall submit detailed baseline program and methodology indicating the proposed overall schedule for documentation such as calculations, shop/ working drawings, plan/ procedures and records. Submission of samples, process of fabrication / delivery to site storage yard for the approval of the Employer. Also, Contractor shall submit Method statements and Quality Assurance plan for each activity to be done and get approval from ANERT before commencing the work. Contractor shall maintain the necessary Quality and Quantity documentation. All the documents shall be submitted to Employer for their review and records.

b. Detailed work procedures and schedules shall be submitted by contractor at least one month before start of work and shall get necessary approval from ANERT authorities and various entities. If required meeting shall be called to settle all the open issues. Contractor to ensure that all issues are closed one month prior to start of work.

c. Complete fabrication drawings, materials list, cutting lists, bolt lists, welding schedules and QC schedules, based on the design drawing furnished to him and in accordance with the approved schedule. It is highlighted that structural steel

members, dimensions thereof indicated in tender drawings are tentative only, and may be modified during final design stage.

d. Results of any tests, as and when conducted and as required by Employer.

e. A detailed list of all constructional Plant & Equipment, such as cranes, derricks, winches, welding sets etc. their makes, model, present condition and location, available to the contractor and the ones he will employ on the job to maintain the progress of work in accordance with the contract.

f. The total number of experienced personnel of each category, like fitters, welders, riggers etc., which he intends to deploy on the project.

g. The contractor shall submit complete design calculations for any alternative sections proposed by him, for the approval of Employer and records of Owner.

18. PROJECT COST

18.1 The Project cost shall include all the costs related to above Scope of Work. Bidder shall quote for the entire facilities on a "single responsibility" basis such that the total Bid Price covers all the obligations mentioned in the Bidding Documents in respect of Design, Supply, Erection, Testing and Commissioning including Warranty, Operation & Maintenance for a period 10 years under CAPEX model, goods and services including spares required if any during O&M period. The Bidder has to take all permits, approvals and licenses, Insurance etc., provide training and such other items and services required to complete the scope of work mentioned above.

18.2 The Project cost shall remain firm and fixed and shall be binding on the Successful Bidder till completion of work. No escalation will be granted on any reason whatsoever. The bidder shall not be entitled to claim any additional charges, even though it may be necessary to extend the completion period for any reasons whatsoever.

18.3 The cost shall be inclusive of all duties and taxes, insurance etc. The prices quoted by the firm shall be complete in all respect and no price variation /adjustment shall be payable during the 10-year period.

18.4 The Operation & Maintenance of Solar Photovoltaic Power Plant would include wear, tear, overhauling, machine breakdown, insurance, and replacement of

defective modules, invertors / Power Conditioning Unit (PCU), spares, consumables & other parts for a period of 10 years.

18.5 The cost shall be specified in sanction letter based on Successful Bidder's quote for the project. The project cost shall be in accordance with all terms, conditions, specifications and other conditions of the Contract as accepted by ANERT and incorporated into the sanction letter.

19. INSURANCE

20.1 The Bidder shall be responsible and take an Insurance Policy for transit-cum-storage-cum-erection for all the materials to cover all risks and liabilities for supply of materials on site basis, storage of materials at site, erection, testing and commissioning. The bidder shall also take appropriate insurance during O&M period.

20.2 The Bidder shall also take insurance for Third Party Liability covering loss of human life, engineers and workmen and also covering the risks of damage to the third party/material/equipment/properties during execution of the Contract. Before commencement of the work, the Bidder will ensure that all its employees and representatives are covered by suitable insurance against any damage, loss, injury or death arising out of the execution of the work or in carrying out the Contract. Liquidation, Death, Bankruptcy etc., shall be the responsibility of bidder.

20. WARRANTIES AND GUARANTEES

The Bidder shall warrant that the goods supplied under this contract are new, unused, of the most recent or latest technology and incorporate all recent improvements in design and materials. The bidder shall provide system warrantee covering the rectification of any and all defects in the design of equipment, materials and workmanship including spare parts for a period of the 10-years from the date of commissioning. The successful bidder has to transfer all the Guarantees /Warrantees of the different components to the Owner of the project. The responsibility of operation of Warrantee and Guarantee clauses and Claims/ Settlement of issues arising out of said clauses shall be

joint responsibility of the Successful bidder and the owner of the project and ANERT will not be responsible in any way for any claims whatsoever on account of the above.

21. TYPE AND QUALITY OF MATERIALS AND WORKMANSHIP

22.1 The Design, Engineering, Manufacture, Supply, Installation, Testing and Performance of the equipment shall be in accordance with latest appropriate IEC/Indian Standards as detailed in the Vol- III (Technical specifications) of the bid document. Where appropriate Indian Standards and Codes are not available, other suitable standards and codes as approved by the MNRE / authorised Government agency shall be used.

22.2 The specifications of the components should meet the technical specifications mentioned in Volume III.

22.3 Any supplies which have not been specifically mentioned in this Contract but which are necessary for the design, engineering, manufacture, supply & performance or completeness of the project shall be provided by the Bidder without any extra cost and within the time schedule for efficient and smooth operation and maintenance of the SPV plant.

22. OPERATION & MAINTENANCE

i. The bidder shall be responsible for Operation and Maintenance of the Solar PV system for the 10-year period, during which ANERT will monitor the project for effective performance in line with conditions specified elsewhere in the bid document. During this period, the bidder shall be responsible for supply of all spare parts as required from time to time for scheduled and preventive maintenance, major overhauling of the plant, replacement of defective modules, inverters, PCU's etc and maintaining log sheets for operation detail, deployment of staff for continuous operations and qualified engineer for supervision of O&M work, complaint logging & its attending.

ii. If any Operation & Maintenance issues are not resolved within 7 days, then complaint may be raised to ANERT, pursuant to which a penalty as decided by CEO, ANERT will be imposed.

iii. If the outage of the plant is more than 30 days continuously, then the 50% PBG amount shall be encashed by ANERT.

iv. If the outage is exceedingly more than 60 days then complete PBG amount shall be encashed by Owner. (This will be applicable till 10 years of O&M as per the Scope of the RFS.) Legal proceedings and other as deemed necessary by CEO, ANERT will be initiated against the defaulted contractor.

23. METERING AND GRID CONNECTIVITY

Metering and grid connectivity of the solar PV system under this project would be the responsibility of the Bidder in accordance with the prevailing guidelines of the concerned DISCOM and / or CEA (if available by the time of implementation). The bidder need to connectivity and the entire responsibility lies with bidder only. This particular power plant will be connected to the 11 kV bus at the 66 kV Substation under Captive consumer category.

24. PLANT PERFORMANCE EVALUATION

The successful bidder shall be required to meet minimum guaranteed generation with Performance Ratio (PR) at the time of commissioning and related Capacity Utilization Factor (CUF) as per the GHI levels of the location during the O&M period. PR should be shown minimum of 75% at the time of inspection for initial commissioning acceptance. Minimum CUF shall not be less than 21% for a period of 10 years. The bidder should send the periodic plant output details to ANERT for ensuring the CUF. The PR will be measured at Inverter output level during peak radiation conditions.

25. PROGRESS REPORT

The bidder shall submit the progress report monthly to ANERT in Prescribed Proforma. ANERT will have the right to depute his/their representatives to ascertain the progress of contract at the premises of works of the bidder.

26. SCHEDULE OF SUPPLY

i. The items should be delivered and installed at the sites of institution for which work order shall be given and specified by ANERT, under prior intimation and supervision of ANERT. The list of sites is listed below:

ii. If the successful bidder fails to deliver the materials within the days mentioned below, the order stands cancelled and ANERT will award the work to the next bidder and penalty as decided by ANERT will be levied.

#	Capacity of Solar Plant	Material Delivery (Days)	Completion Period (Days)
1	2 MWp	25	45

iii. For any delay in Installation and Commissioning beyond the period mentioned above, the ANERT will charge penalty of 0.5% of the order value/week or part thereof, subject to the cost not exceeding 10% of the total cost. Order will be cancelled if the delay of service is more than this time period and work will be issued to the second successful bidder

iv. Bidders are to submit their quotes only after visiting the site and the details of additional works required for the successful commissioning of the power plant is to be mentioned in the technical bid. No additional amount for any works will be provided under any circumstance, even if the site requires additional work other than quoted by the bidder. Hence, special care must be taken while submitting the bids.

v. Supply of the SPV module must be from the ALMM list issued by MNRE from time to time. The test certificates and reports of the inverters being used for the project must be submitted along with the bid. ANERT reserves the right to reject the bid based on the non-conformity of the inverter being supplied.

vi. The successful bidder shall submit the detailed BoM and the timeline for completion along with the agreement and security deposit. This timeline must be followed and no extension of time for completing the installation will be granted. Although, time extension may be granted for things beyond the control of the bidder.

vii. In case of no valid reason, extension of time of completion that can be granted at a time shall will be 25% of the original time. The maximum extension that can be granted for a work shall be limited to half the original time of completion.

viii. When the contract period has to be extended wholly or partly due to default on the part of the bidder, the Agreement Authority may sanction extension of time after imposing fine as mentioned below;

Period	Rate of Fine
First Extension	1% of the PAC subject to a minimum of Rs. 1000/- and maximum of Rs. 50,000/-.
Second Extension	2% of the PAC subject to a minimum of Rs. 2000/- and maximum of Rs. 1,00,000/-

27. PAYMENT

27.1 No advance payment will be given. All the documents submitted should be certified by the concerned personnel of ANERT.

27.2 The quotes for the Design, Supply, Installation & Commissioning including 10 years of warranty (EPC Part) to be provided by the bidders. The L1 bidder will be selected on the basis of their quotes on the EPC part with 10-year warranty and the O&M quote will not be part of bid evaluation.

27.3 The terms of payment shall be:

27.3.1 ***EPC Payment***

i. Upon delivery of major components (PV Modules, Inverter etc) at the site/warehouse, a maximum of 60% of the contract value can be released through Running Accounts Bills of min 10% of the contract value. The supplier shall submit the part invoice for the materials (including serial numbers and delivery chalan) for the materials duly certified by the concerned District Office along with a report regarding the supply of materials. Each RAB shall be accompanied with an item wise statement of work completion with qty, rate & the actual expenditure incurred audited by a Chartered Accountant.

ii. On completion of installation of the power plant, a maximum of 20% of the contract value can be released as Running Account Bills of min 10% of the

contract value. The supplier shall submit the invoice for the materials supplied and all documents related including the Project Completion Report to the completion of the work certified by the district office shall be submitted for the release of the amount. The second part invoice can be raised only after submitting application for energization to the Electrical Inspectorate. Each RAB shall be accompanied with an item wise statement of work completion with qty, rate & the actual expenditure incurred audited by a Chartered Accountant.

iii. After the Inspection and Approval of the Electrical Inspectorate, 5% of the contract value will be released. All documents related to the completion of the work including commissioning report shall be submitted for the release of the amount.

iv. The date of Energisation to the Grid by the DISCOM will be considered as the official Date of Commissioning (CoD) of the project and this will be treated as the commissioning of the system. On commissioning of the grid connected system, 5% of the contract value will be released after proving the Performance ratio (AC). The PR report as per standard is to be provided for release of the amount.

v. The balance 10% shall be retained as performance security and will be released in five equal parts - 2% after 1 year of operation, 2% after 3 years of operation, 2% after 5 years of operation, 2% after 7 years of operation and last 2% after the 10 years of warranty. For releasing these payment, Performance ratio (AC) shall be proved within a period of 7 consecutive days at the end of each year for release of payment. **The plant shall be handed over at the end of 10 years after commissioning after proving the performance ratio (AC).** This period will be considered only from the date of commissioning.

vi. The security deposit of 3% furnished along with the contract agreement shall be released on successful completion of supply, installation and commissioning.

