

TENDER
FOR
DESIGN, MANUFACTURE, SUPPLY, ERECTION, TESTING AND
COMMISSIONING ALONG WITH OPERATION AND MAINTENANCE
(O&M) FOR 5 YEARS OF 4 Nos. x 4 MWp CAPACITY EACH SPV
POWER PLANTS AT VARIOUS LOCATIONS
IN THE STATE OF PUNJAB

- a) VILLAGE: TARKHANWALA, TEHSIL: TALWANDI SABO,
DISTRICT: BATHINDA
- b) VILLAGE: BHAGI BANDAR, TEHSIL: TALWANDI SABO,
DISTRICT: BATHINDA
- c) VILLAGE: SHERGARH, TEHSIL: TALWANDI SABO, DISTRICT:
BATHINDA
- d) VILLAGE: KOTHE MALLUANA, TEHSIL: RAMPURA PHUL,
DISTRICT: BATHINDA



Punjab Genco Limited
(A Punjab Government Undertaking)
CIN: U40108CH1998SGC21134
Plot No. 1 & 2, Sector- 33D,
Chandigarh - 160034

Tel: 0172 - 2646384
Email – pgl@peda.gov.in

DISCLAIMER

1. Though adequate care has been taken while preparing the tender document, the bidder(s) shall satisfy themselves that the document is complete in all respect. Intimation regarding any discrepancy shall be given to the office of Punjab Genco Limited immediately. If no intimation is received from any bidder within **7 (Seven) days from the date of issuance of Tender documents**, it shall be considered that the document is complete in all respect and has been received/ acknowledged by the bidder(s).
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Place: Chandigarh

Date: 12/09/2022

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SECTION I

1. INVITATION FOR BIDS (IFB)



Punjab Genco Limited,
(CIN: U40108CH1998SGC21134)
Solar Passive Complex
Plot No.1 & 2, Sector 33-D, Chandigarh-160034,
Tel.: 91-172-2663328
Email: - pgl@peda.gov.in

E-Tender No. – PEDA/PGL/2022-23/16

E-Bids are invited Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning alongwith Operation and Maintenance (O&M) for 5 Years of 4 Nos. X 4 Mwp Capacity each SPV Power Plants at below mentioned locations in the State of Punjab

- a) VILLAGE: TARKHANWALA, TEHSIL: TALWANDI SABO, DISTRICT: BATHINDA**
- b) VILLAGE: BHAGI BANDAR, TEHSIL: TALWANDI SABO, DISTRICT: BATHINDA**
- c) VILLAGE: SHERGARH, TEHSIL: TALWANDI SABO, DISTRICT: BATHINDA**
- d) VILLAGE: KOTHE MALLUANA, TEHSIL: RAMPURA PHUL, DISTRICT: BATHINDA**

The prospective bidders are requested to submit bids as per schedule given below-

Sale date of Bid	Pre Bid Meeting	Closing date and time	Opening Date and time of Technical e-bids.
12.09.2022	22.09.2022 at 12.00 Noon	11.10.2022 till 05:00 PM	13.10.2022 at 11:30AM
Tender document fee (non-refundable)	Rs. 10,000/- (Ten Thousand Only) through online mode only.		
Bid evaluation charges (non-refundable)	Rs. 90,000/- (Ninety Thousand Only) through online mode only.		
E-Processing Fee (Non-refundable)	As applicable through online mode only.		
Earnest Money Deposit (Refundable)	Rs. 40 Lakhs (Rs. Forty Lakhs only) shall be deposited for 4 MW capacity Solar PV Project in a manner as stated below : Rs. 10 Lakhs through e-banking or e-payment mode and balance Rs. 30 Lakh in the form of Bank Guarantee through online mode only. The Bidders interested in participating for more than one project need to submit EMD for the total number of projects they intend to participate in a manner as stipulated above.		

All other terms and conditions, instructions to bidder regarding e-tendering process, etc. may kindly be seen carefully before submission of e-bids on www.eproc.punjab.gov.in. PGL reserves the rights to reject the bidding process without assigning any reason. Any corrigendum(s) to this tender shall be published on the above website only.

DIRECTOR

BID-SUBJECT

The Punjab Genco Limited (PGL) invites sealed bids from eligible bidders for Design, Manufacture, Supply, Erection, Testing and Commissioning alongwith Operation and Maintenance (O&M) for 5 Years of 4 Nos. X 4 MWp Capacity each SPV Power Plants at below mentioned locations in the State of Punjab:

- a) VILLAGE: TARKHANWALA, TEHSIL: TALWANDI SABO, DISTRICT: BATHINDA
- b) VILLAGE: BHAGI BANDAR, TEHSIL: TALWANDI SABO, DISTRICT: BATHINDA
- c) VILLAGE: SHERGARH, TEHSIL: TALWANDI SABO, DISTRICT: BATHINDA
- d) VILLAGE: KOTHE MALLUANA, TEHSIL: RAMPURA PHUL, DISTRICT: BATHINDA

1. E-competitive bidding will be conducted and tender is open to all bidders.
2. Interested eligible Bidders may download the e-bid document free of cost from the web portal www.eproc.punjab.gov.in
3. E-Bids are to be submitted after payment of requisite fee mentioned in this tender document as well as on the web portal.
4. E-Bids must be submitted online before the scheduled date & time. All bids must be accompanied with non-refundable tender document fee @ Rs. 10,000/- and bid evaluation charges @ Rs. 90,000/-. Late bids will be rejected. Technical e-bids will be opened in the presence of Bidders representative who chose to attend at the address below at **11:30 AM on 13.10.2022**. The details are given below:

(a)	Name of office	:	Punjab Genco Limited
(b)	Name of Officer	:	Director
(c)	Postal Address	:	Plot no. 1&2, Sector 33-D Chandigarh 160034, Punjab
(d)	Telephone nos.	:	(91) 0172 - 2667005
(e)	Email	:	mpsingh@peda.gov.in
(f)	Sale date of e-bid	:	12.09.2022
(g)	Pre-Bid Meeting	:	22.09.2022 at 12.00 Noon
(h)	Bid Closing date & time	:	11.10.2022 till 05.00 PM
(i)	Date and time of opening of Technical e-bids	:	13.10.2022 at 11.30 AM

SECTION II

2. INSTRUCTIONS TO BIDDERS (ITB)

A. Introduction

1. About the Purchaser

Punjab Genco Limited (hereinafter referred to as "PGL" or "Purchaser"), a 100% subsidiary of Punjab Energy Development Agency (PEDA) under the administrative control of Department of New and Renewable Energy Sources, is facilitating to develop and promote New and Renewable Sources of Energy based projects/ schemes in State of Punjab.

2. Eligible Bidders

- 2.1 The bidder should be a company registered under Companies Act 1956/2013, Limited Liability Partnership (LLP) registered under LLP Act 2008/ manufacturer / System integration Companies / Consortium or Joint Venture of maximum 3 companies or LLPs who have designed, manufactured, tested supplied, erected and commissioned at least one Solar PV Project of 2 MW or above capacity anywhere in India. The bidder must also have experience of Operation and Maintenance of Solar PV projects of aggregate 2 MW capacity or more for minimum 1 year, in any of the last five (5) years in which project(s) is/are in successful operation on the date of bid opening (The Bidder should meet the qualification criteria for setting up of the project as well as O&M as mentioned above).
- 2.2 The Bidder shall submit copies of Orders of similar type of works executed as mentioned above, along with proof of satisfactory execution in the form of certificate of completion etc. issued by the ordering agency/department.
- 2.3 The bidder should not have been debarred/ blacklisted by any Govt. Deptt.'s/ organization/ PSU's / institutions/ agencies/ autonomous Organizations.
- 2.4 Bidders should not be associated, or have been associated in the past directly or indirectly or involved in the preparation of the bidding documents or specifications of the contract.
- 2.5 Government-owned enterprises may participate only if they are legally and financially autonomous, if they operate under commercial law, and if they are not a dependent agency of the Purchaser.

3. Eligible Goods and Services

- 3.1 For purposes of this ITB Clause, "origin" means the place where the goods are mined, grown, or produced or the place from which the related services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.
- 3.2 The origin of goods and services is distinct from the nationality of the Bidder.

4. Cost of Bidding

- 4.1 The Bidder shall bear all costs associated with the preparation and submission of its bid, and Punjab Genco Limited (PGL), will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

B. Bidding Document

5. Content of Bidding Documents

5.1 The goods required, bidding procedures and contract terms are prescribed in the Bidding Documents. In addition to the Invitation for Bids, the Bidding Documents include:

- a. Invitation for Bids (IFB)
- b. Instruction to Bidders; (ITB)
- c. Guidelines to Bidders (GTB)
- d. General Conditions of Contract; (GCC)
- e. Special Conditions of Contract (SCC)
- f. Qualification Requirement (QR) (Appendix-A)
- g. Functional Guarantee / Performance Ratio Tests (Appendix-B)
- h. Schedule of Requirements; (SOR)
- i. Technical Specifications (TS)
- j. Bid Form, Price Schedule and Other Performas:-
 1. Bid Proposal Sheet (Performa – I)
 2. Technical Deviation (Performa – II)
 3. Use of Genuine and Quality Components (Performa –III)
 4. Proof of Experience (Performa – IV)
 5. Particular of Bidder (Performa –V)
 6. Bid Securing Declaration (Performa –VI)
 7. Declaration regarding Banning, Liquidation, Court Receivership etc. (Performa-VII)
 8. Performance Security Bank Guarantee (Performa – VIII)
 9. Declaration regarding the Mandatory Procurement of Solar Inverters from Class-I Local Suppliers (Performa – IX)
 10. Bank Guarantee for Advance Payment (Performa – X)
 11. Power of Attorney for Bidding Company (Performa – XI)
 12. Technical Detail Form (Performa – XII)
 13. Contract Form (Performa – XIII)
 14. Price/ Financial Bid (Performa – XIV)
- k. Scope of O&M of Plant (Section-IX)
- l. Annexures (Section-X)
 - List of minimum spares and tools (Annexure-I)
 - Bidder undertaking (Annexure-II)
 - Civil Part consisting of Topographical Map, Demarcation, Site Layout Plan and soil testing report (Annexure-III)

5.2 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Documents. Failure to furnish all information required as per the Bidding Documents or submission of a bid not substantially responsive to the Bidding Documents in every respect will be at the Bidder's risk and may result in rejection of its bid.

6. Clarification of Bidding Documents

- 6.1 A prospective Bidder requiring any clarification of the Bidding Documents may notify the Project Implementing Agency (i.e. Punjab Genco Limited) in writing or by cable (hereinafter the term cable is deemed to include email and facsimile) -at the Project Implementing Agency's address indicated in the Bid document. The Project Implementing Agency will respond in writing to any request for clarification of the Bidding Documents which it receives not later than 8 days prior to the deadline for submission of bids prescribed in the ITB Clause 19.1. Written copies of the Project Implementing Agency's response (including an explanation of the query but without identifying the source of inquiry) will be uploaded on e-procurement website only.

7. Amendment of Bidding Documents

- 7.1 At any time prior to the deadline for submission of bids, the Purchaser may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by amendment.
- 7.2 All prospective bidders will be notified of the amendment through online mode by uploading the same on e-proc website only.
- 7.3 In order to allow prospective Bidders reasonable time in which to take the amendment into account in preparing their bids, the Purchaser may, at its discretion, extend the deadline for the submission of bids.

C. Preparation of Bids

8. Language of Bid

- 8.1 The Bid prepared by the Bidder, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Purchaser, shall be written in English language. Supporting documents and printed literature furnished by the Bidder may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified in this tender document, in which case, for purposes of interpretation of the bid, the translation shall govern.

9. Documents Constituting the Bid

- 9.1 The bid prepared by the Bidder shall comprise the following components:
- a) A Bid Form and Price Schedule completed in accordance with ITB Clauses 10, 11 and 12;
 - b) Documentary evidence established in accordance with ITB Clause 13 that the Bidder is eligible to bid and is qualified to perform the contract if its e-bid is accepted;

- c) Documentary evidence established in accordance with ITB Clause 14 that the goods and ancillary services to be supplied by the Bidder are eligible goods and services and conform to the Bidding Documents; and
- d) Earnest money furnished in accordance with ITB Clause 15.

10. **Bid Form**

- 10.1 The Bidder shall complete the Bid Form and the Price Schedule furnished in the Bidding Documents, indicating the goods to be supplied, a brief description of the goods, quantity and prices.

11. **Bid Prices**

- 11.1 The Bidder shall indicate on the Price Schedule the unit prices (where applicable) and total Bid Prices of the goods it proposes to supply under the Contract.
- 11.2 Prices indicated on the Price Schedule shall be entered separately in the following manner:

(a) For goods offered:

- (i) The price of the goods quoted EXW (ex-works, ex-factory, ex-showroom, ex-warehouse or off-the-shelf, as applicable) including GST and any other taxes and duties if any paid or payable on components and raw material used in the manufacture or assembly of the goods quoted ex-works or ex-factory.

Note :

The price quoted shall be for Carriage and Insurance Paid (CIP) at the 4 different project sites in the State of Punjab mentioned in this bid document.

- (ii) the price for inland transportation, insurance and other local costs incidental to delivery of the goods to their final destination, as mentioned in this bid document.
- (iii) The price of other incidental services if any. The incidental services to be provided are specified in clause 13 of the General conditions of the Contract. This will include:

-the cost of providing services for erection, testing and commissioning of 4MWp SPV power plant including all auxiliaries and incidental services as detailed in the special conditions of the contract and the technical specifications.

-the cost of annual operation and maintenance services listed in clause 13 of the General conditions of contract for a period of 5 years, after commissioning.

Bidder shall quote as specified in this bid document. All activities to clear the goods and transport the equipment to ultimate destination will be done by the bidder. Prices for incidental services must be quoted in addition to the above CIP prices.

- 11.3 The terms EXW, CIF, CIP, etc. shall be governed by the rules prescribed in the current edition of *Incoterms*.
- 11.4 The Bidder's separation of the price components in accordance with the ITB Clause 11.2 above will be solely for the purpose of facilitating the comparison of bids by the Purchaser and will not in any way limit the Purchaser's right to contract on any of the terms offered.
- 11.5 Prices quoted by the Bidder shall firm and fixed during the Bidder's performance of the Contract and not subject to variation on any account. A bid submitted with an adjustable price quotation will be treated as non responsive and rejected, pursuant to ITB Clause 24.

12. **Bid Currencies**

- 12.1 Prices shall be quoted in the Indian Currency INR :

13. **Documents Establishing Bidder's Eligibility and Qualifications**

- 13.1 Pursuant to ITB Clause 9, the Bidder shall furnish, as part of its bid, documents establishing the bidder's eligibility to bid and its qualifications to perform the Contract if its bid is accepted.
- 13.2 The documentary evidence of the Bidder's eligibility to bid shall establish to the Purchaser's satisfaction that the Bidder, at the time of submission of the bid, is from an eligible source country as defined under ITB Clause (2).
- 13.3 The documentary evidence of the Bidder's qualifications to perform the Contract if its bid is accepted, shall establish to the Purchaser's satisfaction.
 - (a) that, in the case of a Bidder offering to supply goods under the contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the goods' manufacturer or producer to supply the goods to the Purchaser.
 - (b) that the Bidder has the financial, technical, and production capability necessary to perform the Contract. Audited balance sheets of the last three years of the bidding company be enclosed.
 - (c) that the Bidder meets the qualification criteria listed in **Appendix-A**.
 - (d) That adequate, specialized technical expertise is already available in the shape of manpower and other resources or will be made available following the award of the contract, in the Purchaser's country, to ensure that the support services are responsive;
 - (e) That the bidder has adequate experience in providing technical project management;

- (f) That the bidder will assume total responsibility for the fault free operation of Power plant and all auxiliaries including operation & maintenance services for the 5 years period and warranty obligations; and
- (g) That the bidder selected for the award of the contract shall be responsible both for complying with any applicable regulations and for obtaining the necessary approvals. To this effect Bidder shall provide along with their bids, a document stating that it expects to obtain the required approvals the equipment, specified in the Technical specifications within 30 days of the contract signature date.

14. **Documents Establishing Goods' Eligibility and Conformity to Bidding Documents**

- 14.1 Pursuant to ITB Clause 9, the Bidder shall furnish, as part of its bid, documents establishing the eligibility and conformity to the Bidding Documents of all goods and services which the Bidder proposes to supply under the Contract.
- 14.2 The documentary evidence of the eligibility of the goods and services shall consist of a statement in the Price Schedule of the country of origin of the goods and services which shall be confirmed by a certificate of origin at the time of shipment.

(Note:- The supply of Solar Modules and Inverters shall comply with Ministry of New & Renewable Energy (MNRE) Order No 283/22/2019-GRID SOLAR dated 23rd Sep 2020 for the Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of Renewable Energy (RE) Sector and Department for Promotion of Industry and Internal Trade (DPIIT) Notification No. P- 45021/2/2017-PP (BE-II) dated 4th June, 2020 and amendments thereof.)

- 14.3 The documentary evidence of conformity of the goods and services to the bidding documents may be in the form of literature, drawings and data, and shall consist of:
 - (a) a detailed description of the essential technical and performance characteristics of the goods in **Performa - XII**;
 - (b) a list giving full particulars, including available sources and current prices, of all spare parts, special tools, etc., necessary for the proper and continued functioning of the goods for a period of 5 years of operations, following conformity of the goods by the Purchaser; and
 - (c) a item-by-item commentary on the Purchaser's Technical Specifications demonstrating the goods and services to those specification, brand/catalogue no's or a statement of deviations and exceptions to the provisions of the Technical Specifications.
 - (d) A confirmation that, if the bidder offers equipment and /or other components manufactured by another company, such equipment operates seamlessly along with other components of the plant without any error and the bidder is willing to accept responsibility for it's successful operations and provide complete warranty and operation and maintenance support for 5 years period including all spares required during the complete duration of the O &M period."
 - (e) A confirmation that the bidder is either the owner of the intellectual Property Rights in the equipment/hardware and the software items offered, or that it

has proper authorization and /or license from the owner to offer them. An authorization from the OEM shall be furnished. Willful misrepresentation of these facts will lead to the cancellation of the contract without prejudice of other remedies that the Purchaser /implementing agency may take.

- 14.4 For purposes of the commentary to be furnished pursuant to ITB Clause 14.3 (c) above, the Bidder shall note that standards for workmanship, material and equipment, as well as references to brand names or catalogue numbers designated by the Purchaser in its Technical Specifications are intended to be fully adhered to.

15. **Earnest money**

- 15.1 The Bidder shall furnish, as part of its bid, earnest money amount of **Rs. 40 Lakhs (Rs. Forty Lakhs Only)** for single project of 4MW capacity. Bidders interested in participating for more than one project need to submit EMD for the total number of projects they intend to participate. The EMD/Security Deposit will not carry any interest.
- 15.2 The earnest money is required to protect the Purchaser against risk of Bidder's conduct which would warrant the security's forfeiture, pursuant to ITB Clause 15.7.
- 15.3 The earnest money is required to be deposited in the following manner for single 4MW capacity project:
- i. Rs. 10 Lakhs through e-banking or e-payment mode.
 - ii. Balance Rs. 30 Lakhs in the form of Bank Guarantee i.e. digitally signed or hard copy of the BG should be handed over after submission of online bid on e-tendering portal but before opening date and time of techno-commercial e-bids.
 - iii. Bidders interested in participating for more than one project need to submit EMD for the total number of projects they intend to participate in similar manner as stipulated above at 15.3 i. & ii.
- 15.4 Any bid not secured in accordance with ITB Clause 15.1 and 15.3 will be rejected by the Purchaser as non responsive, pursuant to ITB Clause 24.
- 15.5 Unsuccessful Bidder's earnest money will be discharged/returned as promptly as possible but not later than thirty (30) days after the expiration of the period of bid validity prescribed by the purchaser, pursuant to ITB Clause 16.
- 15.6 The successful Bidder's Earnest Money will be discharged upon the Bidders executing the Contract, pursuant to ITB Clause 31, and furnishing the Performance Bank Guarantee, pursuant to ITB Clause 31.
- 15.7 The Earnest Money may be forfeited:
- a) if a Bidder :
 - (i) withdraws its bid during the period of bid validity specified by the Bidder on the Bid Form

- (ii) does not accept the correction of errors pursuant to ITB Clause 24.2;
or

b) in case of a successful Bidder, if the Bidder fails:

- (i) to sign the Contract in accordance with ITB Clause 31; or
- (ii) to furnish Performance Bank Guarantee in accordance with ITB Clause 31.

16. **Period of Validity of Bids**

- 16.1 Bids shall remain **valid for the period of 90 days** after the date of bid opening prescribed by the Purchaser. A bid valid for a shorter period shall be rejected by the Purchaser as non-responsive.
- 16.2 In exceptional circumstances, the Purchaser 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 (or by cable). The earnest money provided under ITB Clause 15 shall also be suitably extended. A Bidder may refuse the request without forfeiting its earnest money. A Bidder granting the request will not be required nor permitted to modify its bid, except as provided in 16.3 hereinafter.
- 16.3 In the case of fixed price contracts, if the award is delayed by a period exceeding sixty (60) days beyond the expiry of the initial bid validity, the contract price will remain fixed and no change shall be allowed.

17. **Format and Signing of Bid**

- 17.1 The Bidder is required to furnish all 'Techno-commercial' and 'Price Bid' Performa/Format.
- 17.2 The Technical Bid in all circumstances should not contain any reference to the Prices quoted.
- 17.3 Bidder should explicitly note that no offline documents are to be submitted.
- 17.4 The bid shall be signed by the Bidder or a person or persons duly authorized to bind the Bidder to the Contract. All pages of the bid, except for un-amended printed literature, shall be initialed by the person or persons signing the bid.

D. Submission of Bids

18. **Bid Submission**

- 18.1 The Bidder shall submit the bid online on the e-tendering web portal www.eproc.punjab.gov.in.

19. **Deadline for Submission of Bids**

- 19.1 Bids must be uploaded by the Purchaser by 05:00 PM till 11.10.2022.
- 19.2 The Purchaser may, at its discretion, extend this deadline for submission of bids by amending the Bid Documents in accordance with ITB Clause 7, in which case all rights

and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

20. **Incomplete Bids**

20.1 Any bid uploaded incomplete by the Bidder will be rejected by the Purchaser.

21. **Modification and Withdrawal of Bids**

21.1 No bid can be modified subsequent to the deadline for submission of bids.

21.2 No bid may be withdrawn in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Bid Form. Withdrawal of a bid during this interval may result in the Bidder's forfeiture of its earnest money, pursuant to ITB Clause 15.7.

E. Bid Opening and Evaluation

22. **Opening of Bids by Purchaser**

22.1 The Purchaser will open Technical bids, in the presence of Bidders' representatives who choose to attend, at the time, on the date, and at the office of Punjab Genco Limited, Plot No. 1 & 2, Sector 33-D, Chandigarh. The bidder's representatives who are present shall sign a register evidencing their attendance.

22.2 The Bidders' names, the presence or absence of the requisite earnest money and such other details as the Purchaser, at its discretion, may consider appropriate will be announced at the opening.

22.3 The technical bids shall be evaluated by the purchaser for assessing responsiveness, bidders qualification and technical confirmation.

22.4 The bidders whose technical bids are declared as technically responsive and qualified shall be informed accordingly and their Price Bids shall be opened.

22.5 The bidders whose technical bids do not qualify, their Price Bids shall not be opened.

22.6 Price Bids opening date shall be conveyed subsequently.

23. **Clarification of Bids**

23.1 During evaluation of the bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its bid. The request for clarification and the response shall be in writing, and no change in the prices or substance of the bid shall be sought, offered, or permitted.

24. **Preliminary Examination**

24.1 The Purchaser 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 whether the bids are generally in order.

- 24.2 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between words and figures, the amount in words will prevail. If the supplier does not accept the correction of the errors, its bid will be rejected, and its earnest money, may be forfeited.

The Purchaser may waive any minor informality, non-conformity or irregularity in a bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder.

- 24.3 Prior to the detailed evaluation, the Purchaser will determine the substantial responsiveness of each bid to the Bidding Documents. For purposes of these Clauses, a substantially responsive bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. Deviations from or objections or reservations to critical provisions such as those concerning Earnest Money (ITB Clause 15) Applicable Law (GCC Clause 31), and Taxes and Duties (GCC Clause 33), will be deemed to be a material deviation. The Purchaser's determination of a bid's responsiveness is to be based on the contents of the bid itself without recourse to extrinsic evidence.

Additional critical provisions deviations from or objections or reservations to which will be treated as material deviations:

- "Performance Bank Guarantee"(GCC Clause7);
- "Warranty" (GCC Clause 15); and
- "Force Majeure" (GCC Clause 25)
- "Limitation of Liability" (GCC Clause 29)

- 24.4 If a bid is not substantially responsive, it will be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the nonconformity.

25. **Evaluation and Comparison of Bids**

- 25.1 The Purchaser will evaluate and compare bids which have been determined to be substantially responsive, pursuant to ITB Clause 24.
- 25.2 The comparison shall be of FOR Project Site Price excluding GST of the total goods offered by the bidder.
- 25.3 The Purchaser's evaluation of a bid will take into account, in addition to the bid price and price quoted in accordance with ITB Clause 11.2, one or more of the following factors as specified in the tender document, and quantified in ITB Clause 26.4.:
- a. Cost of inland transportation, insurance, and other costs incidental to delivery of the goods to their final destination.
 - b. Delivery schedule offered in the bid;
 - c. Deviations in payment schedule from that specified in the Special Conditions of Contract;

- d. The cost of components, mandatory spare parts, and service;
- e. The availability of spare parts and after-sales services for the equipment offered in the bid;
- f. The operation and maintenance costs during 10 year period;
- g. The performance and productivity of the equipment offered; and/or
- h. Other specific criteria indicated in the tender and/or in the Technical Specifications.

25.4 For factors retained in the Bid Data Sheet, one or more of the following quantification methods will be applied:

- a. Cost of Port clearance, inland transportation, insurance, and other costs incidental to delivery of the goods to their final destination.
- b. Delivery schedule offered in the bid;
- c. Deviations in payment schedule from that specified in the Special Conditions of Contract;
- d. Deleted
- e. The availability of spare parts and after sales service for the equipment offered in the bid
- f. The projected operation and maintenance costs during the life of the equipment;
- g. The performance and productivity of the equipment offered; and
- h. The cost of erection, testing & commissioning of supplied equipment as detailed in Special Conditions of Contract & Technical specification, annual maintenance charges for 5 years after warranty and other incidental services.
- i. the Quality and adaptability of the equipment.

26. **Contacting the Purchaser**

- 26.1 From the time of bid opening to the time of contract award, if any bidder wishes to contact the purchaser on any matter related to the bid, it should do so in writing.
- 26.2 Any effort by a Bidder to influence the Purchaser in its decision on bid evaluation, bid comparison or contract award decisions may result in rejection of the Bidder's bid.

F. Award of Contract

27. **Post qualification**

- 27.1 In the absence of pre-qualification, the Purchaser will determine to its satisfaction whether the Bidder selected as having submitted the lowest evaluated responsive bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in ITB Clause 13.3.
- 27.2 The determination will take into account the Bidder's financial, technical and production capabilities. It will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB Clause 13.3, as well as such other information as the Purchaser deems necessary and appropriate.
- 27.3 An affirmative determination will be a prerequisite for award of the contract to the bidder. A negative determination will result in rejection of the bidder's bid, in which

event the purchaser will proceed to the next lowest evaluated bid to make a similar determination of that bidder's capabilities to perform satisfactorily.

28. **Award Criteria**

- 28.1 Subject to ITB Clause 31, the Purchaser will award the Contract to the successful Bidder whose bid has been determined to be substantially responsive and has been determined as the lowest evaluated bid, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily. There will be separate contracts for each project site.
- 28.2 If in case there is a tie between any no. of Bidders i.e. L1, L2, L3 and so on for a single project site, reverse bidding will be carried out for award of contract for that particular project site.

