



Office of the Principal

KHUNTA DEGREE MAHAVIDYALAYA

KHUNTA, MAYURBHANJ,- 757019. CODE-22229301

E.Mail- khuntadm@gmail.com., Web. www.khuntadm.in, Mob:-9437259966

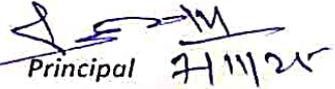
NAAC-B+

No: KDM/25-26/04

Date: 07.11.2025

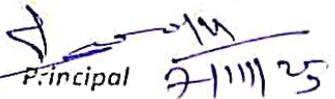
Short Tender Call Notice

Sealed tenders in the prescribed format are invited from registered firms/ Dealers/ Suppliers having valid GST registration, PAN & IT clearance for supply of Hybrid Solar System "Capacity: 7.5KWp". (Funds Provided by AMA GAURAV AMA COLLEGE PARICALANA SANGATHAN (AGACPS) Project Cost-Not Exceed 6 Lakhs) to the college so as to reach the undersigned through Registered Post/ Speed Post/ Courier/ latest by 03:00P.M. on or before 15.11.2025. The tender document can be available from College Website (www.khuntadm.in). The technical bid and financial bid shall be opened by the Purchase Committee in the presence of the parties or their authorized representatives on 18.11.2025 at 11:30 AM. The authority reserves the right to accept / reject any or all tenders without assigning any reason thereof and will not be responsible for any postal delay.


Principal 7/11/25
Khunta Degree Mahavidyalaya,
Khunta, Mayurbhanj

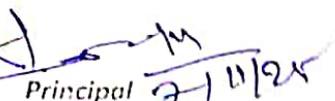
Memo No. :- 439/25 Date:- 07.11.25

Copy Forwarded to the College Notice Board/ College Website for wide circulation and information of public.


Principal 7/11/25
Khunta Degree Mahavidyalaya,
Khunta, Mayurbhanj

Memo No. :- 440/25 Date:- 07.11.25

Copy along with soft copy forwarded to the DeGM, OSWAN, Mayurbhanj for information and requested to upload the detail Tender call notice to the District website for information of the Public/Prospective Bidders.


Principal 7/11/25
Khunta Degree Mahavidyalaya,
Khunta, Mayurbhanj

OFFICE OF THE PRINCIPAL
KHUNTA DEGREE MAHAVIDYALAYA
Khunta , Mayurbhanj, Odisha-757019

TENDER CALL NOTICE

Tender No & Date	No. KDM/25-26/04 dt.: 07.11.2025
Name of The Tenderer	Principal Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj
Description of Tender	Design, Supply, Installation, Commissioning & Maintenance(minimum 5 Years) of 7.5KWp Capacity HYBID RTS(Rooftop Solar Plant) with Battery storage capacity of 10KWH at KHUNTA DEGREE MAHAVIDYALAYA(KDM) for the year 2025-26.
List of Items	See in Annexure-II
Date of publication of tender notification on official notice board, newspapers & College Website (www.khuntadm.v.in)	Date: 07.11.2025
Availability of Tender Form	College Website (www.khuntadm.v.in) & Mayurbhanj District Portal (www.mayurbhanj.odisha.gov.in)
Last date & Time for receive of duly filled in Tender form	Date: 15.11.2025 Time:03.00PM
Date & Place of opening of Tender	18.11.2025 at-11.30A.M, Office of the Principal Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

CHECK LIST

The tenderers are hereby instructed to arrange and submit the following required documents as per the checklist

Sl. No	Name of Document	Yes/No	Page No
1	Bidder Details(Annexure-I)		
2	Technical specification & BoQ(Bill of Quantity)(Annexure-II)		
3	Copy of Valid GSTIN Registration Certificate		
4	Copy of PAN		
5	Copy of Income Tax Return for last 03 Assessment years (22-23, 23-24 & 24-25)		
6	Self-declaration for not having been black listed(Annexure-IV) (Letter Head)		
7	Guarantee/Warranty (Annexure-V) (10/- Stamp Paper)		
8	Letter of Willingness (Annexure-VI) (Letter Head)		
9	Original Tenderer form Duly Signed & Stamp on each Page		

Date :

Signature and with seal of tenderer

Note - If tender is not submitted in above manner by the tenderer, may be treated as non-responsive & liable to be rejected


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

NOTICE INVITING TENDER

The Principal Khunta Degree Mahavidyalaya, Khunta invites sealed tenders under **"TWO BID SYSTEM"** from reputed suppliers of good standards for selection of a supplier for the purpose of supplying different items to Principal Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj

"TWO BIDS SYSTEM"

Tenderer should take due care to submit the tender in accordance with requirement in sealed covers. Bids received shall be evaluated as per the Criteria pre scribed in the tender document.

The College will not entertain any modifications subsequent to opening of bids and bids not conforming to tender conditions shall be liable to be rejected. Therefore, bidders are advised to submit their bids complete in all respects as per requirement of tender document specifying their acceptance to all the clauses of Bid Evaluation Criteria, General terms and conditions and compliance to the Scope of Work requirement etc.

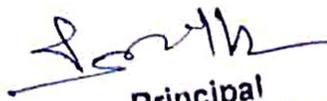
i) **Technical Bid** shall consist of all technical details along with commercial terms and conditions.

AND

ii) **Financial Bid** shall indicate item-wise price for the items mentioned in the technical bid.

The technical bid and the financial bid should be sealed by the bidder in separate covers duly super scribed as "Technical Bid" and "Financial Bid" respectively. **Both these sealed covers** should then be kept in a bigger cover which should also be sealed & duly super scribed as "Tender for Supplying (Name of the dept.) to Principal Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj. "The Letter of Willingness & Check List.

The tender document can also be available from the official website. The tender document is not transferable to any other person.


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

ELIGIBILITY CRITERIA

The bidders who are desirous for above work require fulfilling the following conditions:

- A. Must be registered under GST Act
- B. Should not have been blacklisted by any State Govt. / Central Govt. / PSU India. A self-declaration is required as per Annexure IV.
- C. The Tenderer must have Odisha Office for after sales & Service (If OEM/ Dealer outside of the State). Tenderer who has their own sales and service station in Odisha with GST Registration Number should only quote.
- D. Proof of Establishment of Firms / Manufacturing unit/ Dealership certificate from the OEM to be attached with **Technical Bid**.
- E. The bidder should supply the items as per technical specification mentioned in **Annexure II**. The list of items available with the tenderer. Original Technical Catalog as Proof of Technical Specification should be enclosed by Bidder, merely Copy & Paste of Technical Specification will be out right Rejected.
- F. The bidder should compile as per **Annexure II**, duly filled in, signed and complete in all respects. No alteration/modification in the formats shall be permitted.
- G. A self-declaration that the tenderer has not been blacklisted by any State Government/ Central Govt./PSU in India as per **Annexure IV**.
- H. If any Technical conflict arises while evaluating the Technical Bid, **Principal of Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj** may ask for **Live Demonstration** of same product in front of the Purchase committee.

1. LIST OF ITEMS:

Design, supply, installation, Commissioning and maintenance of 75.Kwp Capacity HYBRID RTS (Rooftop Solar Plant) with 10KWh battery storage capacity. The items have been described in Annexure-II . A bidder can submit financial bid for any number of items however care should be taken to submit for accounting units mentioned against each item.