27.3.2 ***Maintenance Payment***

i. The amount shall be released on annual basis after completion of the period of the previous year. The start of maintenance period will be considered from the scheduled date of operation.

ii. The preventive maintenance reports along with receipt of premium of insurance and generation reports are to be submitted for the release of payments.

iii. The payment shall be released after the inspection by the authorised personnel of ANERT on annual basis.

27.4 Income tax, contribution to workers' welfare fund and other statutory deductions shall be made from the payment as per prevailing norms.

28. PROJECT INSPECTION

The project progress will be monitored by ANERT and the projects will be inspected for quality at any time during commissioning or after the completion of the project either by officer(s) from ANERT or any authorized agency/ experts.

29. APPLICABLE LAW

The Contract shall be interpreted in accordance with the laws of the Union of India and in the Jurisdiction of Thiruvananthapuram, Kerala.

30. SETTLEMENT OF DISPUTE

29.1 If any dispute of any kind whatsoever arises between ANERT and Successful bidder in connection with or arising out of the contract including without prejudice to the generality of the foregoing, any question regarding the existence, validity or termination, the parties shall seek to resolve any such dispute or difference by mutual consent. If the same cannot be resolved, the courts in the jurisdiction will be approached and finalised by the appropriate court after legal proceedings.

31. FORCE MAJEURE

30.1 Notwithstanding the provisions of clauses contained in this RFS document; the contractor shall not be liable to forfeit (a) Security deposit for delay and (b)

termination of contract; if he is unable to fulfill his obligation under this contract due to force majeure conditions.

30.2 For purpose of this clause, "Force Majeure" means an event beyond the control of the contractor and not involving the contractor's fault or negligence and not foreseeable, either in its sovereign or contractual capacity. Such events may include but are not restricted to Acts of God, wars or revolutions, fires, floods, epidemics, quarantine restrictions and fright embargoes etc. Whether a “Force majeure” situation exists or not, shall be decided by ANERT and its decision shall be final and binding on the contractor and all other concerned.

30.3 In the event that the contractor is not able to perform his obligations under this contract on account of force majeure, he will be relieved of his obligations during the force majeure period. In the event that such force majeure extends beyond six months, ANERT has the right to terminate the contract in which case, the security deposit shall be refunded to him.

30.4 If a force majeure situation arises, the contractor shall notify ANERT in writing promptly, not later than 14 days from the date such situation arises. The contractor shall notify ANERT not later than 3 days of cessation of force majeure conditions. After examining the cases, ANERT shall decide and grant suitable additional time for the completion of the work, if required.

32. LANGUAGE

All documents, drawings, instructions, design data, calculations, operation, maintenance and safety manuals, reports, labels and any other date shall be in English Language. The contract agreement and all correspondence between ANERT and the bidder shall be in English language.

33. OTHER CONDITIONS

32.1 The Successful bidder shall not transfer, assign or sublet the work under this contract or any substantial part thereof to any other party without the prior consent of ANERT in writing.

32.2 The Successful bidder shall not display the photographs of the work and not take advantage through publicity of the work without written permission of ANERT.

32.3 The Successful bidder shall not make any other use of any of the documents or information of this contract, except for the purposes of performing the contract.

32.4 Successors and Assigns:

In case ANERT or Successful bidder may undergo any merger or amalgamation or a scheme of arrangement or similar re-organization & this contract is assigned to any entity (ies) partly or wholly, the contract shall be binding mutatis mutandis upon the successor entities & shall continue to remain valid with respect to obligation of the successor entities.

32.5 Severability:

It is stated that each paragraph, clause, sub-clause, schedule or annexure of this contract shall be deemed severable & in the event of the unenforceability of any paragraph, clause sub-clause, schedule or the remaining part of the paragraph, clause, sub-clause, schedule annexure & rest of the contract shall continue to be in full force & effect.

32.6 Counterparts

This contract may be executed in one or more counterparts, each of which shall be deemed an original & all of which collectively shall be deemed one of the same instruments.

32.7 Rights and Remedies under the contract only for the parties

This contract is not intended & shall not be construed to confer on any person other than the ANERT & Successful bidder hereto, any rights and / or remedies herein.

BID EVALUATION

34. BID EVALUATION

The evaluation process comprises the following four steps:

Step I - Responsiveness check of Techno Commercial Bid

Step II - Evaluation of Bidder's fulfilment of Eligibility Criteria as per Clause 16

Step III - Evaluation of Price Bid

Step IV - Successful Bidders(s) selection

I. Responsiveness check of Techno Commercial Bid

The Techno Commercial Bid submitted by Bidders shall be scrutinized to establish responsiveness to the requirements laid down in the RFS subject to Clause 16.1 and Clause 16.2. Any of the following may cause the Bid to be considered "non-responsive", at the sole discretion of ANERT:

a. Bids that are incomplete, i.e. not accompanied by any of the applicable formats inter alia covering letter, power of attorney supported by a board resolution, applicable undertakings, format for disclosure, etc.;
b. Bid not signed by authorized signatory and /or stamped in the manner indicated in this RFS;
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 RFS;
e. Bid being conditional in nature;
f. Bid having Conflict of Interest;
g. More than one Member of a Bidding Company using the credentials of the same Parent Company /Affiliate;
h. Bidder delaying in submission of additional information or clarifications sought by ANERT as applicable;
i. Bidder makes any misrepresentation.

Each Bid shall be checked for compliance with the submission requirements set forth in this RFS before the evaluation of Bidder's fulfilment of Eligibility Criteria is taken up. Clause 16.2 shall be used to check whether each Bidder meets the stipulated requirement.

33.1 Preliminary Examination

33.1.1 ANERT will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed and stamped and whether the Bids are otherwise in order.

33.1.2 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total Amount that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total amount shall be corrected. If there is a discrepancy between words and figures, the amount written in words will prevail.

II. 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 as specified in Clause 16.2. Non-availability of information and related documentary evidence for the satisfaction of Eligibility Criteria may cause the Bid to be non-responsive.

III. Evaluation of Price Bid

The Price Bid of only 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 ANERT to the Bidders through ANERT. The evaluation of Price Bid shall be carried out based on the information furnished in the BoQ. The Price Bid submitted by the Bidders shall be scrutinized to ensure conformity with the RFS. Any Bid not meeting any of the requirements of this RFS may cause the Bid to be considered "non-responsive" at the sole decision of the ANERT.

IV. Successful Bidder(s) Selection

i. Bids qualifying in Clause 16.2 shall only be evaluated in this stage.
ii. The Price Bids of Qualified Bidders shall be ranked from the lowest to the highest. The lowest bidder will be declared as the successful bidder.
iii. Letter of Acceptance (LOA): The Letter of Acceptance (LOA) shall be issued to Successful Bidder selected as per the provisions of this Clause 33
iv. The Successful Bidder shall acknowledge the LoA and return duplicate copy with signature & stamp of the authorized signatory of the Successful Bidder to ANERT within Seven (7) days of issue of LoA.
v. If the Successful Bidder, to whom the Letter of Acceptance has been issued does not fulfil any of the conditions specified in Bid document, ANERT reserves the right to annul/cancel the award of the Letter of Acceptance of the Successful Bidder and forfeit the Bid security.
vi. ANERT at its own discretion, has the right to reject any or all the Bids without assigning any reason whatsoever, at its sole discretion

35. NOTIFICATION TO SUCCESSFUL BIDDERS

The name of Successful Bidder shall be notified indicating the awarded project price individually through letter of acceptance.

36. REQUIREMENT OF APPROVALS ON MAKES OF THE COMPONENTS:

The modules should be manufactured in India only. Rest of the components can be procured from any source. However, these items should meet the Technical specification and standards mentioned in RFS.

37. OPERATION OF THE SYSTEM DURING WEEKENDS AND GENERAL HOLIDAYS AND CALCULATION OF CUF:

During grid failure, the SPV system stops generating. Any instances of grid failure need to be mentioned in the monthly report and those instances need to be authorised by local DISCOM. Then the period will be excluded in calculation of CUF.

38. COMMERCIAL OPERATION DATE:

38.1 Document Submission for Issue Commissioning/ Completion Certificate:

The following documents will be deemed to form the completion documents:

a. Project completion report from successful bidder as per ANERT format

b. Project completion/satisfaction certificate from ANERT.

38.2 Commercial Operation Date

If the results of system acceptance testing indicate that the System is capable of generating electric energy (at full rated kWp) for 3 continuous days using such instruments and meters as have been installed for such purposes, then the power producer shall send a written notice to Employer to that effect, and the date of successful conducting such tests and injection of power at delivery point shall be the "Commercial Operation Date"

39. CORRUPT OR FRAUDULENT PRACTICES

The Successful Bidders/ Contractors should follow the highest standard of ethics during the execution of contract. In pursuance of this policy, ANERT:

39.1 defines, for the purposes of this provision, the terms set forth as follows:

a. "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the bid process or in contract execution; and

b. "fraudulent practice" means a misrepresentation of facts in order to influence a bid process or the execution of a contract to the detriment of ANERT/Govt. scheme, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non-competitive levels and to deprive ANERT of the benefits of free and open competition;

c. will declare a firm ineligible/debarred, either indefinitely or for a specific period of time, a GOVT contract if at any time it is found that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a Government/ ANERT schemes.

AGENCY FOR NEW & RENEWABLE ENERGY RESEARCH AND TECHNOLOGY (ANERT)
Department of Power, Government of Kerala
Thiruvananthapuram, Kerala – 695 033;
www.ANERT.gov.in , projects@ANERT.in

E-TENDER DOCUMENT

Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

Ref. No.: ANERT-TECH/99/2022-T2

VOL – 3: TECHNICAL SPECIFICATIONS

Date of Publishing of Bids : - 12/04/2023

Last Date of Submission of Bids : - 26/04/2023

TECHNICAL SPECIFICATIONS

The proposed projects shall be commissioned as per the technical specifications given below.

40. DEFINITION

A Grid Tied Solar Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid tied SPV system do not have battery backup and should be designed with necessary features to supplement the grid power during day time. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

Solar PV system shall consist of following equipments/components.

- Solar PV modules consisting of required number of **Crystalline** PV modules.
- Grid interactive Power Conditioning Unit with Remote Monitoring System
- Mounting structures
- String Monitoring Units / Junction Boxes.
- Power evacuation system
- Earthing and lightening protections.
- IR/UV protected PVC Cables, pipes and accessories
- RTTU / Metering

The detailed list of certifications and standards to be followed are given in annexure – F

41. SYSTEM COMPONENTS - TECHNICAL COMPLIANCE FOR SYSTEM COMPONENTS

S/N	System Component	Capacity/ rating	Minimum Technical Compliance
1.	Solar panel (MONO PERC Half cut of capacity 600 Wp or above)	As per the required capacity	IS 14286 - Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
			IEC/IS 61730: Part I & II;
2.	Grid Tied Inverter (DC to AC ratio of 1.2 to be maintained at all sites)	As per the required capacity	IS 16221: Part 1 &2 - Safety of Power Converters for use in Photovoltaic Power Systems
			IS 16169 - Test Procedure of Islanding Prevention Measures for Utility-Interconnected Photovoltaic Inverters
3.	Module Mounting Structure	As per the required capacity	IS 2062 - Hot Rolled Medium and High Tensile structural Steel
			IS 4759 - Hot-dip Zinc Coatings on structural steel and other products
4.	Cables	As required	IEC 60227 / IS 694
			IEC 60502 / IS 1554 (Pt. I & II)
5.	Switches/ Circuit Breakers	As required	IEC 60947 part I, II, III / IS 60947 Part I, II, III
6.	Connectors		EN 50521
7.	Surge Protection Device		IEC 60364-5-53 / IS 15086-5
8.	Junction Boxes/Enclosures for Inverters/ Charge Controllers	As required	IP 54 (for outdoor) or IP 65 / IP 21(for indoor) as per IEC 529
9.	Energy Meter for Recording Solar Electricity Generated & Two-way meter for Distribution Licensee grid connection		As per CEA Regulations; IEC 60687/ IEC 62052-11 / IEC 62053-22 / IS 14697
10.	Lightning Protection	As required	As per IEC 62305 / IEC 62561
11.	Electrical Grounding (Earthing)	As required	As per IS 3043

42. SOLAR PHOTOVOLTAIC MODULES:

42.1 The PV modules used should be made in India and should be from the ALMM list issued by MNRE from time to time of Mono PERC type having module capacity of 600Wp or above.