29. **Purchaser's Right to Accept Any Bid and to Reject Any or All Bids**

- 29.1 The Purchaser reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders. Even at the time of bidder selection or after allotment of the project, PGL at its sole discretion may increase or decrease the scope of work.

30. **Notification of Award**

- 30.1 Prior to the expiration of the period of bid validity, the Purchaser will notify the successful Bidder in writing by Letter of Intent, that its bid has been accepted.
- 30.2 The notification of award will constitute the formation of the Contract.
- 30.3 Upon the successful Bidder's furnishing of Performance Bank Guarantee (PBG) pursuant to ITB Clause 31, the Purchaser will promptly notify the name of winning bidder to each unsuccessful Bidder and will discharge its Earnest Money, pursuant to ITB Clause 15.

31. **Signing of Contract & Performance Bank Guarantee**

- 31.1 The Bidder whose tender will be accepted will be notified through Letter of Award (LOA). The successful Bidder is required to acknowledge and accept the LOA within 7 days, failure to which, the EMD and other Guarantees if any, of the Bidder shall be forfeited by PGL.
- 31.2 The successful Bidder/ Supplier's within 15 days after the receipt of Work Order shall furnish Performance Bank Guarantee to the Purchaser for an amount of 3% (As per MNRE, GOI letter no. F.No. 283/114/2018-GRID SOLAR dt. 07.03.2022) of the contract price, excluding annual maintenance costs valid upto 60 days after the date of completion of performance obligations and 5 years operation and maintenance contract period.
- 31.3 In case the Bidder fails to submit the Performance BG within 15 days, the LOA/ Work Order shall stand automatically cancelled. Also, the EMD and other Guarantees if any, of the Bidder will be forfeited without any prior notice and in this event the Purchaser may make the award to the next lowest evaluated bidder or call for new bids.

- 31.4 An unexcused delay by the Bidder in the Performance of its supply and installation obligations shall render him liable to penalties as mentioned in the contract and in addition to that Performance Guarantee will be forfeited in case the maximum value of penalty is reached.
- 31.5 Hiding of facts, misrepresentation, corrupt practices by the Bidder if revealed at any stage, withdrawing the bid after opening of financial bid, non-signing of contract/Contract within stipulated period would amount to forfeiture of EMD and subsequently the company/firm may also be blacklisted.

32. **Completion Period & Penalty for Delay**

- 32.1 The completion period for all the allocated projects will be within 10 months from the date of signing of the contract by the bidder(s).
- 32.2 In the event of delay in the supply and /or installation & commissioning, specified above, the bidder shall be liable to pay a penalty @ 1% value of contract for every week of delay in achieving project milestones as specified under Section –VI (SOR) Part-III subject to a maximum of 5% value. If the projects are not commissioned within 11 months of signing of contract, subject to clause 32.4 below, PGL shall be at liberty to cancel the work order/ contract. For the purpose of this clause, part of a week shall be considered to be a full week.
- 32.3 Relaxation in completion period for the purpose of penalty shall be allowed if it is felt that the delay is beyond the control of contractor or due to force majeure conditions. The decision in this regard shall be given by competent authority of PGL.
- 32.4 “If the 4 MW capacity project is commissioned partly (i.e. minimum 2 MW) within 11 months of signing of contract, the contract for the un-commissioned capacity will stand cancelled and the capacity commissioned over and above 2 MW will be the contracted capacity.

In any case, the commissioned capacity shall not be less than 2 MW. However, PGL may accept the capacity over and above 2 MW only after imposition of penalty @ Rs. 2.75 per Kwh on the shortfall in generation to be calculated as specified at Section - IX, Clause 10.8 a) due to non-commissioning plus Rs. 2000/- per day per MW plus applicable GST upto 13 months.

Further, PGL shall forfeit the Performance BG at the end of 13th month for the un-commissioned capacity and shall also retain the complete equipment delivered over and above the commissioned capacity if any on which 70% payment has been released against delivery of equipment and the remaining capacity for which equipment is delivered shall be property of PGL.

SECTION – III

Guidelines to Bidders (GTB) for Using E-Procurement System for Bid Submission

1. Registration of Bidders on E-Procurement System:

For participating in the e-tendering process, the Suppliers shall have to get themselves registered with <https://www.eproc.punjab.gov.in> and get user ID, Password. Class-2 or Class-3 Digital Signature is mandatory to participate in the e-tendering process.

2. Digital Certificates:

Bidders can obtain digital certificates from any Government approved Agency/ Institution.

3. Publishing of N.I.T:

For the Tenders processed using the e-Procurement System, only a brief Advertisement related to the Tender shall be published in the newspapers and the Detailed Notice shall be published only on the e-Procurement System. The contractors can view the Detailed Notice and the time schedule for all the Tenders processed using the e-Procurement System on the website <https://www.eproc.punjab.gov.in>

4. Key Dates:

The Bidders are strictly advised to follow the time schedule (Key Dates) of the Tender given in the Tender Summary in this document for their side of tasks and responsibilities to participate in the Tender as all the stages of each Tender are locked before the start time and date and after the end time and date for the relevant stage of the Tender as set by Punjab Genco Limited.

5. Purchase of Tender Document:

The tender document can be downloaded online from 12.09.2022 to 11.10.2022 till 5:00 PM from the website <https://www.eproc.punjab.gov.in>. Arrangements have been made for the Bidders to make payments as per NIT online via IPG (Internet Payment Gateway) / Internet Banking/NEFT/RTGS. As this is online tendering, the application form for the purchase of tender documents shall not be required.

The Bidders are to pay for purchase of the tender documents and bid processing fee (Non – Refundable) as per NIT by making online payment using the service of the secure electronic payments gateway via one of the payments modes as mentioned above, and should print out the system generated receipt for their reference which can be produced whenever required.

6. Submission of EMD:

The Bidders are to deposit the Earnest Money of Rs. 40 Lakhs per 4MW capacity Project (Rs. Forty Lakhs only) in a manner as specified in ITB clause 15, and should print out the system generated receipt for online deposit for their reference so that it can be produced whenever required.

7. Bid Clarifications:

The comments/ clarifications if any can be sent/ obtained through email/phone within 7 days from date of publication of this tender document at contact details provided in Clause 9 below.

8. Amendment of Bid Document:

At any time upto the last date for receipt of bids, the PGL, may, for any reason, whether at his own initiative or in response to a clarification requested by prospective Bidders, modify/amend the Bidding document or annul the entire bidding process.

- a. The amendment will be notified on the website and will be binding on the prospective bidders. No separate emails will be sent to prospective bidders.
- b. In order to afford prospective Bidders reasonable time or otherwise for any other reason, in which to take the amendment into account in preparing their bids, PGL may, at his discretion, extend the last date for the receipt of Bids.

9. Opening of Tenders:

The concerned Officials/Committee of the department will open the Technical Bids online on the date and time stipulated in the NIT. In case the tender could not be opened on due date and time, the same will be opened in the subsequent working day/days at the same time. Date & time of the financial bid opening will be uploaded on the web site. Financial Bids of only technical qualified bidders will be opened on that date and time.

Financial Bid of only Technical Qualified Bidders will be opened on that date & time. Date & time of Financial Bid opening will be uploaded on the website.

For any clarification/difficulty regarding e-tendering, process flow, please contact on 0172-2970263, 2970284 or Contact PGL Tel no. 0172– 2646384, 8699007080, 9876173555. Email: pgl@peda.gov.in

10. Authorized Signatory:

Bid must bear full / complete signatures of a person authorized as per constitution and composition of the company. Authenticating documents to prove authority of signatory (Legal power of attorney in favor of signatory) must

be attached with the tender. Name and Designation of the so authorized signatory must be indicated with each signature. It may be noted that in case signatures do not tally or differ, such signatures shall not be considered authentic. Any correspondence with improper signatures shall not be entertained.

11. The Bidder selected shall be responsible for the performance of the following scope of work (more detailed in this tender document):
 - (i) Design, Manufacture, Supply, Erection, Testing and commissioning of 4MWp capacity each Grid Connected SPV Power Plants at different locations in the State of Punjab.
 - (ii) Comprehensive Operation & Maintenance of the Solar PV Power Plants for 5 (Five) years as mentioned in detailed scope of work, after successful commissioning and performance demonstration, as detailed in technical specification, including supply and storage of all mandatory spare parts, consumables, repairs/ replacement of any defective equipment, etc.

The above scope of work is indicative and the detailed scope of work is given in the Scope of Work and Technical Specification.

12. Performance Securities as per this tender document shall be furnished by the successful bidder after issuance of Letter of Intent (LOI)/ Letter of Award (LOA) by PGL.
13. The detailed Qualifying Requirements (QR) are as given in this document.
14. PGL reserve the right to cancel/ annul/ withdraw this invitation for bids without assigning any reason and shall bear no liability whatsoever consequent upon such a decision.

SECTION IV

GENERAL CONDITIONS OF CONTRACT (GCC)

1. Definitions

1.1 In this Contract, the following terms shall be interpreted as indicated:

- a) "The Contract" means the agreement entered into between the Punjab Genco Limited (Purchaser) and the successful Bidder/ Supplier, as recorded in the Contract Form signed by the parties, including all the attachments and appendices thereto and all documents incorporated by reference therein;
- b) "The Contract Price" means the price payable to the successful Bidder/ Supplier under the Contract for the full and proper performance of its contractual obligations;
- c) "The Goods" means all the equipment, machinery, and/or other materials which the successful Bidder/ Supplier is required to supply to the Purchaser under the Contract;
- d) "Services" means services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training and other obligations of the Supplier covered under the Contract;
- e) "GCC" means the General Conditions of Contract contained in this section.
- f) "The Purchaser" means the Organization purchasing the Goods (i.e. Punjab Genco Limited).
- g) "The purchaser country" is INDIA.
- h) "The Supplier" means the Successful Bidder or Company supplying the Goods and services under the Contract.
- i) "The implementing agency" means the Punjab Genco Limited (PGL) and it shall undertake complete execution of this contract.
- j) "The Project Site(s)", where applicable, means site(s) at District: Bathinda comprising of Village: Tarkhanwala, Tehsil: Talwandi Sabo, Village: Bhagi Bandar, Tehsil: Talwandi Sabo, Village: Shergarh, Tehsil: Talwandi Sabo, Village: Kothe Malluana, Tehsil: Rampura Phul.
- k) "Day" means Calendar day.

2. Application

2.1 These General Conditions shall apply to the extent that they are not superseded by provisions in other parts of the Contract.

3. Country of Origin

All the material to be supplied shall be indigenously manufactured and services offered shall be at project sites located in India.

4. Standards

4.1 The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, to the authoritative standard appropriate to the Goods'. Such standards shall be the latest issued by the concerned institution.

5. Use of Contract Documents and Information

- 5.1 The Supplier shall not, without the Purchaser's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the Purchaser in connection therewith, to any person other than a person employed by the Supplier in performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.
- 5.2 The Supplier shall not, without the Purchaser's prior written consent, make use of any document or information enumerated in para. 5.1 except for purposes of performing the Contract.
- 5.3 Any document, other than the Contract itself, enumerated in GCC Clause 5.1 shall remain the property of the Purchaser and shall be returned (all copies) to the Purchaser on completion of the Supplier's performance under the Contract if so required by the Purchaser.
- 5.4 The supplier shall permit the Bank to inspect the supplier's accounts and records relating to the performance of the Supplier and to have them audited by the auditors appointed by the Bank, if so required by the Bank.

6. Patent Rights

- 6.1 In the event of any claim asserted by a third party of infringement of copyright, patent, trademark or industrial design rights arising from the use of the Goods or any part thereof, the supplier shall act expeditiously to extinguish such claim. If the supplier fails to comply and the Purchaser is required to pay compensation to a third party resulting from such infringement, the supplier shall be responsible for the compensation including all expenses, court costs and lawyer fees. The Purchaser will give notice to the supplier of such claim, if it is made, without delay.

7. Performance Bank Guarantee

- 7.1 Within 15 days after the successful Bidder/ Supplier's receipt of Work Order, the Bidder/ Supplier shall furnish Performance Bank Guarantee (PBG) to the Purchaser for an amount of 3% of the contract price (**As per MNRE, GOI letter no. F.No. 283/114/2018-GRID SOLAR dt. 07.03.2022**), excluding annual maintenance costs valid upto 60 days after the date of completion of performance obligations including warranty obligations and 5 years operation and maintenance contract period.
- 7.2 The proceeds of the Performance Bank Guarantee shall be payable to the Purchaser as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract including complete operation and maintenance obligations.
- 7.3 The Performance Bank Guarantee shall be denominated in the currency of the Contract, and shall be in one of the following forms:
 - (a) A Bank guarantee, issued by a reputed bank located in the purchaser's country, acceptable to the Purchaser, in the form provided in the Bidding Documents; or
 - (b) A cashier's cheque or banker's certified cheque or crossed demand draft or pay order or Bank Guarantee drawn in favour of the Purchaser (i.e. Punjab Genco Limited).

- 7.4 The Performance Bank Guarantee will be discharged by the Purchaser and returned to the Supplier not later than 60 days following the date of completion of the Supplier's performance obligations, including any warranty obligation and after completion of 5 years operation & maintenance period, under the contract.
- 7.5 In the event of any contract amendment, the Supplier shall, within 21 days of receipt of such amendment, furnish the amendment to the Performance Bank Guarantee, rendering the same valid for the duration of the Contract, as amended for 60 days after the completion of performance obligations including warranty obligations and operation & maintenance obligations.

In the event of any correction of defects or replacement of defective equipment during the warranty period, the warranty for the corrected/replaced equipment shall be extended to a further period of 12 months. The performance guarantee for a proportionate value shall be extended 60 days over and above the extended warranty period.

8. Inspections and Tests

8.1 The Purchaser or its representative shall have the right to inspect and/or to test the Goods to confirm their conformity to the Contract specification at no extra cost to the purchaser. Inspection and tests prior to shipment of Goods and at final acceptance are as follows :

- 8.1.1 The inspection of the Goods shall be carried out to check whether the goods are in conformity with the technical specifications attached to the purchase order form and shall be in the line with the inspection/test procedures laid down in the schedule of specifications and the contract conditions.
- 8.1.2 Manufacturer must have suitable facilities at their works for carrying out various performance tests on the equipment. In case of system integrators they should tie up with principle suppliers in case of inspection at their works.
- 8.1.3 All tests specified in the technical specifications
- 8.1.4 Approved supplier's drawings shall not be departed from except as provided in the bidding document
- 8.1.5 The purchaser shall have the right at all reasonable times to inspect, at the supplier's premises all supplier's drawings of any part of the work
- 8.1.6 The supplier shall provide, within the time stated in the contract or in the project schedule, drawings showing how the plant is to be designed and any other information required for:-
 - 8.1.6.1 Preparing suitable foundations or other means of support.
 - 8.1.6.2 Providing suitable access on the site for the plant and any necessary equipment.
 - 8.1.6.3 Making necessary electrical connections for the plant.

- 8.1.7 Before the goods and equipment are taken over by the purchaser, the supplier shall supply operation and maintenance manuals together with drawings of the goods and equipment as built. These shall be in such details as will enable the purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications. The manuals and drawings shall be in the ruling language (English) and in such form and numbers as stated in the contract. Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawings have been supplied to the purchaser. In case of the Supplier, supplying critical equipment which is being manufactured by a Foreign sub-contractor or vendor, mandatory inspection/test bed simulation at works of Foreign sub-contractor or vendor shall be carried out by the purchaser's engineers. The complete charges for such inspection & tests including equipment simulation at the works of the sub-contractors including to & fro airfare, boarding & lodging for a maximum of two engineers shall be borne by the supplier.
- 8.1.8 In case of indigenous equipment/goods inspection shall be carried out at the works of the supplier by the purchaser's engineer and the costs for such inspection have to be borne by the supplier.
- 8.1.9 If the goods/services or any section fails to pass the Tests. The supplier may require such tests to be repeated on the same terms and conditions. All costs to which the purchaser may be put to by the repetition of the tests under this sub-clause shall be deducted from the contract price.
- 8.1.10 If the purchaser and the supplier disagree on the interpretation of the test results each shall give a statement of his views to the other within 14 days after such disagreement arises. The statement shall be accompanied by all relevant evidence. The purchaser will review both the statements and render a final decision within a further period of fourteen days which shall be binding on the supplier
- 8.1.11 If the goods/services or any section fails to pass the tests on the repetition thereof under sub-clause 8.1.10 the purchaser after due consultation with the supplier, shall be entitled to :
- 8.1.11.1 Order one further repetition of the tests under the conditions of sub-clause 8.1.10
- 8.1.11.2 Reject the goods or a section thereof in which event the purchaser shall have the same remedies against the supplier as are provided under sub-clause 8.1.16
- 8.1.11.3 Issue a taking over certificate, if the purchaser so wishes, notwithstanding that the goods are not complete. The supplier's price shall then be reduced by such amount as may be agreed to by the purchaser and the supplier or failing on agreement, as may be determined through arbitration.
- 8.1.12 As soon as the goods/services or any section thereof has passed the tests, the purchaser shall issue a certificate to the supplier to that effect.

8.1.13 The goods and services shall be accepted by the purchaser when they have been completed in accordance with the contract, except in minor respects that do not affect the use of the goods for their intended purposes and having passed the tests on completion and a taking over certificate has been issued or deemed to have been issued in accordance with sub-clause 8.1.15

8.1.14 The supplier may apply by notice to the purchaser for taking over certificate not earlier than 14 days before the goods will in the supplier's opinion be complete and ready for taking over under sub-clause 8.1.14

The purchaser shall within 28 days after the receipt of the supplier's application either.

8.1.14.1 Issue the taking over certificate to the supplier stating the date on which the works were complete and ready for taking over, or

8.1.14.2 Reject the application giving his reasons and specifying the work required to be done by the supplier to enable the taking over certificate to be issued.

8.1.15 If the supplier fails to remedy a defect or damage pointed out by the Purchaser within a reasonable time, the purchaser may fix a final time for remedying the defect or damage.

If the supplier fails to do so, the purchaser may:

- a) Carry out the work himself or by others at the supplier risk and cost, provided that he does so in a reasonable manner. The costs properly incurred by the purchaser in remedying the defect or damage shall be deducted from the contract price, but the supplier shall have no responsibility for such work, or
- b) Require the supplier to grant the purchaser a reasonable reduction in the contract price to be agreed or fixed by arbitration or
- c) If the defect or damage is such that the purchaser has been deprived of substantially the whole of the benefits of the goods or a part thereof, he may terminate the contract, in respect of such parts of the goods as cannot be put to the intended use. The purchaser shall, to the exclusion of any remedy be entitled to recover all sums paid in respect of such parts of the goods together with the cost of dismantling the same, clearing the site and returning plant to the supplier or otherwise disposing of it in accordance with the supplier's instructions.

8.1.16 Until the final certificate or commissioning has been issued, the supplier shall have the right of access to all parts of the goods and to the records of the working and performance of the goods and services.

Such right of access shall be during the purchaser's normal working hours at the supplier's risk and cost. Access shall also be granted to any duly authorized representative of the supplier whose name has been communicated in writing to the supplier.

Subject to the purchaser's approval, the supplier may also at his own risk and cost make any tests which he considers desirable.

- 8.1.17 Nothing in the clause 8.1 and all sub-clauses shall in any way relieve the supplier from any warranty or other obligations under this contract.
- 8.1.18 The following inspection procedures and tests are required by the Purchaser:-

(a) Inspection at Works:

The Purchaser, his duly authorized representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times access to the Contractor's premises or works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured at the sub-contractor's works or assembled in their premises or works, the contractor shall obtain for the Purchaser and for his duly authorized representative, permission to inspect as if the works were manufactured or assembled in the Contractor's own premises or works.

The Contractor shall give the Purchaser/Inspector 20 days written notice of any material being ready for testing. Such test shall be to the Contractor's account except for the expenses of the Inspector. The Purchaser/Inspector, unless witnessing of the test is virtually waived, will attend such test within 7(seven) days of the date on which the equipment is notified as being ready for test/inspection, failing which the Contractor may proceed with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of tests in triplicate.

The Purchaser or Inspector shall within 7(seven) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing that no modifications are necessary to comply with Completion of these tests or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests after erection be found not to comply with the Contract. In all cases where the contract provide for tests whether at the premises or works of the Contractor or of any Sub-contractor, the contractor, except where otherwise specified, shall provide free of charge such items as labour, materials, electricity, apparatus and instruments as may be reasonably demanded by the Purchaser/Inspector or his authorized representative to carry out effectively such tests of the equipment in accordance with the contract and shall give facilities to the Purchaser/Inspector or to his authorized representative to accomplish testing.

The inspection by Purchaser/Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.

(b) Pre-Commissioning test

On completion of erection of the equipment and before start up, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the purchaser or his authorized representative and the Contractor for correctness and completeness of installation and acceptability for start-up, leading to initial pre-commissioning tests at site.

The Contractor's commissioning/start-up engineers specifically identified as far as possible shall be responsible for carrying out all the pre-commissioning tests. On completion of inspection, checking and after the pre commissioning tests are satisfactorily over, the complete equipment shall be ready for trial operation.

During the trial run the operator shall be under the supervision of the Contractor but the schedule of operations shall be agreed to be the Purchaser and the Contractor. During the pre-commissioning, commissioning and performance guarantee tests the operator will be under the supervision of the Contractor if the tests are being carried out by him. In case the tests are being carried out by a third party the operator will be under the control of the Purchaser. In both cases all aspects of the tests shall be agreed to by the Purchaser and the contractor and the safety of the equipment shall be the responsibility of the Contractor.

(c) Trial Operation

The Plant shall then be on Trial Operation during which period all necessary adjustments shall be made while operating over the full load-range enabling the plant to be made ready for performance and guarantee tests.

The Trial run shall have to be performed for a period of 5 continuous days with grid synchronization. In the absence of grid availability necessary load and set up to be required for trial operation shall have to be arranged by the supplier.

A Trial Operation report comprising of observations and recording of various parameters to be measured in respect of the above Trial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during trial run, shall also include the dates of start and finish of the Trial Operations and shall be signed by the representatives of both the parties. The report shall have sheet, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Trial Operation. Based on the observations, necessary modifications, repairs to the plant shall be carried out by the Contractor to the full performance and guarantee tests on the Plant. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for withholding the aforesaid permission.

(d) i) Performance and Guarantee Test of the SPV Plant.

The final test of each project as to the performance and guarantees shall be conducted at site, by the purchaser. Such tests will be commenced within a period of 10 days after successful completion of Trial Operations. Any extension of time beyond above 10 days shall be mutually agreed upon.

These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the performance guarantees.

Any special equipment, load, tool and tackles required for the successful completion of the performance and guarantee tests shall be provided by the Contractor.

ii) Guaranteed Performance Test of the Equipment:

The guaranteed performance figures of the equipment, shall be proved by the Contractor during these performance and guarantees tests. Should the results of these tests show any decrease from the guaranteed values, the Contractor shall modify the equipment as required to enable it to meet the guarantees. In such case, performance and guarantee tests shall be repeated within one month, from the date the equipment is ready for retest and all cost for modification including labour, materials and the cost of additional testing to prove that the equipment meet the guarantees, shall be borne by the Contractor.

- 8.2 The inspection and tests may be conducted on the premises of the Supplier and its subcontractor(s) at point of delivery and/or at the Goods final destination. If conducted on the premises of the supplier or its subcontractor(s) all reasonable facilities and assistance, including access to drawing and production data - shall be furnished to the inspectors at no charge to the Purchaser.
- 8.3 Should any inspected or tested Goods fail to conform to the specifications, the Purchaser may reject the Goods, and the Supplier shall either replace the rejected Goods or make all alterations necessary to meet specification requirements free of cost to the Purchaser.
- 8.4 The Purchaser's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival and shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by the Purchaser or its representative prior to the Goods transport.
- 8.5 Nothing in GCC Clause 8 shall in any way release the Supplier from any warranty or other obligations under this Contract.

8.6 Manuals and Drawings

- 8.6.1 Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance manuals together with drawings of the goods and equipment. These shall be in such detail as will enable the Purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications.
- 8.6.2 The manuals and drawings shall be in the ruling language (English) and in such form and numbers as stated in the contract.
- 8.6.3 Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purpose of taking over until such manuals and drawings have been supplied to the Purchaser.

8.7 For the System & Other Software the following will apply:

The Supplier shall provide complete and legal documentation of hardware, all subsystems, operating systems, compiler, system software and the other software. The Supplier shall also provide licensed software for all software products, whether developed by it or acquired from others. The supplier shall also indemnify the purchaser against any levies/penalties on account of any default in this regard.

8.8 Acceptance Certificates:

- 8.8.1 On successful completion of acceptability test, receipt of deliverables etc, and after

the purchaser is satisfied with the working on the plant, the acceptance certificate signed by the supplier and the representative of the purchaser will be issued. The date on which such certificate is signed shall be deemed to be the date of successful commissioning of the systems.

- 8.8.2 The training shall be conducted on the dates mutually agreed upon and within two months from the date of acceptance of supply.

9. Packing

- 9.1 The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.
- 9.2 **Packing Instructions:** The Supplier will be required to make separate packages for each Consignee. Each package will be marked on three sides with proper paint/indelible ink with the following:
- (i) Project; (ii) Contract No.; (iii) Origin of Goods; (iv) Manufacturer's Name ;(v) Supplier's Name; (vi) Packing List Reference number.

10. Delivery and Documents

- 10.1 Delivery of the Goods shall be made by the Supplier in accordance with the terms specified in the Schedule of Requirements. The details of shipping and/or other documents to be furnished by the supplier in GCC.
- 10.2 For purposes of the Contract, "EXW", "FOB", "FCA", "CIF" and "CIP" and other trade terms used to describe the obligations of the parties shall have the meanings assigned to them by the current edition of the Incoterms published by the International Chamber of Commerce, Paris.
- 10.3 Documents to be submitted by the supplier are:
Upon delivery of the goods to the transporter /consignee, the supplier shall notify the purchaser and mail the following documents to the Purchaser:
- (i) 3 Copies of the Supplier invoice showing contract number, goods description, quantity, unit price, total amount;
 - (ii) Delivery note, Railway receipt or acknowledgment of receipt of goods from the Consignee;
 - (iii) 3 Copies of Packing list identifying contents of each package;
 - (iv) Insurance Certificate;
 - (v) Manufacturer's/Supplier's warranty certificate;
 - (vi) Inspection Certificate issued by the nominated inspection agency, and the Supplier's factory inspection report; and
 - (vii) Certificate of Origin.

The above documents shall be received by the Purchaser before arrival of the Goods (except where it is handed over to the Consignee with all documents) and if not received, the supplier will be responsible for any consequent expenses.

11. Insurance

- 11.1 The Goods supplied under the Contract shall be fully insured against the loss or damage incidental to manufacture or acquisition, transportation, storage and delivery. The insurance shall be in an amount equal to 110 percent of the CIF or CIP value of the Goods from "Warehouse to warehouse (final destination)" on "All Risks" basis including +War Risks and Strikes, valid for a period not less than 3 months after installation and commissioning and issue of acceptance certificate by the purchaser.
- 11.2 Where delivery of the Goods is required by the Purchaser on a CIF or CIP basis, the Supplier shall arrange and pay for cargo insurance, naming the Purchaser as the beneficiary. Where delivery is on a FOB or FCA basis, insurance shall be the responsibility of the Purchaser.
- 11.3 Should any loss or damage occur, the Supplier shall -
- a) initiate and pursue claim till settlement, and
 - b) promptly make arrangements for repair and/or replacement of any damaged item/s irrespective of settlement of claim by the underwriters.
- An all risk covered insurance, "Fire Policy 'C' along with equipment failure policy for full value of the plant & equipment shall be taken out by the supplier for the full O&M period of 5 years on annual renewal basis.