2. BIDDER:

The term Bidder shall mean Company, Firm, Agency or the Individual to whom the Contract is awarded and shall include its/ his/ her/ its heirs and legal representative. Successful Bidder is referred to as "Party" in this tender document.

3. MODE OF PAYMENT

- I. Payment shall be made through NEFT/RTGS/Chq. transfer only after satisfactory supply of the said items.
- II. The principal shall be at liberty to withhold any of the payments in full or in part.
- III. No advance payment will be made in any case.
- IV. The 100% payment shall be given within 10-15 days after satisfactory installation & Commissioning of the Solar Power plant in all respective upon the issue of the 'WORK COMPLETION' certificate successfully by the concerned authority.

Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

4. MODE OF SUBMISSION OF TENDER

- A. Tender should be submitted by tenderer in prescribed form.
- B. Tenderer should submit their offer in two parts as under:
 - (a) Technical Bid, consisting of technical details, drawing/catalogues/ brochures, data sheets or models etc.(Annexure-II)
 - (b) Financial Bid on prescribed format attached with the tender document (Annexure-IV)
- C. Proposals complete in all respect should be submitted to the **The Principal, Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj, Pincode: 757019** through **Speed Post/ Registered Post/ Courier Service** only. Delivery in person shall not be accepted.
- D. All details asked for in the Annexure (s) should be properly filled in and each page of tender should be Stamped & Signed by the tenderer. Failure to attach Annexure required may in valid at the tender.
- E. Any tender which is not found in the proper form or is received late due to postal delay or other wise shall in no case be accepted.
- F. The bidder is expected to examine all instructions, forms, terms and specifications in the bid document. Failure to furnish all information required as per the tender document or submission of bids not substantially responsive to the bidding document in every respect will be at the bidder's risk and may result in rejection of the bid.
- G. Offers should be typed and Price be quoted in words as well as in figures. In case of any discrepancy or variation in between figures and words is found, the offer in words shall be finally acceptable. Disagreement with this provision shall entail the bid as non-responsive and subsequently rejected.
- H. Tender documents are not transferable.
- I. Incomplete tenders or tender received after due date and not accompanied
- J. In no case the bidding manufacturer or the bidder, otherwise can authorize any other agency what so ever to supply the items to purchaser and receive payment in respect thereof.
- K. No amendment or supplementary attachment in the bidding document shall be allowed or entertained after the bid having been submitted to the purchaser. No representation there to at any stage shall be entertained.
- L. Principal, Khunta Degree Mahavidyalaya, Khunta, Mayurbhanj reserves the right to reject any or all offers or increase/decrease in quantities, call for acceptance the offer in full or in part, without assigning any reasons thereof.
- M. ISO certified Company should have established service team & net work across the state.
- N. The principal is not bound to accept the tender quoting the least in the financial bid. The principal reserves the right to place order for a part of the quantity offered. The rates quoted by the bidder shall be valid for any such part.
- O. They should be registered for GST/CST/ST & Income Tax and should enclose copies of relevant certificates.
- P. Tenderer will have to produce all these original documents at any time as deemed by the Institute.

5. TERMS & CONDITIONS

The tenderer are requested to follow the below mentioned instructions

- A. Failure to comply with the conditions will result in forfeiting of the tender. Please cross out any mistakes and rewrite the same and countersign.
- B. Cost involved in submitting the bids, attending the tender opening meeting, arrangements for the demonstration/presentation etc. shall be borne by the bidder.


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

- C. No tenderer shall be allowed to withdraw the tender rates after opening of the tender. If any tenderer withdraws the rates, Rates should be offered unconditionally and if rates are submitted with any condition the tender shall be rejected.
- D. Tenderer shall have to quote item wise rates; consolidated rates shall not be considered and tender shall be liable to be rejected out rightly.
- E. It is a compulsory requirement that the items offered make and model, as quoted by the bidder must be supplied, installed and must be in good working condition.
- F. Tenderer should quote for the whole set of items required and should be willing to undertake responsibility of commissioning, warranties and after sales service. Part offer/offers not as per given specification will not be considered.
- G. Tenders should comply all the terms and conditions given in the tender document and be quoted for the specification given in the tender documents.
- H. Not with standing anything stated herein above, the principal reserves the right to assess the tenderer capability and capacity to perform the contract, should the circumstances warrant such assessment.
- I. In case any part of the Solar Power Plant Balance of System(BoS) including Solar PV modules supplied being found to be non-functional the entire unit of Solar Power Plant Balance of System(BoS) including Solar PV modules shall be taken as non-functional
- J. The principal reserves the right to change the quantity/ upgrade the criteria/ drop any item or part thereof/extension of delivery date at any time before placing the purchase/ work/ supply order.
- K. Right to Acceptance: The college authority is not bound itself to accept the lowest tender. It is the sole discretion of the principal to place order for better quality.
1. Signing of Tender: The individual signing the tender (or the documents in connection with it) must specify whether he/she is sign in gas:
- (i) A sole proprietor of the farm, or constituted attorney of such proprietor.
- (ii) A partner of the farm, if it be a partnership, in which case he/she must have the authority to refer to arbitration, disputes if any, concerning the business of the partnership, either by virtue of the partnership agreement or power of attorney.
- (iii) Authorized signatory of the farm, if it is a company, a letter of the authority in this respect must been closed along with the bid.
- (iv) A person signing the tender form or any part thereof, on behalf of another, shall be deemed to warrant that he/she has the authority to bind the other and if on inquiry it appears that the person so signing has no authority do to so, Principal may without prejudice to other Civil and Criminal remedies, cancel the contract and hold the signatory liable for all costs and damages.
- (v) The undersigned reserves the right to cancel the tender without assigning any reason thereof.



Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

6. PRICES

Farm will submit the prices (all inclusive) for each item to be quoted on prescribed format attached with the tender document including charges for installation and commissioning with at least Warranty from the date of satisfactory installation and commissioning of the Solar Power Plant Balance of System(BoS) including Solar PV modules. The installation will include the mechanical, civil, electrical, furnishing work (if any) required at site.

The tenderer should take care that the rates and amounts are written in such a way its misinterpretations not possible.

The price ranking will be carried out as under:

1. The prices of optional items if not required as per technical specifications will be excluded for ranking purpose.
2. The ranking will be determined as under. Total Price (Cost) = Price quoted with all accessories as per technical specifications along with all the taxes and charges (if any). All these calculations must be clearly written by the bidder in price bid.
3. Offer with any price variation clause will not be accepted. The rates quoted in ambiguous terms such as "Freight on actual basis", "taxes as applicable extra" or "packing & forwarding extra" will render the tender liable for rejection.
4. G.S.T. or Central sales tax (C.S.T.) or as applicable must be reflected in the financial bid and the tax amount is to be clearly indicated separately but included in the lump sum price.
5. Bids shall be accepted with price quoted in variably in Indian Currency.
6. No increase in price shall be allowed even if claimed on the grounds of any statutory increase or fresh in position of any other tax later.
7. Discount, if any, offered by the bidder shall not be considered unless specifically indicated in the price schedule and shall be taken into account for consideration only if it is quoted clearly with net price taking all such factors like discount, free supply etc. to arrive at net price.
8. Prices: The tenderer are required to quote as per "Annexure" (Financial Bid) in a Separate Envelope. The rates quoted shall include the cost of Material, labour, Transport & Packaging etc., as required for the completion of work.