42.2 The PV modules used must qualify to the latest edition BIS standards for Crystalline Silicon Solar Cell Modules - IS 14286. In addition, the modules must conform to IEC 61730 Part-2- requirements for construction & Part 2 – requirements for testing, for safety qualification or equivalent IS.

i. For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701

ii. The total solar PV array capacity should not be less than 2 MWp and should comprise of solar crystalline modules of MONO PERC type of minimum 525 Wp and above wattage. Module capacity less than minimum 525 watts shall not be accepted. Inspection of testing of PV array will be conducted by the Tendering Authority including identification of panels ready for dispatch to be confirmed with details provided in RFID tag using RFID reader at site during FAT. The RFID details of each module shall be issued to the employer during FAT.

iii. Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.

iv. PV modules must be tested and approved by one of the BIS approved test centers.

v. The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.

vi. The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid. ANERT shall allow only minor changes at the time of execution.

vii. Other general requirement for the PV modules and subsystems shall be the Following:

a. The rated output power of any supplied module shall have tolerance of ± 3%.

b. The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall

not vary by more than 2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.

c. The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP-65 rated.

d. IV curves at STC should be provided by bidder.

42.3 Modules deployed must use a RF identification tag. The following information must be mentioned in the RFID used on each module (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions).

a. Name of the manufacturer of the PV module
b. Name of the manufacturer of Solar Cells.
c. Month & year of the manufacture (separate for solar cells and modules)
d. Country of origin (separately for solar cells and module)
e. I-V curve for the module Wattage, I_m, V_m and FF for the module
f. Unique Serial No and Model No of the module
g. Date and year of obtaining BIS PV module qualification certificate.
h. Name of the test lab issuing BIS certificate.
i. Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001

42.4 **Warranties:**

A. Material Warranty:

i. Material Warranty is defined as: The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than five (10) years from the date of sale to the original customer ("Customer")

ii. Defects and/or failures due to manufacturing

iii. Defects and/or failures due to quality of materials

iv. Non conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the Owners sole option

B. Performance Warranty:

i. The predicted electrical degradation of power generated not more than 10% after ten years' period and not exceeding 20% of the minimum rated power over the 25-year period and of the full rated original output.

42.5 Use of advance cell technologies

a. The Contractor shall try to maximize the output within the allocated area. The contractor is allowed to propose use of new and better technology. (Eg. Bifacial Modules)

b. Additionally, the bidder at bidding stage may propose modern methods for maintenance & cleaning of the plant. Technology employing drone, cleaning methods without water, which will automate the maintenance and reduce the cost of maintenance may be proposed.

c. Based on the technology employed, the contractor has to design, Electrical System Features, Architecture and Structural requirement and the same shall be implemented with the prior approval of ANERT. The tenderer at tender stage shall submit the details of the technology proposed. The tender submission shall also include the proposed modified structure also. The capacity mentioned in the tender is indicative and extra capacity over and above the indicative capacity mentioned will be permitted, based on the technology proposed and employed.

43. ARRAY STRUCTURE

43.1 For Ground Mounted:

a. Hot dip galvanized MS as per specifications BIS 2062 or shall be cold formed light gauge structural steel sections with IS 811: 1987/IS 801: 1975 having galvanization thickness as per BIS 4759 -amended upto date; may be used for mounting the modules/ panels/arrays. 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.

b. 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 (min wind speed of 150 kM/ hour). It may be ensured that the design has been certified by a recognized Lab/ Institution in this regard and submit wind loading calculation sheet to ANERT. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed. The array design shall be submitted with the STAAD structural design report for the materials used with relevant IS.
c. 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.
d. 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
e. Regarding civil structures, the bidder needs to take care of the load bearing capacity of the soil at the site of installation. The soil is fine sand and specific care is to be taken while designing the foundation. The foundation design must be submitted to ANERT duly certified by a chartered structural engineer before start of works.
f. The minimum clearance of the structure from the ground level should be 200 mm for ground mounted installations
g. The array will be installed on steel racking structures that are anchored in the ground. Racks will be laid out in parallel matrices allowing for individuals to access the area between the racks for cleaning and other maintenance needs. In between the row of solar panels sufficient gap need to be provided to avoid falling of shadow

of previous row on the next row. Seismic factors for the site will be considered while making the design of the foundation.

43.2 For Ground Mounted:

a. Photovoltaic arrays must be mounted on a stable, durable structure that can support the array and withstand wind, rain, and other adverse conditions. The modules will be fixed on structures with fixed arrangement.
b. The module mounting structures shall have adequate strength and appropriate design suitable to the locations, which can withstand the load and high wind velocities. Stationary structures shall support PV modules at a given orientation, absorb and transfer the mechanical loads to the surface properly.
c. Wherever required, suitable number of PV panel structures shall be provided. Structures shall be of flat-plate design using minimum size of C (75 x 40 x 5mm) or L (55 x 55 x 5mm) or I (60x 40x 4mm) sections or higher dimensions for respective sections.
d. Each structure with fixed tilt should have a tilt angle as per the site conditions to take maximum insolation which will be approximately equal to the latitude of the location facing true South with a North - South orientation. The tilt angle can vary from 9 degree to 12 degree based on the location's latitude in Kerala
e. The PV module mounting structure shall have a capacity to withstand a wind velocity of 150 km/hr unless specified for dedicated requirements
f. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed. The PV array structure design shall be appropriate with a factor of safety of min 1.5.
g. The materials used for structures shall be Hot dip Galvanized Mild Steel conformed to IS 2062:1992 or aluminium of suitable grade minimum alloy 6063 or better.
h. The minimum thickness of galvanization for hot dip Galvanized Mild Steel should be at least 80 microns as per IS 4759. The galvanisation thickness will be checked during inspection and the vendor is to arrange the equipment needed for the same at the site.

i. The Bolts, Nuts, fasteners, and clamps used for panel mounting shall be of Stainless-Steel SS 304.

j. Structures shall be supplied complete with all members to be compatible for allowing easy installation at the site. Additional Structures/Frames for required for the installation of modules if any need to be provided by the bidder.

k. The structures shall be designed to allow easy replacement of any module, repairing and cleaning of any module. No Welding is allowed on the mounting structure. Adequate spacing shall be provided between two panel frames and rows of panels to facilitate personnel protection, ease of installation, replacement, cleaning of panels and electrical maintenance

l. Aluminium structures used shall be protected against rusting either by coating or anodization. Aluminium frames should be avoided for installations in coastal areas.

m. The structure shall be designed to withstand operating environmental conditions for a period of minimum 25 years. And shall be free from corrosion while installation.

n. Screw fasteners shall use existing mounting holes provided by module manufacturer. No additional holes shall be drilled on module frames

o. The total load of the structure (when installed with PV modules) on the roof should be less than 60 kg/m^2.

p. Minimum distance between the lower level of PV Module and the ground shall be 0.6m from the ground level.

q. The PV Panel area shall be accessible for cleaning and for any repair work.

r. Sufficient gap needs to be provided between the rows to avoid falling of shadow of one row on the next row. Seismic factors for the site will be considered while making the design of the foundation.

s. Adequate spacing shall be provided between any two modules secured on PV panel for improved wind resistance.

t. Installation of structure for solar PV mounting should not tamper with the water proofing of the roofs.

43.3 The Rooftop Structures maybe classified in three broad categories as follows (drawings at **Annexure-G**). The bidders are required to quote the rates for each separately in the financial bid:

i. Ballast structure

a. The mounting structure must be Non-invasive ballast type and any sort of penetration of roof to be avoided.

b. The minimum clearance of the structure from the roof level should be in between 70 - 150 mm to allow ventilation for cooling, also ease of cleaning and maintenance of panels as well as cleaning of terrace.

c. The structures should be suitably loaded with reinforced concrete blocks of appropriate weight made out of M25 concrete mixture.

ii. Tin shed

a. The structure design should be as per the slope of the tin shed.

b. The inclination angle of structure can be done in two ways

b.1. Parallel to the tin shed (flat keeping zero-degree tiling angle), if the slope of shed in Proper south direction

b.2. With same tilt angle based on the slope of tin shed to get the maximum output.

c. The minimum clearance of the lowest point from the tin shade should be more then 100mm.

d. The base of structure should be connected on the Purlin of tin shed with the proper riveting. e. All structure member should be of minimum 2 mm thickness.

iii. RCC Elevated structure: It can be divided into further three categories:

A. Minimum Ground clearance (300MM – 1000 MM)

a. The structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. The gap between module should be minimum 30MM.

b. Base Plate – Base plate thickness of the Structure should be 5MM for this segment.

c. Column – Structure Column should be minimum 2MM in Lip section / 3MM in C Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.

d. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in C Channel section. The minimum section should be 70MM in Web site (y-axis) and 40MM in flange side (x-axis).
e. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 60MM in Web side and 40MM in flange side in Lip section.
f. Front/back bracing – The section for bracing part should be minimum 2MM thickness.
g. Connection – The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.
h. For single portrait structure the minimum ground clearance should be 500MM.

B. Medium Ground clearance (1000MM – 2000 MM)

a. Base Plate – Base plate thickness of the Structure should be Minimum 6MM for this segment.
b. Column – Structure Column should be minimum 2MM in Lip section / 3MM in C-Channel section. The minimum section should be 80MM in Web side and 50MM in flange side in Lip section.
c. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in C Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
d. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
e. Front/back bracing – The section for bracing part should be minimum 2MM thickness.
f. Connection – The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.

C. Maximum Ground clearance (2000MM – 3000 MM)

a. Base Plate – Base plate thickness of the Structure should be minimum 8 MM for this segment.
b. Column – Structure Column thickness should be minimum 2.6MM in square hollow section (minimum 50x50) or rectangular hollow section (minimum 60x40) or 3MM in C-Channel section.
c. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in Channel section. The minimum section should be 80MM in Web side and 50MM in flange side in Lip section.
d. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 80MM in Web side and 50MM in flange side in Lip section.
e. Front/back bracing – The section for bracing part should be minimum 3MM thickness.
f. Connection – The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.

D. Super elevated structure (More than 3000 MM)

i. Base structure

b. Base Plate – Base plate thickness of the Structure should be 10MM for this segment.
c. Column – Structure Column minimum thickness should be minimum 2.9MM in square hollow section (minimum 60x60) or rectangular hollow section (minimum 80x40).
d. Rafter - Structure Rafter minimum thickness should be minimum 2.9MM in square hollow section (minimum 60x60) or rectangular hollow section (minimum 80x40)

e. Cross bracing – Bracing for the connection of rafter and column should be of minimum thickness of 4mm L-angle with the help of minimum bolt diameter of 10mm.

ii. Upper structure of super elevated structure

a. Base Plate – Base plate thickness of the Structure should be minimum 5MM for this segment.
b. Column – Structure Column should be minimum 2MM in Lip section / 3MM in Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
c. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
d. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 60MM in Web side and 40MM in flange side in Lip section.
e. Front/back bracing – The section for bracing part should be minimum 2MM thickness.
f. Connection – The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.

iii. If distance between two legs in X-Direction is more than 3M than sag angle/Bar should be provide for purlin to avoid deflection failure. The sag angle should be minimum 2MM thick, and bar should be minimum 12Dia.
iv. Degree - The Module alignment and tilt angle shell be calculated to provide the maximum annual energy output. This shall be decided on the location of array installation
v. Foundation – Foundation should be as per the roof condition; two types of the foundation can be done- either penetrating the roof or without penetrating the roof.
   a) If penetration on the roof is allowed (based on the client requirement) then minimum 12MM diameter anchor fasteners with minimum length 100MM can

be used with proper chipping. The minimum RCC size should be 400x400x300 cubic mm. Material grade of foundation should be minimum M20.

b) If penetration on roof is not allowed, then foundation can be done with the help of 'J Bolt' (refer IS 5624 for foundation hardware). Proper Neto bond solution should be used to adhere the Foundation block with the RCC roof. Foundation J - bolt length should be minimum 12MM diameter and length should be minimum 300MM.