12. Transportation

- 12.1 Where the Supplier is required under the Contract to deliver the Goods FOB, transport of the Goods, up to and including the point of putting the Goods on Board the vessel at the specified port of loading, shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price. Where the supplier is required under the Contract to deliver the Goods FCA, transport of the Goods and delivery into the custody of the carrier at the place named by the Purchaser or other agreed point shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.
- 12.2 Where the Supplier is required under the Contract to deliver the Goods CFR or CIF, or CIP, transport of the Goods to the destination, as shall be specified in the Contract shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.
- 12.3 Where the Supplier is required under the Contract to transport the goods to a specified place of destination, defined as the Project site, transport to such place of destination, including insurance and storage, as shall be specified in the Contract, shall be arranged by the supplier, and related costs shall be included in the Contract price.
- 12.4 Where the Supplier is required under the Contract to deliver the Goods CIF or CIP, no restriction shall be placed on the choice of the carrier.

13. Incidental Services

- 13.1 The incidental services to be provided are as under. The costs shall be included in the contract price:
- a) Performance of on-site assembly, installation, start-up and commissioning of the supplied goods

- b) Furnishing of tools required by the Supplier for on-site assembly, installation, commissioning and maintenance of the supplied Goods, would be the responsibility of the Supplier;
- c) Supply of detailed Installation, Operations & Maintenance manuals (hard copy-original documentation) for each appropriate item/sub-item of the supplied Goods;
- d) Conduct training of Purchaser's personnel at Contractor's works and on site, in assembly, start up, O&M and repair of supplied plant and equipment consisting of:-
 - In plant training for 2 Engineers at the manufacturing shop of the supplier/contractor for a period of 2-3 days with special emphasis on SPV Modules and INVERTER operation control and maintenance. Travel, lodging and boarding expenses for the engineers to be borne by the bidder.
 - On site training for engineers and technical staff in start up, monitoring, operations and maintenance for a period of 2 weeks.
- e) Operation and maintenance of 4 nos. x 4MWp Grid Interactive SPV power plant for a period of 5 years from date of commissioning as per Section IX.

13.2 Prices charged by the Supplier for the preceding incidental services, if not included in the contract price of the Goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.

14. Spare Parts

- 14.1 Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spares such as Cable lugs, Nut & bolts, Screws, Switches, fuses, indicating lamps & blocking diodes, spare modules, batteries, battery spares etc. Other mandatory spare parts & components shall be supplied as promptly as possible but in any case within two months of the draw down on the spares inventories at the plant site during O&M period. Two sets of critical spares like PLC cards, IGBT driver cards, IGBT's, Surge arrestors, Both AC and DC MCB's, MCCB's and any other critical spares required at plant site etc. shall be kept as minimum inventory level for each of the Inverters at the plant site. The inventory of spares to be maintained by the supplier shall be separate from the spares being purchased by the purchaser as per **Annexure-I**.
- 14.2 Above spare part inventory shall not relieve the supplier of any warranty obligation under the contract and failure to rectify the problem/issue in stipulated time schedule by the supplier may lead to penalty or rectification of the problem / issue on the risks and costs of the supplier by the purchaser.

15. Warranty

- 15.1 The Supplier warrants that the Goods supplied under this Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Supplier further warrants that the Goods supplied under this Contract shall have no defect arising from design, materials or workmanship (except when the design and/or is required by

the Purchaser's Specifications) or from any act or omission of the Supplier, that may develop under normal use of the supplied Goods upto destination.

- 15.2 In partial modification of the provisions, the OEM / Supplier warranty period shall be 60 months from date of commissioning of the SPV Power plant or 72 months from the date of shipment, whichever occurs earlier. The supplier shall, in addition, comply with the performance and/or consumption guarantees specified under the contract. If, for reasons attributable to the supplier, these guarantees are not attained in whole or in part, the supplier shall:

- (a) make such changes, modifications, additions and/or replacement to the goods or any part thereof as may be necessary in order to attain the contractual guarantees specified in the contract at its own cost and expense and to carry out further performance tests in accordance with GCC clause 8,
- or
- (b) pay liquidated damages to the purchaser with respect to the failure to meet the contractual guarantees if such shortfall is not more than 5% from that stated in the technical specifications by the purchaser. The rate of these liquidated damages shall be 1% of the bid price for each percent drop in the performance or efficiency and the maximum deduction is 10% of the contract price. Normal degradation in the PV modules shall not be included for LD calculation.

- 15.3 The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty.

- 15.4 Upon receipt of such notice, the Supplier shall, with all reasonable speed, repair or replace the defective goods or parts thereof, without cost to the Purchaser.

- 15.5 If the Supplier having been notified, fails to remedy the defect(s) within 72 hours, the Purchaser may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.

15.6 MAINTENANCE SERVICE

- 15.6.1 Maintenance services shall be provided by the supplier during the period of warranty. Annual maintenance and repairs of the entire system including supply of spares etc. for next 60 months will be done by the supplier.

- 15.6.2 The maximum response time for a maintenance complaint from any of the destination specified in the schedule of requirements (i.e. time required for suppliers maintenance engineers to report to the installations after a request call/telegram/fax is made or letter is written) shall not exceed 48 hours.

- 15.6.3 It is expected that the average downtime of an item will be less than half the maximum downtime (i.e. defined as number of days for which an item of equipment is not usable because of inability of the supplier to repair it) as mentioned by the bidder in the form of technical details. In case an item is not usable beyond the stipulated maximum downtime the supplier will be required to arrange for an immediate replacement of the same till it is repaired. Failure to arrange for the immediate repair/replacement will be liable for penalty of 0.5% of the item/items cost per day per item. The amount of penalty will be recovered from bank guarantee during warranty or annual maintenance period as the case may be.

16. Payment**16.1 Payment shall be made in the following manner:-****(A) Payment for Goods and Services (excluding Annual Maintenance Charges)**

- i) **Advance Payment:** Twenty (20%) of contract price (without GST) against Advance Bank Guarantee of 110% amount of advance will be paid after acceptance of work order and submission of performance bank guarantee by the contractor.
- ii) **On Delivery:** Seventy (70%) of the contract value (including GST on actual basis) against delivery of goods/material at site after adjustment of 20% mobilization advance on PRO-RATA basis for the corresponding consignment for goods/material after delivery at final destination with due acceptance of PGL. Bank Guarantees for advance payment shall be released not later than 30 days after delivery of the complete goods at their final destination with due acceptance of PGL.
- iii) **On Final Acceptance:** 90% of contract value of respective plant on commissioning including submission and acceptance of GTP and other test reports by PGL after adjusting the earlier payments.
- iv) 100% of contract value of respective plant after completion of 3 months from submission and acceptance of GTP including commissioning of each plant after adjusting the earlier payments. However, the bidder may claim the balance payment on submission of Bank Guarantee of equivalent amount valid for a period of 3 months.
- v) All payments against dispatch/receipt of equipments/materials and work executed shall be made by Director, PGL, Chandigarh, upon furnishing the documents as stated in the bidding document to Director, PGL.
- vi) Successful bidder shall be the consignee. Joint inspection/verification will be made by the representative of Successful Bidder Company & PGL after receipt of material at site before payment is released. The joint inspection will be carried out within a period of 10 days on receipt of material at site.
- vii) Advance intimation to the Director, PGL, Chandigarh shall be sent at least 10 days before the dispatch of material to enable him to arrange payments.
- viii) All payments shall be released directly by the PGL to the Bidder/contractor through direct bank transfer except as otherwise provided in the contract.

(B) Payment for annual Operation & Maintenance:

The annual maintenance and repair cost shall be paid in year end in equal yearly installments within thirty days of receipt of claim at the end of each year, after completion of operation & maintenance obligations of that year, at the rates quoted in the price schedule. The Performance Bank Guarantee of 3% value of the contract amount excluding Operation & Maintenance costs shall be valid throughout the 5 years operation & maintenance period.

- (C)** For all the payments to be made against Bank Guarantees, the Bank Guarantee shall be issued by a Scheduled Indian Bank located in India. The guarantees issued by other banks should be confirmed by a scheduled Indian Bank operating in India.

17. Prices

- 17.1 Prices payable to the Supplier as stated in the Contract shall be firm and not subject to adjustment during performance of the Contract.

18. Change Orders

- 18.1 The Purchaser may at any time, by a written order given to the Supplier can make changes within the general scope of the Contract in any one or more of the following:
- (a) Drawings, designs, or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the Purchaser;
 - (b) The method of shipping or packing;
 - (c) The place of delivery; or
 - (d) The services to be provided by the Supplier.
- 18.2 If any such change causes an increase or decrease in the cost of, or the time required for, the Supplier's performance of any provisions under the Contract, an equitable adjustment shall be made in the Contract Price or delivery schedule, or both, and the Contract shall accordingly be amended. Any claims by the Supplier for adjustment under this Clause must be asserted within thirty (30) days from the date of the Supplier's receipt of the Purchaser's change order.

19. Contract Amendments

- 19.1 Subject to GCC Clause 18, no variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.

20. Assignment

- 20.1 The Supplier shall not assign, in whole or in part, its obligations to perform under the Contract, except with the Purchaser's prior written consent.

21. Subcontracts

- 21.1 The Supplier shall notify the Purchaser in writing of all subcontracts awarded under the Contract if not already specified in his bid. Such notification, in his original bid or later, shall not relieve the Supplier from any liability or obligation under the Contract. Sub-contract shall be only for bought-out items and sub-assemblies.
- 21.2 Subcontracts must comply with the provisions of this tender document.

22. Delays in the Supplier's Performance

- 22.1 Delivery of the Goods and performance of Services shall be made by the Supplier in accordance with the time schedule prescribed by the Purchaser in its Schedule of Requirements.
- 22.2 If at any time during the performance of the Contract, the Supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the Goods and performance of the Services, the Supplier shall promptly notify the Purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Supplier's notice, the Purchaser shall evaluate the situation and may at its discretion extend the Supplier's time

for performance, with or without liquidated damages, in which case the extension shall be ratified by the parties by amendment of the Contract.

- 22.3 Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of liquidated damages pursuant to GCC clause 23, unless an extension of time is agreed upon pursuant to GCC clause 22.2 without the application of liquidated damages.

23. Liquidated Damages

- 23.1 Subject to GCC Clause 25, if the Supplier fails to deliver any or all of the Goods or perform the Services within the period(s) specified in the Contract, the Purchaser shall, without prejudice to its other remedies under the Contract, deduct from the Contract Price, as liquidated damages, a sum equivalent to 1 % per week or part thereof of the delivered price of the delayed Goods or unperformed Services for each week or part thereof of delay until actual delivery or performance, up to a maximum deduction of 5% of contract price. Once the maximum is reached, the Purchaser may consider termination of the Contract pursuant to GCC Clause 24.

24. Termination for Default

- 24.1 The Purchaser may, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or in part:

- (a) if the Supplier fails to deliver any or all of the Goods within the period(s) specified in the Contract, or within any extension thereof granted by the Purchaser pursuant to GCC Clause 22; or if the Supplier fails to perform any other obligation(s) under the Contract.
- (b) If the supplier, in the judgement of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

For the purpose of this clause:

“corrupt practice” means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.

“fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the borrower, 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 the borrower of the benefits of free and open competition.

- 24.2 In the event the Purchaser terminates the Contract in whole or in part, pursuant to GCC clause 24.1, the Purchaser may procure, upon such terms and in such manner as it deems appropriate, Goods or services similar to those undelivered, and the Supplier shall be liable to the Purchaser for any excess costs for such similar Goods or services. However, the Supplier shall continue the performance of the Contract to the extent not terminated.

25. Force Majeure

- 25.1 Notwithstanding the provisions of GCC Clauses 22, 23, 24, the Supplier shall not be liable for forfeiture of its Performance Bank Guarantee, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.
- 25.2 Force Majeure' means any event or circumstance or combination of events those stated below that wholly or partly prevents or unavoidably delays an Affected Party in the performance of its obligations under this Agreement, but only if and to the extent that such events or circumstances are not within the reasonable control, directly or indirectly, of the Affected Party and could not have been avoided if the Affected Party had taken reasonable care or complied with Prudent Utility Practices:
- a) Act of God, including, but not limited to lightning, drought, fire and explosion (to the extent originating from a source external to the site), earthquake, volcanic eruption, landslide, flood, cyclone, typhoon or tornado if and only if it is declared / notified by the competent state / central authority / agency (as applicable);
 - b) any act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot, insurrection, terrorist or military action if and only if it is declared / notified by the competent state / central authority / agency (as applicable); or
 - c) radioactive contamination or ionizing radiation originating from a source in India or resulting from another Force Majeure Event mentioned above excluding circumstances where the source or cause of contamination or radiation is brought or has been brought into or near the Power Project by the Affected Party or those employed or engaged by the Affected party.

Force Majeure Exclusions

Force Majeure shall not include (i) any event or circumstance which is within the reasonable control of the Parties and (ii) the following conditions, except to the extent that they are consequences of an event of Force Majeure:

- a. Unavailability, late delivery, or changes in cost of the plant, machinery, equipment, materials, spare parts or consumables for the Power Project;
- b. Delay in the performance of any contractor, sub-contractor or their agents; c. Non-performance resulting from normal wear and tear typically experienced in power generation materials and equipment;
- d. Strikes or labour unrest/disturbances at the facilities of the Affected Party; e. Insufficiency of finances or funds or the agreement becoming onerous to perform; and
- f. Non-performance caused by, or connected with, the Affected Party's:
 - i. Negligent or intentional acts, errors or omissions;
 - ii. Failure to comply with an Indian Law; or
- i. Breach of, or default under this Agreement.

25.3 Notification of Force Majeure Event

25.3.1 The Affected Party shall give notice to the other Party of any event of Force Majeure as soon as reasonably practicable, but not later than seven (7) days after the date on which such Party knew or should reasonably have known of the commencement of the event of Force Majeure. If an event of Force Majeure results in a breakdown of communications rendering it unreasonable to give notice within the applicable time limit specified herein, then the Party claiming Force Majeure shall give such notice as soon as reasonably practicable after reinstatement of communications, but not later than one (1) day after such reinstatement.

25.3.2 Provided that such notice shall be a pre-condition to the Affected Party's entitlement to claim relief under this Agreement. Such notice shall include full particulars of the event of Force Majeure, its effects on the Party claiming relief and the remedial measures proposed. The Affected Party shall give the other Party regular (and not less than weekly) reports on the progress of those remedial measures and such other information as the other Party may reasonably request about the Force Majeure Event.

25.3.3 The Affected Party shall give notice to the other Party of (i) the cessation of the relevant event of Force Majeure; and (ii) the cessation of the effects of such event of Force Majeure on the performance of its rights or obligations under this Agreement, as soon as practicable after becoming aware of each of these cessations.

26. Termination for Insolvency

26.1 The Purchaser may at any time terminate the Contract by giving written notice to the Supplier, if the Supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Purchaser.

27. Termination for Convenience

27.1 The Purchaser, may by written 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 is for the Purchaser's convenience, the extent to which performance of the supplier under the Contract is terminated, and the date upon which such termination becomes effective.

27.2 The Goods that are complete and ready for dispatch within 30 days after the Supplier's receipt of notice of termination shall be accepted by the Purchaser at the Contract terms and prices. For the remaining Goods, the Purchaser may elect:

- a) to have any portion completed and delivered at the Contract terms and prices; and/or
- b) to cancel the remainder and pay to the Supplier an agreed amount for partially completed Goods and services for materials and parts previously procured by the Supplier.

28. Disputes & Arbitration

Both Contractor AND PGL shall comply with the provisions of this tender document and discharge the respective obligations. In the event of a disagreement and if the issue is unresolved, a meeting shall be held by designated representatives of PGL and the Contractor to resolve the issue. In case the issue is still unresolved provisions of this clause shall apply.

- a) All differences or disputes between the parties arising out of or in connection with these presents, including any question or matter of dispute and the parties are unable to resolve by mutual agreement shall be submitted for arbitration to the Sole Arbitrator and shall be resolved in accordance with the provisions of the Arbitration and Conciliation Act 1996 as amended from time to time. The Arbitration proceedings shall take place at Chandigarh. All Legal proceedings in connection with this agreement shall be subjected to the territorial jurisdiction of competent courts at Chandigarh.
- b) In the event of differences or disputes, between the parties, either party may by written notice of 30 days to the other party seek arbitration. The arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act 1996 as amended from time to time.
- c) Notwithstanding the existence of any question, disputes and difference referred to arbitration, the parties hereto shall continue to perform their respective obligations under this tender document and the payment of any bill preferred shall not be withheld for any reason whatsoever during the pendency of arbitration.

29. Limitation of Liability

29.1 Except in cases of criminal negligence or willful misconduct, and in the case of infringement pursuant to Clause 6,

- (a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the supplier to pay liquidated damages to the purchaser and
- (b) the aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

30. Governing language

30.1 The contract shall be written in English language. Subject to GCC clause 31, the version of the contract written in the specified language shall govern its interpretation. All correspondence and other documents pertaining to the contract which are exchanged by the parties shall be written in the same language.

31. Applicable Law

31.1 The Contract shall be interpreted in accordance with the applicable laws of Union of India.

32. Notices

32.1 Any notices given by one party to the other pursuant to this Contract shall be sent to the following address of the Purchaser and Supplier.

Purchaser's address for notice purposes:
Punjab Genco Limited, Plot no. 1&2, Sector-33-D, Chandigarh

Supplier's address for notice purposes: (To be filled in at the time of contract signature)

32.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

33. Taxes and Duties

33.1 Bidder will be entirely responsible for taxes and levies to be charged in connection with supplies and services, and the Purchaser shall pay all the taxes and duties legally payable on the goods.

Bidders will be entirely responsible for all taxes, duties, license fees, octroi, road permits, etc in connection with delivery of goods at site including incidental services and commissioning. Price bid submitted by the bidder shall include all taxes in the contract price.

33.2 Income / Corporate Taxes in India:

33.2.1 The Supplier shall be liable to pay all corporate taxes and income tax that shall be levied according to the laws and regulations applicable from time to time in India and the price bid by the supplier shall include all such taxes in the contract price.

33.2.2 Wherever the laws and regulations require deduction of such taxes at the source of payment, the Purchaser shall effect such deductions from the payment due to the supplier. The remittance of amounts so deducted and issuance of certificate for such deductions shall be made by the Purchaser as per the laws and regulations in force. Nothing in the Contract, shall relieve the Supplier from his responsibility to pay any tax that may be levied in India on income and profits made by the Supplier in respect of this contract.

33.2.3 The Supplier's staff, personnel and labour will be liable to pay personal income taxes in India in respect of such of their salaries and wages as are chargeable under the laws and regulations for the time being in force, and the Supplier shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

34. SUPPLIER INTEGRITY:

The supplier is responsible for and obliged to conduct all contracted activities in accordance with the contract using state-of -the-art methods and economic principles and exercising all means available to achieve the performance specified in the Contract.

35. **SUPPLIER'S OBLIGATIONS:**

The Supplier is obliged to work closely with the Purchasers staff, act within its own authority and abide by directives issued by the Purchaser and implementation activities.

The Supplier will abide by the job safety measures prevalent in India and will free the Purchaser from all demands or responsibilities arising from accidents or loss of life the cause of which is the Supplier's negligence. The Supplier will pay all indemnities arising from such incidents and will not hold the Purchaser responsible or obligated.

The Supplier is responsible for managing the activities of its personnel or sub-contracted personnel and will hold itself responsible for any misdemeanors.

The Supplier will treat as confidential all data and information about the Purchaser, obtained in the execution of his responsibilities, in strict confidence and will not reveal such information to any other party without the prior written approval of the Purchaser.

36. **SITE PREPARATION AND INSTALLATION**

The Purchaser is solely responsible for the construction of the hardware sites in compliance with the technical and environmental specifications defined by the supplier. The Purchaser will designate the installations sites before the scheduled installation date to allow the Supplier to perform a site inspection to verify the appropriateness of the sites before the installation of the hardware.

37. **PLANT INSTALLATION:**

The Supplier is responsible for all unpacking, assemblies, wiring, installations, cabling between solar modules and connecting to power supplies & INVERTER. The Supplier will test all equipment operations and accomplish all adjustments necessary for successful and continues operation of the plant at the installation site.

38. **MAINTENANCE:**

The Supplier will accomplish preventive and breakdown maintenance activities to ensure that data logging system (all hardware and software) execute without defect or interruption for at least 95% uptime for 24 hours a day, 7 days a week of operation of the machine worked on a quarterly basis.

If any critical component of the entire configuration is out of service for more than three days, the Supplier shall either immediately repair the defective unit or replace it at its own cost, if replacement is the only solution.

The Supplier will respond to a site visit and commence repair work on the equipment within 48 hours of being notified of equipment malfunction.

39. **TRAINING**

For each equipment installed, the Supplier is required to train the designated Purchaser's technical and end-user personnel to enable them to effectively operate the total plant. The training schedule will be agreed to by both parties during the performance of the Contract.

40. **TECHNICAL DOCUMENTATION**

The Technical Documentation involving detailed instruction for operation and maintenance is to be delivered with every unit of the equipment supplied. The language of the documentation should be English.

41. **RIGHT TO USE DEFECTIVE EQUIPMENT**

If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the equipment proves to be unsatisfactory, the Purchase shall have the right to continue to operate or use such equipment until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Purchaser's operation.

SECTION V

5. SPECIAL CONDITIONS OF CONTRACT (SCC)

APPENDIX – A

(Referred to in Clause 13.3 (b) of ITB sheet)

Qualification Requirements

1. The bidder should be a company registered under Companies Act 1956/2013, Limited Liability Partnership (LLP) registered under LLP Act 2008 / Consortium or Joint Venture of maximum 3 companies or LLPs and a manufacturer/ System integrator for Solar Plants Companies / SPG who have designed, manufactured, tested, supplied, erected and commissioned at least one Solar PV Project of 2 MW or above capacity anywhere in India.

The bidder must also have experience of Operation and Maintenance (O&M) of Solar PV projects of aggregate 2 MW capacity or more for minimum 1 year, in any of the last five (5) years in which project(s) is/are in successful operation on the date of bid opening (The Bidder should meet the qualification criteria for setting up of the project as well as O&M as mentioned above).

2. The bidder should furnish the information w.r.t supplies and satisfactory performance, in the attached Proformas for the last 5 years. **The bidders are mandatorily required to furnish Annexure-II.**
3. All bids submitted shall also include the following information along with formats under Section VIII.
 - (i) Copies of original documents defining the constitution or legal status, place of registration and principle place of business of the company.
 - (ii) The bidder should furnish a brief write-up, backed with adequate data, explaining his available capacity and experience (both technical and commercial) for the manufacture and supply of the required systems and equipment within the specified time of completion after meeting all their current commitments.
 - (i) The bidder should clearly confirm that all the facilities exist in his factory for inspection and testing and these will be made available to the Purchaser or his representative for inspection.
 - (ii) Details of Service Centers and information on service support facilities that would be provided after the warranty period in the Service Support Form given in Section VIII.
 - (iii) Reports on financial standing of the Bidder such as audited profit and loss statements, balance sheets and auditor's report for the past three years, bankers certificates, etc. All accounting statements submitted should be duly audited and with proper auditors notes on accounts and accounting standards.
 - (iv) Bidders shall be required to submit a solvency certificate from their bankers clearly stating that the company has the credit worthiness and financial standing to execute the project of this capacity.
 - (v) Bidders should meet the following minimum eligibility criteria mentioned below for each of the last three financial years of business operations i.e. 2019-20, 2020-21, 2021-22 :

ii. **Net worth:-**

The net worth for the last financial year i.e. 2020-21 should be positive. "Net Worth" of the Bidder shall be calculated as per the Companies Act, 2013.

iii. **Annual Turnover:-**

For single project of minimum 4 MW capacity, Average Annual Turnover of Rs. 30 crore (INR), during the last three years' as per audited annual accounts i.e for FY 2019-20, FY 2020-21 and FY 2021-22.

Bidders interested in participating for more than one project need to fulfill the turnover requirement in multiple of Rs. 30 Crore per 4MWp (AC) capacity Solar PV Project for the total number of projects they intend to participate.

For example: Bidders participating in 2 projects of 4MWp capacity each will be required to fulfill the turnover requirement of Rs. 60 Crore (INR), during the last three years' audited annual accounts for FY 2019-20, FY 2020-21 and FY 2021-22.

APPENDIX – B

1 INTRODUCTION

This document lays down the procedures and requirements for conducting Functional Guarantee tests including scope of the tests, procedures for the tests, reporting formats and process for determining test results in accordance with the Tender Specifications, applicable standards and industry best practices.

2 FUNCTIONAL GUARANTEE TESTS FOR SOLAR PV PLANT

Functional Guarantee for Solar PV Plant shall comprise of following Guarantees:

- (1) Performance Ratio Guarantee test for operational acceptance.

2.1 PERFORMANCE RATIO GUARANTEE TEST

A Performance Ratio Guarantee test shall be commenced within 60 days of the commissioning of Plant Facilities to demonstrate that the plant has achieved the Guaranteed Performance Ratio in line with requirements under section VII of the bidding document. This will be one of the pre-conditions for the Plant Operational Acceptance. Performance Ratio (PR) test period would be continuous measurement of 30 consecutive days. The test shall be conducted in accordance with the IEC-61724 as per the methodology described in Technical Specifications under section VII of the bidding document. The report shall contain all the measured energy and Met data values, calculations, results and conclusions.

2.1.1 Performance Ratio

The Performance Ratio (PR) of the PV Plant will be calculated as follows:
(according to IEC 61724 Ed.2)

$$PR = \frac{E_{out}}{\sum_k (Ck \times Po) \times (Gi,k \times rk)}$$

$G_{i,ref}$

Where

Temperature Corrected Performance Ratio

E_{out} Cumulative AC energy measured at ABT meter import export meter over the duration of reporting period (kWh)

r_k Duration of the k^{th} recording interval, i.e. (1/60) hour

$\sum_k$ Summation over all recording intervals in the reporting period, (1/4) hour

C_k Power rating temperature adjustment factor and can be calculated as below
 $C_k = 1 + \gamma \times (T_{avg_mod,k} - T_{ref})$

γ Temperature coefficient of power with negative sign ($^{\circ}C^{-1}$)

$T_{avg_mod,k}$ Average PV Module temperature measured at the commencement of time interval ' r_k ' (°C)

PV Module temperature at which P_o is determined, i.e. 25°C

P_o Installed nominal peak power of PV modules, i.e. Nameplate rating at STC (kWp)

$G_{i,}$ Average irradiance measured at the Plane of Array (POA) at the commencement of time interval r_k (kW/m²) (average of all Pyranometres in various sites)

$G_{i,ref}$ Irradiance value at which P_o is determined, i.e. 1 kW/m²

2.1.2 General Requirement

- The Functional Guarantee shall comprise of a set of visual/mechanical/Electrical checks followed by a Performance Ratio (PR) test of the Plant Facilities.
- The PR test shall be carried out for a period of 30 consecutive days at site by the Contractor in the presence of PGL Engineer(s).
- These tests shall be binding on both the parties to the contract to determine compliance of the equipment with the guaranteed performance parameters.
- The test will consist of guaranteeing the correct operation of the Plant Facilities, by way of the performance ratio based on the reading of the energy produced and delivered to the grid (ABT meter) and the Plane of Array incident solar radiation.
- PR is calculated as per the formula given in Clause no. 2.1.1.
- The Functional Guarantee condition for the purpose of Provisional Acceptance of the Plant Facilities shall be considered to have been met if the guaranteed Performance Ratio (PR) is achieved on a daily basis for 30 consecutive days.
- During this PR test, equipment failure/interruption of any kind, except for SCADA communication failures, will not be accountable. In case of a breakdown, the test may be resumed once the complete system is rectified and working properly.