7. VALIDITY OF BID:

The bid will remain valid for 1 months from the date of opening of financial bid.

8. TEST AND INSPECTIONS

Upon completion of the installation work, the tenderer /supplier shall facilitate inspection of the Solar Power Plant Balance of System(BoS) including Solar PV modules by the principal or his authorized representative, to inspect & test the Solar Power Plant Balance of System(BoS) including Solar PV modules and to confirm that they are installed in conformity to the required specifications and are serving the desired purpose. Any defect or failure to serve the desired purpose, discovered during the inspection will be promptly rectified and made good to the satisfaction of the principal or his authorized representatives.

9. GUARANTEE/ WARRANTY (Annexure-V)

The tenderer shall furnish along with their quotations the under noted Guarantee/Warranty:

- A. The Guarantee/ Warranty shall be for a period of at least 25 Years from the date of satisfactory installation and handing over the Solar Power Plant Balance of System(BoS) including Solar PV modules and of works conducted there with


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj.

covered under the contract in working order. During the guarantee period the replacement of any part(s) of the Solar Power Plant Balance of System(BoS) including Solar PV modules or rectification of defect of works will be free of cost. If the downtime exceeds seven consecutive days at any one time, the guarantee period will be extended beyond aforesaid 25 Years by duration equal to the total down time during the period of warranty.

- B. The tenderer should produce written guarantee stating that the Solar Power Plant Balance of System(BoS) including Solar PV modules being offered is latest model and that spares for the Solar Power Plant Balance of System(BoS) including Solar PV modules will be available for a period of at least five years after its supply to the purchaser.
- C. The tenderer whose tender is accepted shall furnish the warranty (Where Ever Applicable) in Annexure-V Along with Bill.
- D. The manufacturer and the tenderer should guarantee the entire unit against defects of manufacture, workmanship and poor quality of components.
- E. The tenderer shall be are all cost of such replacement, including freight, if any, of such replace or repaired Solar Power Plant Balance of System(BoS) including Solar PV modules and/or other articles but without being entailed to any extra payment on that or any other account. All documents required for replacement in part/parts will be made available by the indenter.



Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

Annexure-I

Bidder Details

1. Name & Postal address of Bidder:.
2. E-mail:
Name & address of Owners/ Partners/Directors:
Nature of Farm/Agency/Company (Sole/Partnership/otherwise):
3. Copy of GST Registration Certificate:
4. Copy of PAN Card:
5. Income Tax Return for last 03 Assessment years (22-23, 23-24 & 24-25):
6. Undertaking certifying that the Farm is not blacklisted in Annexure:
7. Each page of tender form duly signed in:
8. Whether agreed to abide by all the terms & conditions of this tender:

Signature of the Proprietor/Authorized Signatory (Name & Signature of the tenderer with seal)

Place:

Date

:



Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

FINANCIAL BID

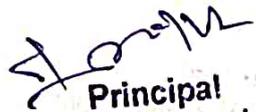
SN	Name of the Items	Make	Qty	Taxable price Per unit	GST@%	Total Price Including GST
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Price: - Total price should be inclusive of all taxes. Items quoted must be as per the specifications given in enclosed Annexure-II

Signature & Seal of the Supplier

Place:

Date:


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

SELF DECLARATION CUM UNDERTAKING

Annexure-IV

It is certified that my Farm/ Agency/ Company has never been **black listed** by any of the Departments/ Autonomous Institutions/ Universities/ Public Sector Undertakings of the Government of India or Government of Odisha or any other State Government or reputed educational institutions and no criminal case is pending against the said Farm/Agency/Company as on date

Signature of the Bidder:

Name of the Authorized Signatory:
Name of the Farm:

Seal:



Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

GUARANTEE/WARRANTY

I/We hereby declare that the Solar Power Plant Balance of System (BoS) including Solar PV modules supplied to the purchaser under this contract shall be of the best quality and workmanship and are strictly in accordance with the specification and particulars contained/mentioned in the clause hereof and I/we hereby guarantee that the said Solar Power Plant Balance of System(BoS) including Solar PV modules and other articles confirm to the description and quality a foresaid.

The purchaser will be entitled to reject the said Solar Power Plant Balance of System(BoS) including Solar PV modules and other articles as maybe discovered not to confirm to the said description and quality. On such rejection the Solar Power Plant Balance of System(BoS) including Solar PV modules and other articles will be returned in own risk and all the provision herein contained relating to rejection thereof shall apply. I/we shall, if called upon to do so, replace within a period of 14 days or such further period that be extended from time to time by the purchase at his discretion, and an application made thereof by us, the Solar Power Plant Balance of System(BoS) including Solar PV modules and other articles as are rejected by the purchaser and in such an event the above mentioned Warranty shall apply to the Solar Power Plant Balance of System(BoS) including Solar PV modules and/or other articles replaced from the date of replacement thereof, otherwise the tenderer shall pay to the purchaser such damages as may arise by reason of therein contained without prejudice to any other right of the purchaser in that behalf.

The Solar Power Plant Balance of System (BoS) including Solar PV modules being offered is latest model and that spares for the Solar Power Plant Balance of System (BoS) including Solar PV modules will be available for a period of at least five years after its supply to the purchaser. The Guarantee/ Warranty shall be for a period of at least 25 Years from the date of satisfactory installation and handing over the Solar Power Plant Balance of System (BoS) including Solar PV modules and of works conducted there with covered under the contract in working order. During the guarantee period the replacement of any part(s) of the Solar Power Plant Balance of System (BoS) including Solar PV modules or rectification of defect due to manufacturing of works will be free of cost. If the downtime exceeds seven consecutive days at any one time, the guarantee period will be extended beyond afore said 25 Years by duration equal to the total down time during the period of warranty.

Signature with seal of the tenderer

Date:

Place:


Principal
Khunta Degree Mahavidyalaya

LETTER OF WILLINGNESS

Annexure-VI

To
The Principal,
Khunta Degree Mahavidyalaya Khunta, Mayurbhanj,
Odisha-757019

Sub: Submission of willingness certificate to supply/ install (Solar Systems) at your college premise.

Sir,

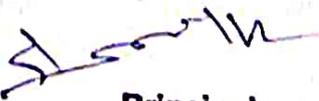
I am to inform you that my farm (_____) is ready to supply/install (Solar Systems) within the specified period of receipt of work order from the college, if my farm is selected as eligible bidder during the selection of tender. I am willing to accept all the clauses of Bid evaluation criteria, general terms and compliance to the scope of work requirement as mentioned in the Tender form. If my farm fails to supply and install the required items in the quoted price.

Yours faithfully,

Authorized Signatory of the farm with Seal

Date:

Place:


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

**TECHNICAL SPECIFICATIONS
OF
7.5 KWp HYBRID
SOLAR PV POWER PLANT**


**Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj**

TECHNICAL SPECIFICATIONS OF 7.5 KWp HYBRID SOLAR POWER PLANT

1. SCOPE OF THE WORK

The scope includes guidelines and practices for the Design, Supply, Installation, Testing, Commissioning & maintenance of Hybrid Rooftop PV Power Plant.