44. ARRAY JUNCTION BOXES (JBs)

a. 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 Aluminum /cast aluminum 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.

b. 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 for earthing the box must be provided.

c. 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. Each string combiner box/ junction box will have suitable Reverse Blocking Diodes of maximum DC blocking voltage of 600 / 1000Vor as per the system requirement with suitable arrangement for its connecting.

d. 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

e. The junction boxes/ enclosures should be IP 65(for outdoor)/ IP 54 (indoor) and as per IEC 529 specifications. The Junction boxes / string combiner boxes shall conform to IEC 60529 (Degrees of Protection provided by Enclosures (IP Code))

45. DC DISTRIBUTION BOARD:

a. DC Distribution panel to receive the DC output from the array field. DC generated by the solar modules is transmitted through the appropriate cables from Array Yard to Control facility. DC bus & panel should be provided for the incoming DC supply from array yard. The panel should consist of adequate size.

b. DC DPBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 protection. 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.

46. AC DISTRIBUTION PANEL BOARD:

a. AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Output from the inverter shall be fed to the ACDB through 4 pole MCCB of suitable current rating and multifunction export solar meter.

b. All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.

c. The changeover switches, cabling work should be undertaken by the bidder as part of the project.

d. 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

e. The panels shall be designed for minimum expected ambient temperature of 45 degrees Celsius, 80 percent humidity and dusty weather.

f. All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.

g. Should conform to Indian Electricity Act and rules (till last amendment).

h. 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

47. PCU/ARRAY SIZE RATIO:

a. The combined wattage of all inverters should not be less than 80% of rated capacity of DC power of the plant under STC.
b. Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.

48. PCU/ INVERTER:

The Power Conditioning Unit shall be String Inverter with power exporting facility to the Grid. The DC to AC ratio of 1.25 is to be maintained at all sites. (For eg. – For DC capacity of 100 kWp, the AC capacity of minimum 80 kW is to be maintained). Prefereed Makes – Fronius / ABB / SMA

General Specifications:

48.1 All the Inverters should contain the following clear and indelible Marking Label & Warning Label as per IS16221 Part II, clause 5. The equipment shall, as a minimum, be permanently marked with:

a. The name or trademark of the manufacturer or supplier.
b. A model number, name or other means to identify the equipment.
c. A serial number, code or other markings allowing identification of manufacturing location and the manufacturing batch or date within a three-month time period.
d. Input voltage, type of voltage (A.C. or D.C.), frequency, and maximum continuous current for each input.
e. Output voltage, type of voltage (A.C. or D.C.), frequency, maximum continuous current, and for A.C. outputs, either the power or power factor for each output.
f. The Ingress Protection (IP) rating

48.2 The inverter output shall be 415 VAC, 50 Hz, 3 phase.

48.3 The inverter shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of inverter component failure or from parameters beyond the inverter's safe operating range due to internal or external causes.

48.4 PCU shall have the dynamic and efficient MPPT algorithm behaviour which finds maximum power point even in low light conditions. The PCU Company should be able to display this feature.

48.5 The PCU shall be supplied with in-built advanced grid feed-in feature along with dynamic feed-in control considering self-consumption. The PCU shall also include control functions for optimum feed-in of reactive power and effective power. The amount of reactive power injection and absorption can be controlled depending upon under/over excited systems.

48.6 The PCU shall have a provision of external shutdown via remote signal separately with an in-built floating-point contact or similar option using any minimum interface which is to ensure the emergency stop function in the inverter

48.7 The PCU shall have a higher degree of ingress protection of IP 65 to handle robust environment conditions from dust and water ingress under complete outdoor installations.

48.8 The data logger should possess the feature of extracting the data externally with open protocols like Modbus TCP/RTU. The manufacturer should provide the Modbus register mapping file to utilise this feature

48.9 **The inverter shall have an efficient cooling concept with better power derating feature to handle higher temperatures and ensure the best efficiency. The inverter shall be able to provide full rated output power even at ambient temperatures of 50^0C. The manufacturer to provide the power derating curves to demonstrate the same.**

48.10 The inverter shall be flexible in terms of the installation and should be capable for installation in a horizontal position facilitating easy installation for site specific requirements.

48.11 The inverter shall have an integrated feature of emergency stop to halt the inverter from operation considering safety scenarios

48.12 The PCU manufacturer should have an authorised service centre in Kerala. The details of the service centre along with the spare list must be submitted along with the bid.

48.13 **PCU should be able to respond smoothly to the voltage fluctuations on the low-tension grid via active & reactive power control/ support. The PCU should be able to respond separately to fulfil below mentioned:**

48.13.1 Finding out optimisation of the system

48.13.2 Optimal power distribution on each phase

48.13.3 Prevent PCU from unnecessary disconnections

48.14 The PCU Company should have grid connected solar plants running in the country with inverters at least 7 years from the time of bidding to showcase the service reliability and long-term presence. Also, the PCU should have local presence in the county for at least last 5 years. The PCU manufacturer to provide details to authenticate the same.

48.15 The Technical Specification of On-Grid Inverters are summarized below:

Specifications of Inverters	
Parameters	**Detailed specification**
Nominal voltage	230V/415V
Voltage Band	Between 80% and 110% of V nominal
Nominal Frequency	50 Hz
Operating Frequency Range	47.5 to 50.5 Hz
Waveform	Sine wave
Harmonics	AC side total harmonic current distortion < 3%
Ripple	DC Voltage ripple content shall be not more than 1%
Efficiency	Efficiency shall be >98%
Casing protection levels	Degree of protection: Min IP-65
Operating ambient Temp range	-10 to + 60 degree Celsius
Operation	Completely automatic including wakeup, synchronization (phase locking) and shut down
MPPT	MPPT range must be suitable to individual array voltages

Specifications of Inverters	
Parameters	**Detailed specification**
Protection Class	1
Protections	Over voltage: both input and output Over current: both input and output Over / Under grid frequency Over temperature Short circuit Lightning Surge voltage induced at output due to external source Islanding
Ingress Protection	IP 65
Recommended LED indications	ON Grid ON Under/ Over voltage Overload Over temperature
Recommended LCD Display on front Panel	DC input voltage DC current AC Voltage (all 3 phases) AC current (all 3 phases) Frequency Ambient Temperature Instantaneous power Cumulative output energy Cumulative hours of operation Daily DC energy produced
Communication Interface	RS485/ RS232/Wi-Fi (with or without USB)

48.16 The Technical Specification for Interconnection are summarized below:

Sl No	Parameters	Requirements	Reference
1	Overall conditions of service	Reference to regulations	Conditions for Supply of Electricity
2	Overall Grid Standards	Reference to regulations	Central Electricity Authority (Grid standards) Regulations 2010

3	Equipment	Applicable industry standards	IEC/EN standards
4	Safety and Supply	Reference to regulations, (General safety requirements	Central Electricity Authority (Measures of safety and electricity supply) Regulations, 2010 and subsequent amendments
5	Meters	Reference to regulations and additional conditions issued by the commission.	Central Electricity Authority (Installation & operation of meters) regulations 2006 and subsequent amendments
6	Harmonic current	Harmonic current injections from a generating station shall not exceed the limits specified in IEEE 519	IEEE 519 relevant CEA (Technical Standards for connectivity of the distributed generation resource) Regulations 2013 and subsequent amendments
7	Synchronization	Photovoltaic system must be equipped with a grid frequency synchronization device, if the system is using synchronizer inherently built in to the inverter, then no separate synchronizer is required	Relevant CEA (Technical Standards for Connectivity of the distributed generation resources) regulations 2013 and subsequent amendments.
8	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 the clearing time of 2 seconds, the Photovoltaic system must isolate itself from the grid	
9	Flicker	Operation of Photovoltaic system should not cause	Relevant CEA regulations 2013 and subsequent if

		voltage flicker in excess of the limits stated in IEC 61000 or other equivalent Indian standards if any	any, (Technical standards for connectivity of the distributed generation resource)
10	Frequency	When the distribution system frequency deviates outside the specified limits (50.5 Hz on upper side and 47.5 Hz on lower side) up to 0.2 sec, the Photovoltaic systems shall automatically disconnect from grid and be in island mode.	
11	DC injection	Photovoltaic system shall not inject DC current greater than 0.5% of full rated output at the interconnection point or 1% rated inverter output current into distribution system under any operating conditions.	
12	Power Factor	While the output of the inverter is greater than 50%, a lagging power factor greater than 0.9 shall be maintained.	
13	Islanding and Disconnection	The photovoltaic system in the event of voltage or frequency variations must island/disconnect itself with the time stipulated as per IEC standards	
14	Overload and overheat	The inverter should have the facility to automatically switch off in case of overload or overheat and should restart when normal conditions are restored	

48.17 The Certifications of On-Grid Inverters are summarized below:

Standard	Description
IS 16221-2	Safety of Power Converters for use in Photovoltaic Power Systems Part 2 (Particular Requirements for Inverters)
IEC 61683	Photovoltaic systems - Power conditioners - Procedure for measuring efficiency
IEC 61727	Photovoltaic (PV) systems- Characteristics of the utility interface
IEC/EN 62109-1	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
IEC/EN 62109-2	Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
IEC/EN 61000-3-3/ 3-11/ 3-5	Electromagnetic compatibility (EMC) - Part 3-11; Limits; Limitation of Voltage Change, Voltage Fluctuations and Flicker in Public Low- Voltage Supply Systems; Rated Current <16A / >16A and <75A / >75A per Phase respectively
IEC/EN 61000-3-2/ -3-12/ -3-4	Electromagnetic compatibility (EMC) - Part 3-12; Limits; Limits for Harmonic Currents produced by equipment connected to the public low voltage systems with Rated Current <16A / >16A and <75A / >75A per Phase respectively
*IEC/EN 61000-6-1 / 6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for residential and commercial / industrial environments
*IEC/EN 61000-6-3 / 6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for residential and commercial / industrial environments
IEC 62116 / IS 16169	Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures
IEC 60068-2-1	Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2	Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-14	Environmental testing - Part 2-14: Tests - Test N: Change of temperature
IEC 60068-2-30	Environmental testing - Part 2-30: Tests - Test Db:, Damp heat, cyclic (12 h + 12 h cycle)

***Recommended but not mandatory**

49. INTEGRATION OF PV POWER WITH GRID:

The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization. In case of grid failure, or low or high voltage, solar PV system shall be out of synchronization and shall be disconnected from the grid.

50. REMOTE MONITORING SYSTEM

A dedicated Remote Monitoring System (Hardware and software) for monitoring the plant shall be provided even if the inverter has embedded data logging system. The following weather parameters are to be measured as part of the datalogging system.

a) Solar Irradiance:

A Pyranometer/ Solar cell-based irradiation sensor (along with calibration certificate) shall be provided, with the sensor mounted in the plane of the array.

b) Temperature: Integrated temp, sensors for measuring the module surface temp., inverter inside enclosure temp, and ambient temp to be provided complete with readouts integrated with the data logging system.

It is recommended that the following important parameters shall be accessible through the Data Logging Facility.

i. AC Voltage
ii. AC Output current
iii. Output Power
iv. Energy in kWh
v. DC Input Voltage
vi. DC Input Current
vii. Ambient Temperatures
viii. Invertor Status
ix. Irradiation
x. Module temperature

Provision for Internet monitoring and download of historical data shall be incorporated. GSM Modem/Wi Fi modem in case GSM connectivity is used or Wireless Router + modem in case Ethernet connection is being used for remote access must be provided. The data is to be transmitted to ANERT server as well as to the Integrated Command and Control Centre (ICCC) developed by Smart City Thiruvananthapuram Ltd. The successful bidder has to undertake all the works required for such deployment including software and arrange for APIs etc.