IMPORTANT NOTE TO BIDDERS/ SUPPLIERS:-

A. Regarding PPP:

With regard to MNRE order no. 283/22/2019-grid solar dated 23rd Sep' 2020 for the public procurement (preference to Make in India) including any amendments, to provide for purchase preference (linked with local content) in respect of Renewable Energy (RE) Sector & Department for Promotion of Industry and Internal Trade (DPIIT) notification no. P-45021/2/2017- PP (BE-LI) dated 4th June, 2020 including any amendments, the procurement of solar modules & solar inverters for the subject tender will be done from Class-I Local Suppliers only, wherein, a Class-I Local Supplier' means a Supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%, as defined under the above said orders.

B. Regarding ALMM:

The provisions as contained in the O.M. dated 10.03.2021 issued by MNRE on the subject "approved models and manufacturers of solar photovoltaic modules (requirement of compulsory registration) order, 2019- implementation-reg." and its subsequent amendments and clarifications shall be applicable for this tender. The cells and modules used in the project under this tender shall be sourced only from the models and manufacturers included in the List-I (Solar PV Modules) of ALMM order, Annexure-I of the OM, issued by MNRE on 4th March, 2022 (Revision –V) which are being updated by MNRE from time to time. The modules to be procured for this project, shall be from the List-I of the ALMM order applicable on the date of invoicing of such modules. Bidders shall also provide a disclosure regarding that they are aware of binding provisions of the ALMM order and the list(s) thereunder, while quoting for the tender.

C. The Bidder before submitting bid shall ensure that restrictions imposed by the Govt. of India regarding procurement of components for manufacture of the items covered in the bid shall be followed strictly in letter and spirit.

SECTION VI

5. SCHEDULE OF REQUIREMENTS (SOR)

Part I:

The general scope under this contract includes design, manufacture, shop testing, inspection, packing & forwarding, transportation upto project site loading & unloading, storage in safe custody, erection, carrying out preliminary tests at site, commissioning, performance testing & handing over to the purchaser all the equipment installed including the insurance coverage for the concept to commissioning period (10 MONTHS) including operation and maintenance for 5 years after commissioning.

The illustrative Schedule of requirements is in accordance with the specifications contained in this document. The quantity is for one project of 4 MWp capacity.

A	ELECTRO-MECHANICAL WORKS	
SNo.	Brief Description	Units
1	SPV modules for a total capacity 4 MWp (AC side). There is no restriction of DC capacity.	1 Set
2	SPV module ground mounting structure suitable for accommodating 4MWp (AC) capacity SPV modules including foundation.	1 Set
3	String Monitoring Units.	1 Set
4	Central Inverters of minimum 800 KW capacity or above to be supplied for aggregate 4000 KW capacity as per specifications considering site ambient temperature of 50°C.	1 Set
5	Inverter duty Transformer of 4400 KVA, Inverter Voltage/11KV.	1 Set
6	11 KV VCB alongwith current transformer, potential transformer, protection system with cabling etc. alongwith DC system for Control and Supply.	1 Set
7	Aux. AC Distribution Panel as required.	1 Set
8	LT/HT power and control cables requirement as per design.	As required at site
9	Fire extinguishers as per BIS for electrical short circuit fires along with sand buckets.	1 Set
10	Earthing complete set as per specifications.	1 Set
11	Auxiliary transformer 50 KVA, 11KV/415V.	1 Nos.
12	Main Gate to Switch Yard Lighting for the complete area.	1 Set
13	Lightning Arrestors for Plant and Power Evacuation system.	1 Set
14	Weather Monitoring System.	1 Set
15	11 KV H-Pole structure with Isolator and XLPE cables for power evacuation.	1 Set
16	Fuses, MCBs, MCCBs, switches etc. as required for power plant.	1 Set
17	Engineering and installation drawings along with O&M manuals	5 Sets
18	Providing training to engineers and site staff for operating, Maintenance and trouble shooting skills.	
20	Operation and Maintenance of the SPV Power Plant and Evacuation System for a period of 5 years from date of commissioning of the power plant as per scope in Section IX.	
21	Control room, office Air conditioning and workstation alongwith 4 Chairs, Desktop alongwith laserjet all-in-one printer of reputed make any other equipment required to complete the installation.	
22	MS structures of standard steel section for arrays shall be provided by the bidder. The structures should be safe to withstand wind loads upto 180 Kmph.	

B	CIVIL WORKS
BRIEF DESCRIPTION OF CIVIL WORKS AT EACH SITE CONSISTING OF 4MW CAPACITY SOLAR PV PROJECT	

The details of the civil works involved at each project site are as under:

1. Project Land:

The project land is generally plain in nature with gentle gradient. The bidder is required to level the project land at existing N.S.L without involving major backfilling/excavation. All PV module structures are proposed to be erected/installed at N.S.L only. However, the roads/pavements are proposed to be constructed at a level higher than N.S.L (minimum 300 mm above the N.S.L). The gradient of the roads/pavements may be kept as per the existing contours. The project land at the N.S.L maybe lightly rolled/compacted to make it smooth and firm without any pits and humps.

2.Chain-Link Fencing:

The chain link-fencing as proposed in the drawing shall be erected all around the boundary to safe-guard project area.

The chain link fencing shall be of galvanized wire of 10G, the mesh opening shall be 50x 50 mm. The average weight of chain link fencing shall be 3.44 Kg per sqm. The height of the fencing shall be minimum 1800 mm.

The contractor to provide a sleeve of 50 mm dia PVC pipe (6Kg/sqcm) upto road/pavement level around the MS angle (50x50x4) and the sleeve may be filled with M-20 concrete.

The fencing may be provided as per arrangement shown in the drawing.

3.Main Entrance Gate:

The main entrance gate shall be of MS sections (preferably RHS), swing type fixed in the brick masonry columns. A wicket gate of same specifications i.e. MS RHS sections are to be constructed along the main entrance gate.

The size of the gates may be kept as under

- a) Main Gate – 4500x1500 mm
- b) Wicket Gate – 1200x1500 mm

4.Security hut:

The security hut shall be PVC/MS pre-fabricated type of size 2500x2500 mm. Minimum ceiling height shall be 3000mm. The hut shall be provided near the

main entrance gate as indicated in the drawing. The security hut must be placed on the raised M-20 concrete platform of size 3000x3000 mm.

The security hut shall be equipped with all kinds of electrical fixtures such as lighting points, power points and ceiling fans etc. with furniture. It should have an entrance door and window for proper entry/ventilation.

5.Switchyard/ODY:

The switchyard/ODY of 11KV capacity shall be constructed at the location as indicated in the drawing. Chain link fencing may be provided all around the ODY boundary as per the specifications mentioned above.

The Transformer foundation shall be on a raised platform (minimum 600mm above N.S.L). The foundation shall be placed on compacted sub-strata and shall be of R.C.C with minimum M-20 cement concrete and Fe 500 reinforcement steel.

All trenches as per requirement should be of R.C.C M-20 grade and shall be covered with R.C.C covers. The switchyard shall have an entry gate of MS RHS sections and walking paths as per requirement. The switchyard area/paths may be filled with pebbles/gravels.

6.Metering room:

The metering room shall be provided as indicated in the drawing adjoining to the ODY and shall be of size 2500x2500 mm with minimum ceiling height of 3000mm. The metering room shall be built with first class bricks and R.C.C M-20. The metering room shall be provided with all electrical fixtures and wooden/aluminum joinery as per the requirements of PSPCL/PGL. The successful bidder must ensure that the metering room to be constructed is as per guidelines/ specifications of PSPCL.

7.Control Room:

The bidder will provide a Cubicle of PVC/MS structure of “knock down type” as a control room. The control room shall be fully air-conditioned with all electrical fittings/fixtures. The cubicle shall have proper windows and entry doors.

The control room cubicle shall be placed on a raised R.C.C. M-20 concrete platform. The cement concrete platform shall be structurally safe to withstand all the loads/forces. The cubicle may be properly anchored/fixed with R.C.C platform.

The cubicle shall be of sufficient size to accommodate all control panels/Inverter/SCADA system etc. as per requirements to have smooth operation of the plant and necessary safety equipments. The height of the cubicle shall be kept in such a way to have clearance of atleast 600 mm between the top of the control panels and ceiling of the cubicle.

8.PGL office:

The PGL office shall be built at the location indicated in the drawing. The office shall consist of 2 rooms (minimum 4500x4500x3000mm each), 2 bathrooms (separate for Ladies and Gents) and a pantry. The approximate covered area of the office shall be 49.5 sqm. The rooms shall be fully furnished and shall be equipped with all the required electrical fittings (i.e. switches, fans, AC's etc.), furniture as per the requirement. Proper wooden/aluminum joinery such as doors/windows should be provided.

All walls should be cement plastered and painted with branded paints. The flooring shall be of vitrified tiles (minimum size 600x600mm).

The Gents bathroom shall be of size 2000x2000x3000mm and shall consist of 2 Lip-type urinals with separator and 1 W.C and Ladies bathroom shall be of size 2000x1500x3000mm and shall consist of 1 W.C's. and other necessary electrical, sanitary amenities etc. All chinaware such as W.C's/Washbasins etc. shall be of highest quality such as CERA, Hindware etc. or any other equivalent brand. All C.P. fittings such as faucets, taps etc. shall be of good quality and of reputed brands.

All walls shall be cement plastered and painted with branded paints. The flooring shall be of vitrified tiles.

An overhead water tank of Polyethylene material of any reputed brands such as SINTEX, JINDAL etc. of minimum 1000 liters capacity shall be placed on the roof of the bathroom.

The pantry shall be of size 2000x1000x3000 mm and shall consist of a working slab, a washing sink, and provision for the fridge etc.

9.Store/Utility room/general bathrooms:

The block for store/utility room/ common bathrooms shall be built on the location as indicated in the drawing with a minimum covered area of 50 sqm. The minimum sizes shall be as under;

- i) Store: 5000x5000x3000mm
- ii) Utility Room: 3000x5000x3000mm
- iii) General bathrooms:
 - 2000x2000x3000mm (for Ladies)
 - 2000x3000x3000mm (for Gents)

The block shall be equipped with all the required electrical fittings (i.e. switches, fans etc.), furniture as per the requirement. Proper wooden/aluminum joinery such as doors/windows should be provided.

All walls should be cement plastered and painted with branded paints. The flooring except store shall be of vitrified tiles. The store floor shall be of cement concrete.

The General bathrooms shall consist of 2 bathrooms, separate for Ladies and Gents. The Gents bathroom shall have atleast 3 Lip-type urinals with separators and 1 W.C. and the Ladies bathroom shall have 1 W.C's and other necessary electrical, sanitary amenities etc. All chinaware such as W.C's/Washbasins etc shall be of highest quality such as CERA, Hindware etc. or any other equivalent brand. All C.P. fittings such as faucets, taps etc. shall be of good quality and of reputed brands.

An overhead water tank of Polyethylene material of any reputed brands such as SINTEX, JINDAL etc. of minimum 1000 liters capacity shall be placed on the roof of the bathroom and connected with water supply piping.

10. Polyethylene Water tanks alongwith Platform:

2 no. of overhead water tank of Polyethylene material of any reputed brands such as SINTEX, JINDAL etc. of minimum 5000 liters capacity to be placed on raised platform of R.C.C M-20 concrete to accommodate 2 Nos water tanks of capacity 5000 liters each. The height of the platform may be kept minimum 1500 mm higher than the N.S.L.

The location of the platform may be decided by the bidder to have efficient utilization of the storage tanks.

11. Septic tank:

The septic tank shall be of R.C.C and shall be designed for atleast 50 users and may be located at the location as per the site requirements.

12. Module erection arrangement:

The pedestal for the fixing of the module frame shall be of M-20 concrete with a base layer of M-15 P.C.C, the height of the pedestal may be kept atleast 300 mm high from the N.S.L and 500 mm below the N.S.L. The general arrangement for providing the structure is shown in the drawing. The bidder may have its own design and arrangement for module erection, however, the successful bidder must get design approval from PGL prior to module erection. The structure shall be of MS sections such as ISMC, ISMB, ISA etc. upto the top base plate. i.e excluding the module fixing structure frame.

13. Roads/Pavements:

All roads/pavements shall be of cement concrete M-20 grade laid on P.C.C of M-15 grade. The roads/pavements shall be constructed on compacted sub-strata and shall be atleast 300 mm above the N.S.L. The gradient of the roads /pavements may be kept as per the natural contours.

The minimum width of the roads shall be 5.5 m with 0.75 m wide shoulder on each side, whereas the width of the pavements shall be 3 m wide with 0.5m wide shoulder on each side.

The cross section of the road/pavement shall be as per the drawing.

Notes:

1. The scope of work described above is general in nature and indicative only. Any additional structure/civil works invariably required for successful commissioning and operation of the plant shall be considered included in the scope of work. The bidder may evaluate the requirement of civil works- not limited to the above scope- at its own level and may quote the prices accordingly.
2. Nothing extra shall be payable for any additional civil works required for successful commissioning and operation of the plant.
3. All civil works shall be designed and executed as per the prevailing PWD/CPWD specifications and as per the relevant IS codes.
4. All design shall be vetted by PGL & the bidder shall be required to modify the drawings as per the observations of PGL. PGL may appoint an independent consultant for vetting of drawings.

Part II:

S.No.	Brief Description	Delivery and implementation schedule	Earnest Money (INR)
1.	To Design, Manufacture, Supply, Erection, Testing and Commissioning including warranty along with operation and maintenance for 5 years of 4MW each (AC) capacity SPV Power Project at different locations in the State of Punjab.	Delivery & commissioning in 10 months from handing over of site	Rs. 40 lakhs (Rs. Forty Lakhs only) Refer Section-2, ITB clause no. 15.

Note: The requirements for the plant and machinery are indicated in the schedule of requirements. The items indicated in the schedules are only indicative and the suppliers are required to include and quote for any other item left out in the schedule. Complete details and quantity of mandatory spare parts shall be furnished by the supplier in their bid. Suppliers shall offer their complete design along with drawings for the plant in their bids. The details of the energy output for the plant for the entire year based on the global radiation values be furnished by the bidders. Interested Bidders can visit the proposed site for plant installation.

Part-III**Delivery/ Work Schedule:**

1.	Implementation of Project Starts and handing over of site	:
2.	Submission of Detailed Drawing, Design for approval	: 4 weeks from 1
3.	Approval of the Drawing & Design	: 3 weeks from 2
4.	Foundations and civil work for accommodating SPV module mounting structure	: 7 weeks from 3
5.	Completion of all civil constructions/office/control room etc.	: 12 weeks from 3
6.	Supply of module mounting structure and erection of module mounting structure	: 4 weeks from 4
7.	Equipment Simulation and testing/inspections	: 3 weeks from 5
8.	Delivery of all equipment at site	: 10 weeks from 5
9.	Installation of the all equipment and completion of associated inter connections	: 8 weeks from 8
10.	Pre-Commissioning test	: 2 weeks from 9
11.	Commissioning of the Power plant	: 1 weeks from 10
12.	Training	: 2 weeks from 11
13.	Handing over along with all documents/manuals/drawings	: 1 week from 12

Note: The delivery and commissioning schedule annotated above reckons from the date of handing over of site. Provision for power evacuation, VCB and metering in PSPCL Grid will be got done by the Bidder from PSPCL on deposit basis for which actual charges will be reimbursed.

In case of delays in completion of project milestones activities as given in delivery/work schedule above, PGL retains the right to impose penalties in accordance with Section – II, ITB 32.2.

SECTION VII

7. TECHNICAL SPECIFICATIONS (TS)

General Description

The grid connected SPV power plant at each location shall have a capacity of 4 MWp (AC side) with total cumulative capacity being 16 MWp. The power plant shall provide a reliable and independent power supply to PSPCL at 11 KV bus in the nearest 66/11KV Grid in IPP mode which are also indicated in the NIT. As the Delivery/Interconnection point is located in the PSPCL grid, as such the quantum of export i.e. 4 MWp on AC side is measurable at the Delivery Point separately for each location and there will be no limitation on DC capacity of the project. The power plant shall have provision to meet the auxiliary power requirements of the plant such as control room, yard lighting and export the excess power generated to the PSPCL grid after stepping it up to 11KV.

The Inverter shall be designed to convert DC power produced by SPV modules, in to AC power and adjust the voltage & frequency levels to suit the grid voltage & frequency.

The plant shall also have a provision to import power from grid for localized use in case of load exceeding the PV generation/ non-availability of backup DC power during night/shut down conditions.

Note: The equipments described in this Section are for a SPV Project of 4 MWp (AC) capacity and the scope described herein will be identical for all the Projects.

1. Solar Photovoltaic Modules

- 1.1 The total Solar PV minimum array capacity shall be such that 4 MWp on AC side is injected at Delivery point located in the PSPCL grid throughout during the term of contract /PPA. Solar Modules shall be Mono-crystalline PERC of minimum 380 Wp and above wattage. Module capacity less than minimum 380 Wp should not be supplied. The Photovoltaic modules must be tested and certified by an independent testing laboratory that is accredited in accordance with ISO Guide 25. Photovoltaic Modules shall comply with the specified edition of the following standards and codes. Also, the half cut cell technology in the modules will not be accepted.

Standard	Description
IEC 61215-1:2016 Ed.1	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1: Test requirements
IEC 61215-1-1:2016 Ed.1	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules
IEC 61215-1-2 Ed.1	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-2: Special requirements for testing of thin-film Cadmium Telluride (CdTe) based photovoltaic (PV) modules
IEC 61730-1:2016 Ed.2	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction

IEC 61730-2:2016 Ed.2	Photovoltaic (PV) module safety qualification - Part 2:Requirements for testing
IEC 62716:2013 Ed.1	Photovoltaic (PV) modules - Ammonia corrosion testing (if applicable)
IEC TS 62804-1:2015 Ed.1	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon (under conditions of 85°C/85% RH for minimum 192 hours)
As per the Solar Photovoltaic, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, PV Modules used in the grid connected solar power projects shall be registered with BIS and bear the Standard Mark as notified by the Bureau of Indian Standards. Further, PV Modules should have been included in the ALMM list as per MNRE Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirements for Compulsory Registration) Order, 2019 and its amendments thereof.	

1.2 Technical Requirements:

Parameter	Specification
Cell/ Module Technology	Mono crystalline PERC
Origin	Modules shall be domestically manufactured
Module Efficiency (at STC)	≥ 20.0%
Rated power at STC	No negative tolerance is allowed
Temperature co-efficient of power	Not less than -0.40%/°C
Application Class as per IEC 61730	Class A

1.3 Component Specifications:

1.3.1 The PV Modules glass panel shall be:

- i) Modules, with minimum of 3.2 mm glass thickness. It shall be laminated using a laminator with symmetrical structure, i.e. heating plates on both sides.

1.3.2 The encapsulant used for the PV modules should be polyolefin based, UV resistant and PID resistant in nature. No yellowing of the encapsulant with prolonged UV exposure shall occur. The encapsulant shall have the following properties:-

Parameter	Value
Gel content	> 75%
Volume resistivity	> $1 \times 10^{15} \Omega \cdot \text{cm}$
Peeling strength with glass	> 40 N/cm

- 1.3.3 The sealant used for edge sealing of PV modules shall have excellent moisture ingress protection with good electrical insulation (Break down voltage >18 kV/mm) and with good adhesion strength. Edge tapes for sealing are not allowed.
- 1.3.4 The module frame shall be made of anodized Aluminum, which shall be electrically & chemically compatible with the structural material used for mounting the modules. It is required to have provision for earthing to connect it to the earthing grid. The anodization thickness shall not be less than 15 micron.
- 1.3.5 The material used for junction box shall be UV resistant to avoid degradation during module life. The degree of protection of the junction box shall be at least IP68. Minimum three number of bypass diodes and two number of IEC 62852/EN 50521 certified MC4 compatible connectors with appropriate length of IEC 62930/EN 50618 certified 4 sq.mm copper cable shall be provided. The cable length shall be in accordance with the PV Module wiring strategy and adequate to ensure that the cable bending radius standard is not exceeded.
- 1.3.6 Each PV Module shall be provided a bar code which is embedded inside the module lamination and must be able to withstand harsh environmental conditions. The bar code data base shall contain the following information. Bar code scanner and database of all the modules containing the following information shall also be provided.
 - i) Name of the manufacturer of PV Module
 - ii) Name of the Manufacturer of Solar cells
 - iii) Type of cell: Monocrystalline
 - iv) Month and year of the manufacture (separately for solar cells and module)
 - v) Place of Manufacture (separately for solar cells and module)
 - vi) I-V curve for the module
 - vii) Peak Wattage, I_m , V_m and FF for the module
 - viii) Unique Serial No. and Model No. of the module.
 - ix) Date and year of obtaining IEC PV module qualification certificate
 - x) Name of the test lab issuing IEC certificate
 - xi) Other relevant information on traceability of solar cells and modules as per ISO9000 series.

1.4 Warranty

- 1.4.1 PV modules must be warranted with linear degradation rate of power output except for first year (maximum 0.7% including Light Induced Degradation (LID)) and shall guarantee 80% of the initial rated power output at the end of 25 years.
- 1.4.2 The modules shall be warranted for minimum of 12 years against all material/ manufacturing defects and workmanship.

1.5 Approval

- 1.5.1 The Contractor shall provide Guaranteed Technical Particular (GTP) datasheet and Bill of Materials (BOM) of the module that is submitted for approval along with the datasheets of each component. The component datasheet shall contain all the information to substantiate the compliance for component specifications mentioned above.
- 1.5.2 The Contractor shall also provide test certificates corresponding to the standards mentioned above along with complete test reports for the proposed module. The tests should have been conducted at a test laboratory compliant with ISO 17025 for testing and calibration and accredited by an ILAC/IECEE member signatory. Laboratory accreditation certificate or weblink along with scope of accreditation shall also be submitted.
- 1.5.3 The BOM proposed shall be the subset of Constructional Data Form (CDF)'s of all the test reports.
- 1.5.4 The Contractor shall submit a detailed Manufacturing Quality Plan (MQP) for the PV Module with list of checks/tests performed during incoming material inspection, production, pre-dispatch and package.
- 1.5.5 The Contractor shall obtain the approval of the proposed module make & model prior to manufacturing/ inspection call.

1.6 Manufacturing and Inspection

- 1.6.1 The Contractor shall inform the module manufacturing schedule to the PGL at least 7 (seven) working days before the start of proposed schedule.
- 1.6.2 The PGL may perform material inspection at the Manufacturer's factory before the start of proposed manufacturing schedule. Proof of procurement of components as per the approved BOM mentioning manufacturer name, manufacturing date and relevant test certificate shall be submitted during material inspection for verification.
- 1.6.3 The Manufacturing shall start only after the clearance by the PGL.
- 1.6.4 The cells used for module making shall be free from all defects like edge chipping, breakages, printing defects, discoloration of top surface etc. Only Class A solar cell shall be used.
- 1.6.5 The modules shall be uniformly laminated without any lamination defects.
- 1.6.6 Pre-dispatch inspection of modules shall be performed as per the inspection protocol mentioned in this document.

1.7 Transportation, Handling, Storage and Installation

- 1.7.1 Transportation, handling, storage and installation of modules shall be in accordance with the manufacturer manual so as not to breach warranty conditions. The Standard Operating

Procedure (SOP) for the same shall be shared by the Contractor prior to dispatch.

1.7.2 It is required to construct a temporary platform (graded) while keeping the modules at least above the highest flood level. If the contractor scheduled/ planned to mount the modules immediately after the receipt at site, then the module shall be kept in common storage area with proper arrangement.

1.7.3 Modules shall be dispatched in line with the Construction schedule. If Modules are dispatched ahead of schedule, following measures shall be undertaken:

Modules shall be covered with tarpaulin sheet. Alternatively, the Modules, properly stacked as per OEM recommendations, shall be stores under a temporary shed. Further, the temporary platform for keeping the modules shall be treated with anti- termite treatment.

2 String Monitoring Unit (SMU)

1.1 Standards and Codes

Standard/Code	Description
IEC 60529	Enclosure Ingress Protection
IEC 62262	Enclosure Impact Protection
IEC 60269	Fuse
IEC 61643-11	Surge Protection Device
IEC 62852 or EN 50521	Solar cable connector
IEC 60695-2-11	Fire hazard testing

1.2 Construction

1.2.1 SMU enclosure shall be made of UV resistant, fire retardant, thermoplastic material. Enclosure degree of protection shall be at least IP65 and mechanical impact resistance shall be at least IK08.

1.2.2 Not more than two strings can be connected in parallel to a single input of SMU. One spare input terminal along with connector shall be provided for each SMU.

1.2.3 Every SMU input shall be provided with fuses on both positive and negative side. In case of negative grounded system, fuse at positive side only is acceptable. The rating of the fuses shall be selected such that it protects the modules from reverse current overload. The fuses shall be 'gPV' type conforming to IEC 60269-6.

1.2.4 DC switch disconnecter of suitable rating shall be provided at SMU output to disconnect both positive and negative side simultaneously.

1.2.5 Type-II surge protective device (SPD) conforming to IEC 61643-11/IEC 61643-31/ EN 50539-11 shall be

connected between positive/negative bus and earth.

1.2.6 Resistance Temperature Detector (RTD) type or semiconductor type temperature sensor shall be provided to monitor the cabinet temperature.

1.2.7 MC4 connector conforming to IEC 62852 or EN 50521 shall be provided at each SMU input. Cable gland (double compression metallic) of suitable size for DC cables shall be provided at the SMU output.

1.2.8 UV resistant printed cable ferrules for solar cables & communication cables and punched/ embossed aluminum tags for DC cables shall be provided at cable termination points for identification.

1.2.9 Suitable communication interface shall be provided to communicate the data to SCADA. The following parameters shall be measured/ monitored and made available at SCADA:

- i) String current
- ii) Bus voltage
- iii) Output current
- iv) Cabinet temperature
- v) DC disconnect switch ON/OFF status
- vi) SPD operating status

1.3 Warranty

The SMU unit shall be warranted against all material/ manufacturing defects and workmanship for minimum of 2 (two) years from the date of supply.

1.4 Tests

Routine tests and acceptance tests for the assembled unit shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

2. **Solar and DC Cables**

2.1 Standards and Codes

Cable	From	To	Conductor/ Insulation	Voltage Rating	Applicable Standard
Solar Cable*	Module	SMU	Copper/ XLPO	1.1 kV DC/ 1.5 kV DC	IEC 62930/ EN50618
DC Cable	SMU	PCU	Copper or Aluminum/ XLPE	1.1 kV DC/ 1.5 kV DC	IS 7098 Part I for 1.1 kV DC IS 7098 Part II for 1.5 kV DC
* Cable used for module interconnection shall also be referred as solar cable.					

- 2.2 Solar cable outer sheath shall be flame retardant, UV resistant and black in colour. Solar cable with positive polarity should have marking of red line on black outer sheath.
- 2.3 DC cables shall be single core, armoured, Flame Retardant Low smoke (FRLS), PVC outer sheath conforming to IS 7098-I /IS 7098-II. DC cable with positive polarity should have marking of red line on black outer sheath.
- 2.4 In addition to manufacturer's identification on cables as per relevant standard, following marking shall also be provided over outer sheath.
- (i) Cable size and voltage grade
 - (ii) Word 'FRNC/ FRLS' (as applicable) at every metre
 - (iii) Sequential marking of length of the cable in metres at every metre
- 2.5 Cables shall be sized based on the following considerations:
- i) Rated current of module
 - ii) Based on finalized design for DC system, in case of central inverters, average voltage drop in the cables (from PV Modules to PCU) shall be limited to 1.5 % of the rated voltage. The Contractor shall provide voltage drop calculations in excel sheet.
 - iii) Short circuit withstand capability
 - iv) De-rating factors according to laying pattern

2.6 Warranty

The cables (Solar and DC) shall be warranted against all material/ manufacturing defects and workmanship for minimum of 1 (one) year from the date of supply.