All the necessary approvals from TPNODL/Electrical Inspectorate, feasibility study, necessary civil work, Mounting of Module Structures, PV Module Installation, Inverter Installation, Battery Bank DC/AC Cabling and interconnections, Installation of Lightning Arresters and Earthing System as per the standards, Net Metering, Arranging all the necessary inspections from TPNODL/Electrical Inspectorate as part of Pre-Commissioning, if any, Commissioning of the PV Power Plant, are coming under the scope of the EPC company.

2. LOCATION

Shade free Rooftops of KHUNTA DEGREE MAHAVIDYALAY (KDM) Campus Building.

3. DEFINITION

A Hybrid Solar PV power plant system comprises of C-Si (Crystalline Silicon) Solar PV modules with intelligent Inverter having MPPT technology and Intentional- Islanding feature and associated power electronics, which feeds generated AC power to the Grid and islands when the Grid is not available. Other than PV Modules and Inverter/Inverters, the system consists of a Battery Bank, Module Mounting Structures, appropriate DC and AC Cables, Array Junction Boxes (AJB) / String Combiner Boxes (SCB), AC and DC Distribution Box, Lightning Arrester, Earthing Systems, Net meter, etc.

The system should be capable for exporting the generated AC power to the Grid, whenever the Grid is available and islands whenever the grid is not available. The Hybrid power plants of all the capacities shall be capable of giving a battery backup of minimum Two hours.


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

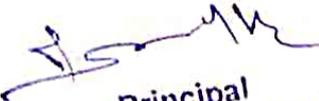
4. SOLAR PV MODULE

The EPC Company/ Contractor shall use only the PV modules that are empanelled to MNRE/BIS. However the specifications for the PV Module is detailed below:

1. The PV modules must be PID compliant, salt, mist & ammonia resistant and should withstand weather conditions for the project life cycle.
2. The back sheet of PV module shall be minimum of three layers with outer layer (exposure to ambience) and shall be made of PVDF or PVF. The Back sheets for PV Module with 2 layered or 3 layered Polyester types or the back sheets with Polyester (PET type) at Air side material are not permitted for the empanelment; The minimum thickness of the core layers (without adhesive and inner EVA coated) must be 300 microns. The maximum allowed water vapor transmission rate shall be less than $2 \text{ g / m}^2/\text{day}$ and shall have a Partial Discharge $> / = 1500\text{V DC}$
3. The front glass shall meet the following specifications:
 - a. The facing glass must be Tempered, PV grade with Low iron and high transmission.
 - b. The transmission shall be $> 93 \%$
 - c. Thickness shall be min 3.2 mm
 - d. Textured to trap more light
 - e. The glass shall have an Anti-reflective coating for the better transmission and light absorption.
 - f. Tempered glass to meet the external load conditions
4. The encapsulant used for the PV modules should be UV resistant in nature. No yellowing of the encapsulant with prolonged exposure shall occur. The sealant used for edge sealing of PV modules shall have excellent moisture ingress Protection with good electrical insulation and with good adhesion strength. Edge tapes for sealing are not allowed.
5. Anodized Aluminium module frames of sufficient thickness shall be used which are electrically & chemically compatible with the structural material used for mounting the modules having provision for earthing.


Principal
Khunt: Deesa: Mahavidyalaya
Jayisronanj

6. UV resistant junction boxes with minimum three numbers of bypass diodes and two numbers of MC4 connectors or equivalent with appropriate length of 4 sq.mm Cu cable shall be provided. IP67 degree of protection shall be used to avoid degradation during Life. .
7. Shading correction/ bypass diode for optimizing PV out to be incorporated in each solar module or panel level.
8. Each PV module used in any solar power project must use a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module laminate but must be able to withstand harsh environmental conditions.
 - a) Name of the manufacturer of PV Module.
 - b) Name of the manufacturer of Solar cells.
 - c) Month and year of the manufacture (separately for solar cells and module).
 - d) Country of origin (separately for solar cell and module).
 - e) I-V curve for the module.
 - f) Peak Wattage, I_M , V_M and FF for the module.
 - g) Unique Serial No. and Model No. of the module.
 - h) Date and year of obtaining IEC PV module qualification certificate.
 - i) Name of the test lab issuing IEC certificate.
 - j) Other relevant information on traceability of solar cells and module as per ISO 9000 series.
9. The following details should be provided on the module
 - a) Name of the manufacture.
 - b) Month and year of manufacture.
 - c) Rated Power at STC.
 - d) V_{MP} , I_{MP} , V_{OC} , I_{sc} .


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

10. The successful bidder shall arrange an RFID reader to show the RFID details of the modules transported to sites, to the site Engineer in charge up to their satisfaction, which is mandatory for the site acceptance test.
11. Each PV module used in any solar power project must use a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module laminate but must be able to withstand harsh environmental conditions.
12. The PV modules must qualify (enclose Test Reports/Certificates from IEC/NABL accredited laboratory) as per relevant IEC standard. The Performance of PV Modules at STC conditions must be tested and approved by one of the IEC/NABL Accredited Testing Laboratories.
13. PV modules used in solar power plant/ systems must be warranted for 10 years for their material, manufacturing defects, workmanship. The 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
14. Original Solar Power Plant Balance of System (BoS) including Solar PV modules Manufacturers (OEM) Warrantee of the PV Modules shall be submitted by the successful bidder when the materials delivered at site.
15. The PV Module may be under the Indigenous / DCR (Domestic Content Requirement) category (Based on the specific requirement) or Non-DCR.
*The List of MODULE OEMs is attached as Annexure II-1
16. The PV modules shall conform to the following standards:
 - IS 14286: Crystalline silicon terrestrial photovoltaic (PV) modules — design qualification and type approval.
 - IEC 61215 / IEC 61646: c-Si (IEC 61215): Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval Thin Film (IEC 61646): Design, Qualification & Type Approval
 - IEC 61730-1: Photovoltaic Module safety qualification- Part 1: Requirements for construction
 - IEC 61730-2 : Photovoltaic Module safety qualification- Part 2: Requirements for testing
 - IEC 61701 : Salt mist corrosion testing of photovoltaic modules


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

- **IEC 62716** : Test Sequences useful to determine the resistance of PV Modules to Ammonia (NH₃)
17. The PV module should have IS14286 qualification certification for solar PV modules (Crystalline silicon terrestrial photovoltaic (PV) modules — design qualification and type approval). The exemption of this certification and other details are described, as per MNRE's Gazette Notification No. S.O. 3449 €. Dated 13th July, 2018.
18. PV Module of same Make/ Model in the same series shall be considered as a single product while making the payment as per MNRE Order No. 283/54/2018-Grid Solar (ii) Dt. 06- Feb-2020.

5. POWER CONDITIONING UNIT (PCU)/ INVERTER

The Power Conditioning Unit shall be String Inverter with power exporting facility to the Grid.