51. PROTECTIONS

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

51.1 LIGHTNING PROTECTION

The SPV power plants shall be provided with lightning & overvoltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IS/IEC 62305 standard. The protection against induced high-voltages shall be provided by the use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth.

51.2 SURGE PROTECTION

The system should have installed with Surge Protection Device (SPD) for higher withstand of the continuous PV-DC voltage during earth fault condition. SPD shall have safe disconnection and short circuit interruption arrangements through integrated DC in-built bypass fuse (parallel) which should get tripped driving failure mode of MOV, extinguishing DC arc safely in order to protect the installation against fire hazards. The SPD should be provided in the AC Distribution Box as well.

51.3 EARTHING PROTECTION

i. 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 ANERT as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly.

ii. 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.

iii. Earthing System shall connect all non–current carrying metal receptacles, electrical boxes, appliance frames, chassis and PV module mounting structures in one long run. The earth strips should not be bolted. Earthing GI strips shall be interconnected by proper welding.

iv. Masonry enclosure with the earth pit of size not less than 400mm X 400mm (width) complete with cemented brick work (1:6) of minimum 500 mm depth duly plastered with cement mortar (inside), shall be provided. Hinged inspection covers of size not less than 300mm X 300mm with locking arrangement shall be provided. Suitable handle shall be provided on the cover by means of welding a rod on top of the cover for future maintenance.

v. Earthing system must be interconnected through GI strip to arrive equipotential bonding. The size of the GI earth strip must be minimum 25mm X 6mm.

vi. The complete earthing system shall be mechanically and electrically connected to provide independent return to earth. All three-phase equipment shall have two distinct earth connections. An earth bus shall be provided inside the control facility. For each earth pit, necessary test point shall have to be provided.

51.4 GRID ISLANDING:

i. 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 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.

ii. A manual disconnect 4pole 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

52. CABLES

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

i. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards
ii. Temp. Range: –10°C to +80°C.
iii. Voltage rating 660/1000V
iv. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation
v. Flexible
vi. 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. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use.
vii. 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 ferrule or by other means so that the cable easily identified.
viii. The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25years.
ix. The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant provided by the bidder. Any change in cabling sizes if desired by the bidder/approved after citing appropriate reasons. All cable schedules/layout drawings approved prior to installation.
x. Multi Strand, annealed high conductivity copper conductor PVC type 'A' pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV

protection Armored cable for underground laying. All cable trays including covers to be provided. 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.

xi. For the DC cabling, XLPE or XLPO insulated and sheathed, UV stabilized single core flexible copper cables shall be used; For the AC cabling, PVC or XLPE insulated and PVC sheathed single or, multi-core flexible Aluminium cables shall be used, Outdoor AC cables shall have a UV -stabilized outer sheath.

xii. The size of each type of DC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 1%.

xiii. The size of each type of AC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 2 %.

xiv. The minimum DC cables size shall be 4.0mm^2 copper; The minimum AC cable size shall be 4.0mm^2 copper. In three phase systems, the size of the neutral wire shall be equal to the size of the phase wires.

xv. The following colour code shall be used for cable wires and shall confirm to IEC 69947

- 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

53. CABLING PRACTICE

Cable Cabling is required for wiring from AC output of inverter/PCU to the Grid Interconnection point. It includes the DC cabling from Solar Array to AJB and from AJB to inverter input.

53.1 All cables of appropriate size to be used in the system shall have the following characteristic:

a. Shall conform to IEC 60227 / IS 694 & IEC 60502 / IS 1554 standards.
b. Temperature Range: -10 degree Celsius to +80 degree Celsius
c. Voltage rating: 660/1000V
d. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation
e. Flexible

53.2 Sizes of cables between any 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%).

53.3 For the DC cabling, XLPE or XLPO insulated and sheathed, UV stabilized single core flexible copper cables shall be used; multi-core cables shall not be used.

53.4 For the AC cabling, PVC or XLPE insulated and PVC sheathed single or, multi-core flexible copper cables shall be used. However, for above 10kWp systems, XLPE insulated Aluminium cable of suitable area of cross section can be used in the AC side subject to a minimum area of cross section of 10 sq.mm. Outdoor AC cables shall have a UV -stabilized outer sheath IS/IEC 69947.

53.5 All LT XLPE cables shall conform to IS:7098 part I&II.

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

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

53.8 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

53.9 Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers

53.10 All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50cm; the minimum DC cables size shall be 4.0mm2 copper; the minimum AC cable size shall be 4.0mm2 copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires. Conduits for taking outdoor cables shall be UV treated.

53.11 Cable Marking: All cable/wires are to be marked in proper manner by good quality ferule or by other means so that the cable can be easily identified. The following colour code shall be used for cable wires

a. DC positive: red (the outer PVC sheath can be black with a red line marking
b. DC negative: black
c. AC single phase: Phase: red; Neutral: black
d. AC three phase: phases: red, yellow, blue; neutral: black
e. Earth wires: green

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

53.13 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.

53.14 All cables and connectors used 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 solar grade copper (Cu) with XLPO insulation and rated for 1.1 kV as per relevant standards only.

53.15 Bending radii for cables shall be as per manufactures recommendations and IS: 1255.

53.16 For laying/termination of cables latest BIS/IEC Codes/ standards shall be followed.

54. FACTORY TESTING

a. PCU shall be tested prior to shipment and factory test certificate for relevant parameters should be provided with the PCU supplied. ANERT or authorised representative of ANERT may be allowed to witness the tests if required.
b. Factory testing shall not only be limited to measurement of phase currents, efficiencies, harmonic content and power factor, but shall also include all other

necessary tests/simulation required and requested by the Purchasers Engineers. Tests may be performed at 25, 50, 75 and 100 percent of the rated nominal power.

55 NET METERING AND UTILITY INTERCONNECTION

a. Net metering equipment (an Import-Export Energy Meter) approved and tested by the electrical utility based on the accuracy class required for the proposed capacity of the system must be provided with the necessary data cables if required.
b. Net Metering and Utility Interconnection should be accomplished according the Kerala State Electricity Regulatory Commission (Grid Interactive Distributed Solar Energy Systems) Regulations 2014 Clauses (8) & (9) (Notification No. 2096/KSERC/CT/2014 dt. 10th June 2014)

56 INTER CONNECTION OF INVERTER OUTPUT WITH UTILITY GRID

a. The interconnection of load with inverter output should be done after obtaining permission from Electrical Inspectorate and Electrical Utility.
b. The plan scheme and drawing related to interconnection details should be submitted to Electrical Inspectorate through a licensed Electrical contractor with the guidance appropriate Engineering Authority.
c. Licenced contractor has to be engaged for preparation of plan scheme to be submitted to the Kerala State Electricity Licensing Board and necessary fee should be remitted for energisation of Solar Power Plant.
d. The panel board and distribution board required for AC interconnection should be done as per specification/ instruction given appropriate Engineering Authority.
e. All the electrical works required for the interconnection of load with inverter output should be done by the successful bidder as a part of the Solar Power Plant installation.
f. Bidder should visit the actual site and ensure the exact place for providing Solar Modules and Inverter etc. in presence of technical representative from the ANERT.
g. Net Metering Equipment shall be installed and maintained in accordance with the provisions of The Central Electricity Authority (Installation and Operation of

Meters) Regulations, 2006 as amended from time to time. The Contractor shall maintain the Metering System as per metering code and CEA guidelines. The defective meter shall be immediately tested and calibrated.

h. The accuracy class of the Net Metering Equipment will be selected so that all levels of energy produced or taken by the Solar Power Plant will be measured accurately, and this equipment has applicable accuracy class.

i. Net Metering Equipment shall be microprocessor-based conforming to the relevant IEC standards with Advanced Metering Infrastructure (AMI) with RS232 cable facility.

j. Net Metering Equipment shall measure active energy (both import and export) and reactive energy (import) by 3 ph, 4 wire principle suitable for balanced / un-balanced 3 phase load (With KVAr, KWh, KVA measuring registers). Tri-vector based energy meter shall have an accuracy class of energy measurement of at least Class 0.2 for active energy and at least 0.5 Class for reactive energy according to IEC 60687.

k. Display parameters: LCD test, KWH import, KWH export, MD in KW export, MD in KW import, Date & Time, AC current and voltages and power factor (Cumulative KWH will be indicated continuously by default)

57 WARRANTY

a. 10 years' warranty should be provided by the supplier for the system and components or part of the system has to be provided as per the special conditions of the contract.

b. PV modules used in solar power plants/ systems 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

c. The Warranty Card to be supplied with the system must contain the details of the all the components supplied including serial numbers accompanied with the OEM warranty card

58. OPERATION & MAINTENANCE OF THE PLANT

58.1 For the optimal operation of a PV plant, maintenance must be carried out on a regular basis. All the components should be kept clean. It should be ensured that all the components are fastened well at their due place. The O&M Charges for 10-year period is to be quoted by the bidders

58.2 The service personnel should visit the installations at least once a month for preventive maintenance even if no faults are reported. **Reports of these preventive maintenance visits and generation data should be submitted to the concerned ANERT District Offices on a quarterly basis**.

58.3 Maintenance guidelines for various components viz. solar panels, inverter, wiring etc. are discussed below:

58.3.1 SOLAR PV PANELS

Although the cleaning frequency for the panels will vary from site to site depending on soiling, it is recommended that

a) The panels are cleaned at least once every thirty days.
b) Use water and a soft sponge or cloth for cleaning.
c) Do not use detergent or any abrasive material for panel cleaning.
d) Iso-propyl alcohol may be used to remove oil or grease stains.
e) Do not spray water on the panel if the panel glass is cracked or the back side is perforated.
f) Wipe water from module as soon as possible.
g) Use proper safety belts while cleaning modules at inclined roofs etc.
h) The modules should not be cleaned when they are excessively hot. Early morning is particularly good time for module cleaning.
i) Check if there are any shade problems due to vegetation or new building. If there are, make arrangements for removing the vegetation or moving the panels to a shade-free place.
j) Ensure that the module terminal connections are not exposed while cleaning; this poses a risk of electric shock.

k) Never use panels for any unintended use, e. g. drying clothes, chips etc.⎪Ensure that monkeys or other animals do not damage the panels.

58.3.2 CABLES AND CONNECTION BOXES

a) Check the connections for corrosion and tightness.
b) Check the connection box to make sure that the wires are tight, and the water seals are not damaged.
c) There should be no vermin inside the box.
d) Check the cable insulating sheath for cracks, breaks or burns. If the insulation is damaged, replace the wire.
e) If the wire is outside the building, use wire with weather-resistant insulation.
f) Make sure that the wire is clamped properly and that it should not rub against any sharp edges or corners.
g) If some wire needs to be changed, make sure it is of proper rating and type.

58.3.3 INVERTER

a) The inverter should be installed in a clean, dry, and ventilated area.
b) Remove any excess dust in heat sinks and ventilations. This should only be done with a dry cloth or brush.
c) Check that vermin have not infested the inverter. Typical signs of this include spider webs on ventilation grills or wasps' nests in heat sinks.
d) Check functionality, e.g., automatic disconnection upon loss of grid power supply, at least once a month.
e) Verify the state of DC/AC surge arrestors, cable connections, and circuit breakers.