2.7 Tests

Type test, routine test and acceptance tests requirements shall be as per IEC 62930/EN 50618 for solar cables and IS 7098-1 for DC cables.

2.8 Installation

2.8.1 Cable installation shall be as per IS 1255.

Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted.

2.8.2 Solar cables shall be provided with UV resistant printed ferrules and DC cables shall be provided with punched/ embossed aluminum tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.

2.8.3 Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu bus bar and Al cables or vice-versa.

2.8.4 Solar cables, wherever exposed to direct sunlight and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits. The size of the conduit or pipe shall be selected on the basis of 40% fill criteria.

2.8.5 Solar cables shall be aesthetically tied to Module Mounting Structure using UV resistant cable-ties suitable for outdoor application.

2.8.6 A.C and D.C cables shall be kept in separate trenches. The horizontal and vertical clearances between power and communication cable shall not be less than 300mm.

3. Power Conditioning Unit (PCU)

3.1 Standards and Codes

Power Conditioning Unit (PCU) shall comply with the specified edition of the following standards and codes.

Standard	Description
IEC 61683 Ed. 1	Photovoltaic systems - Power conditioners - Procedure for measuring efficiency
IEC 62109-1 Ed. 1	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
IEC 62109-2 Ed. 1	Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
IEC 61000-6-2 Ed. 2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
IEC 61000-6-4 Ed. 2.1	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
IEC 62116 Ed. 2	Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures
IEC 60068-2-1:2007	Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2:2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-14:2009	Environmental testing - Part 2-14: Tests - Test N: Change of temperature
IEC 60068-2-30:2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)
CEA Technical Standards for Connectivity to the Grid Regulations 2007 with 2013 and 2019 Amendment	

3.2 Technical Requirements

Parameter	Specification
Type	Central
No. of PCU	1 Lot 4 MW capacity
Rated AC power	Minimum 800 KW or above
Maximum input DC voltage	600 V - 1500 V
Rated AC output voltage	As per design
Tolerance on rated AC output voltage	+/-10%
Rated frequency	50 Hz
Operating frequency range	47.5 Hz to 52 Hz
Power factor control range	0.9 lag to 0.9 lead
European efficiency	Minimum 98%
Maximum loss in Sleep Mode	0.05% of rated AC power
Total Harmonic Distortion	Less than 3% at 100% load
Degree of protection	IP 66 (Outdoor type)
Make	i) FIMER ii) HITACHI

3.2.1 The rated/ name plate AC capacity of the PCU shall be AC power output of the PCU at 50°C.

3.2.2 Maximum power point tracker (MPPT) shall be integrated in the PCU to maximize energy drawn from the Solar PV array. The MPPT voltage window shall be sufficient enough to accommodate the output voltage of the PV array at extreme temperatures prevailing at site.

3.2.3 The PCU output shall always follow the grid in terms of voltage and frequency. The operating voltage and frequency range of the PCU shall be sufficient enough to accommodate the allowable grid voltage and frequency variations.

3.3 Construction

3.3.1 Power Conditioning Unit (PCU) shall consist of an electronic three phase inverter along with associated control, protection, filtering, measurement and data logging devices.

3.3.2 Every DC input terminal of PCU shall be provided with fuse and contactors of appropriate rating. The combined DC feeder shall have suitably rated isolators for safe start up and shut down of the system. One spare DC input

terminal shall be provided for each PCU.

- 3.3.3 Type-II Surge Protective Device (SPD) conforming to IEC 61643-11/IEC 61643-31/ EN 50539-11 shall be connected between positive/ negative bus and earth.
- 3.3.4 The inverter should have its own auxiliary power supply for its own auxiliary loads.
- 3.3.5 Circuit Breaker of appropriate voltage and current rating along with the necessary protection system shall be provided at the output to isolate the PCU from grid in case of faults.
- 3.3.6 The PCU shall be tropicalized and the design shall be compatible with conditions prevailing at site. Suitable number of exhaust fan with proper ducting shall be provided for cooling keeping in mind the extreme climatic condition of the site as per the recommendations of OEM to achieve desired performance and life expectancy.
- 3.3.7 All the conducting parts of the PCU that are not intended to carry current shall be bonded together and connected to dedicated earth pits through protective conductor of appropriate size. DC negative terminal shall be grounded. In case DC negative grounding is not possible, appropriate anti-PID device shall be provided.
- 3.3.8 Dedicated communication interface shall be provided to monitor the PCU from SCADA.

PCU front panel shall be provided with LCD/ LED to display all the relevant parameters related to PCU operation and fault conditions. It shall include, but not limited to, the following parameters.

- 1) DC input power
- 2) DC input voltage
- 3) DC input current (for each terminal)
- 4) AC output power
- 5) AC output voltage (all the 3 phases and line)
- 6) AC output current (all the 3 phases and line)
- 7) Frequency
- 8) Power Factor

3.4 Operating Modes

Operating modes of PCU shall include, but not limited to, the following modes. These operating modes and conditions for transition are indicative only. The Contractor shall provide the detailed flow chart indicating the various operating modes and conditions for transition during detailed engineering.

3.4.1 Standby Mode

The PCU shall continuously monitor the input DC voltage and remain on Standby Mode until it reaches the pre-set value.

3.4.2 MPPT Mode

When the input DC voltage is above the pre-set value and AC grid connection conditions are fulfilled, the PCU shall enter into MPPT mode.

3.4.3 Sleep Mode

When the AC output power/DC input voltage decreases below the pre-set value for pre-set time delay, the PCU shall switch into Sleep Mode.

3.5 Protection Features

The PCU shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU's safe operating range due to internal or external causes. The self-protective features shall not allow signals from the PCU front panel to cause the PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices.

The PCU shall provide protection against the following type of faults, among others.

- (i) DC/AC over current
- (ii) DC/AC over voltage
- (iii) DC reverse polarity
- (iv) DC earth fault
- (v) AC under voltage
- (vi) AC under frequency/over frequency
- (vii) Islanding
- (viii) Over temperature
- (ix) Lightning surges

3.6 Grid Support Functions**3.6.1 Active power regulation**

The PCU shall be able to limit the active power exported to the grid based on the set point provided through PCU front control panel. The PCU shall also be able to automatically limit the active power after an increase in grid frequency above a pre-set value. The ramp rate shall be adjustable during operation and start-up after fault. The applicability of the requirement shall be as per CEA regulation and compliance.

3.6.2 Reactive power control

The PCU shall be able to inject /absorb reactive power to/ from the grid based on the set point provided through PCU front control panel. The same shall be performed automatically with adjustable ramp rate based on dynamic changes in grid voltage or reactive power reference.

3.6.3 Voltage Ride Through

The PCU shall remain connected to the grid during temporary dip or rise in grid voltage as per the LVRT and HVRT requirements of CEA Technical Standards for Connectivity to the Grid Regulations. The PCU shall also be able to inject reactive power during the period of voltage dip.

3.7 Warranty

The complete Power Conditioning Unit shall be warranted against all material/ manufacturing defects and workmanship for minimum of 5 (five) years.

3.8 Tests**3.8.1 Type Tests**

The type test certificates as per the standards mentioned above should be from any of the ILAC/IECEE member signatory accredited test centres. Laboratory accreditation certificate or weblink along with scope of accreditation shall also be submitted. It is the responsibility of the Contractor to substantiate the compliance for CEA Regulations using test reports.

3.8.2 Routine Tests

Routine tests and acceptance tests shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

4. Inverter Transformer and Auxiliary Transformer**4.1 Standards and Codes**

Inverter transformer and auxiliary transformer, shall comply with the latest edition of the following standards and codes including amendments.

Standard	Description
IS 2026, IEC 60076	Specification of Power Transformers
IS 2099, IEC 60137	Bushings for alternate voltage above 1000 V
IS 335, IEC 60296	Insulating oil
IS 3639 or as applicable	Fittings and Accessories for Power Transformers

IS 12063	Degree of protection provided by enclosures
Indian Electricity rules and other statutory regulations	

4.2 Technical Requirements

Parameters	Inverter Transformer	Auxiliary Transformer
VA Rating	4400 KVA	50 KVA
Voltage Ratio	Inverter Voltage/11KV	11 KV/415 V
Duty, Service & Application	Continuous Solar Inverter application and converter Duty (Outdoor)	Continuous application (Outdoor)
Frequency	50 Hz	50Hz
Nos. of Phase	3	3
Vector Group & Neutral earthing	As per system/inverter manufacturer requirement	Dyn11
Cooling	ONAN	ONAN/ AN
Tap Changer	OCTC, No. of steps shall be as per system requirement	
Impedance at 75°C	As per Inverter Manufacturer requirement	As per system requirement
Permissible Temperature rise over an ambient of 50°C (irrespective of tap)		
Top Oil	50°C	As per IS/IEC
Winding	55°C	As per IS/IEC
SC withstand time (thermal)	2 second	2 second
Short Circuit Apparent power	As per system requirement	
Termination	As per system requirement	
Bushing rating, Insulation class (Winding & bushing)	As per standards of manufacturer	As per the system requirement
Noise level	As per NEMA TR-1	
Loading Capability	Transformer shall be capable of being loaded in accordance with IEC 60076-7	
	Not to exceed 1.9 Wb/sq.m. at any tap position with combined frequency and voltage variation from rated	

Flux density	V/ratio by 10% corresponding to the tap. Transformer shall also withstand following over fluxing conditions due to combined voltage and frequency fluctuations: a) 110% for continuous rating b) 125% for at least one minute 140% for at least five seconds. Bidder shall furnish overfluxing characteristic up to 150%
Air Clearance	As per CBIP

Note: The auxiliary transformer will be oil type as per Clause 5.4 below and will be fed from 11 KV bus and will feed ACDB for plant auxiliaries.

5.3 Construction

- 5.3.1 The transformer shall be provided with conventional single compartment conservator with prismatic toughened glass oil gauge. The top of the conservator shall be connected to the atmosphere through indicating type cobalt free silica gel breather with transparent enclosure. Silica gel shall be isolated from atmosphere by an oil seal. Inverter transformers shall be provided with Magnetic Oil Gauge (MOG) with low oil level alarm contact.
- 5.3.2 It is the responsibility of the Contractor to ensure that the inverter transformer comply with all the requirements of inverter provided by the inverter manufacturer.
- 5.3.3 Inverter Transformer shall be designed for at least 5% total harmonic distortion (THD) to withstand distortion generated by the inverter as well as possible outside harmonics from the network.
- 5.3.4 The transformer shall be suitable for continuous operation with a frequency variation of $\pm 2.5\%$ from nominal frequency of 50 Hz without exceeding the specified temperature rise.
- 5.3.5 Inverter Transformer shall have shield winding between LV & HV windings. Each LV winding must be capable of handling non-sinusoidal voltage with voltage gradient as specified by the inverter manufacturer. Also, shield winding shall be taken out from tank through shield bushing and the same shall be brought down to the bottom of the tank using copper flat and support insulator for independent grounding.
- 5.3.6 Neutral bushing of Inverter duty transformer shall be brought outside the tank for the testing purpose. It shall be covered with MS sheet and a sticker "For testing purpose only. Do not earth". Neutral bushing of auxiliary transformer shall be brought outside the tank for earthing.
- 5.3.7 Transformer shall have 150 mm dial type Oil Temperature Indicator (OTI) and Winding Temperature Indicator (WTI) with alarm and trip contacts. All indicators shall have accuracy of 1.5%. For inverter transformers, WTI shall be provided for all the windings.

- 5.3.8 The radiators shall be detachable type, mounted on the tank with shut off valve at each point of connection to the tank, lifts, along with drain plug/ valve at the bottom and air release plug at the top.
- 5.3.9 Marshalling Box shall be of sheet steel, dust and vermin proof provided with proper lighting and thermostatically controlled space heaters. The degree of protection shall be IP 55. Marshalling Box of all transformers shall be preferably Tank Mounted. One dummy terminal block in between each trip wire terminal shall be provided. At least 10% spare terminals shall be provided on each panel. The gasket used shall be of neoprene rubber. Wiring scheme (TB details) shall be engraved in a stainless-steel plate with viewable font size and the same shall be fixed inside the Marshalling Box door.
- 5.3.10 Buchholz relay, double float type with alarm and trip contacts, along with suitable gascollecting arrangement shall be provided.
- 5.3.11 Inverter transformer shall be provided with spring operated Pressure Relief Device (with trip contacts) with suitable discharge arrangement for oil. For Auxiliary transformers, diaphragm type explosion vent shall be provided.
- 5.3.12 Filter valve at top the tank and drain cum sampling valve at bottom of the tank shall be provided.
- 5.3.13 All external surface of the transformer shall be painted with two coats of epoxy-based paint of colour shade RAL 7032. Internal surface of cable boxes and marshalling box shall be painted with epoxy enamel white paint. The minimum dry film thickness (DFT) shall be 100 microns.
- 5.3.14 LV and HV cable box shall be provided with disconnecting chamber to facilitate the movement of transformer without disturbing cable box and termination.
- 5.3.15 Air release plug, bi-directional wheel/skids, cover lifting eyes, transformer lifting lugs, jacking pads, towing holes, core and winding lifting lugs, inspection cover, rating plate, valve schedule plate, accessories and terminal marking plates, two nos. of earthing terminals shall be provided.
- 5.3.16 Rain hoods to be provided on Buchholz, MOG & PRD. Entry points of wires shall be suitably sealed.
- 5.3.17 The accessories listed above are indicative only. Accessories which are not mentioned above but required for satisfactory operation of the transformers are deemed to be included in the contract without extra charges.
- 5.3.18 Fire-protection for inverter transformer shall be provided in accordance with relevant CEA regulations as amended time to time.

5.4 Oil Type Auxiliary Transformer

- 5.4.1 Transformer shall be Oil type transformer, made of cold rolled grain-oriented silicon steel laminations of M4 grade or better.

Winding conductor shall be electrolytic grade Copper/Aluminum and insulation shall be ClassF or better.

- 5.4.2 The transformers shall be housed in a metal protective housing, having a degree of protection suitable for outdoor installation. The enclosure shall be provided with suitable hardware and accessories required for satisfactory operation of the transformer per the relevant standard.

5.5 Warranty

The transformer shall be warranted against all material/manufacturing defects and workmanship for minimum of 5 (five) years from the date of supply.

5.6 Testing and Inspection

5.6.1 Type Tests and Special Tests

The following type test and special test reports shall be submitted during detailed engineering. The tests should have been conducted on the similar transformer by NABL accredited laboratory.

5.6.1.1 Type Tests

- (i) Lightning impulse (Full & Chopped Wave) test on windings as per IEC 60076-3
- (ii) Temperature Rise test at a tap corresponding to maximum losses as per IEC60076-2

5.6.1.2 Special Tests

- (i) Measurement of zero-sequence impedance as per IEC 60076-1
- (ii) Measurement of harmonics of no-load current as per IEC 60076-1
- (iii) Measurement of acoustic noise level as per NEMA TR-1
- (iv) Short-circuit withstand test as per IEC 60076-5

In case the contractor is not able to submit the test reports during detailed engineering, the contractor shall submit the reports of type/special tests either conducted by NABL accredited laboratory or witnessed by Employer.

- 5.6.1.3 Type and Special tests are not required for auxiliary transformers of rating including 100 KVA and below. However, auxiliary transformer shall have minimum 3 star BEE rating as per BIS guidelines.

5.6.2 Routine Tests

Each completed transformer shall be subjected to following routine tests as per the latest edition of IEC 60076 unless specified otherwise.

- i) Measurement of winding resistance at each tap
- ii) Measurement of voltage ratio between HV and LV windings at each tap

- iii) Check of vector group
- iv) Measurement of no-load loss and no-load current
- v) Measurement of short-circuit impedance and load loss
- vi) Magnetic balance test as per CBIP manual publication no. 295
- vii) Separate source voltage withstand test
- viii) Induced over voltage withstand test
- ix) Measurement of insulation resistance
- x) Marshalling box functional test
- xi) IR Measurement on wiring of marshalling box
- xii) Breakdown voltage test on transformer oil as per IS 335
- xiii) Oil leakage test on completely assembled transformer along with radiators

5.6.3 Tests at Site

After erection at site all transformer(s) shall be subjected to the following tests:-

- i) Measurement of voltage ratio
- ii) Check of vector group
- iii) Magnetic balance test
- iv) Measurement of insulation resistance
- v) Breakdown voltage test on transformer oil

In case the equipment is not found as per the requirements of the Technical Specifications of NIT, all expenses incurred during site testing will be to the Contractor's account and the equipment shall be replaced by him at free of cost.

6 HT Switchgear

6.1 Standards and Codes

All equipment provided under HT switchgear shall comply with latest editions and amendments of the relevant IEC standards and IS codes. In particular, the switchgear shall comply with the following standards and codes.

Standard/Code	Description
IS/IEC 62271-1	High Voltage Switchgear and Control gear - Part 1: Common Specifications
IS/IEC 62271-100	High Voltage Switchgear and Control gear - Part 100: AC Circuit Breakers
IS/IEC 62271-102	High Voltage Switchgear and Control gear - Part 102: AC Disconnectors and Earthing Switches
IS/IEC 62271-200	High Voltage Switchgear and Control gear - Part 200: AC Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 kV and Up to and Including 52 kV
IEC 61869	Instrument Transformers
IS 3231	Electrical relays for power systems protection
IEC 60255	Measuring relays and protection equipment

IEC 61850	Communication networks and systems for power utility Automation
IEC 61131-3	Programmable controllers - Part 3: Programming languages
IS 9385	High voltage fuses
IS 9431	Indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to and including 300 kV
IEC 60099-4	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for A.C. systems
IS 3070-3	Lightning Arresters for Alternating Current Systems - Part 3: Metal Oxide Lightning Arresters Without Gaps
IEC 62052-11	Electricity metering equipment (A.C.) - General requirements, tests and test conditions - Part 11: Metering equipment
IEC 62053	Electricity metering equipment (A.C.) - Particular requirements

6.2 Technical Parameters

Parameter	Specification
System Parameters	
Highest system voltage	12 kV
Rated system voltage	11 kV
Rated frequency	50 Hz
Number of phases	3
Power frequency withstand voltage	70 kV (r.m.s.)
Lightning impulse withstand voltage	170 kV (peak)
System fault current	25 KA
Circuit Breaker	
Type	Vacuum type
Operating duty cycle	O – 0.3sec – CO – 3min – CO
Short circuit breaking current	As per system requirement
Short circuit making current	2.5 times S.C. breaking current
Current Transformer	
Accuracy class	0.2 for metering (0.2s for metering at outgoing feeder), 5P10 for protection
Rated VA burden	As per requirement
Insulation class	Class F
Voltage Transformer	
Accuracy class	0.2 for metering, 3P for protection
Rated VA burden	As per requirement
Insulation class	Class F

6.3 S

switchgear Panel (Outdoor/ Indoor)

6.3.1 The switchgear panel shall be free standing, floor mounted, single front, single tier fully compartmentalized, metal enclosed construction. Each panel shall have separate compartments for circuit breaker, bus bars, cable termination and auxiliary circuit, CTs, PTs, relays etc.

6.3.2 The circuit breakers shall be mounted on horizontally withdrawable

trucks with locking facility in SERVICE and TEST positions.

- 6.3.3 The panel enclosure shall be constructed with CRCA steel/Aluzinc sheet. The thickness of load bearing members shall be minimum 3 mm and that of non-load bearing members shall be minimum 2 mm.
- 6.3.4 All surfaces shall be painted with two coats of epoxy-based paint of colour shade RAL 7032. The minimum dry film thickness (DFT) shall be 100 microns.
- 6.3.5 The circuit breaker and auxiliary circuit compartments provided on the front side shall have separate concealed hinged doors. Cable and bus bar compartments provided on the rear side shall have separate bolted covers. All doors and covers shall be provided with neoprene/synthetic rubber gaskets to prevent entry of vermin and dust.
- 6.3.6 Pressure relief device shall be provided in each high voltage compartment of a panel to safely vent the gases in the event of internal arc. Seal-off bushing arrangement shall be provided between the breaker compartment and bus bar/cable compartments to prevent transfer of arc from one compartment to other.
- 6.3.7 Automatic safety shutters shall be provided to cover up the fixed high voltage contacts on bus bar and cable sides when the truck is moved to TEST position. For outdoor panels, degree of protection shall not be less than IP 55.
- 6.3.8 Mechanical /Electrical interlocks shall be provided to prevent mal-operation and in particular to ensure the following.
- 6.3.9 The breaker shall be operated only if it is in SERVICE or TEST position.
- 6.3.10 Movement of the breaker truck between SERVICE and TEST positions shall be possible only if the breaker is OFF.
- 6.3.11 It shall be possible to open the door only when the breaker is in TEST position.
- 6.3.12 Panel shall be provided with local bus-bar protection
- 6.3.13 Each switchgear panel shall be provided with thermostatically controlled space heaters, separately for breaker, cable and bus bar compartments, to prevent condensation within the compartment. The space heater shall be connected to 240 V, 50 Hz, single phase AC supply through suitable switch and fuse.
- 6.3.14 240 V, 5 A, SPN industrial socket-outlet with ON/OFF switch shall be provided in panel.
- 6.3.15 Panel shall be provided with LED lamp rated for 240 V, 50 Hz, single phase AC supply for interior illumination controlled by door switch.
- 6.3.16 Gapless, metal-oxide surge arrestors shall be provided between line and earth in cable compartment of the switchgear panel.
- 6.3.17 Suitable lifting hooks shall be provided for each panel.

6.4 Circuit Breakers

- 6.4.1 Circuit breakers shall be of vacuum type. It shall comprise of three separate identical single pole units operated through the common shaft and shall be fully interchangeable both electrically and mechanically.
- 6.4.2 The circuit breaker operating mechanism shall be based on motor operated spring charging and it shall be re-strike free, trip free both electrically and mechanically, with anti-pumping feature.
- 6.4.3 The rated control voltage of the spring charging motor shall be 110 VDC/230 VAC or as per system design. Closing coil shall operate at all values of voltages between 85% and 110% of rated voltage. Opening coil shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity and at all values of supply voltage between 70% and 110% of rated voltage.

The spring charging motor shall have adequate thermal rating such that continuous sequence of the closing and opening operations is possible as long as power supply is available to the motor. It shall also be possible to charge the spring manually and close the breaker in the event of failure of motor / control supply to motor. Operating handle shall be provided for charging the operating mechanism. After failure of control supply to the motor, one open-close-open operation shall be possible with the energy contained in the operating mechanism.

- 6.4.4 The motor rating shall be such that it requires not more than 30 seconds for full charging of the closing spring. Closing action of the circuit breaker shall compress the opening spring ready for tripping. When closing springs are discharged after closing the breaker, they shall be automatically charged for the next operation.
- 6.4.5 Mechanical indicators shall be provided to indicate OPEN/CLOSED positions of the circuit breaker and CHARGED/DISCHARGED positions of the closing spring. An operation counter shall also be provided. These indicators and counter shall be visible from the panel front door without opening it.

6.5 Relays

- 6.5.1 All relays shall be microprocessor based numerical type. However, auxiliary relays can be static or electromechanical type. The relays shall be flush mounted on panel front with connections from the inside.
- 6.5.2 Auxiliary voltage of the relays shall be 110 VDC and the relays shall be capable of operating continuously between 80 – 120% of auxiliary voltage.
- 6.5.3 All numerical relays shall have adequate number of freely configurable, optically isolated, Binary Inputs (BI) and potential free Binary Outputs (BO).
- 6.5.4 All numerical relays shall have minimum four no. of current inputs, three for phase current and one for earth current, suitable for CT secondary current of 1A. The current inputs shall be compatible with

- both residual connected CT and Core Balance CT (CBCT). In addition, numerical relay in main outgoing feeder shall have three no. of voltage inputs for Under Voltage/Over Voltage protection.
- 6.5.5 All I/O's shall have galvanic isolation. Analog inputs shall be protected against switching surges and harmonics.
- 6.5.6 Making, breaking and continuous capacity of the relay contacts shall be adequate enough for the circuits in which they are used.
- 6.5.7 The numerical relay shall have the following protection functions with at least two independent protection setting groups. The protection functions shall be selectable from any of the IEC characteristic curves.
- i) Definite time (DT) phase over current protection
 - ii) Inverse Definite Minimum Time (IDMT) phase over current protection
Definite time (DT) earth fault current protection
 - iii) Inverse Definite Minimum Time (IDMT) earth fault current protection
 - iv) Under Voltage protection
 - v) Over Voltage protection
- 6.5.8 Transformer feeder protection relay shall have provision for the following protection functions.
- i) Buchholz alarm & trip
 - ii) Oil Temperature Indicator (OTI) alarm & trip
 - iii) Winding Temperature Indicator (WTI) alarm & trip
 - iv) Pressure Relief Valve (PRV) trip
 - v) Magnetic Oil Gauge (MOG) alarm
 - vi) Voltage and Current Balance (60)
 - vii) Directional over current (67)
 - viii) Directional neutral current flow (67 N)
- 6.5.9 All numerical relays shall have provision for measurement and storage of electrical parameters such as voltage, current, frequency, active power, reactive power etc.
- 6.5.10 The numerical relay shall be able to record faults and events in non-volatile memory.
- i) Fault record – At least 5 recent faults including the protection function operated, operating phase(s), voltages and currents along with date and time stamp.
 - ii) Event record – At least 200 events with date and time stamp.
- 6.5.11 The numerical relay shall have trip circuit supervision facility to monitor the circuit breaker trip circuit both in pre-trip and post-trip conditions. The relay shall also be able to provide circuit breaker monitoring, CT and VT supervision.
- 6.5.12 The numerical relay shall have self-diagnostic feature with separate output contact for indication of any internal relay failure.

- 6.5.13 The numerical relay shall have RS-232/RS-485/RJ-45/USB ports on front side for local communication with PC and on rear side for remote communication to SCADA system.
- 6.5.14 The numerical relay shall have feature for time synchronization through the SCADA system / networking.
- 6.5.15 The numerical relay shall be provided with backlit alphanumeric LCD to access protection settings, measurement parameters, fault and event records. Read and write access to protection settings shall be password protected.

6.6 Instrument Transformers

Instrument transformers shall be completely encapsulated cast resin type, suitable for continuous operation at the ambient temperature prevailing inside the switchgear enclosure, when the switchgear is operating at its rated load and the outside ambient temperature is 50°C.

- 6.6.1 Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block.
- 6.6.2 Voltage transformers shall be single phase units. Bus voltage transformers shall be housed in a separate panel on withdrawable truck.
- 6.6.3 HRC fuses of suitable rating shall be provided on primary side of voltage transformers. For secondary side, four pole Miniature Circuit Breakers (MCB) shall be provided with its supervision facility.

6.7 Earthing

- 6.7.1 An earth bus made of copper shall be provided throughout the length of the panel. It shall be bolted to the framework of each panel and brazed to each breaker earthing contact bar.
- 6.7.2 The earth bus shall have sufficient cross section to carry maximum fault current without exceeding the allowable temperature rise.
- 6.7.3 All non-current carrying conductors of the panel shall be connected to the earth bus. All joints to the earth bus shall be made through at least two bolts. Hinged doors shall be earthed through flexible earthing braid of adequate cross section. Suitable provision shall be provided at each end of the earth bus for connection with Owner's Earth conductor.
- 6.7.4 Positive earthing of the breaker truck and frame shall be maintained when it is in the connected position and in all other positions whilst the auxiliary circuits are not totally disconnected.
- 6.7.5 All metallic cases of relays, instruments and other panel mounted equipment shall be connected to earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation.
- 6.7.6 Instrument transformer secondary neutral point shall be earthed at one place only on the terminal block. Such earthing shall be made through links so that earthing of one circuit may be removed without disturbing the earthing of other circuits.