* **The List of Inverters under HYBRID category is attached as Annexure II-4.**

However the specifications for the Hybrid Inverters are detailed below:

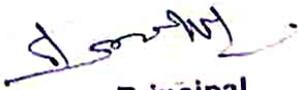
General Specifications:

- 5.1 . All the Inverters should contain the following clear and indelible Marking Label & Warning Label as per IS16221 Part II, clause 5. The Solar Power Plant Balance of System(BoS) including Solar PV modules 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 Solar Power Plant Balance of System(BoS) including Solar PV modules.
 - 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.


Principal
Khunta Degree Mahavidyalaya

- f. The Ingress Protection (IP) rating.
- 5.2 The Hybrid inverter output shall be 415 VAC, 50 Hz, 3 phase or 230 VAC, 50 Hz, 1 phase.
- 5.3 The Hybrid inverter should have all the technical requirements for connecting to the Grid and provision of Intentional Islanding with facility for connecting to a battery bank
- 5.4 The Hybrid 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.
- 5.5 The Hybrid Inverters from 2kW to 100kW will be empanelled.
- 5.6 The Technical Specification of Hybrid Inverters are summarized below:

Specifications of Inverters	
Parameters	Detailed specification
Nominal voltage (AC)	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 >97%
Casing protection levels	Degree of protection: Minimum IP-54 for internal units and IP-65 for outdoor units
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


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

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 20 / IP 21
Recommended indications	LED 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)

5.7 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

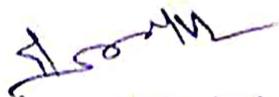
[Signature]
Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

2	Overall Grid Standards	Reference to regulations	Central Electricity Authority (Grid standards) Regulations 2010
3	Solar Power Plant Balance of System(BoS) including Solar PV modules	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 synchronize 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

8	Voltage	The voltage-operating window should minimize nuisance tripping and should be under operating range of 80% to 110% of	subsequent amendments.
		the nominal connected voltage. Beyond the clearing time of 2 seconds, the Photovoltaic system must isolated itself from the grid	
9	Flicker	Operation of Photovoltaic system should not cause voltage flicker in excess of the limits stated in IEC 61000 or other equivalent Indian standards if any	
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.	Relevant CEA regulations 2013 and subsequent if any, (Technical standards for connectivity of the distributed generation resource)


Principal
 Khunta Degree Mahavidyalaya
 Khunta, Mayurbhanj

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



Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

5.8 The IEC Certifications of On-Grid Inverters are summarized below:

Standard	Description
IEC 61683	Photovoltaic systems – Power conditioners – Procedure for measuring efficiency
IEC 61727 or VDE-AR-N 4105	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
Standard	Description
IEC/EN 61000-3-2/ -3-12/ -3-4	Electromagnetic compatibility (EMC) – Part 3-12; Limits; Limits for Harmonic Currents produced by Solar Power Plant Balance of System(BoS) including Solar PV modules 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 /IEEE 1547 or IEEE 1547.1 / UL 1741	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

Principal
 Khunta Degree Mahavidyalaya
 Navirbhan

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

6. BATTERY BANK

6.1. The battery bank can be LMLA, VRLA (Smf or Gel) or Lithium Ferro Phosphate. The EPC Company/ Contractor shall use only the Batteries that are MAINTENANCE FREE WITH MINIMUM 5 YEARS OF LIFE-CYCLE WARRANTY.

* The List of Batteries are attached as Annexure II-5.

However the specifications for the Batteries are detailed below:

6.2. Technical Requirements

SINo:	Parameters : MINIMUM BATTERY STORAGE : 10KWH
1.	Nominal Capacity (Ah) shall be rated @C10
2.	Minimum Nominal voltage (V): 2V / Lithium ferro phosphate: 3.2V
3.	Self-discharge (less than 3% per month at 30°C)
4	A 1 hour backup of MNRE requirement is required for Hybrid Power Plant and is estimated as 1200Wh

6.3. General Specifications:

- Test certificate submitted should qualify the minimum requirements as per above standards for capacity test, ampere-hour efficiency test, watt-hour efficiency test, self- discharge test.
- Battery (Lead Acid LMLA/Lead Acid -VRLA or SMF/Lead Acid GEL) shall have a warrantee of minimum 5 years and Lithium Ferro Phosphate Battery shall have a warrantee of minimum 10years.
- Battery capacity is rated C/10 at 27°C


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

Original Solar Power Plant Balance of System(BoS) including Solar PV modules

Manufacturers (OEM) Warrantee of Battery shall be submitted

6.4. STANDARDS AND CERTIFICATIONS

Major IS/IEC Certification for LMLA/VRLA / Lithium Ferro Phosphate batteries are listed below:

Standard	Description
IEC 61427	IEC 61427 - This series gives general information relating to the requirements for the secondary batteries used in photovoltaic energy systems (PVES) and to the typical methods of test used for the verification of battery performances.
IEC 60896	This part of IEC 60896 applies to all stationary lead-acid cells and Monobloc batteries of the valve regulated type for float charge applications, (i.e. permanently connected to a load and to a d.c. power supply), in a static location (i.e. not generally intended to be moved from place to place) and incorporated into stationary Solar Power Plant Balance of System(BoS) including Solar PV modules or installed in battery rooms for use in telecom, uninterruptible power supply (UPS), utility switching, emergency power or similar applications.
IS 13369:1992	This standard specifies Ah capacities, voltage, overall dimensions, performance requirements and tests for stationary lead-acid units in Monobloc container.
IS 1651:2013	This standard specifies rated Ah capacities, overall dimensions, performance requirements and tests for Stationary Lead Acid Cells and Batteries using Tubular Positive Plates
IS 15549:2005	This standard specifies capacities and performance requirements and corresponding test methods for all types of high integrity series stationary Valve regulated lead acid batteries.
IS 16046 : 2015 / IEC 62133 : 2012**	Defines requirements and tests for the safe operation of portable sealed secondary cells and batteries containing alkaline or other non- acid electrolyte , under intended use and reasonably foreseeable misuse.
IEC 61056*	IEC 61056-1:2012 specifies the general requirements, functional characteristics and methods of test for all general-purpose lead-acid cells and batteries of the valve-regulated type

Principal
...anta Degree Mahavidyalā
...urbhanj

IS 16220*	IS 16220 defines the general requirements, functional characteristics and methods of test for all general-purpose lead-acid cells and batteries of the valve-regulated type.
IEC 62133-2: 2017**	IEC 62133 requirements and tests for the safe operation of portable sealed secondary lithium cells and batteries containing non-acid electrolyte, under intended use and reasonably foreseeable misuse.
IEC 62620:2014**	IEC 62620 defines marking, tests and requirements for lithium secondary cells and batteries used in industrial applications including stationary applications.

* Recommended

** Applies for Lithium ferro phosphate batteries

7. DATALOGGING

A dedicated data logging 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.

7.1. 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. Readout shall be integrated with data logging system : from 25kWp to less than 100kWp

Pyranometer (Class II or better) shall be provided with the sensor mounted in the place of the array. Readout shall be integrated with data logging system : for 100kWp and above.

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.

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

- a) AC Voltage
- b) AC Output current
- c) Output Power


Principal
 Khunta Degree Mahavidyalaya
 Khunta, Mayurbhanj

- d) Energy in kWh
- e) DC Input Voltage
- f) DC Input Current
- g) Temperatures (C)
- h) Invertor Status
- i) Irradiation
- j) Module temperature
- k) String Voltage & Current (For PV Plants from 100kWp onwards)

7.3. 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.