58.4 Inspection and Maintenance Schedule

Component	Activity	Description	Interval
PV Module	Cleaning	• Clean PV modules with plain water or mild dishwashing detergent. • Do not use brushes, any types of solvents, abrasives, or harsh detergents.	Monthly or as per site conditions
PV Array	Inspection	• Check the PV modules and rack for any damage.	Annual

Component	Activity	Description	Interval
		• Note down location and serial number of damaged modules.	
	Inspection	• Determine if any new objects, such as vegetation growth, are causing shading of the array and move them if possible.	Half Yearly
	Vermin Removal	• Remove bird nests or vermin from array and rack area.	Half Yearly
Junction Boxes	Inspection	• Inspect electrical boxes for corrosion or intrusion of water or insects. Seal boxes if required. • Check position of switches and breakers. • Check operation of all protection devices.	Annual
Wiring	Inspection	• Inspect cabling for signs of cracks, defects, lose connections, overheating, arcing, short or open circuits, and ground faults.	Annual
Inverter	Inspection Service	• Observe instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. • Inspect Inverter housing or shelter for physical maintenance, if required.	Monthly
Plant	Monitoring	• Operation and Performance Monitoring	Monthly
Spare Parts	Management	• Manage inventory of spare parts.	As needed

58.5 The faulty system or components should be replaced/ repaired within 7 days of fault reporting. The servicing should be carried out at the site of installation. If any of the components are to be taken out from the site for repair, a standby must be provided to ensure un-interrupted power generation and the systems functions smoothly.

58.6 Any Delay in servicing beyond 7 days of fault reporting would attract penalty at the rate of at the rate fixed by CEO, ANERT and further actions will be initiated against the agency.

58.7 A designated contact Telephone Number and address should be submitted for reporting faults during the O&M period of 5 years.

59. CIVIL WORKS

While installing solar power pants on rooftops, the physical condition of the rooftop, chances of shading, chances water level rise in the rooftop during raining due improper drainage in the roof-top should be taken in to consideration.

a. PV array shall be installed in the terrace space free from any obstruction and/or shadow and to minimize effects of shadows due to adjacent PV panel rows.
b. PV array shall be oriented in the south direction in order to maximize annual energy yield of the plant.
c. The solar PV array must be installed on the rooftop in such a way that there is sufficient space on the rooftop for maintenance etc.
d. There should not be any damage what so ever to the rooftop due to setting up of the solar power plant so that on a later day there is leakage of rainwater, etc. from the rooftop.
e. Some civil works are inevitable for erecting the footings for the module mounting structure as discussed in Module Mounting Structure section. The roof top may be given a suitable grading plaster with suitable leak proof compound so as to render the roof entirely leak proof.
f. Ample clearance shall be provided in the layout of the inverter and DC/AC distribution boxes for adequate cooling and ease of maintenance.
g. While cabling the array, care must be taken such that no loose cables lie on the rooftops.
h. The roof top should look clean and tidy after installation of the array.
i. Neatness, tidiness and aesthetics must be observed while installing the systems.
j. RCC Works - All RCC works shall be as per IS 456 and the materials used viz. Cement reinforcement, steel etc. shall be as per relevant IS standards. Reinforcement shall be high strength TMT Fe 415 or Fe 500 conforming to IS: 1786-1985.
k. Brick Works (If any) - All brick works shall be using 1st class bricks of approved

quality as per IS 3102.

l. Plastering - Plastering in cement mortar 1:5, 1:6 and 1:3 shall be applied to all.

m. Display of mandatory items- Single Line Diagram and layout diagram of modules and interconnection at installation site shall be provided near the inverter.

n. For painting on concrete, masonry and plastered surface IS:2395 shall be followed. For distempering IS 427 shall be followed referred. For synthetic enamel painting IS 428 shall be followed. For cement painting IS 5410 shall be followed.

o. All Civil works required for the installation of the PV Plant and other civil and electrical work in evacuation infrastructure, wherever necessary, shall be within the scope of the bidder

The layout of Inverter accommodation shall be designed to enable adequate heat dissipation and availability. Mount within the existing infrastructure available in consultation with the Site in charge. String Inverters may be installed with Canopy type structure over it to protect it from frequent monsoon and weather changes.

60. TESTING & COMMISSIONING

a. The contractor shall provide necessary drawings and documents required by statutory authorities and obtain the approval before taking up erection.

b. Any modification in the equipment or installation that may be demanded by the inspecting authorities shall be carried out by the contractor at no additional cost to the KSEBL

c. In accordance with the specific installation instruction as per the manufacturers drawings or as directed by the KSEBL, the successful Bidder shall unload, assemble, erect, install test, commission and hand over all electrical equipments included in this contract after O&M of 10 years.

d. Erection materials including all consumables, tools, testing instruments or any other equipment required for successful commissioning shall be arranged by the successful Bidder in a timely manner.

e. All equipment and instruments, indoor and outdoor, shall be marked with No. and provided with danger boards before commissioning.

f. All Power equipments shall be handled and erected as per the relevant codes of practice and manufacturer's drawings and instruction manuals.

g. The Contractor shall obtain the temporary Electrical connection for construction purposes and the same has to be dismantled off the premises after completion of erection of plant.

61. PERFORMANCE RATIO TEST (PR TEST)

The Plant should run minimum two weeks without any major equipment failure to start the PR test. The EPC Contractor shall submit two copies of O&M manual with soft copy before the start of PR Test. Depending on the requirement, capacity and suitable Pyranometer shall be installed at locations suggested by ANERT or else METEONORM data shall be considered for calculating PR.

i. The PR test shall be conducted at site by the Contractor in presence of the ANERT officials as per IEC 61724. The PR test procedure shall be submitted by the Contractor for review and approval. Any special equipment, instrumentation tools and tackles required for the successful completion of the performance test shall be arranged by the Contractor at his own cost.

ii. The procedure for PR demonstration test shall be as follows:

The Weather monitoring station installed in the plant shall be in working condition for minimum 2 weeks and all the parameters shall be available for analysis and verification. The test report for the calibration shall be submitted by the Contractor for approval. After the successful verification of the initial parameters by ANERT, PR test shall be conducted. The Following factors shall be excluded for calculation;

- Generation loss due to grid outage.
- Irradiance below 250 W/m2
- The measured global solar radiation of the period of the outage of the power evacuation system shall be excluded to calculate average global solar radiation for the period of PR test.

PR is to be calculated as per the below formula:

$$PR = \frac{\text{Measured output in kW}}{\text{Installed Plant capacity in kW} * (1000 / \text{Measured radiation intensity in W/m2})}$$

The EPC Contractor shall demonstrate minimum PR of 75% (measured at output of the inverter/solar meter level) in the initial PR test within 7 consecutive days. If the contractor fails to prove the desired performance ratio at the time of completion and during any of the consecutive years of defect liability period, he will be given a second chance to demonstrate the PR within another 7 consecutive days. Still if it is not achieved, the same shall be demonstrated within another 7 consecutive days and still if it is not achieved, EPC contractor shall improve the quality of the plant by replacement of module/other components with all suitable modification requirements on balance of systems at his own cost to achieve the performance ratio. After obtaining Energisation Approval from Electrical Inspectorate and demonstration of minimum specified PR, the solar plant shall be commissioned which shall be the date of completion of the project.

62. DATE OF COMMISSIONING

After the Inspection and approval of the Electrical Inspectorate, date of Energisation to the Grid will be considered as the official Date of Commissioning (CoD) of the project. To ensure PR, the bidder will be allowed EPC contractor shall improve the quality of the plant by replacement of any components with all suitable modification requirements on balance of systems at his own cost to achieve the performance ratio.

63. SOLAR PV SYSTEM FOR MEETING THE ANNUAL ENERGY REQUIREMENT

Key Performance Indicators (For installations above 50 kW)

The following KPIs would be monitored by the ANERT/Owner throughout the contract tenure and the contractor shall furnish monthly reports on above, without fail.

- PV Array Energy Yield
- Final System Yield
- PV System Efficiency (DC/AC)
- Performance Ratio (PR): The performance ratio test as per IS/IEC 61724 has to be carried out at site by the agency in presence of authorized officials of ANERT, deriving sample data within a period of 7 consecutive days sufficient to provide operational data representing insolation and ambient conditions as desired by the

agreement authority to prove the Performance ratio of 75%. If a Solar Plant achieves the Minimum Performance Ratio, then the ANERT will issue Commercial Operation Date Certificate.

- Capacity Utilization Factor (CUF)
- Plant uptime
- Reactive Power Consumption
- Auxiliary Energy Consumption
- CO_2 Savings
- Environment, Health & Safety

64. 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 ANERT/ owner.

65. DRAWINGS & MANUALS:

i. Two sets of Electrical drawings installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.
ii. Approved ISI and reputed makes for equipment be used.
iii. For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to ANERT before progressing with the installation work

67. BILL OF MATERIAL

The bidder should provide the bill of material mentioning the quantity of each of the item consisting in the system, along with the offer in the format as show below for each capacity:

Sl. No.	Item	Make (if any)	Model & Individual Capacity (If any)	Qty (Nos)	Rating / Capacity
1.	PV Module				
2.	PCU/Inverter				
3.	DC Cables				
4.	AC Cables				
5.	AJB/SCB				
6.	Module Mounting Structure (MMS)				
7.	ACDB				
8.	Lightning Arrester				
9.	Earthing System Details and No. of Earth pits				
10.	Data Acquisition System				

68. SITE INSPECTON

It is recommended that the bidders visit all the sites listed here for the physical verification and for correctly estimating the quantity, especially related to structure and cabling, before submitting the bids. **Bidder must include all the AC/DC wiring cost, replacement of instrument transformers, panel boards etc only after visiting the proposed site. The quoted amount will be for all the site-specific works and no additional amount will be allotted for any sort of works.**

The site-specific requirement of ladders for accessing PV modules, pathway facility along with handrails in case of sheet roofs are under the scope of the bidder. The Fabrication of Permanent Ladder should be of GI (min14 SWG), coated with Epoxy steel primer with rung spacing not be more than 10 inches and rung width of min 50 inches. Side Handrails / Grab Bars welded on both sides for safety purpose with an extension of

Min 50 inches above the landing or access level. The pathway can be either of GI or FRP material and shall include handrails for safety without causing shade on the PV modules.

69. CLEANING

The bidder shall provide permanent arrangement for module washing in the SPV Plant. Water lines may be drawn to feed water from the available resources. Contractor has to provide additional facility including pipeline, motor for pumping to the additional overhead tank, if required.

70. DISPLAY BOARD

The vendor has to display a board of size at the project site of size minimum 60 cm x 30 cm including the following details

- Plant Name, Capacity, Location, Type of Renewable Energy plant (solar), Date of commissioning etc. The logo of ANERT and details of the scheme as specified in the work order.

71. INSURANCE

i. The power plant must be insured at every stage of operation – from Material dispatch, storage, completion of installation and till 5 years after commissioning. The insurance coverage on handing over of the system must include all conditions of **Standard Fire and Special Perils Policy (Material Damage)**.

ii. The insurance premium for the 10 years of warranty is to be paid by the bidder. Only the system components are to be insured. On handing over of the system, the original insurance policy is to be handed over to the authorised person at the site of installation and a copy to ANERT District Office. The annual premium payment receipt must be handed to the authorised person at the site of installation.

72. ENGINEERING DRAWINGS

The bidder should submit and get the necessary approval of the following detailed Engineering Drawings before execution of the project:

i. Schematic drawing showing the PV panels, Power conditioning Unit(s)/Inverter, Array Junction Boxes (AJBs)/String Combiner Boxes (SJB), AC and DC Distribution Box, Net meters, MSB etc.
ii. Layout of solar PV Array
iii. Single Line Diagram (SLD) with specification of all components.
iv. Design document for Module Mounting Structure (MMS) including certificate showing wind speed withstanding capacity of the structure (STAAD/Equivalent).
v. Module Mounting Structure (MMS) drawing along with foundation details for the structure.
vi. Sizes and specification of cables for PV Module interconnections, PV Array to Array Junction Boxes, Array Junction Boxes to Inverter, Inverter to ACDB/ Grid Connection point etc. shall be furnished.