Separate earthing trucks shall be provided for earthing of busbars and incoming/outgoing feeders. The trucks shall have voltage transformer to indicate presence of voltage prior to earthing. An audible alarm shall also be provided in case of voltage on the earthing terminal. Integral earth switches may also be considered instead of earthing trucks. The earthing truck/switch shall have short circuit withstand capability equal to that of the associated switchgear panel.

6.7.7 The interlocks shall be provided to ensure the following.

- i) It is not possible to rack-in the earthing truck/close the earthing switch when the breaker truck is in SERVICE position.
- ii) It is not possible to rack-in the breaker truck into SERVICE position when earthing truck is connected/earthing switch is in closed position.

6.8 Bus bar

6.8.1 Bus bar shall be made of copper or aluminium with uniform cross section throughout their length. They shall be adequately supported on insulators to withstand electrical and mechanical stresses due to specified short circuit current.

6.8.2 All bus bars joints shall be thoroughly cleaned and anti-oxide grease shall be applied. Plain and spring washers shall be provided to ensure good contacts at the joints and taps. Wherever aluminium to copper connections are required, suitable bimetallic connectors or clamps shall be used.

6.8.3 Bus bars shall be provided with heat shrinkable sleeves of suitable insulation class throughout their length with proper colour coding. All bus bar joints and taps shall be shrouded.

6.8.4 Bus bar support insulators shall be made of non-hygroscopic, arc and track resistant, high strength material suitable to withstand stresses due to over voltage and short circuit current.

6.8.5 The Contractor shall submit busbar sizing calculation for specified continuous and short time current ratings during detailed engineering.

6.9 Measuring Instruments

6.9.1 All the measuring instruments shall be digital, flush mounting type with communication facility.

6.9.2 All feeders except main outgoing feeder shall be provided with digital Multi-Function Meter (MFM). Tri Vector Meter (TVM) shall be provided for the main outgoing feeder (in the HT Panel). Accuracy class of MFM shall be 0.2 and that of TVM shall be 0.2S.

6.9.3 Measuring instruments shall have provision to display the following parameters.

- i) Line and phase voltages
- ii) Line and phase currents
- iii) Active power, Reactive power, Apparent power
- iv) Frequency

- v) Power factor
- vi) Total Harmonic Distortion (THD)

6.10 Wiring and Terminal blocks

- 6.10.1 All internal wiring shall be done with 650 V grade, 1.5 sq.mm. PVC insulated stranded flexible copper wire. For CT secondary circuits, 2.5 sq.mm copper wire shall be used.
- 6.10.2 Wire terminations shall be made with solderless crimping type tinned copper lugs, which shall firmly grip the conductor. Insulation sleeves shall be provided at all the wire terminations.
- 6.10.3 Printed identification ferrules, marked to correspond with panel wiring diagram shall be provided at both ends of each wire. The ferrules shall be firmly located on each wire so that they cannot move or turn freely on the wire. Wire identification shall be done in accordance with IS 11353.
- 6.10.4 The Contractor shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.
- 6.10.5 All internal wiring to be connected to the external equipment shall terminate on terminal blocks. Terminal blocks shall be rated for 650 V, 10 A and made of non- inflammable material.
- 6.10.6 CT and VT secondary circuits shall be terminated on stud type, non-disconnecting terminal blocks.
- 6.10.7 At least 10% spare terminals shall be provided on each panel and these spare terminals shall be distributed on all terminal blocks.

6.11 Warranty

The HT panel unit shall be warranted against all material/ manufacturing defects and workmanship for minimum of 2 (Two) years from the date of supply.

6.12 Testing and Inspection

6.12.1 Type Tests

The switchgear panel shall be of type tested design. The type test reports shall be submitted during detailed engineering as per IEC 62271. The tests should have been conducted on the similar equipment by NABL accredited laboratory.

In case the contractor is not able to submit the test reports during detailed engineering, the contractor shall submit the reports of type/special tests either conducted by NABL accredited laboratory or witnessed by Employer.

6.12.2 Routine Tests

Routine tests and acceptance tests shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

7 AC Cables

7.1 Standards and Codes

All AC Cables shall conform to the following standards and codes.

IS 7098	Crosslinked polyethylene insulated PVC sheathed cables, Part 1: For working voltage up to and including 1100 V
IS 7098	Crosslinked Polyethylene Insulated Thermoplastics Sheathed Cables Part 2: for Working Voltages from 3.3 kV up to and Including 11 kV

- 7.2 All AC cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions.
- 7.3 Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. However, cable joints may be allowed if the route length is more than maximum available drum length subject to Employer's approval.
- 7.4 In addition to manufacturer's identification on cables as per relevant standard, following marking shall also be provided over outer sheath.
- (i) Cable size and voltage grade
 - (ii) Word 'FRLS' at regular lengths
 - (iii) Sequential marking of length of the cable in meters at every metre
- 7.5 Cables shall be sized based on the following considerations:
- (i) Rated current of the equipment.
 - (ii) In case of Central inverters, maximum voltage drop in LT cable (from PCU to inverter transformer) shall be limited to 0.5% of the rated voltage. For HT cables (from inverter transformer to plant take off point), maximum voltage drop shall be limited to 0.5 % of the rated voltage. The Contactor shall provide voltage drop calculations in excel sheet.
 - (iii) Short circuit withstand capability as per design for 1s.
 - (iv) De-rating factors according to laying pattern

7.6 Warranty

All cables shall be warranted for minimum of 1 (one) year against all material/manufacturing defects and workmanship.

7.7 Testing

Type, routine and acceptance tests requirements shall be as per relevant standards for all cable sizes.

7.8 Installation

7.8.1 Cable installation shall be as per IS 1255.

- 7.8.2 Cables within transformer yard and switchyard shall be laid through RCC cable trench with supports.
- 7.8.3 Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu bus bar and Al cables or vice-versa.
- 7.8.4 All AC cables shall be provided with punched/embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.

8. Auxiliary Supply System

- 8.1 Scheme for Auxiliary supply system shall be submitted by contractor during detailed engineering for the approval by Employer.
- 8.2 It shall mainly comprise of auxiliary transformer, AC distribution board(s) (ACDB), emergency lighting network, Uninterrupted power supply (UPS), distribution cables and metering & protective devices.

9 LT Switchgear

9.1 Standards and Codes

All equipment provided under LT switchgear shall comply with latest revisions and amendments of the relevant IEC standards and IS codes. In particular, the switchgear shall comply with the following standards and codes.

Standard/Code	Description
IEC 61439-1	Low-voltage switchgear and control gear assemblies - Part 1: General rules
IEC 61439-2	Low-voltage switchgear and control gear assemblies - Part 2: Power switchgear and control gear assemblies
IEC 60947-1	Low-voltage switchgear and control gear - Part 1: General rules
IEC 60947-2	Low-Voltage Switchgear and Control gear: Circuit Breakers
IEC 60947-3	Low voltage switchgear and control gear: Part 3 Switches, disconnectors, switch-disconnectors and fuse combination units
IEC 60947-4-1	Low-voltage switchgear and control gear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters
IEC 60947-5-1	Low-voltage switchgear and control gear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
IEC 62052-11	Electricity metering equipment (a.c.) - General requirements, tests and test conditions - Part 11: Metering equipment

IS 694	Polyvinyl chloride insulated unsheathed-and sheathed cables/ cords with rigid and flexible conductor for rated voltages - up to and including 450/750V
IEC 61869	Instrument Transformers
IS 3043	Code of practice for earthing
IEC 60255	Measuring relays and protection equipment - Part 1: Common requirements

9.2 Technical Parameters

System Details	
Rated system voltage	415 V $\pm$ 10%, 3 Phase, 50Hz, 4 wire, Neutral Solidly Earthed
Digital Multifunctional Meter (MFM)	
Accuracy class	0.5 class for main distribution board at main control room and 0.5 class for DB at inverter room(s)
Communication with SCADA	RS485 communication with Modbus RTU
Current transformer (CT)	
Type	Cast Resin Bar Primary
Voltage class and frequency	650V, 50Hz
CT Secondary Current	1 or 5 A
Class of insulation	Class F
Accuracy class & burden	
a) For Protection	5P10, 5VA PS Class for REF and core balance CT (CBCT)
b) For Metering	Class 0.5, 5VA (min)
Minimum primary earth fault current to be detected by CBCT	1 A
Instrument Security Factor for metering CT	5
Voltage transformer (VT)	
Type	Cast Resin
Accuracy class	0.5
Rated Voltage factor	1.1 continuous, 1.5 for 30 seconds
Class of insulation	E or better
Molded case circuit breaker (MCCB)	
Rated voltage	415V

Release	Thermal-Magnetic/Microprocessor
Rated current	As per system requirement
Poles	4 poles
Rated insulation level	690V
Rated ultimate and service short circuit breaking Capacity	As per system requirement
Rated Making capacity (as per system requirement)	2.1 X Short circuit breaking Capacity
Utilization category	A

9.3 **Constructional Details**

- 9.3.1 The panel shall be metal enclosed, free standing, floor mounted, modular type with compartmentalized construction having degree of protection of IP 24 (Indoor) and IP54 (outdoor) as per IS/IEC 60529. All doors and covers shall be provided with neoprene gaskets to prevent entry of vermin and dust.
- 9.3.2 All switches, push buttons etc. shall be operated front and shall be flush/semi-flush mounted.
- 9.3.3 The panel shall be fabricated from 2 mm CRCA sheet steel for frame & load bearing surfaces. Partitions may be fabricated from 1.6 mm CRCA if no components are mounted on them.
- 9.3.4 Cable entries shall be from bottom. The opening of cable entry shall be covered by 3mm thick gland plates with proper sealing to avoid water and rodent entry.
- 9.3.5 Earthing bus bar of suitable cross section shall be provided throughout the length of panel.
- 9.3.6 The panel shall be duly wired with suitable size of 1.1kV, PVC insulated cable and terminals shall be brought out for cable connections. 10% spare terminals subjected to minimum one of each rating shall be provided on each distribution switchgear. All wire shall have ferrules as per wiring diagram.
- 9.3.7 The panel shall be painted with 2 coats of primer after pre-treatment and 2 coats of Polyurethane / epoxy paint with shade as decided by the Owner.
- 9.3.8 The panel shall be of dead front construction suitable for front operated and back maintained functioning.
- 9.3.9 240 V, 5 A, 3 pin industrial socket-outlet with ON/OFF switch shall be provided in each panel.
- 9.3.10 Each panel shall be provided with LED lamp rated for 240 V, 50 Hz, single phase AC supply for interior illumination controlled by door switch.
- 9.3.11 Suitable lifting hooks shall be provided for each panel.

9.3.12 Each switchgear panel shall be provided with thermostatically controlled space heaters to prevent condensation within the enclosure. The space heater shall be connected to 240 V, 50 Hz, single phase AC supply through suitable switch and fuse.

Earth leakage relay with Core balance CTs (CBCT) shall be provided on main incoming feeders having phase CT ratio more than 50/1A. CBCT's shall be circular window type with window size based on the overall diameter of the cables, to be finalized during detailed engineering.

9.4 Warranty

Distribution panels (ACDB and DCDB) shall be warranted against all material/ manufacturing defects and workmanship for minimum of 1 (one) year from the date of supply.

9.5 Testing

Routine test and acceptance tests requirements shall be as per relevant standards for all cable sizes.

10 Uninterrupted Power Supply

10.1 Standards and Codes

Standard/Code	Description
IEC 62040-1	Uninterruptible power systems (UPS) - Part 1: General and safety requirements for UPS
IEC 62040-2	Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
IEC 62040-3	Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements

10.2 General Requirements

10.2.1 The Uninterrupted Power Supply (UPS) system shall be designed to supply power to following loads (but not limited to).

- i) Data logger / SCADA
- ii) Fire Detection/ Alarm Panel
- iii) HMI of SCADA
- iv) Emergency Lighting
- v) Inverter's Auxiliary supply (if applicable)
- vi) CCTV

10.2.2 Sizing of UPS shall be done considering the above-mentioned load at power factor of 0.8 lagging inclusive of 10% design margin at 50 °C.

10.3 System Description

10.3.1 The UPS shall automatically provide continuous, regulated AC power to critical loads under normal and abnormal conditions, including loss of input AC power. The UPS system shall consist of the following major equipment.

i) UPS Module

- a) Insulated Gate Bipolar Transistor (IGBT) Converter
- b) Insulated Gate Bipolar Transistor (IGBT) Inverter
- c) Digital Signal Processor (DSP) using Pulse Width Modulation (PWM) for Direct Digital Control (DDC) of all UPS control and monitoring functions
- d) Static (byp) pass switch
- ii) Battery system for 2 hours
- iii) Battery protective and disconnect device
- iv) Maintenance bypass switch
- v) LCD display panel and LED indications
- vi) Integrated UPS Communications Protocols capable of communicating with SCADA system

10.3.2 The UPS shall meet the following minimum specifications.

Parameter	Specification
Topology	Online double conversion UPS
Input	
Voltage	230 V $\pm$ 10% AC
Frequency	50 $\pm$ 5 Hz
Power factor	0.95
Output	
Voltage	230V $\pm$ 1% AC
Frequency	50 Hz
Power factor	0.9
Battery	
Type	Sealed, Maintenance-Free (AGM) battery
Capacity	100% UPS load for 2 hours
Monitoring and communication	
LED Indicators	Load on Inverter, Battery operation, Load on Bypass, Overload, LCD Fault, UPS Fault
Electrical contacts	Closing contacts for each of the following conditions: 1. Unit on Battery 2. Low Battery

	3. Summary Alarm 4. UPS On 5. Input Fail
Local Display	LCD/ LED
SCADA communications	RS-232 & RS-485 Interface Port
Overall efficiency	>90%
Electrical Protection	Input/ output under voltage, over temperature, overload, Short circuit, battery low trip

10.3.3 The UPS shall be forced air cooled by internally mounted fans. The fans shall be redundant in nature to ensure maximum reliability. The fans shall be easily replaceable without the use of special tools.

10.3.4 Contractor shall provide the Operation & Maintenance Manual and mandatory spareparts list along with the equipment

10.4 **Warranty**

UPS shall be warranted for minimum of 5 (five) years and batteries shall be warranted for a minimum of 2 (two) years against all material/ manufacturing defects and workmanship from the date of supply.

10.5 **Tests**

10.5.1 Routine tests and acceptance tests on final product shall be done as per QAP approved by the Employer.

10.5.2 On completion of installation and commissioning of the equipment on site tests shall be carried out with the max. available load, which does not exceed the rated continuous load. An on-site test procedure shall be submitted by contractor include a check of controls and indicators after installation of the equipment.

11 **Uninterrupted Power Supply System**

11.1 **Standards and Codes**

Standard/Code	Description
IEC 60896-22:2004	Stationary lead-acid batteries - Part 22: Valve regulated types – Requirements
IEC 60896-21:2004	Stationary lead-acid batteries - Part 21: Valve regulated types - Methods of test
IS 1652	Specification for stationary cells and batteries, lead acid type (with plate positive plates)

IS 8320	General requirements and methods of tests for lead acid storage batteries.
IS 15549	Stationary Regulated Lead Acid Batteries

12**Earthing****12.1 Standards and Codes**

Earthing system shall comply with latest revisions and amendments of the relevant IEC standards and IS codes. In particular, earthing system shall comply with the following standards and codes.

Standard/Code	Description
IS 3043	Code of Practice for Earthing
IEC 62561-2	Requirements for conductors and earth electrodes
IEC 62561-7	Requirements for earthing enhancing compounds
IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE 142	IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems
Indian Electricity Rules	

12.2 General Requirements

12.2.1 Earthing system shall be designed based on system fault current and soil resistivity value obtained from geo-technical investigation report. Earth grid shall be formed consisting of number of earth electrodes sufficient enough to dissipate the system fault current interconnected by earthing conductors.

12.2.2 The earth electrode shall be made of high tensile low carbon steel rod, molecularly bonded by high conductivity copper on outer surface with coating thickness not less than 250 micron as per relevant standards. Suitable earth enhancing material shall be filled around the electrode to lower the resistance to earth. Inspection chamber and lid shall be provided as per IS 3043.

12.2.3 Earth conductors shall be made of copper bonded steel or galvanized steel of sufficient cross section to carry the fault current and withstand corrosion.

12.2.4 Earth conductors buried in ground shall be laid minimum 600 mm below ground level unless otherwise indicated in the drawing. Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures.

12.2.5 Earth electrodes shall not be situated within 1.5m from any building whose installation system is being earthed.

Minimum distance between earth electrodes shall be two times the driven depth of the electrode.

12.2.6 Transformer yard and switchyard fence shall be connected to the earth grid by one GS flat and gates by flexible lead to the earthed post.

12.2.7 All welded connections shall be made by electric arc welding. For rust protection, the welds should be treated with red lead compound and afterwards thickly coated with bitumen compound.

12.3 Earthing of PV array field

All PV Modules, Module Mounting Structures (MMS) and String Monitoring Unit (SMU) structures in the PV array field shall be bonded to the earthing system by two distinct connections.

12.3.1 Each PV Module frame shall be earthed using copper wire of sufficient cross section. The copper wire shall be connected to the earth hole provided in the module frame using suitable arrangement in line with the manufacturer recommendation. The earthing arrangement shall use stainless washers to prevent galvanic corrosion between aluminum frame and copper wire. In order to achieve effective earthing, serrated washers shall be employed to penetrate the anodization layer of the module frame.

12.3.2 Continuous copper earthing wire shall be run to connect a group of modules and both ends of the loop shall be bolted to the DC earth grid using bimetallic lugs and stainless-steel fasteners. The copper earthing wire shall be routed in such a way to avoid physical contact with the module aluminium frame.

12.3.3 The connection between MMS and DC earth grid shall be bolted or welded. Portion of the MMS which undergoes welding at site shall be coated with two coats of cold galvanising and anti-corrosion paint afterwards.

12.3.4 Earth electrodes of the DC earth grid shall be uniformly distributed throughout the PV array field so that optimum earth resistance is offered to leakage current flowing from any module frame or MMS.

12.3.5 SMU equipment earthing point shall be connected to the DC earth grid using flexible copper cable of sufficient cross section as recommended by the manufacturer. The connection with the DC earth grid shall be done using suitable bimetallic lugs and stainless-steel fasteners.

12.4 PCU Earthing

DC negative bus bar of the PCU shall be earthed to avoid Potential Induced Degradation (PID). DC negative bus bar and PCU equipment earth shall be bonded to the PCU earth bus and connected to earth electrodes through flexible copper cable of

sufficient cross section as mentioned by the manufacturer. The interconnection of PCU earth electrodes with DC earth grid shall be as per PCU manufacturer recommendation.

12.5 Transformer Earthing

- 12.5.1 Inverter transformer neutral shall be floating, not to be earthed. However, recommendation of inverter manufacturer shall also be taken into account. Transformer tank, cable box, marshalling box and all other body earth points shall be earthed.
- 12.5.2 Inverter transformer shield shall be earthed separately using minimum two no. of earth electrodes. Earthing conductor between shield bushing and earth electrodes shall be copper flat of suitable size not less than 25 x 6 mm.
- 12.5.3 Neutral and body of the auxiliary transformer shall be earthed.

12.6 Switchyard Earthing

The metallic frame work of all switchyard equipment and support structures shall be connected to the earth grid by means of two separate and distinct connections.

Switchyard shall be shielded against direct lightning stroke by provision of overhead shield wire or earth wire or spikes(masts) or a combination thereof as per CEA regulations 2010 (Technical standards)- 42(2)(C).

12.7 Tests

Type test reports for earthing electrode, earth enhancing compound and its associated accessories shall be submitted during detailed engineering for approval.

On completion of installation, continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded.

The earth plate shall be provided to facilitate its identification and for carrying out periodical inspection.

13 Lightning Protection System

- 13.1 Lightning Protection System (LPS) for entire plant against direct lightning strokes shall be provided as per IEC 62305:2010 or NFC 17-102:2011.
- 13.2 Protection level for the entire plant shall be Level-III.

13.3 LPS as per IEC 62305

Location of air terminals shall be designed as per rolling sphere method.

13.4 LPS as per NFC 17-102

Lightning Protection System shall consist of following accessories:-

- (i) Early Streamer Emission (ESE) air terminal

- (ii) Highly insulated poly-plastic adaptor to fix the ESE air terminal with the FRP mast
 - (iii) Fiberglass Reinforced Plastic (FRP) mast
 - (iv) Coupler to connect FRP mast with GI mast
 - (v) Galvanized Iron mast with base plate and guy wire kit
 - (vi) Down-conductor: PVC insulated flexible copper cable of suitable size complying with EN 50164-2 or equivalent standard. It shall be routed along the mast with suitable fixings and connectors
 - (vii) Test joint with each down conductor
 - (viii) Lightning event counter complying with EN 50164-6 or equivalent standard. It shall be fixed at suitable height in series with the down conductor.
 - (ix) Earth termination system in accordance with NFC 17-102. Earth electrodes shall comply with the EN 50164-2 or equivalent standard. Earth enhancing compounds complying with EN 50164-7 or equivalent standard, may be used where soil resistivity is higher and making it impossible to achieve system resistance within specified limit.
- 13.5 Accessories listed above are indicative only and any other fittings or accessories, which are usual or necessary for satisfactory operation of the lightning protection shall be provided by the Contractor without extra charges.
- 13.6 Necessary foundation/anchoring for holding the lightning mast in position to be made after giving due consideration to shadow on PV array, maximum wind speed and maintenance requirement at site in future.
- 13.7 The product shall be warranted for minimum of 2 (two) years against all material/ manufacturing defects and workmanship.
- 13.8 Type test reports as per IEC 62305:2010 or NFC 17-102:2011 shall be submitted during detailed engineering for approval.

14 Communication Cables

14.1 Optical Fiber Cables

- 14.1.1 Optic Fiber cable shall be 4/8/12 core, galvanized corrugated steel taped armoured, fully water blocked with dielectric central member for outdoor/ indoor application so as to prevent any physical damage.
- 14.1.2 The cable shall have multiple single-mode or multimode fiber on as required basis so as to avoid the usage of any repeaters.
- 14.1.3 The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturing, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.

- 14.1.4 The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling.
- 14.1.5 All testing of the optic fiber cable being supplied shall be as per the relevant IEC, EIA and other international standards.
- 14.1.6 The Contractor shall ensure that minimum 100% cores are kept as spare in all types of optical fiber cables.
- 14.1.7 Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground buried installation.
- 14.1.8 Spliced/ Repaired cables are not acceptable. Penetration of water resistance and impact resistance shall be as per IEC standard.

14.2 Communication Cable (Modbus)

- 14.2.1 Data (Modbus) Cable to be used shall be shielded type with stranded copper conductor. Cable shall have minimum 2 pair each with conductor size of 0.5 Sq.mm. Cable shall be flame retardant according to IEC 60332-1-2.
- 14.2.2 Cable shall be tested for Peak working voltage of not less than 300 V and shall be suitable for serial interfaces (RS 422 and RS 485).
- 14.2.3 Communication cable shall be laid through underground with suitable HDPE ducts.

15 SCADA

15.1 General Requirements

- 15.1.1 The Contractor shall provide complete SCADA system with all accessories, auxiliaries and associated equipment and cables for the safe, efficient and reliable operation and monitoring of entire solar plant and its auxiliary systems.
- 15.1.2 The Contractor shall provide all the components including, but not limited to, Hardware, Software, Panels, Power Supply, HMI, Laser Printer, Gateway, Networking equipment and associated Cables, firewall etc. needed for the completeness.
- 15.1.3 SCADA System shall have the provision to perform the following features and/or functions:
 - i) Web enabled Operator Dashboards: Showing key information on Generation, Performance and Current Status of various equipment in Single Line Diagram (SLD) format with capability to monitor PV array string level parameters.
 - ii) Real time Data Logging with Integrated Analytics & Reporting: Logging of all parameters - AC, DC, Weather, System Run Hours, Equipment Status and Alarms as well as derived/ calculated/ integrated values. The SCADA User interface shall be customizable and enable Report Generation and

Graphical Analysis.

- iii) Fault and System Diagnostics with time stamped event logging.
- iv) Support for O&M Activities: The interface shall allow integration with Surveillance System(s), Module Cleaning System and various other O&M support systems to provide a Data Analysis and Decision Support System for smooth and efficient Plant Operations.
- v) AI based Distributed Analytics for Predictive Maintenance, trend analysis and Alerts with backup for desirable time period with backup for desirable time period.
- vi) Generate, store and retrieve user configurable Sequence of Event (SOE) Reports.
- vii) Interface with different field equipment in the plant and work seamlessly with field equipment supplied by different companies.
- viii) Transfer of plant data reliably, to an Owner designated server or Cloud (Option: check with client) on any kind of remote network.

(Note: Telecom Lease line connection/ Data Connection (3G/ 4G) , as required for transferring data from Plant to SLDC and plant owner over internet shall be taken by Contractor in the name of Employer for O&M period)

- 15.1.4 The Control system shall be designed to operate in non-air-conditioned area. However, the Contractor shall provide a Package/ Split AC of suitable capacity decided by heat load requirement in SCADA room at Main Control Room.

15.2 Architecture

The contractor shall submit the details of the architecture of SCADA System for approval of the owner.

The broad functionalities are as under:-

- 15.2.1 The SCADA system shall monitor instantaneous and cumulative electrical parameters from all DC & AC Equipment including inverters, string monitoring unit, weather station, MFM, Transformer and Switchgear (LT & HT Panels) at regular intervals not greater than one minute.
- 15.2.2 The SCADA system shall monitor Instantaneous and cumulative environment parameters from weather sensors or data loggers at same interval as electrical parameters and provide PR, CUF.
- 15.2.3 The SCADA system shall provide Alarms and Alerts on equipment faults and failure in less than 5 seconds. Alarms on status change of hardwired DI shall also be provided.
- 15.2.4 The SCADA system shall provide configurable alerts on any parameter crossing settable thresholds. The list of such parameters shall be finalized in consultation with

the Owner.

- 15.2.5 The SCADA system shall enable integration with other sub-systems at the plant for supporting O&M activities. The list shall include but not limited to:
 - i) Surveillance Cameras,
- 15.2.6 The SCADA system shall have user-friendly browser-based User Interface for secure access from anywhere, for minimum Five concurrent connections from the Operator PC or other securely connected laptop/mobile, for plant monitoring, O&M, daily reporting, and analysis. A dashboard providing summary details of total plant generation, day's export, irradiance, Inverter Control Room level generation and performance indicators like PR and CUF.
- 15.2.7 The SCADA system shall be extensible to include maintenance of O&M schedules and related activities for plant equipment as per the O&M Manual.
- 15.2.8 Connectivity shall be provided to Owner's Data Monitoring Centre. Data collected by Plant SCADA shall be replicated in real-time, using industry standard interfaces as required – with Owner's Central Monitoring System in Chandigarh.
- 15.2.9 Mobile User Interface: summary of plant performance and issues should be accessible in a mobile Native UI or browser UI.
- 15.2.10 Data Communication to SLDC: SCADA system shall provide required interface to integrate with TRANSCO-SLDC, in compliance with grid code, to send any parameters specified by SLDC.

Note: The methodology and specification of SLDC interface will be provided separately by SLDC/TRANSCO and it shall be the responsibility of the Contractor to determine the same.

- 15.2.11 Power Plant Control: SCADA system shall provide required interface to the local SCADA operator to set various power control modes (active/reactive power/frequency/PF) through the inverters over industry standard communication protocols like Modbus over TCP/IP.
- 15.2.12 Forecasting and Scheduling: SCADA shall provide day ahead and week ahead forecasting and scheduling for power generation at the plant as per SLDC/Utility stipulations.
- 15.2.13 Predictive Maintenance: SCADA system shall have in-built or pluggable frameworks to support AI based Predictive Maintenance for all key equipment including inverters, transformers and switchgear at the plant.
- 15.2.14 All programming functionalities shall be password

protected to avoid unauthorized modification.