7.4. The data from the above data monitoring system will be used for calculating the Performance Ratio (PR) of the power plant as per IEC 61724 for plants above 25kWp.capacity Hybrid PV Plant.

Performance Ratio

7.5 Performance Ratio (PR) is to be assessed for Grid Connected PV Plants above 25kWp. The data from the data monitoring system will be used for calculating the Performance Ratio (PR) of the power plant as per IEC 61724 and the recommended procedure is described in the below clause.

7.6 The plant acceptance test period is five days long with the following minimum irradiance criteria for PR measurement.

*** MINIMUM 70-80% PR MUST BE ACHIEVED**

- At least three days must have irradiance measured in the plane of the array that is greater than 600 W/sq.m for three continuous hours, and the daily total irradiance must exceed 3,000 Wh/sq.m/day.
- If there are not five days that meet these minimum irradiance criteria, the test period may be extended until five sufficient days have been recorded. There will not be any liquidated damages triggered as a result of this weather-related test delay.

- 7.7 Performance Ratio (PR) is to be assessed for Grid Connected PV Plants above 25kWp. However, there shall be special clause in the Tender Document to achieve a PR of minimum 75%.

8. MODULE MOUNTING STRUCTURE

- 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.
- 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.
- 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
- The PV module mounting structure shall have a capacity to withstand a wind velocity of 150 km/hr.
- 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. The STAAD / Equivalent structural design report must be attached along with the technical bid as Annexure II-K.
- 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.
- The minimum thickness of galvanization for hot dip Galvanized Mild Steel should be at least 80 microns as per IS 4759.
- The Bolts, Nuts, fasteners, and clamps used for panel mounting shall be of Stainless Steel SS 304.


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

- No Welding is allowed on the mounting structure
- Aluminium structures used shall be protected against rusting either by coating or anodization.
- Aluminium frames should be avoided for installations in coastal areas.
- 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.
- Screw fasteners shall use existing mounting holes provided by module manufacturer. No additional holes shall be drilled on module frames
- The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m².
- Minimum distance between the lower level of PV Module and the ground shall be 0.6m from the ground level.
- The PV Panel area shall be accessible for cleaning and for any repair work.
- Sufficient gap need 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.
- Adequate spacing shall be provided between any two modules secured on PV panel for improved wind resistance.
- Installation of structure for solar PV mounting should not tamper with the water proofing of the roofs.
- The Structural Drawing of the Module Mounting Structure is as per Annexure II-H
- The above drawing is specific for RCC flat roofs and may vary for slope roofs. However the drawings shall be approved by concerned Technical Officer before installing the plant.

The List of Mounting structure materials OEM is attached as Annexure II-2

2. SOLAR METER

Solar Meter:

A separate Energy Meter called Solar Meter shall be provided at the output of PCU to record the energy generation from the Solar System. (This energy meter should not be integrated with PCU). Solar energy meter means a unidirectional meter to be installed at the delivery point of the solar energy system to measure the solar electricity generated. This Energy Meter should be tested.

Principal
 Khunta Degree Mahavidyalaya
 Khunta, Mayurbhanj

10. EARTHING

The Solar PV Plant should have a dedicated earthing system. The Earthing for array and LT power shall be made as per the provisions of IS:3043-2018 "Code of practice for earthing (Second Revision)," that governs the earthing practices of a PV system and IS 732:2019 "Code of practice for electrical wiring installations (Fourth Revision)

- 10.1. 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.
- 10.2. The earthing conductor should be rated for 1.56 times the maximum short circuit current of the PV array. The factor 1.56 considers 25 percent as a safety factor and 25 percent as albedo factor to protect from any unaccounted external reflection onto the PV modules increasing its current
- 10.3. In any case, the cross-section area or the earthing conductor for PV Solar Power Plant Balance of System(BoS) including Solar PV modules should not be less than 6 mm² if copper, 10 mm² if aluminium or 70 mm² if hot-dipped galvanized iron. For the earthing of lightning arrestor, cross-section of the earthing conductor should not be less than 16 mm² of copper or 70 mm² if hot-dipped galvanized iron. The complete Earthing system shall be mechanically & electrically connected to provide independent return to earth.
- 10.4. Masonry enclosure with the earth pit of size not less than 400mm X 400 mm(depth) complete with cemented brick work (1:6) of minimum 150mm width 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.
- 10.5. Minimum four (04) numbers of interconnected earth pit needs to be provided in each location. Minimum required gap shall be provided in between earth pits as per relevant standard. Body earthing shall be provided in inverter, each panel frame, module mounting structure, kiosk and in any other item as required.

Earth pit shall be constructed as per IS: 3043-2018. Electrodes shall be embedded

below permanent moisture level.. Earth pits shall be treated with salt and charcoal if average resistance of soil is more than 20 ohm meter

10.6. Earth resistance shall not be more than 5 ohms. 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.

10.7. In compliance to Rule 11& 61 Of Indian Electricity Rules,1956(as amended up to date), all non-current carrying metal parts shall be Earthing with two separate and distinct earth continuity conductors to an efficient earth electrode.

10.8. The Solar Power Plant Balance of System(BoS) including Solar PV modules grounding wire shall be connected to earth strip by proper fixing arrangement. Each strip shall be continued up to at least 500mm from the Solar Power Plant Balance of System(BoS) including Solar PV modules.

10.9. Necessary provisions shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance.

10.10. For each earth pit, a necessary test point shall be provided.

10.11. Total no of Earth pits for solar plants:

- a. Up to 50kWp: AC-01, DC-02, LA-01
- b. Above 50kWp: AC-02, DC-02, LA-01

*The bidder shall submit the detailed specification and drawings for the Earthing arrangements as per Annexure II-9



Principal
Dy. Degree Mahavidyalaya
Banta Mayurbhanj

11. LIGHTNING PROTECTION

The SPV power plant should be provided with lightning and over voltage protection. The source of over voltage can be lightning or other atmospheric disturbance. The lightning conductors shall be made as per applicable Indian Standards in order to protect the entire array yard from lightning stroke.

The design and specification shall conform to IS/IEC 62305, "Protection against lightning" govern all lightning protection-related practices of a PV system.

- 11.1. The entire space occupying SPV array shall be suitably protected against lightning by deploying required number of lightning arresters. Lightning protection should be provided as per IS/ IEC 62305.
- 11.2. Lightning system shall comprise of air terminations, down conductors, test links, earth electrode etc. as per approved drawings.
- 11.3. The protection against induced high voltages shall be provided by the use of surge protection devices (SPDs) and the earthing terminal of the SPD shall be connected to the earth through the earthing system.
- 11.4. The EPC Contractor / Company shall submit the drawings and detailed specifications of the PV array lightning protection Solar Power Plant Balance of System(BoS) including Solar PV modules to Employer for approval before installation of system.