The Vendor shall submit a PVsyst report for PV power plants from 25kWp and above. All PV plant design should contain the following details which should be approved by the concerned officer before installation.

i. Design of strings including the number of PV modules
ii. AC Protection (Circuit Breaker, Switches, Fuses, SPD)
iii. DC Protection (Switches, Fuses, SPD)
iv. AJB / SCB details
v. DC Cable size and length from point to point
vi. AC Cable size and length from point to point
vii. Earthing system details and number of pits
viii. Lightning protection details/specification
ix. PV Syst / Any other software-based Simulation Report

73. SAFETY MEASURES

The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc. Adequate firefighting equipment and extinguishing agents of sufficient capacity and quantity must always be available at site

and kept ready for immediate use. The installation of Fire Extinguishers should confirm to BIS standards.

The fire extinguishers shall be provided in the control room housing inverters as well as on the Roof or site where the PV arrays have been installed. One liquefied CO2 fire extinguisher upright type of capacity 8 kg having IS: 2171 -7, IS: 10658 marked per installation of 100kWp shall be supplied by the Successful bidder and kept near the Inverter accommodation and shall also be responsible for periodic renewal during the maintenance period. The fire extinguisher shall be suitable for fighting fire of oils, solvents, gases, paints, varnishes, electrical wiring, live machinery fires and all flammable liquid & gas.

AGENCY FOR NEW & RENEWABLE ENERGY RESEARCH AND TECHNOLOGY (ANERT)
Department of Power, Government of Kerala
Thiruvananthapuram, Kerala – 695 033;
www.ANERT.gov.in , projects@ANERT.in

E-TENDER DOCUMENT

Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

Ref. No.: ANERT-TECH/99/2022-T2

VOL – 4: ANNEXURES

Date of Publishing of Bids : - 12/04/2023

Last Date of Submission of Bids : - 26/04/2023

FORMAT 1 - COVERING LETTER

(This letter to be submitted on the official letter head of the tenderer, signed by the authorised signatory.)

Sir,

I/We hereby e-tender to supply, under annexed terms and conditions of contract, the whole of the articles referred to and described in the attached specification and quantity decided by the Agency for New and Renewable Energy Research & Technology (ANERT), at the rates quoted against each item. The articles will be delivered and installed/commissioned operated and maintained for 10 years thereafter within the time and at the place(s) specified in the schedule.

I am/We are remitting herewith the required amount of Rs. ..... towards the cost of e-tender and Earnest Money Deposit by electronic payment vide transaction No ..... dtd.....

Yours faithfully,

Place:

Date:

Signature

Name

Designation

(Office Seal)

FORMAT 2 - POWER OF ATTORNEY

(To be on non-judicial Kerala stamp paper of appropriate value as per Stamp Act relevant to place of execution)

Power of Attorney to be provided by the Bidding Company in favour of its representative as evidence of authorized signatory's authority.

Know all men by these presents, We …….. (name and address of the registered office of the Bidding Company as applicable) do hereby constitute, appoint and authorize Mr./Ms. …….. (name & residential address) who is presently employed with us and holding the position of …….. as our true and lawful attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to submission of our Bid for Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram, Kerala in response to the RFS. No …….. dated …….. issued by ANERT including signing and submission of the Bid and all other documents related to the Bid, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document which the ANERT may require us to submit. The aforesaid Attorney is further authorized for making representations to the ANERT and providing information / responses to ANERT representing us in all matters before ANERT and generally dealing with ANERT in all matters in connection with this Bid till the completion of the bidding process as per the terms of the above mentioned RFS.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the RFS.

Signed by the within named
…….. (Insert the name of the executant company)
through the hand of Mr. ……..

duly authorized by the Board (vide Board Resolution No_____) to issue such Power of Attorney

Dated this …… day of ……..

Accepted

……..

Signature of Attorney

(Name, designation and address of the Attorney)

Attested

……

(Signature of the executant)

(Name, designation and address of the executant)

……

Signature and stamp of Notary of the place of execution

Common seal of …… has been affixed in my/our presence pursuant to Board of CEO's Resolution dated……..(Board of CEO's Resolution is also enclosed)

WITNESS

1. ……..

(Signature)

Name……

Designation ……

2. ……..

(Signature)

Name……

Designation ……

Notes:

The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.

The person authorized under this Power of Attorney, in the case of the Bidding Company / Lead Member being a public company, or a private company which is a subsidiary of a public company, in terms of the Companies Act, 1956, with a paid up share capital of more than Rupees Five crores, should be the Managing CEO / whole time CEO/manager appointed under section 269 of the Companies Act, 1956. In all other cases the person authorized should be a CEO duly authorized by a board resolution duly passed by the Company. Also, wherever required, the executant(s) should submit for verification the extract of the chartered documents and documents such as a Board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

FORMAT 3 – GENERAL PARTICULARS

(This letter to be submitted on the official letter head of the tenderer, signed by the authorised signatory.)

Name of the Agency	
Registered Office	
Nature of Agency (Ltd. Co., Partnership etc.) Attach Copy of partnership Deed/ Certification of Incorporation	
Year of Establishment	
Registration of Number	
Address for Communication	
Telephone number of Contact person(Mobile if any)	
Name of CEOs/ Proprietor/Partners(with address and Telephone No)	
GST Registration Number (Copy to be Attached)	
PAN Number	
TAN Number	
Whether the bidder wishes to form a project company for execution of work	
Whether any Civil Suit / Litigation arisen in the contract executed during the last five years/being executed. If yes, please furnish the name of the Contract, employer nature of work, contract value,	

work order and date and brief details of litigation.	
Details of Total Experience in general since inception(Details of similar systems installed till the date of bid)	
Details of Turnover for last Two years. (Copy Audited Statements has to be submitted for last two financial years)	
Details of offices in Kerala, India and abroad- address and contact details	

Documentary evidence for the bid qualification requirements are submitted along with this document and the details furnished above are true and correct.

Signature
of authorised signatory

Name

Designation

Date:

(office seal)

FORMAT 4 – FINANCIAL CRITERIA

(certified by Authorized Signatory and the Statutory Auditor / Practising Chattered Accountant of the Bidding Company)

Financial Qualification Certificate

(Rupees in Crores)

S/N	Financial parameters	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22
1.	**Net Worth**					
a)	Paid up Capital					
b)	Free Reserves and Surplus*					
c)	Misc expenses to the extent not written off					
	Net Worth (a+b-c)					
2.	**Annual Turnover ****					

** Free Reserve and Surplus shall be Exclusive of Revaluation Reserve, written back of Depreciation Provision and Amalgamation.*

*** Annual total Income/ turnover as incorporated in the Profit and Loss Account excluding non-recurring income, i.e., sale of fixed asset etc.*

It is certified that all the figures are based on audited accounts read with auditors report and Notes to Accounts etc.

(Signature & Seal of Authorized Signatory

Name of Authorized Signatory: **Certifying Chartered Accountant:**

Designation: **Name of Firm:**

Date: **UDIN No:**

Place: **Date:**

Place:

Note:

1. *In addition to above certificate from Chartered Accountant, Bidder is required to submit Firm's Annual Audit Report, Balance sheet, Profit & Loss and Income Tax Returns / CA certificate for last Five years i.e., F.Y: 2017-18, 2018-19, 2019-20, 2020-21 & 2021-22.*

FORMAT 5 - PERFORMANCE SECURITY GUARANTEE

(To be on non-judicial Kerala stamp paper of appropriate value as per Stamp Act relevant to place of execution)

BG No. :

Amount :

Date :

Valid up to :

In consideration of the Agency for New & Renewable Energy Research and Technology, therein after called "ANERT") have allotted work to M/s..... (hereinafter called the said Contractor) under the terms and conditions of Supply Order No..... issued by ANERT and the agreement dated ..... made between (name of contractor) and ANERT for covering ..... (hereinafter called the said agreement) of Security Deposit for the due fulfilment by the said contractor of the terms and conditions.

Contained in the said agreement, on production of the Bank Guarantee for Rs..... (Rupees..... only) we, ...Bank having our Head Office at ..... (herein after referred to as "the Bank") at the request of M/s. .....(name of contractor) do hereby undertake to pay to the ANERT an amount not exceeding Rs..... (Rupees .... only), against any loss or damage caused to or suffered or would be caused to or suffered by the ANERT by reason of any breach by the said contractor of any of the terms and conditions contained in the said agreement

We, ...Bank, do hereby undertake to pay the amount due and payable under this Guarantee without any demur, merely on a demand from the ANERT stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the ANERT by reasons of breach by the said contractor of any of the terms or conditions contained in the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. ..... (Rupees ..... only).

This guarantee will not be discharged due to change in the constitution of the bank or the contractor/supplier.

Notwithstanding anything contained hereinbefore:

1) Our liability under this Bank Guarantee shall not exceed Rs.....(Rupees .... only)
2) This Bank Guarantee shall be valid upto .....
3) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee amount only and only if you serve us a written claim or demand on or before.....

Dated at ..... this .... day of 2023

FORMAT 6 – COMPONENT WISE SPLIT UP OF COSTS

(On Letterhead of the respective entity for which the below details are provided.)

To be provided for all capacity quoted by the bidder

S/N	Component	Percentage (%)
1	SPV Modules	
2	Module Mounting Structure	
3	Grid Tied Inverter as per specification	
4	Balance of System	
5	Cost for 10 Year Warranty and Preventive Maintenance	
6	Installation and Commissioning Charges	
7	Insurance (From Material dispatch till 10 years warranty period)	
8	Any miscellaneous expenses required for the successful commissioning of the plant	
9	Remote Monitoring and associated costs	
Total		100%

ANNEXURE A – PRE-AGREEMENT

(To be on non-judicial Kerala stamp paper of value Rs. 200)

ARTICLES OF AGREEMENT executed on this the . . . . . day of . . . . Two thousand and . . . .between the **Agency for New & Renewable Energy Research and Technology** (hereinafter referred to as **ANERT**) of the one part and Sri . . . . (Name and Address of the tenderer) hereinafter referred to as "the Bounden") of the other part.

WHEREAS in response to the Notification No. . . . . dated . . . . the bounden has submitted to ANERT a e-tender for the ***Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd*** specified therein subject to the terms and conditions contained in the said e-tender.

AND WHEREAS the bounden has furnished to ANERT a sum of Rs. . . . . .. as Earnest Money Deposit for execution of an agreement undertaking the due fulfilment of the contract in case his e-tender is accepted by ANERT. NOW THESE PRESENTS WITNESS and it is hereby mutually agreed as follows: -

In case the e-tender submitted by the bounden is accepted by ANERT and the contract for . . . . is awarded to the bounden, the bounden shall within Fifteen days of acceptance of this e-tender, execute an agreement with ANERT incorporating all the terms and conditions under which ANERT accepts this e-tender.

In case the bounden fails to execute the agreement as aforesaid incorporating the terms and conditions governing the contract, ANERT shall have power and authority to recover

from the bounden any loss or damage caused to ANERT by such breach as may be determined by ANERT by appropriating the moneys inclusive of Earnest Money deposited by the bounden and if the Earnest Money is found to be inadequate the deficit amount may be recovered from the bounden and his properties movable and immovable in the manner hereinafter contained.

All sums found due to ANERT under or by virtue of this agreement shall be recoverable from the bounden and his properties movable and immovable under the provisions of the Revenue Recovery Act for the time being in force as though such sums are arrears of land revenue and in such other manner as ANERT may deem fit.

In witness whereof Sri . . . . . (Name and Designation) for and on behalf of the Agency for New & Renewable Energy Research and Technology and Sri . . . . the bounden have hereunto set their hands the day and year shown against their respective signature.

Signed by Sri	Signed by Sri . . . . .
(Date)	(Date) . . . .
in the presence of witnesses	in the presence of witnesses
1.	1.
2.	2.