- 15.2.15 The Contractor shall provide software locks and passwords to Employer for all operating & application software. Also, the Contractor shall provide sufficient documentation and program listing so that it is possible for the Employer to carry out modification at a later date.

15.3 Earthing

- 15.3.1 Two isolated electronic earth pits near to SCADA panel at every Inverter and Control Room with < 1 Ohm resistance shall be provided. One earth pit shall be used for protective/body earth and the other to be used for Signal Earth.
- 15.3.2 Apart from providing separate earth pits, manufacturer specified earthing recommendations shall be followed for all communicating equipment connected to SCADA.

15.4 Communication Cable Laying

- 15.4.1 All RS485, IO and CAT6 cables shall be laid in separate conduits with a minimum separation of 1.5ft from AC/DC power cables all along.
- 15.4.2 Power cables shall be laid deep in the trenches first. Data cables shall be laid in separate conduits after partially filling the trenches to ensure minimum 1.5 ft separation between power and communication cables all along the trench.
- 15.4.3 IO Cables between switch gear panels and SCADA panel shall be laid on separate cable trays, with a minimum of 1.5ft separation from trays carrying AC Power cables.
- 15.4.4 RS485 & CAT6 cables between switch gear panels or Inverters and SCADA panel shall be laid on separate cable trays, with a minimum of 1.5ft separation from trays carrying AC Power cables.

15.5 Control Cabinets / Panels / Desks at Main Control Room

- 15.5.1 The cabinets shall be IP-22 protection class. The Contractor shall ensure that the temperature rise is well within the safe limits for system components even under the worst condition and specification requirements for remote I/O cabinets.
- 15.5.2 The cabinets shall be totally enclosed, free standing type and shall be constructed with minimum 2 mm thick steel plate frame and 1.6 mm thick CRCA steel sheet or as per supplier's standard practice for similar applications.

15.6 Software Licenses

The Contractor shall provide software license for all software being used in Contractor's System. The software licenses shall be provided for the project and shall not be hardware/ machine-specific.

15.7 Hardware System

- 15.7.1 The Hardware as specified shall be based on latest state of the art Workstations and Servers and technology suitable for industrial application & power plant environment.
- 15.7.2 The Local Monitoring & Control Server and the Operating Work station, to be deployed in the Plant Control Room, shall have the following server hardware and operating system along with accessories:

Plant Server	
Server Hardware	Hex/Octal Core Xeon, 32GB RAM (expandable to 64 GB RAM), 4 X 2TB SATA hard discs in RAID 5 configuration, 2TB external USB hard disc (for backup), dual power supplies, 2 LAN ports, LCD console, keyboard & mouse. The Server hardware shall be housed in a rugged fan-cooled, and rodent-proof Server Rack.
Operating System	Operating System and Database shall be of enterprise scale (preferably RedHat Linux or equivalent Linux OS, Oracle/MySQL or Windows or equivalent DB), with required AMC for 5 years.
Accessories	1. Monitor: Min 22" LED Flat Monitor with non-interfaced refresh rate min. 75Hz.
	2. Keyboard: ASCII type 3. Pointing Device: Mouse 4. Intelligent UPS (on line): Minimum 4 hour battery backup.
Operator Workstation	
Hardware	i7 CPU running at 3.0 GHz or faster with 8GB RAM, 500GB hard disk, 25" LED monitor, keyboard and mouse, 4 USB ports, LAN port
Operating System	Windows operating system with necessary tools, anti-virus software.
Accessories	1. Screen Display Unit: Min 50" LED Flat Monitor with wall mounted arrangement for the display of SCADA screen 2. A4 size monochrome laser printer.

	3. UPS of required capacity with 4 hour battery backup.
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15.7.3 All network components of LAN and Workstations shall be compatible to the LAN, without degrading its performance.

15.7.4 Factory Acceptance Test (FAT)

FAT procedure shall be submitted by bidder for approval. SCADA shall communicate with all third devices which are part of solar plant and same shall be demonstrated during the FAT.

16 Illumination

16.1 Standards and Codes

LED luminaires shall be tested at independent laboratory as per the following test standards.

Standard/Code	Description
LM79-08	Electrical and Photometric Measurements of Solid-State Lighting Products.
LM 80-15	Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules

16.2 General specification

16.2.1 This specification covers design, supply and installation of uniformly Illumination system from the plant entrance to switchyard.

16.2.2 The Contractor shall furnish Guaranteed Technical Particulars of the LED luminaires, from renowned brands available in the market for approval of PGL.

16.2.3 Lighting system shall work on the auxiliary supply and same shall be incorporated in auxiliary loads.

16.3 Lighting Levels

16.3.1 The average LUX level of 20 lm is to be maintained in switchyard.

16.3.2 The lighting level shall take into account appropriate light output ratio of luminaires, coefficient of utilization maintenance factor (of 0.7 or less) to take into account deterioration with time and dust deposition and illuminance uniformity [Uo] shall be min 0.3.

16.3.3 The luminaire should be suitable for standard street light poles.

16.3.4 GI Lighting pole of suitable diameter capable of withstanding system and wind load, shall be provided with average Zn coating thickness of 80micron. The street light poles shall have loop in loop out arrangement for cable entry and light fixture / wiring protected with suitably rated MCB.

16.3.5 Lighting panels shall be earthed by two separate and distinct connections with earthing system. Switch boxes, junction boxes, lighting fixtures, etc. shall be earthed by means of separate earth continuity conductor. Cable armour shall be connected to earthing system at both the ends. Proper earthing of street light poles shall be ensured.

16.3.6 Junction box for lighting shall be made of fire retardant material. The degree of protection shall be IP55 for outdoor JB.

16.3.7 Lighting cables, wherever exposed to direct sunlight, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.

16.4 LED Luminaire/Lamps for Indoor Applications

16.4.2 LED luminaire/lamps shall have minimum 3-star BEE rating.

16.4.3 All indoor LED luminaire/lamps shall be supplied with proper diffuser to avoid direct visibility of LED and suitable heat sink for longer life.

16.5 Warranty

All luminaires shall be warranted against all material/manufacturing defects and workmanship for minimum of 2 (two) years from the date of supply.

17 Weather Monitoring System

As a part of weather monitoring system, the Contractor shall provide the following measuring instruments with all necessary software and hardware required to integrate with SCADA.

17.1 Pyranometer

17.1.1 The Contractor shall provide minimum 1 (one) number of Type -II pyranometer (ISO 9060 classification) along with necessary accessories for measuring the incidental solar radiation at horizontal, inclined plane of array and albedo at each site.

17.1.2 Each instrument shall be supplied with necessary cables. Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. The signal cable length shall not exceed 20m. The Contractor shall provide instrument manual in hard and soft form.

17.1.3 Downward facing pyranometer to measure albedo shall be mounted at least 2 m above uniform surface. To avoid reflections, masts/mounting pole shall be painted with black, non-reflective paint. To minimize shading, the pyranometer shall be mounted on boom (minimum length 1 m) extending towards the equator.

17.2 Temperature Sensor

The Contractor shall provide minimum 2 (two) temperature sensors (1 (one) for ambient temperature measurement with shielding case and 1 (one) for module temperature measurement) at each site. The temperature sensor shall be Resistance Temperature Detector

(RTD)/ Semiconductor type with measurement range of 0°C to 80°C. The instrument shall have valid calibration certificate.

17.3 **Anemometer**

Contractor shall provide minimum one no. ultrasonic wind sensor (no moving parts) for wind speed and direction monitoring.

Parameter	Specification
Velocity range with accuracy limit	0-60m/s with +/-2% accuracy @12 m/s; Resolution: 0.01m/s
Wind direction range with accuracy limit	0 to 360° (No dead band) with +/-2° accuracy @12 m/s; Resolution: 1°
Mounting Bracket	Anodized Aluminium bracket to reduce corrosion, all mounting bolts of SS
Protection Class	IP66
Output	RS232 and RS485

17.4 **Data logger and Data Acquisition System**

Data logger for the weather monitoring station should have the following features:

17.4.1 Provision for analog, digital and counter type inputs for interfacing with various type of sensors

- i) Analog Input
 - Adequate nos. for all analog sensors with redundancy
 - Provision for operation in different current and voltage ranges as per connected sensors
 - Accuracy of +/-0.1% of FS
- ii) Digital Inputs
 - Adequate no. of Digital inputs and outputs for the application
- iii) Provision for RS232 and RS485 serial outputs
- iv) Built-in battery backup
- v) Connectivity and Data transmission:
 - RS485 MODBUS interface for data collection and storage
 - on SCADA Communication protocol should support fast data transmission rates, enable operation in different Frequency bands and have an encryption-based data security layer for secure data transmission
- vi) Display Settings: Graphic LCD screen which should be easily accessible and should display relevant details like all sensor values, battery strength, network strength etc.
- vii) Provision of Time synchronization from telecom time or server time

- viii) Data Storage: Provision for at least 2 MB internal Flash Memory and at least 8 GB Micro SD card (expandable)
- ix) Protection level: IP65

18 **CCTV Camera**

- 18.1 CCTV Cameras along with monitoring stations (sufficient numbers) and all other accessories required for its proper operation must be installed to have complete coverage of following areas for 24 hours.
 - (i) Main entry: Covering all the entry/exit
 - (ii) Along the Plant Perimeter: Covering complete perimeter of Plant Area to capture all possible intrusion
 - (iii) Control Rooms: Covering Entry/Exit and Equipment Rooms
 - (iv) Switchyard
- 18.2 Monitoring stations of the CCTV Network shall be installed in Main Control Room.
- 18.3 The CCTV system shall be designed as a standalone IP based network architecture. System shall use video signals from different cameras at defined locations, process the video signals for viewing on monitors at control room and simultaneously record all video streams using latest compression techniques.
- 18.4 Camera shall be colour, suitable for day and night surveillance (even under complete darkness) and network compatible.
- 18.5 It shall be possible to control all cameras i.e., PTZ auto/ manual focus, selection of pre-sets, video tour selection etc. The software shall support flexible 1/2/4 windows split screen display mode or scroll mode on the display monitor for live video.
- 18.6 The system shall support video analytics in respect of the following:
 - (i) Video motion detection
 - (ii) Object tracking
 - (iii) Object classification
 - (iv) Camera server shall be provided with sufficient storage space to storage recordings of all cameras at HD mode for a period of 15 days. All recordings shall have camera ID, location, date and time of recording.

19 **Cleaning/ Washing System**

2 no. of Borewell along with 2 no. of suitable capacity Submersible Pumps to be provided at site. The permissions/ clearances from the Statutory/Govt. bodies required for digging of borewell / installation of submersible pump will be in the scope of bidder. Also, 2 no. of sufficient capacity motors/pumps to be provided for cleaning/washing of the SPV Modules. A suitable water line all around the Module structures/arrays shall be laid with Hydrant outlets near each Array to supply water at adequate pressure for washing of the Modules. The water line may either be of CPVC or GI Class-B.

Efficient surface drainage system of adequate capacity of drains is required for quick drainage of the rain water/waste water from washing of modules.

20 **Fire Alarm System**

- 20.1 Standards and Codes

Standard/Code	Description
IS 2189	Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System Code of Practice
IS 2171	Portable Fire Extinguishers, Dry Powder (Cartridge Type)
IS 8149	Functional requirements for twin CO ₂ fire extinguishers (trolley mounted)
IS 2546	Galvanized mild steel fire bucket
National Building code 2016	

- 20.2 The installation shall meet all applicable statutory requirements and safety regulations of state/central fire department/body or any other competent authority in terms of fire protection.
- 20.3 Firefighting system for the proposed power plant for fire protection shall be consisting of but not limited to:
- (i) Sand buckets
 - (ii) Portable fire extinguishers (CO₂ and dry powder type)
 - (iii) Hooter cum strobe
- 20.4 Minimum two numbers of fire extinguishers (CO₂ and Foam type each, of capacity 9 kg having BIS certification marking as per IS: 2171) shall be provided at every building/ enclosure, transformer yard and switchyard. However, contractor must comply with existing building code for fire protection and relevant IS codes.
- 20.5 Four numbers of stand with four sand buckets on each stand shall be provided in the Transformer Yard. Sand buckets inside the building shall be provided at strategic locations as decided during detailed engineering.

20 Power Evacuation System

- 21.1 The power evacuation line at 11 KV Voltage Level is to be provided from H-Pole in the switchyard to the designated grid substation of PSPCL as provided in this tender document along with the 11KV VCB and metering system in the PSPCL grid.
- 21.2 The work of laying of 11 KV Power Evacuation Line, Power Cables in the PSPCL grid, VCB Panel and metering equipment will be got done by the Bidder from PSPCL on deposit basis so as to match its commissioning with the power house commissioning.
- 21.3 PGL will reimburse the actual cost of the deposit work paid to PSPCL by the contractor on submission of relevant receipts/ documents.
- 21.4 The bidder will be fully responsible for timely completion of the Power Evacuation System. However, in case there is delay in commissioning of the power evacuation system due to PSPCL, no penalty shall be levied to the contractor. The contractor will be required to provide documentary evidence/proof to PGL that the work is delayed due to PSPCL. It is advisable to the contractor to timely approach PSPCL for the power evacuation works.

SECTION VIII

8. Bid Form, Price Schedules and other Formats

Preamble

This Section (Section - VIII) of the Bidding Documents [named as Bid Form, Price Schedules and other Formats] provides proforma to be used by the bidders at the time of their bid preparation and by the Contractor subsequent to the award of Contract.

The Bidder shall complete, sign and submit with its bid the relevant FORMS to be used unamended, in accordance with the requirements included in the Bidding Documents.

The Bidder shall provide the EMD, in the form included hereafter acceptable to the Employer, pursuant to the provisions in the instructions to Bidders.

The Performance Security (ies) and Bank Guarantee for Advance Payment forms should not be completed by the bidders at the time of their bid preparation. Only the successful Bidder will be required to provide the Performance Security(ies) and Bank Guarantee for Advance Payment, according to one of the forms indicated herein acceptable to the Employer and pursuant to the provisions of the General and Special Conditions of Contract, respectively.

Depending on specific facts and circumstances related to the Bid/ Tender and the contract, the text of the Forms herein may need to be modified to some extent. The Employer reserves the right to make such modifications in conformity with such specific facts and circumstances and rectify and consequent discrepancies, if any. However, modifications, if any, to the text of the Forms that may be required in the opinion of the Bidder/ Contractor shall be effected only if the same is approved by the Employer. The Employer's decision in this regard shall be final and binding.

BID PROPOSAL SHEET

Bidder's Proposal Reference No. & Date :
Bidder's Name & Address :
Person to be contacted :
Designation :
Telephone No. :
Fax No. :

To:

**Director
Punjab Genco Limited,
Solar Passive Complex
Plot No. 1 & 2, Sector 33-D, Chandigarh**

**Subject: Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning
alongwith Operation and Maintenance (O&M) for 5 Years of 4 Nos. X 4 Mwp Capacity
each SPV Power Plants at different locations in the State of Punjab.**

Dear Sir,

This has reference to tender no. **PEDA/PGL/2022-23/16 dated 12.09.2022.**

1.0 We, the undersigned Bidders, have read and examined in detail the specifications and all bidding documents in respect of Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning along with Operation and Maintenance for 5 years for 4 MWp capacity each SPV Power Plants at 4 different locations (mentioned in the referred tender) in the State of Punjab and do hereby propose to provide equipment as specified in the bidding document.

2.0 PRICE AND VALIDITY

- 2.1 All the prices mentioned in our proposal are in accordance with the terms as specified in bidding documents. All the prices and other terms and conditions of this proposal are valid for a period of 90 days from the last date of submission of bids.
- 2.2 We do hereby confirm that our bid prices include all taxes and cess including Income Tax.
- 2.3 We have studied the Clauses relating to valid Indian Income Tax and hereby declare that if any Income Tax, Surcharge on Income Tax and any other Corporate Tax is altered under the law, we shall pay the same.

3.0 EARNEST MONEY

We have enclosed the required earnest money. It is liable to be forfeited in accordance with the provisions of bid document.

4.0 DEVIATIONS

We declare that all the services shall be performed strictly in accordance with the fine-tuned Technical specifications and other bid document except the deviations as mentioned in the Technical deviation Format. Further we agree that additional conditions, if any, found in the proposal documents, other than those stated in deviations Format, shall not be given effect to.

5.0 BID PRICING

We further declare that the prices stated in our proposal are in accordance with your terms & conditions in the bidding document.

6.0 QUALIFYING DATA

We confirm having submitted in qualifying data as required by you in your bid document. In case you require any further information/documentary proof in this regard during evaluation of our bid, we agree to furnish the same in time to your satisfaction.

7.0 CONTRACT PERFORMANCE SECURITY

We hereby declare that in case the contract is awarded to us, we shall submit the Performance Guarantee in the form of Bank Guarantee as per terms of bid document.

7.1 We hereby declare that our proposal is made in good faith, without collusion or fraud and the information contained in the proposal is true and correct to the best of our knowledge & belief.

7.2 Bid submitted by us is properly prepared so as to prevent any subsequent alteration and replacement.

7.3 We understand that you are not bound to accept the lowest or any bid you may receive.

Thanking you,

Date

Place

Signature

Name

Seal

PERFORMA - II**TECHNICAL DEVIATIONS**

Subject: Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning alongwith Operation and Maintenance (O&M) for 5 Years of 4 Nos. X 4 Mwp Capacity each SPV Power Plants at different locations in the State of Punjab.

This has reference to tender no. **PEDA/PGL/2022-23/16 dated 12.09.2022.**

Dear Sir,

Following are the Technical deviations & variations from the exceptions to the specifications of commissioning of Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning along with Operation and Maintenance for 5 years for 4 MWp capacity each SPV Power Plants in the referred tender. These deviations and variations are exhaustive. Except these deviations and variations, the entire work shall be provided as per your specifications and documents.

Sr. No.	Clause No.	Page No.	Statement of deviations and variations
--------------------	-----------------------	---------------------	---

Date	Signature
Place	Name
	Seal

PERFORMA - III

CERTIFICATE

USE OF NEW, GENUINE AND QUALITY COMPONENTS

This has reference to tender no. **PEDAPGL/2022-23/16 dated 12.09.2022.**

We hereby undertake that all the components / parts/ assembly/ equipment's, etc. to be used in Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning along with Operation and Maintenance for 5 years for 4 MWp capacity each SPV Power Plants as mentioned in the referred tender shall be original, new, genuine and as per the said technical specifications in this tender document and will be as per applicable Indian/International Standards. It is also certified that no refurbished/ duplicate/ second-hand components/ parts/assembly are being used or shall be used.

In case we are found not complying with above indicated undertaking and specifications as per tender document specifications/clauses at the time of delivery or during installation, we allow the **Punjab Genco Limited** to take appropriate action (e.g. Forfeiture of Bank Guarantee/ EMD, etc.).

Authorized signatory

PERFORMA - IV**PROOF OF EXPERIENCE**

This has reference to tender no. **PEDAPGL/2022-23/16 dated 12.09.2022.**

The bidder should have designed, manufactured, tested supplied, erected and commissioned at least one Solar PV Project of 2 MW or above capacity anywhere in India. The bidder must also have experience of Operation and Maintenance of Solar PV projects of aggregate 2 MW capacity or more for minimum 1 year, in any of the last five (5) years in which project(s) is/are in successful operation on the date of bid opening (The Bidder should meet the qualification criteria for setting up of the project as well as O&M as mentioned above).

The Bidder shall submit copies of Orders of similar type of works executed as mentioned above, along with proof of satisfactory execution in the form of certificate of completion etc. issued by the ordering agency/department.

S. no.	Agency / Deptt.	Installed Capacity of Solar PV Project (MW)	Date of Award of Contract	Total contract Value	Completion certificate attached (Y/N)	Name/ Designation, Address & phone no. of the contact person of Agency / Deptt.
1.						
2.						
3.						
4.						
5.						

Note: Copies of performance/ execution certificates or any other supporting documents having executed the work to any Department/Agency should be enclosed with the tenders. Only copies/ list of POs may not be treated as authentic proofs.

Dated.

Authorized Signatory

Name: _____

Designation: _____

Address and Seal of the Company

PERFORMA - V**Particular of the Bidder**

This has reference to tender no. **PED A/PGL/2022-23/16** dated **12.09.2022**.

Performa for eliciting information for appraisal of Company capability to execute the works as per requirements of PGL Tender Specification.

1. Name of the tendering Company/ Bidder	
A) Registered address of the Company	
i) Telephone Number(s)	
ii) Fax Number	
iii) E. Mail Address	
iv) Name of the two responsible persons along with Designation	
B) Name, Addresses & Telephone No. of Chairman/ Managing Director/Directors/Partner/Proprietor.	
i) Name	
ii) Address	
iii) Telephone/mobile Number	
i) Name	
ii) Address	
iii) Telephone/mobile Number	
i) Name	
ii) Address	
iii) Telephone/mobile Number	
2. Date of Incorporation of the Company	
3. Memorandum and Article of Association of Company	
4. Financial Position:-	
i) Net Worth	
FY 2020-21 (Positive)	
ii) Turn Over (duly audited for the last three years)	
FY 2019-20	
FY 2020-21	
FY 2021-22	
Average Annual Turnover during last 3 years audited annual accounts (i.e. from FY 2019-20 to FY 2021-22)	
iii) PAN No. & Proof of filling Income Tax Return by the Company	
iv) CIN No.	
v) TAN No.	
vi) GST No.	
E-processing fee	
Amount, Rs.	
Date	

Online Transaction No.	
Tender document & Bid Processing Fee (Non Refundable)	
Amount, Rs.	
Date	
Online Transaction No.	
Details of EMD (Rs. _____/- Lac (Rupees only)	
Online Transaction No.	
Online Transaction Date	

Dated.

Authorized Signatory

Name: _____

Designation: _____

Address and Seal of the Company

NOTES:

- 1) Please attach additional sheets, where required.
- 2) Copies of documents attached with the Performa should be attested by the company authorized signatory with stamp mark of the company.

BID SECURING DECLATAION

(The Bidder shall fill in this Form in accordance with the instructions indicated)

This has reference to tender no. **PEDA/PGL/2022-23/16 dated 12.09.2022.**

To: [complete name of Employer] We, the undersigned, declare that:

We understand that, according to your conditions, Bids must be supported by a Bid-SecuringDeclaration.

We accept that we will automatically be suspended from being eligible for bidding or submitting proposals in any contract with the Employer/Owner for the period of time of 24 months starting from the last date of bid submission, if we are in breach of our obligation(s) under the Bid conditions, because we:

- (a) have withdrawn our Bid during the period of Bid validity specified in the Letter of Bid; or
- (b) having been notified of the acceptance of our Bid by the Employer/Owner during the period of Bidvalidity, (i) fail or refuse to sign the Contract; or (ii) fail or refuse to furnish the Performance Security, if required, in accordance with the ITB/GCC clause.

We understand this Bid Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) twenty- eight days after the expiration of our Bid.

Name of the Bidder

Name of the person duly authorized to sign the Bid

on behalf of the Bidder**Title of the person signing

the Bid

Signature of the person named above

Date signed_day of_____, ____

****:** Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

**DECLARATION REGARDING BANNING,
LIQUIDATION, COURT RECEIVERSHIP ETC.**
(To be submitted on the Letter Head of the Bidding Company)

Ref.No. _____ Date: _____

From: _____ *(Insert name and address of Bidding Company)*

Tel.#:

Fax#:

Email Address:

Punjab Genco Limited

Plot No. 1 & 2, Sector – 33D, Chandigarh

Sub: Bid for the “Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning along with Operation and Maintenance for 5 years for 4 MWp capacity each SPV Power Plants at 4 different locations in the State of Punjab.

Dear Sir / Madam,

This has reference to tender no. **PEDA/PGL/2022-23/16 dated 12.09.2022.**

We hereby confirm that we are not on Banning List by Employer/ Owner or Public Sector Project Management Consultant due to “poor performance” or “corrupt and fraudulent practices” or any other reason or banned by Government department/ Public Sector on due date of submission of bid.

Further, we confirm that neither we nor our allied agency/(ies) are on banning list of Employer/ Owner or the Ministry of New & Renewable Energy.

We also confirm that we are not under any liquidation, court receivership or similar proceedings or 'bankruptcy'.

In case it comes to the notice of Employer/ Owner that we have given wrong declaration in this regard, the same shall be dealt as 'fraudulent practices' and action shall be initiated as per the Procedure for action in case of Corrupt/Fraudulent/Collusive/Coercive Practices.

Further, we also confirm that in case there is any change in status of the declaration prior to award of contract, the same will be promptly informed to Employer/ Owner by us.

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation

Seal

PERFORMANCE SECURITY BANK GUARANTEE

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

Ref. _____ Date: _____ Bank Guarantee
No. _____

In consideration of the [Insert name of the Bidder] (hereinafter referred to as 'Bidder')
submitting

the response to NIT inter alia for selection of the Project in
response to the NIT No. _____ dated issued by Punjab Genco Limited
(hereinafter referred to as PGL) and PGL considering such response to the
NIT of [insert the name of the
Bidder] as per the terms of the NIT, the _____ [insert name &
address of bank] hereby agrees unequivocally, irrevocably and unconditionally to
pay to PGL at [Insert Name of the Place from the address of PGL] forthwith on
demand in writing from PGL or any Officer authorized by it in this behalf, any
amount upto and not exceeding Rupees -----[Insert amount] only, on behalf of
M/s. _____
_____ [Insert name of the Bidder] .

This guarantee shall be valid and binding on this Bank up to and including _____
[insert date of validity in accordance with NIT] and shall not be terminable by
notice or any change in the constitution of the Bank or the term of contract or
by any other reasons whatsoever and our liability hereunder shall not be
impaired or discharged by any extension of time or variations or alternations
made, given, or agreed with or without our knowledge or consent, by or
between parties to the respective agreement.

Our liability under this Guarantee is restricted to Rs _____ (Rs. _____
only). Our Guarantee shall remain in force until _____ [ins
ert date of validity in accordance with NIT]. PGL shall be entitled to invoke this
Guarantee till _____ [Insert date which is 30 days after the date in the preceding
sentence].

The Guarantor Bank hereby agrees and acknowledges that the PGL shall
have a right to invoke this BANK GUARANTEE in part or in full, as it may
deem fit.

The Guarantor Bank hereby expressly agrees that it shall not require any proof
in addition to the written demand by PGL, made in any format, raised at the
above-mentioned address of the Guarantor Bank, in order to make the said
payment to PGL.

The Guarantor Bank shall make payment hereunder on first demand without
restriction or conditions and notwithstanding any objection by [Insert name
of the Bidder] and/or any other person.

The Guarantor Bank shall not require PGL to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse PGL in respect of any payment made hereunder.

This BANK GUARANTEE shall be interpreted in accordance with the laws of India and the courts at Chandigarh have exclusive jurisdiction.

The Guarantor Bank represents that this BANK GUARANTEE has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein.

This BANK GUARANTEE shall not be affected in any manner by reason of merger, amalgamation, restructuring or any other change in the constitution of the Guarantor Bank.

This BANK GUARANTEE shall be a primary obligation of the Guarantor Bank and accordingly PGL shall not be obliged before enforcing this BANK GUARANTEE to take any action in any court or arbitral proceedings against the Bidder, to make any claim against or any demand on the Bidder or to give any notice to the Bidder or to enforce any security held by PGL or to exercise, levy or enforce any distress, diligence or other process against the Bidder.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to Rs.

____(Rs.____only) and it shall remain in force until ____ [Date to be inserted on the basis of this NIT] with an additional claim period of thirty (30) days thereafter. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if PGL serves upon us a written claim or demand.