***The bidder shall submit the detailed specification and drawings for the Lightning Arrestor as per Annexure II-10**


**Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj**

12.ARRAY JUNCTION BOX (AJB)/ STRING COMBINER BOX (SCB)

AJB shall be provided as per the design requirement of the Inverter, if required. AJB comprises of an enclosure, copper busbars, Fuses, Surge Protection Device (SPD) and Isolator. DC generated by the solar modules is transmitted through the appropriate cables from Array Yard to Control facility. AJB bus & panel shall be provided for the incoming DC supply from array yard.

AJB, if required, should be equipped with an adequate capacity indoor DC circuit breaker along with control circuit, protection relays, fuses, etc.

AJB, if required, shall have sheet from enclosure of dust and vermin proof, the bus bar / cables are to be made of copper of desired size.

The Array Junction Boxes are to be provided in the PV array for termination of connecting cables. The Array Junction Boxes shall be made of GRP/FRP/with full dust, water& vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JB's shall be such that input & output termination can be made through suitable cable glands.

- 12.1. 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.
- 12.2. Copper bus bars/terminal blocks housed in the junction box with suitable termination threads conforming to IP 65 standard to prevent water entry, Single/ double compression cable glands, provision of earthing. It should be placed at a height suitable for ease of accessibility.
- 12.3. Each Junction Box shall have high quality Suitable capacity Metal Oxide Varistors (MOVs)/ SPDs. The Surge Protective Device shall be of Type 2 as per IEC 60364-5-53
- 12.4. The junction Boxes shall have suitable arrangement for the followings (typical):-
Combine groups of modules into independent charging sub-arrays that will be wired into the controller. The Junction Boxes shall have arrangements for disconnection for each groups and attest point for sub-group for fault location. AJB/SCB shall be wired with optical fibre cables for enabling data collection for PV Plants from 100kWp onwards.
- 12.5. The current carrying ratings of the string combiner box/ junction box shall be suitable with adequate safety factor, to inter connect the Solar PV array.


Principal
K. J. Somaiya Institute of Engineering & Information Technology
Warananagar, Mumbai

- 12.6. All fuses shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP65 enclosures with transparent covers.
- 12.7. Fuse for both positive and negative inputs of each strings, Isolator of MCB, SPD of type 2 shall be provided.
- 12.8. The surge arresters shall be type 2 (with reference to IEC 61643-1) rated at a continuous operating voltage of at least 125 percentage of the open-circuit voltage of the PV string, and a flash current of more than 5A.
- 12.9. Not more than two strings can be connected in parallel to a single input of SCB/AJB. One spare input terminal along with connector shall be provided for each SCB/AJB.
- 12.10. Every SCB/AJB input shall be provided with fuses on both positive and negative side.
- 12.11. DC switch disconnecter of suitable rating shall be provided at AJB/SCB output to disconnect both positive and negative side simultaneously.

* The List of AJB/DCDB OEMs are attached as Annexure II-3(i)

13.AC DISTRIBUTION BOARD

AC Distribution Board (ACDB) shall control the AC power from inverter and should have necessary surge arrestors. An ACDB panel shall be provided in between PCU and Utility grid. It shall have MCB/MCCB/ACB or circuit breaker of suitable rating for connection and disconnection of PCU from grid.

- 13.1. The connection between ACDB and Utility grid shall be of standard cable/ Conductor with suitable termination. It shall have provision to measure grid voltage, current and power.
- 13.2. The incomer shall be selected at required rating. The ACDB enclosure shall be of good protection and suitable for mounting on the trenches / on wall.
- 13.3. All the 415 V AC or 230 V AC devices/Solar Power Plant Balance of System(BoS) including Solar PV modules like bus support insulators, circuit breakers, SFU isolators (if applicable), SPD, etc. mounted inside the switch gear shall be suitable for continuous operation
- 13.4. Switches/ circuit breakers/ connectors meeting general requirements and safety measurements as per IS 60947 Part I, II, III and IEC 60947 part I, II and III.
- 13.5. Junction boxes, enclosures, panels for inverters/ Controllers shall meet IP 54 (for outdoor) / IP 65 (for indoor) as per IEC 529.

* The List of ACDB OEMs are attached as Annexure II-3(ii)

14.AC/DC CABLING

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.

- 14.1. 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
- 14.2. 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%).
- 14.3. The length exceeding 25m of AC cable from Inverter to the ACDB and to the Grid Connection point shall be borne by the customer.
- 14.4. 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.
- 14.5. For the AC cabling, PVC or XLPE insulated and PVC sheathed single or, multi-core flexible copper cables shall be used. However, for above 25kWp 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.
- 14.6. All LT XLPE cables shall conform to IS:7098 part I&II.
- 14.7. The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%
- 14.8. The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%
- 14.9. 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
- 14.10. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers


Principal
Khunta Degree Mahavidyalaya
Bhavurhanj

- 14.11. 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.
- 14.12. 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
- 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 Cables and conduits that have to pass through walls or ceilings shall be taken through PVC pipe sleeve.
- 14.13. 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.
- 14.14. 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.
- 14.15. Bending radii for cables shall be as per manufactures recommendations and IS: 1255.
- 14.16. For laying/termination of cables latest BIS/IEC Codes/ standards shall be followed.

* The List of DC / AC Cables OEMs are attached as Annexure II-6 & Annexure II-7


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

15.CIVIL WORKS

Existing shade-free roof-top space shall be used to install Solar PV array. While installing solar power plants 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 rooftop should be taken in to consideration.

- 15.1. 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.
- 15.2. PV array shall be oriented in the south direction in order to maximize annual energy yield of the plant.
- 15.3. 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.
- 15.4. 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.
- 15.5. 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.
- 15.6. Ample clearance shall be provided in the layout of the inverter and DC/AC distribution boxes for adequate cooling and ease of maintenance.
- 15.7. While cabling the array, care must be taken such that no loose cables lie on the rooftops.
- 15.8. The roof top should look clean and tidy after installation of the array.
- 15.9. Neatness, tidiness and aesthetics must be observed while installing the systems.
- 15.10. 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.
- 15.11. Brick Works (If any) - All brick works shall be using 1st class bricks of approved quality as per IS 3102.
- 15.12. Plastering - Plastering in cement mortar 1:5, 1:6 and 1:3 shall be applied to all.
- 15.13. Display of mandatory items- Single Line Diagram and layout diagram of modules and interconnection at installation site shall be provided near the inverter for greater than 10 kWp systems.


Principal
Khunta Degree Mahavidyalaya

- 15.14. For painting on concrete, masonry and plastered surface IS:2395 shall be followed. For distemping IS 427 shall be followed referred. For synthetic enamel painting IS 428 shall be followed. For cement painting IS 5410 shall be followed.
- 15.15. 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
- 15.16. 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.
- * The Details of Civil Work is mentioned under Annexure II-11.**

16. CONNECTIVITY

The output of the Solar Power Conditioning Unit has to be connected to the Main ACDB in the building

Plant Capacity	Connecting voltage
Up to 10 kWp	240V-single phase or 415V-three phase at the option of the consumer
Above 10 kWp and up to 100 kWp	415V - three phase or higher at the option of the consumer.