ANNEXURE B – BIDDERS TECHNICAL INFORMATION

TECHNICAL PARTICULAR DATA

Solar PV Module

Sl. No	Particulars	Required	Offered
1	PV Module Manufacture name & Country of origin	Manufacture name to be specified	
2	PV Module type	Poly/Mono Crystalline, Mono PERC	
3	No. of PV cells per Module		
4	Total number of PV modules		
5	Max. Power, P_{mp} @STC	330 Wp or above	
6	Max. Power tolerance (%)	Not more than 3%	
7	Max. Power voltage (V_{mp}) @STC	To be specified	
8	Max. Power current (I_{mp}) @STC	To be specified	
9	Open circuit voltage, V_{oc} @ STC	To be specified	
10	Short circuit current, I_{sc} @STC	To be specified	
11	Nominal voltage	To be specified	
12	Nominal Wattage	To be specified	
13	Fill Factor	Not less than 0.7	
14	Temp. coefficient of V_{oc} (%/C)		
15	Temp. coefficient of P_{mp} (%/C)		
16	Temperature Co-efficient of I_{sc} (%/°C)		
17	Normal Operating Cell Temperature (NOCT) (°C)		
18	Operating Temperature (°C)		
19	Module efficiency	>=17%	
20	No. of By-pass Diodes		
21	Mounting arrangement for Solar Module	Fixed Arrangement	

Sl. No	Particulars	Required	Offered
22	Solar Module frame material	Anodized Aluminium	
23	Module dimensions' cm (L x W x H)	To be specified	
24	PV panel Weight (kg)	To be specified	
25	Output Cables	Polarized, UV protected &Weather Proof DC rated multi-contact connector	
26	Output Terminal	PV Connectors	
27	Junction Box	Weather resistant HDPE (IP65)	
28	Copies of test certificates	IS 14286/IEC 61215,61730 part 1&2, IEC 61701	

INVERTER

Sl. No.	Particulars	Required	Offered
1	Manufacturer		
2	Model name/No.		
3	Number of units		
4	Nominal AC power		
5	Nominal AC voltage		
6	Nominal AC Current		
7	AC grid Frequency range	50Hz ± 0.5%	
8	AC grid voltage range		
9	Power Factor (+ and -)		

Sl. No.	Particulars	Required	Offered
10	Total Harmonic Distortion	As per IEEE-519 2014	
11	AC over / under voltage over / under frequency protection		
12	Max PV input power		
13	Maximum DC voltage	Less than 1000 V	
14	MPPT voltage range		
15	Maximum DC current		
16	No. of DC input ports		
17	Maximum Efficiency	as perIEC61683	
18	DC voltage ripple		
19	Ambient temperature range		
20	Humidity (non-condensing)	95%, non-condensing	
21	Protective functions - AC over/under voltage, AC over/under frequency, over temperature, AC and DC overcurrent, DC over-voltage, against Islanding		
22	Communication Interface	RS485. MPI Profi-Bus/Telephone Modem/WiFi	
22	User-display standard	LCD panel with membrane keypad	
23	Enclosure environment rating		
24	Safety and EMC		
25	Anti-islanding feature	IEEE1547/UL1741/IEC62116	

ANNEXURE C – DECLARATION BY THE BIDDER

e-Tender Notification No: ....., dtd …….. for Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

To

The CEO
ANERT

We, the undersigned, declare that:

1. We have examined and have no reservations to the Bidding Document, including Addenda No.: ..... (if any)
2. We offer to supply in conformity with the Bidding Document and in accordance with the delivery schedule
3. Our Bid shall be valid for a period of 6 months from the date fixed as deadline for the submission of tenders in accordance with the Bidding Document, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
4. If our Bid is accepted, we commit to submit a Security Deposit in the amount of 5 percent of the Contract Price for the due performance of the Contract;
5. We are not participating, as Bidders, in more than one Bid in this bidding process;
6. Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the ANERT or Government of Kerala;
7. We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed.
8. Our firm has obtained the certifications from MNRE or NABL approved Test laboratories that the goods and services are satisfying the technical criteria specified in the bid.

Signature

Date

Name

ANNEXURE D – DECLARATION OF RELATIONSHIP WITH ANERT EMPLOYEE

(to be signed and submitted by the bidder along with the bid)

Tender Notification No.: ……..
Request for Selection (RFS) of agency for the Implementation of 2 MW Solar Power Plant at Travancore Titanium Products Ltd., Kochuveli, Thiruvananthapuram under Solar City project funded by Smart City Thiruvananthapuram Ltd

To

The CEO
ANERT

Name of the ANERT employee with Designation:

Name of the bidder related to the employee:

This is to put on record that Shri/Smt ……..

currently working as …….. in ANERT is related to ……., who is the bidder in the bid. We are aware of the Anti-corruption policy of ANERT and will observe the highest standards during the procurement and the execution of contract and shall retain from corrupt, fraudulent, collusive or coercive practices on competing for the contract.

Signature

Name

Date

ANNEXURE F – CERTIFICATIONS & STANDARDS

QUALITY CERTIFICATION, STANDARDS AND TESTING FOR GRID-CONNECTED SOLAR PV POWER PLANTS

Solar PV Modules/Panels	
IEC 61215	*Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules*
IS 14286	*Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules*
IEC 61646	*Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules*
IS 16077	*Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules*
IEC 62108	*Design Qualification and Type Approval for Concentrator Photovoltaic (CPV) Modules and Assemblies*
IEC 61701	*Salt Mist Corrosion Testing of Photovoltaic (PV) Modules*
IEC 61725	*Analytical expression for Daily Solar Profiles*
IEC 61853-1	*Photovoltaic (PV) Module performance testing and energy rating Part-1: Irradiance and temperature performance measurements, and power rating*
IS 16170: Part 1	*Photovoltaic (PV) Module performance testing and energy rating Part-1: Irradiance and temperature performance measurements, and energy rating*
IEC 62716	*Photovoltaic (PV) Modules - Ammonia (NH3) Corrosion Testing*
IEC 60721-2-1	*Classification of environmental conditions - Part 2-1 : Environmental conditions appearing in nature - Temperature and humidity*
IEC 61730-1	*Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction*
IEC 61730-2	*Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing*
IEC 60904-2	*Photovoltaic devices - Part 2: Requirements for photovoltaic reference devices (STC Performance, 1-V)*
IEC 60891	*Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics (STC Performance)*
IEC TS 62548	*Photovoltaic (PV) Arrays - Design requirements*
IEC 61829	*Crystalline silicon photovoltaic (PV) array- on-site measurement of I-V characteristics*

Solar PV String Inverters/INVERTERs	
IEC 62109-1, IEC 62109-2	*Safety of power converters for use in photovoltaic power systems- Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems - part 2 : Particular requirements for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)*
IEC/IS 61683	*Photovoltaic systems - Power conditioners: Procedure for measuring Efficiency (10%, 25%, 50%, 75% & 90-100% loading conditions)*
IEC 62093	*Balance-of-system components for photovoltaic systems – Design qualification natural environments for solar inverters (grid-connected)*
IEC 62116	*Utility-interconnected photovoltaic inverters- Test procedure of Islanding prevention measures Standard for Inverters, Converters, Controllers and*
UL1741	*interconnection system Equipment for use with Distributed Energy Resources*
IEEE 1547	*Standard for interconnecting Distributed Resources with Electric Power Systems*
IEEE 1547.1	*Standard for Conformance Test procedures for* *Equipment interconnecting Distributed Resources with Electric Power Systems*
IEC 60255-27	*Measuring relays and protection equipment - Part 27 : Product safety requirements*
IEC 60068-2 (1,2,14,27,30 & 64)	*Environmental Testing of PV System – Power Conditioners and Inverters* *IEC 60068 -2-1: Environmental testing - part 2-1: Tests - Test A: Cold* *IEC 60068 -2-2: Environmental testing - part 2-2: Tests - Test B: Dry heat* *IEC 60068 -2-14: Environmental testing - part 2-14: Tests - Test N: Change of temperature* *IEC 60068 -2-27: Environmental testing - part 2-27: Tests - Test Ea and guidance: shock* *IEC 60068 -2-30: Environmental testing - part 2-30: Tests - Test Db: Damp heat, cyclic (12h+12h cycle)* *IEC 60068 -2-64: Environmental testing - part 2-64: Tests - Test Fh : Vibration, broadband random and guidance*
IEC 61727	*Photovoltaic (PV) systems - characteristics of the utility interface (Parallel operation)*
CEA Guidelines / Regulations	*Technical standards for connectivity of the distributed Generation Resources at Voltage - level of below 33kV*
IEC 62103	*Electronic equipment for use in power installations*
BS EN 50438	*Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks*

IEC 61000 Series	*Electromagnetic Interference (EMI), and Electromagnetic Compatibility (EMC) testing of PV inverters*
IEC61850	*Inverters with Reactive Power Control*
IEC 62124	*Photovoltaic (PV) Stand -alone systems- Design verification*
Fuses	
IS/IEC 60947 (Part 1,2 &3) EN 50521	*General safety requirements for connectors, switches, circuit breakers (AC/DC)* *Low-voltage switchgear and Control-gear, Part-1: General rules* *Low-voltage switchgear and Control-gear, Part-2: Circuit Breakers* *Low-voltage switchgear and Control-gear, Part-3: Switches, disconnectors, switch-disconnectors and fuse- combination units* *EN. 50521: Connectors for photovoltaic systems - Sagety requirement*
Surge Arrestors	
IEC 60364-5-53	*DC surge protection device (SPD), class 2*
IEC 60364-5-53	*AC surge protection device (SPD), class 2*
IEC 60364-5-53	*Electrical installations of buildings-Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control*
IS 15086-5	*Surge Arresters, Part 5: Selection and Application Recommendations*
Cables	
IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)	*General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltage up to and including 1100V, and UV resistant for outdoor installation)*
Earthing	
IS 3043-1986	*Earthing shall be done in accordance with iS-3043-1986, provided that earthing conductors shall have a minimum size of 6.0 mm^2 copper, 10 mm^2 aluminum or 70mm^2 hot dip galvanized steel*
IEC 60364-5-53	*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*
IS 3043	*Code of practice for earthing (ETD 20: Electrical Installation)*
IEC 62561 Series	*IEC 62561-1 - Lightning protection system components (LPSC)- Part 1: Requirements for connection components* *IEC 62561-2 - Lightning protection system components (LPSC)- Part 2: Requirements for conductors and earth electrodes* *IEC 62561-7 - Lightning protection system components (LPSC)- Part 2:*

	Requirements for earthing enhancing compounds
Junction Boxes	
IEC 529	*Junction boxes and solar panel terminal boxes shall be of the thermo plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use*
IE 62208, IP 54 as per IEC 529	*General requirements for junction boxes, charge controllers*
CEA Regulations	*Energy Meter Installation and operation of Energy Meters Regulations 2006, and as amended in 2010 & 2014*
IS 13779	*AC Static watt-hour Meters Class 1 and 2 - specification*
IS 14697	*AC Static Transformer Operated Watt-hour and Var- hour Meters, Class 0.2 S and 0.5 S - specification*
IS 15884	*Alternating Current Direct connected static Prepayment Meters for Active Energy (Class 1 and 2) - Specification*
IS 15959	*Data exchange for electricity meter reading, tariff and load control- companion specification*
IS 16444	*AC Static direct connected watt-hour Smart Meter Class 1 and 2 specifications (with Import & Export/Net energy measurements)*
System Performance Monitoring	
IS/IEC 61724	*Guidelines for PV System Performance Monitoring- measurement, Data Exchange, and Analysis*
Rooftop PV System/Power Plant inspection	
IEC 62446	*Grid connected Solar PV Systems-Minimum requirements for system Documentation, Commissioning Tests, and Inspection*
IEC 61557-1	*Electrical Safety in low voltage distribution systems up to 1000 V AC. and 1500 V DC - Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements*
IEC 60364-6	*Low-voltage electrical installations - part 6: Verification*
IEC 61829	*Crystalline silicon photovoltaic (PV) array- on-site measurement of I-V characteristics*