Principal
Khunta Degree Mahavidyalaya
Khunta, Mayurbhanj

BILL OF QUANTITY (BOQ)

KHUNTA DEGREE MAHAVIDYALAYA

Sl. No.	DESCRIPTION OF ITEM	QNTY	UNIT	MAKE
7.5 KWp HYBRID Solar PV PLANT				
1	SOLAR MODULE: Supplying, Installation, testing & corrimissioning of 550 Wp (minimum rated) or above Mono Crystalline Half cut silicon photovoltaic (PV) modules high power 72 solar cells(144 half-cells) with minimum 20% efficiency of solar cell suitable for electricity generation of 7.5 KWp. each panel is not less than 550 Watt. Should have low iron tempered glass including MC 4 connectors on existing metal frame as per specifications. Solar cells used in solar photo voltaic module shall be as per IEC 61215 or amended upto date & each PV module used must have a RF identification tag. It shall perform satisfactorily with temperature variation between (-) 10 Degree C to (+)65 Degree C. with stand wind speed upto 200 Km/hr,etc complete as required	14	No	HR SOLAR TATA VIKRAM SOALR WAREE RENEWSYS RAYZON
2	MODULE MOUNTING STRUCTURE Supplying & fabrication/Fixing of steel structure dulydesigned for suitable site condition to with stand wind pressure and to get desired angle of module for mounting solar panels/modules made of hot dip galvanized (minimum 80 microns) - 'C' channel /angle (square pipe / circular pipe not permitted) for frame / bracket / supports. plates,SS nut-bolts, screws, washers. SS/GI/Aluminium inier module and module clamps. including bracing and hot galvanized angles for dividers, UV protected rubber pad,foundation bolts. etc.to withstand wind speed upto 200 Km/hr.etc complete as required	320	kg	SAIL TATA BHASAN JINDAL VIZAG STEEL
3	SITC Array junction boxes (AJB). DCDB & ACDB AJB/DCDB: Housing made of Thermoplastic /Polycarbonate material of suitable size and depth to match the complete system for Arrays and termination arrangements required to system incoming and outgoing cables along with glands. Lugs. Connectors. Clamps and other accessories such as - MCBs, surge protection device(DC).	1	EACH & AS PER	AJB HENSEL, SPELBERG,COOPER BUSMANN/LEGRAND SPD/FUSE: L&T SCHNEIDER ABB ACDB
3(ii)	ACDB: Housing made of Thermoplastic /Polycarbonate material of suitable size and depth to match the complete system for Arrays and termination arrangements required to system incoming and outgoing cables along with glands. Lugs. Connectors. Clamps and other accessories such as - MCBs (AC side)	1		HAVELLS GEESYS VORTEX ANCHOR



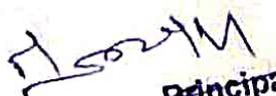
Principal
 Khunta Degree Mahavidyalaya
 Khunta, Mayurbhanj

4	SOLAR HYBRID INVERTER Supply, installation, testing & commissioning of Solar HYBRID PCU / inverter suitable for <u>10KVA/8KW, 3 Phase 1-phase</u> solar power generating system with input battery bank of 240v i/c following parameters. The inverter should be of multiple operating mode for both off-grid, on-grid and hybrid application with MPPT (Maximum Power Point Tracker), protection as per specifications. The inverter shall conform to IEC certification as amended up-to-date or equivalent BIS Standard. The inverter output should be compatible with the grid frequency. It should be DG set & Lead acid/GEL/VRLA/ LiPO4 battery compatible with built-in meter and data logger for remote monitoring etc Complete as required. a) Max DC Array Input Operating Voltage : 675 V b) Output Wave Form : Pure Sine Wave c) Total Harmonic Distortion : < 3% d) Output Voltage : 415 +/- 3% e) Output Frequency : 50 Hz +/- 0.5 Hz f) Power Factor : > 0.8 Lagging g) Inverter efficiency : > 90% or higher h) Operating temperature : 0 - 50 Degree C i) Protection of enclosure : IP 20 (Minimum) indoor k) Display parameters :- As per OEM	1	No	HYBRID PCU (10KVA/8KW) STATCON ENERGIA DEYE KACO ENERTECH DELTA WATTHUT GROWATT ABB SCHNEIDER
5	BATTERY ENERGY STORAGE SYSTEM (BESS) Supplying, installation, testing & commissioning of Battery bank of capacity <u>10KWH (MINIMUM)</u> with a power backup of 2 hours atleast. BATTERY TYPE : MAINTENANCE FREE SEALED BATTERY Tubular GEL VRLA battery /LiPO4 type i/c connector, rack etc. compatible with above solar hybrid power generating System complete as required.	1	set	EXIDE WATTHUT OKAYA EASTMAN AMRA RAJA
6	SOLAR DC CABLE Supplying, laying, connection and testing of following sixes of XLPE insulated, UV resistant XLPE sheathed multi strand annealed tinned copper conductor Solar DC cable with connector of IP 67, suitable for 1500 DC voltage. Heat Resistant upto 120° C. UV Resistant, fixing with pvc button belt / ties or in existing PVC conduit/pipes complete etc as required a) 1 core x 4 sq.mm solar Cu cable b) 1 core x 6 sq mm solar DC cable	-	-	DC SOLAR CABLE POLYCAB RR CABLE KEI FINOLEX HAVELLS
		60 OR AS PER	mtr	
		10 OR AS PER	mtr	


Principal

	c) 1 core x 10 sq mm solar DC cable	10 or AS PER	mtr	
7	AC CABLE Supplying of XLPE 3.5 core AC Cable			<u>AC CABLE</u> POLYCAB RR CABLE KEI FINOLEX HAVELLS
a	3.5 x 10 sqmm	100	mtr	
8	Supplying and making end termination with brass compression gland and Aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of i. i KV grade as required			<u>LUGS</u> JHONSON COMET STANDARD
	4SQMM , 6SQMM, 10SQMM - LUGS(RING,Y,DIAL TYPE)	-	set	
9	SH-II Earthing CHEMICAL EARTHING KIT: COPPER ROD 3MTR LENGTH, DIA: 10 SQMM COPPER BASE PLATE COPPER 6SQMM WIRE FOR INTERCONNECTION EARTHING RESISTANCE <3 OHM	5	Set	<u>EARTHING</u> ELECTROGRIP PRAGATI STANDARD
10	SH:III Lightening Arrester			
1	Providing and fixing of lightning conductor finial, made of 25 mm dia 300 mm long, G.I. tube, having Single prong at top, with 85 mm dia 6 mm thick ti.l. base plate including holes etc. complete as required.	1	Nos	<u>LA</u> GEESYS STANDARD
2	Jointing copper / G.I. tape (with another copper/ C I tape. base of the finial or any other metallic object) by rim eting / nut bolting/ sweating and soldering etc as required.	1	Nos	
11	CIVIL FOUNDATION WORK Civil foundation pit : dimension 300mm x 400mm x 300 mm (L X W X H) Grade of concrete: M20 Materials 1. Sand 2. Cement 3. Aggregator 40mm 4. brick 5. Shuttering plate (wood or Iron) 6. Dr. fixit 7. 6 sqmm Anchor Bolt EARTHING PIT FOUNDATION WORK Same as Above	AS PER	ccu	ULTRATECH RAMCO DOUBLE BULL.

END OF BOQ


Principal
Khunta Degree Mahavidyalaya
Mayurbhanj

...