Signature_____ Name_____

Power of Attorney No.____

For

____[Insert Name of the Bank]____

Banker's Stamp and Full Address. Dated this day of _____, 20_____

Bank Contact Details & E Mail ID is to be provide

**DECLARATION REGARDING THE MANDATORY
PROCUREMENT OF SOLAR INVERTERS FROM
CLASS I LOCAL SUPPLIERS**

(To be submitted on the Letter Head of the Statuary Auditor/Cost Auditor of the company (In case of companies) or from a practicing cost accountant or practicing chartered accountant (In respect of suppliers other than companies))

Reference: Ministry of New & Renewable Energy (MNRE) Order No 283/22/2019-GRID SOLAR dated 23rd Sep 2020 for the Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of Renewable Energy (RE) Sector.

Reference 2: Department for Promotion of Industry and Internal Trade (DPIIT) Notification No. P- 45021/2/2017-PP (BE-II) dated 4th June, 2020.

Ref.No. _____ Date: _____

To
Punjab Genco Limited
Plot No. 1 & 2, Sector – 33 D, Chandigarh

Sub: Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning along with Operation and Maintenance for 5 years for 4 MWp (AC) capacity each SPV Power Plants at 4 different locations in the State of Punjab.

Dear Sir / Madam,

We hereby confirm that in line with the mandate of *Ministry of New & Renewable Energy (MNRE) Order No283/22/2019-GRID SOLAR dated 23rd Sep 2020 for the Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of Renewable Energy (RE) Sector & Department for Promotion of Industry and Internal Trade (DPIIT) Notification No. P-45021/2/2017-PP (BE- II) dated 4th June, 2020*, we hereby declare that:

- a) The procurement of **Solar Inverters** for the subject tender will be done from Class I Local suppliers only.

- b) A Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%, as defined under the above said Orders.
- c) The percentage of Local content in the procurement of mentioned **Solar Inverters** is.....% (In words)

False declaration will be in the breach of the code of integrity under Rule 175(1)(i)(h) of the General Financial rules for which a bidder or its successors can be debarred for up to two years as per rule 151 (iii) of the general Financial rules along with such other actions as may be permissible under the law.

Also, In case it comes to the notice of Employer/ Owner that we have given wrong declaration in this regard, the same shall be dealt as 'wrong declaration under fraudulent practices' and action shall be initiated as per the Procedure for action in case of Corrupt/Fraudulent/Collusive/Coercive Practices.

(Signature and stamp (on each page) of Authorized Signatory of Bidding Company.

Name:

Date:

Place:

Signature and stamp (on each page) of Statuary Auditor/Cost Auditor/ practicing cost accountant or practicing chartered accountant of Bidding Company.

Name:

Date:

Place:

PROFORMA OF BANK GUARANTEE FOR ADVANCE PAYMENT

*(To be stamped in accordance with Stamp Act, the Non-Judicial Stamp
Paper of Appropriate Value should be in the name of the issuing Bank)*

Bank Guarantee
No.:

Date:

NOA/ Contract No.....

..... *[Name of Contract]*

To:

Punjab Genco Limited

Plot No. 1 & 2, Sector 33-D, Chandigarh

Sir / Madam,

We refer to the Contract ("the Contract") signed on*(insert date of the Contract)*
between you
and M/s *(Name of Contractor)*,

(or)

vide notification of award issued on *(insert date of the notification of award)* by
you to M/s
..... *(Name of Contractor)* having its Principal place of business at.....*(Address
of
Contractor)* and Registered Office at *(Registered address of
Contractor)*

..... ("the Contractor") concerning

.....
(Indicate brief scope of work) for the complete execution of the *(insert
name of
Package along with name of the Project)*

Whereas, in accordance with the terms of the said Contract, the Owner has agreed to pay or
cause to be paid to the Contractor an interest bearing Advance Payment against furnishing
of an irrevocable bank guarantee for an amount of *(Amount in figures
and words)*
which is equal
to 110% of the amount of Advance Payment.

By this letter, we, the undersigned, *(insert name & address of the issuing bank)*
....., a Bank (which expression shall include its successors, administrators, executors and
assigns) organized under the laws of and having its Registered/ Head
Office at *(insert address of registered office of the bank)* do hereby
irrevocably guarantee repayment of
(Amount of

the bank guarantee in figures and words)..... upon the first demand of the Employer without cavil

or argument in the event that the Contractor fails to commence or fulfill its obligations under the terms of the said Contract for reasons whatsoever.

Provided always that the Bank's obligation shall be limited to the amount of this Bank guarantee or an amount equal to the outstanding balance of the Advance Payment and the accrued interest on the Advance Payment, taking into account such amounts, which have been repaid by the Contractor from time to time in accordance with the terms of payment of the said Contract, as certified by you.

This Guarantee shall remain in full force from the date upon which the said Advance Payment is received by the Contractor up to sixty (60) days beyond the date on which the entire Advance Payment due thereon has been fully adjusted in terms of the Contract i.e., up to sixty (60) days beyond the date of Completion of the Facilities under the Contract. This Guarantee may be extended from time to time, as may be desired by M/s Punjab Genco Limited on whose behalf this Guarantee has been issued.

Any claims to be made under this Guarantee must be received by the Bank during its period of validity, i.e. upto sixty (60) days beyond the date of Completion of the Facilities by the Employer i.e. upto and inclusive of(dd/mm/yy).

Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed _____ (value in figures) [_____ (value in words)
2. This Bank Guarantee shall be valid upto _____ (validity date) _____.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (validity date) _____.

For and on behalf of the Bank

[Signature of the authorised signatory(ies)] Signature

Name _____

Designation

POA Number

Contact Number(s): Tel.Mobile _____

Fax Number

email

Common Seal of the Bank _____

Witness: Signature

Name _____

Address

Contact Number(s): Tel.Mobile_____

email

Note:

1. For the purpose of executing the Bank Guarantee, the non-judicial stamp papers of appropriate value shall be purchased in the name of Bank who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be signed on all the pages by the Bank Authorities indicating their POAnos. and should invariably be witnessed.

POWER OF ATTORNEY FOR BIDDING COMPANY

*(To be stamped in accordance with Stamp Act, the Non-Judicial Stamp
Paper of Appropriate Value should be in the name of the Bidder)*

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
..... a
s 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 (insert details of Tender) in response
to the Tender No
..... dated issued by Punjab Genco Limited
(PGL), Chandigarh 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
PGL may require us to submit. The aforesaid Attorney is further authorized for making
representations to the Punjab Genco Limited, Chandigarh and providing information/
responses to PGL representing us in all matters before PGL and generally dealing
with PGL, in all matters in connection with Bid till the completion of the bidding
process as per the terms of the above mentioned Tender.

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 Tender.

Signed by the within named

..... (Insert the name of the executant
company)

through the hand of

Mr.

duly authorized by the Board 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
Director's Resolution dated.....

WITNESS

3.
(Signature)

Name.....

Designation

4.
(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.

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).

TECHNICAL DETAIL FORM
(Clause 14 of ITB)

S.No.	ITEM	PARTICULARS
1.	SOLAR PHOTOVOLTAIC MODULES (Nos.)	
1.1	MANUFACTURER/ MAKE	
1.2	SIZE/ CAPACITY OF PV MODULE	
1.3	TESTING AND QUALIFYING STANDARDS (Attach Certificates)	
1.4	I-V curve attach	
1.5	P max	
1.6	I mp	
1.7	V mp	
1.8	CELL EFFICIENCY / MODULE EFFICIENCY	
1.9	No. of cells in a module	
1.10	Warranty offered (Attach Certificate) from OEM	
2	INVERTERS	
2.1	TYPE / MAKE	
2.2	AC Output Voltage	
2.3	DC input voltage range	
2.4	DC operating voltage	
2.5	Continuous rating	
2.6	Grid Voltage Tracking range	
2.7	Grid Frequency tracking range	
2.8	Grid Phase imbalance	
2.9	Efficiency	
2.10	Operating temperature range	
2.11	Power control	
2.12	Protection features	
2.13	Overload capacity	
2.14	Total harmonic distortion	
2.15	Islanding protection	
2.16	Ingress protection	
2.17	Hardware platform	
2.18	DC input overload capacity	
2.19	Electronic metering accuracy	
2.20	Data logger accuracy	
3	Battery	
3.1	Type	
3.2	Manufacturers name	
3.3	Capacity Ah	
3.4	DOD %	
3.5	Rated normal voltage	
3.6	Rated maximum voltage	
3.7	Rated minimum voltage	
3.8	Applicable standard	
3.9	Ampere hour efficiency	

Signature of the Bidder _____

Business Address _____

CONTRACT FORM

THIS AGREEMENT made theday of....., 20... Between (*Name of purchaser*) of (*Country of Purchaser*) (hereinafter "the Purchaser") of the one part and (*Name of Supplier*) of (*City and Country of Supplier*) (hereinafter called "the Supplier") of the other part :

WHEREAS the Purchaser invited bids for certain Goods and ancillary services viz., (*Brief Description of Goods and Services*) and has accepted a bid by the Supplier for the supply of those goods and services in the sum of (*Contract Price in Words and Figures*) (hereinafter called "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:
 - (a) the Bid Form and the Price Schedule submitted by the Bidder;
 - (b) the Schedule of Requirements;
 - (c) the Technical Specifications;
 - (d) the General Conditions of Contract;
 - (e) the Special Conditions of Contract; and
 - (f) the Purchaser's Notification of Award.
3. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the goods and services and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the goods and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

Brief particulars of the goods and services which shall be supplied/provided by the Supplier are as under:

SL. NO.	BRIEF DESCRIPTION- GOODS & ETC.) SERVICES	QUANTITY TO BE SUPPLIED	UNIT PRICE	Total Price	DELIVERY TERMS (CIF/CFR/FOB/FCA OF
---------	--	----------------------------	---------------	----------------	---------------------------------------

TOTAL VALUE:**DELIVERY SCHEDULE:**

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in

accordance with their respective laws the day and year first above written.

Signed, Sealed and Delivered by the
said (For the Purchaser)

in the presence of:.....

Signed, Sealed and Delivered by the
said (For the Supplier)

in the presence of:.....

PERFORMA – XIV

One bidder can quote for multiple project(s) of 4MWp (AC) capacity for which separate SOR is required to be furnished for each project site.

TENDER NO. PEDAPGL/2022-23/16 dated 12.09.2022.

SCHEDULE OF RATES (SOR)

Name of Bidder:

Tender for Design, Manufacture, Supply, Erection, Testing and Commissioning along with Operation and Maintenance for 5 years for 4 MWp (AC) capacity each SPV Power Plants at Village- _____, Tehsil- _____, District- _____.

S. No.	Description of Item	Qty. (Lot)	Prices				
			FOR site Price (Excluding GST)	Total FOR site Price (Excluding GST)	Total value of applicable GST (in figures)	% of GST applied (Eg. 5%, 18% or actual as applicable)	Total FOR site price (including GST)
1	2	3	4	5 = 3*4	6	7	8=5+6

PART A: SCHEDULE OF RATES (SOR-1)- SOLAR PART (4MW)

1.	Supply of PV Modules as specified in the Tender document						
2.	Supply of inverters as specified in the Tender document						
3.	Supply of Inverter Transformer as specified in the Tender document						
4.	Supply of Panels and Switchgears as specified in the Tender document						
5.	Supply of Module Mounting Structure as specified in the Tender Document						
6.	Cables (All DC, LT & HT)						
7.	Weather Monitoring Station						
8.	Manufacture and supply of balance of						

	system including all equipments, materials, Accessories, Safety & Fire Fighting System etc. excluding in above Solar Part supply and any other Supplies specified in the Tender Documents.						
9.	SUB TOTAL – A						
PART B: SCHEDULE OF RATES (SOR-2)- SERVICE PART (4MW)							
10.	Design Engineering, Installation, Erection, Testing and Commissioning including Performance Testing in respect of all the Equipments supplied and any other Services Specified in the Tender Documents.						
11.	Civil works (as per Scope specified in this tender document):						
a.	Development of project land						
b.	Chain-Link Fencing complete in all respects.						
c.	Main Entrance Gate complete in all respects.						
d.	Security Hut complete in all respects.						
e.	Switchyard/ODY complete in all respects.						
f.	Metering Room complete in all respects.						

g.	Control Room complete in all respects.						
h.	PGL Office complete in all respects.						
i.	Store/Utility Room / General Bathrooms complete in all respects.						
j.	2 no. Polyethylene Water Tanks alongwith platforms complete in all respects.						
k.	Septic Tank complete in all respects.						
l.	Module Erection Arrangement complete in all respects.						
m.	Roads / Pavements complete in all respects.						
n.	Any other works/items required for successful completion of the project (details to be provided alongwith cost/ rate)						
12.	SUB TOTAL – B						
PART C: SCHEDULE OF RATES (SOR-3) OPERATION AND MAINTENANCE PART (4MW)							
13.	Bidder to mention here the O&M amount for total 5 years. The O&M cost will be released equally at 5 year period (at the end of each year)						
14.	SUB TOTAL – C						
15.	Grand Total (A+B+C)						

The evaluation of the price bid will be done on the total FOR Price excluding GST. Any change in GST shall be borne by PGL

SECTION IX

SCOPE OF OPERATION & MAINTENANCE OF POWER PLANT

(O&M contract to be signed separately)

Scope of Operation & Maintenance of SPV Power Plant for a period of 5Years from Date of Commissioning

Regular operation & maintenance of the SPV Power Plant including the power evacuation system up to and including delivery point in PSPCL grid for a period of Five (5) years after commissioning along with supply of consumable items as and when necessary and submission of daily performance data of the power plant shall be covered under the operation & maintenance contract. Complete operation & maintenance of the plant has to be carried out by the successful bidding company and cannot be sublet to any third party.

The operation and maintenance schedule of the SPV power plant during the 5 years contract period shall be as detailed below :

1. 5 years operation and maintenance period shall begin on the date of actual commissioning of the power plant. The requisite number of qualified and trained personnel are required to be deputed round the clock from that very day.
2. The security of the power plant will rest with the bidder / supplier till such time operation and maintenance of the power plant is not handed over to / taken over by the purchaser.
3. The deputed personnel shall be qualified, experienced and well trained so that they can handle any type of operation hazard quickly and timely.
4. The deputed personnel shall have to keep daily log sheet for the power plant as per format to be mutually decided after commissioning of the power plant.
5. The deputed personnel shall be in a position to check and test all the equipment regularly, so that, preventive actions, if any, could be taken well in advance to save any equipment from damage. Any abnormal behavior of any equipment shall be brought to the notice of PGL/PEDA immediately for appropriate action.
6. The deputed personnel shall keep the power plant clean and tidy at all times. Cooking in the control room will not be allowed under any circumstances.
7. Normal and preventive maintenance of the power plant such as cleaning of module surface, tightening of all electrical connections, changing of tilt angle of module mounting structures, cleaning & greasing of battery terminals etc., shall be carried out at regular intervals to be mutually decided with PGL/PEDA
8. During operation & maintenance period of 5 years of the power plant, if there is any loss or damage of any component of the power plant due to miss management/miss handling or due to any other reasons, what-so-ever, the supplier shall be responsible for immediate replacement/rectification. The damaged component may be repaired, if it is understood after examination that after repairing performance of the component shall not be degraded, otherwise the defective component shall have to be replaced by new one without any extra cost.
9. List of Spare parts which are to be supplied along with the systems are given in **Annexure-1**. These spares are the property of the purchaser and the contractor will

use these spares sparingly with express permission of the purchaser in case of emergency breakdowns, however, the contractor will have to refill the used spares within one month of draw down. All the spares inventory of the purchaser has to be fully refilled with new and unused spares at the time of handing over of the plant after completion of the 5 years of O&M of the plant by the contractor in case of non-compliance, the purchaser will refill these spares with new ones at the cost of the contractor.

10. Operation & Maintenance Instructions:

10.1 The successful bidder shall furnish 3 sets of the approved manuals of instructions at the time of inspection and taking over of the equipment. These manuals shall properly bound in book form and contain all information, description of equipment, diagram etc., necessary to enable the customer to operate and maintain the whole scheme.

10.2 Proper Operation & maintenance of the plant shall be carried out by the contractor during O&M period of 5 years with annual review checkup of plant and equipment in detail with purchaser.

10.3 Properly qualified and trained personnel well versed in O & M of SPV plants and knowledge of computers with approval from purchaser shall be deployed at site for operation & maintenance.

10.4 Proper repainting, re coating of exposed surfaces/civil works to prevent rusting & replacement of worn out parts shall be carried out along with the maintenance of the INVERTER and UPS systems on as per requirement basis. However, white wash, painting, maintenance of civil structures, buildings, compound wall shall be carried out once in three years.

- Plant personnel shall be deputed on such basis so that 2 nos. qualified person with a minimum qualification of Diploma in Electrical Engineering with minimum 3 years' experience in operating such SPV Power Projects should be available at site always during the operation & maintenance period. Two (2) plant operators with ITI electrical minimum qualification on shift basis must be deployed so as to be available at the project site half an hour before to half an hour after the synchronization of inverter with the grid. Round the clock security with two security personnel to be deployed in each shift. Company will be required to deploy adequate un-skilled / skilled manpower as per site requirement in consultation with PGL for site maintenance, modules cleaning, and general upkeep. One Gardner for taking care of plants and overall plant gardening aspects shall be deployed by the company.
- Supplier shall depute an engineer of their company for the operation and maintenance of the plant who shall be fully responsible for the complete O&M and optimum operation of the plant. The name and contact nos. of this engineer shall be notified to the purchaser, for the purpose of contact, responsibility and correspondence with regard to all trouble shooting.
- Tentative List of the numbers, their minimum qualification and experience of the persons to be deployed during operation and maintenance period shall be attached with the bid
- Replacement & repair of damaged parts shall be carried out immediately during the O&M period so as to ensure "annual CUF as specified in clause 10.8 below."
- Plant operation reports in a format prescribed by the purchaser shall be furnished by the supplier on a weekly and monthly basis.

- Plant shall be operated as per the standard IER practices to ensure proper safety measures.
- Proper data logs and records shall be maintained at the plant office with regard to generation, efficiency, solar radiation, grid conditions, power and energy fed to the grid which shall be supplied on demand to the purchaser.
- Proper operation & maintenance of the complete street lights installed along with replacement of defective wires and lighting fixtures shall be carried out on an immediate basis.
- The supplier shall ensure replacement of worn out parts and components including UPS system during the operation & maintenance period for which purpose the supplier shall carry and maintain minimum inventory levels of spares at the plant and at its works.
- In case of delay in repair & maintenance and non-observance of purchasers O&M schedules, the purchaser shall have the right to impose any penalties including forfeiture of Performance Bank Guarantee and / or termination of O&M contract.
- Round the clock maintenance (routine, preventive, breakdown and capital maintenance) of complete plant and equipments including Facade lighting, UPS, SPV Array, INVERTER, SCADA system etc., with dedicated telephone lines/communication links with PSPCL, PGL and SLDC shall be carried out by the supplier in accordance with manufacturer's instructions, manufacturers procedures, relevant safety codes, Indian Electricity Act, Indian Electricity Rules, purchaser's instructions, prudent utility practices etc.

10.5 Routine, Preventive, Breakdown & Capital Maintenance:

- **Routine and preventive maintenance** shall include such checks and maintenance activities round the clock on hourly, shift wise, daily, weekly, fortnightly, monthly, quarterly, half yearly, and yearly basis which are required to be carried out on all the components of the power plant to minimize breakdowns and to ensure smooth and trouble free running of the power plant. The supplier shall be responsible to carry out routine and preventive maintenance and replacement of each and every component / equipment of the power plant and he shall provide all labour, material, consumables etc. for routine and preventive maintenance at his own cost.

Breakdown maintenance shall mean the maintenance activity including repairs and replacement of any component or equipment of the power plant which is not covered by routine and preventive maintenance and which is required to be carried out as a result of sudden failure/breakdown of that particular component or equipment while the plant is running. The supplier shall be responsible to carry out breakdown maintenance of each and every component of the power plant and he shall provide the required manpower, materials, consumables, components or equipment etc. for breakdown maintenance at his own cost irrespective of the reasons of the breakdown/failure.

Capital maintenance shall mean the major overhaul of any component or equipment of the power plant which is not covered by routine, preventive and breakdown maintenance which may become necessary on account of excessive wear & tear, aging, which needs repair/replacement. The capital maintenance of power plant and all civil structures shall normally be planned to be carried out on an annual basis. For this purpose a joint inspection by the supplier and purchaser shall be carried out of all the major components of the power plant, about two months in advance of the annual maintenance period, in order to ascertain as to which components of the power plant require capital maintenance. In this regard the decision of the purchaser will be final and

binding. However, if the condition of any plant and component warrants its capital maintenance at any other time, a joint inspection of the purchaser and supplier shall be carried out immediately on occurrence of such situation and capital maintenance shall be carried out by arranging the shutdown of the plant/part of the plant, if required, in consultation with concerned authorities. The decision of the purchaser shall be final and binding.

10.6 Dispatch and Scheduling

10.6.1 The O & M Contractor shall be required to schedule its power as per the applicable regulations of PSERC / Procedure of SLDC or any other competent agency and same being recognized by the SLDC or any other competent authority / agency as per applicable regulation/ law / direction and maintain compliance to the applicable Codes/ Grid Code requirements and directions, if any, as specified by concerned SLDC from time to time. Any deviation from the Schedule will attract the provisions of applicable regulation / guidelines / directions and any financial implication on account of this shall be on the account of the O&M Contractor.

10.6.2 The O&M Contractor shall be responsible for directly coordinating and dealing with the DISCOM, State Load Dispatch Centers, and other authorities in all respects in regard to declaration of availability, scheduling and dispatch of Power and due compliance with deviation and settlement mechanism and the applicable Grid code Regulations.

10.6.3 The O&M Contractor shall be responsible for any deviation from scheduling and for any resultant liabilities on account of charges for deviation as per applicable regulations. UI (Unscheduled Interchanges) charges on this account shall be directly paid by the O&M Contractor.

10.7 Reporting of Metered Data and Parameters

10.7.1 The grid connected renewable power plants will install necessary equipment for regular monitoring of required data and simultaneously for monitoring of the electric power and energy generated from the Project.

10.7.2 Online arrangement would have to be made by the O&M Contractor for submission of above data regularly for the entire period of the O&M period to the PSPCL/SLDC, MNRE and concerned agency as per applicable regulation / directions. The equipment for transfer of real time plant data to SLDC as required alongwith communication link(s) shall also be maintained as per requirement of SLDC.

10.7.3 Reports on above parameters on monthly basis (or as required by regulation / guidelines) shall be submitted by the O&M Contractor to Ministry of New and Renewable Energy/National Institute of Solar Energy through SLDC/Concerned agency for entire period of PPA.

10.8 Right to Contracted Capacity & Energy

- a) The O&M Contractor shall maintain minimum energy generation (net energy exported to grid i.e. after deducting auxiliary consumption and import). The guaranteed energy generation shall be calculated based on the energy reading recorded at the main billing meter at PSPCL sub-station end. The O&M Contractor shall achieve minimum annual

CUF of 21% on the contracted capacity (AC) for the first year of the contract i.e. minimum energy exported in kWh per kW of contracted capacity for 1st year will be 1839. Thereafter from 2nd year onward a linear degradation factor of up to 0.7% per year is permissible every year. It shall be the responsibility of the contractor, entirely at its cost and expense to install/ replace such number of Solar Panels and associated infrastructure (like project control equipment, structure etc.) if any as may be necessary to achieve the required yearly CUF and for this purpose contractor shall make its own study and investigation of the Global Horizontal Irradiance (GHI) and other factors prevalent in the area which have implication on the quantum of generation.

While working out the CUF of any year during the contract period, the generation loss due to clauses 10.9.1 and 10.9.2 below shall be permitted to be pass through and added to the actual generation. Thus CUF worked out on the basis of actual plus pass through generation will be considered as the CUF of the plant for that year subject to ceiling of 21%. Maximum Generation at the plant will not exceed the generation corresponding to CUF of 21% of contracted capacity on yearly basis.

- b) In case of part commissioning of the Project, the above limit shall be considered on pro-rata basis at the end of 12 months. It shall be the responsibility of the Contractor, entirely at its cost and expense to install such number of Solar panels and associated equipment as may be necessary to achieve the required CUF, and no additional cost is to be claimed in this regard from PGL. Annual Charges for O&M shall also be reduced proportionately commensurate with the actually commissioned capacity.
- c) **Shortfall in minimum generation:** During the contract period, if for any year, it is found that the Contractor has not been able to generate energy (corresponding to CUF of 16%) for any reason except as mentioned below, the non-compliance by Contractor shall make the Contractor liable to pay the compensation to PGL for the shortfall in generation at Rs. 2.75 per unit. The compensation shall be computed and applied to the amount of shortfall in generation with regard to each year separately. The compensation shall not be applicable in the events of Force Majeure identified under this tender document, affecting supply of solar power by the Contractor. For the measurement of energy the readings of the energy meters installed at the Delivery Point i.e. PSPCL grid will be considered. PGL/PEDA reserves the right to terminate the O&M contract if the CUF in any year is less than the required CUF by 2% after serving 21 days default notice as per the procedure specified in this document.
- d) While maintaining the CUF on contracted capacity as specified, the export of peak solar power will be restricted to the contracted capacity. In case at any point of time, the peak of capacity reached is higher than the contracted capacity at the point where power is injected, the Contractor will have to forego the excess generation and reduce the output to the contract capacity.

10.9 Generation compensation for Off-take constraints

10.9.1 Generation Compensation in off-take constraints due to Grid Unavailability:

10.9.1.1 During the operation of the plant, there can be some periods where the Project can generate power but due to temporary transmission unavailability, the power is not evacuated for reasons not attributable to the Contractor as detailed below:

- a) For repair, replacement and removal of the PSPCL/PSTCLs equipment or any part of its system that is associated with the Generating Company's facility. However, as far as practicable such an event shall be scheduled during the annual shutdown period of the Generating Facility.
- b) Load crash in PSPCL/PSTCL's Grid System due to wide spread rains, cyclones or typhoons etc.
- c) Conditions leading to over-loading of interconnecting transformers, transmission lines and Switch-gears due to outage of some equipment at the PSPCL/PSTCL's interconnecting Grid.
- d) If the PSPCL/PSTCL determines that the continued operation of the Generating Facility may endanger the safety of the PSPCL/PSTCL's personnel or integrity of the PSPCL/PSTCL's electric system or have an adverse effect on the electric service to the PSPCL/PSTCL's other customers.
- e) Under Force -Majeure Conditions of the PSPCL/PSTCL.
- f) In line with directions received from the State Load Dispatch Centre.

10.9.1.2 Instructions for the disconnection of the Generating Facility from the PSPCL/PSTCL's system shall be notified by the State Load Dispatch Centre for the period/ duration indicated by it. However, the PSPCL/PSTCL shall take all reasonable steps to minimize the number & duration of such interruptions,

10.9.1.3 In such cases, subject to the submission of documentary evidences from the competent authority, the generation compensation shall be restricted to the following and there shall be no other claim, directly or indirectly against PGL:

Duration of Grid unavailability	Provision for Generation Compensation
Grid unavailability in a contract year as defined above: (only period from 8 am to 6 pm to be counted):	Generation Loss = [(Average Generation per hour during the Contract Year) × (number of hours of grid unavailability during the Contract Year)] Where, Average Generation per hour during the Contract Year (kWh) = Total generation in the Contract Year (kWh) ÷ Total hours of generation in the Contract Year

The quantum of generation compensation as per above will be pass through and added in actual generation for working out the CUF of the Solar Plant.

10.9.2 Off-take constraints due to Backdown:

10.9.2.1 The Contractor and DISCOM shall follow the forecasting and scheduling process as per the regulations in this regard by the PSERC. In case of backing down of supply of power by the Contractor for reasons solely attributable to PSPCL excluding where the Backdown is on account of events like consideration of grid security or safety of any equipment or personnel or other such conditions, the

SPG shall be eligible for pass through of Generation Compensation in the manner detailed below:

Duration of Backdown	Provision for Generation Compensation for working out annual CUF on account of backdown of power solely attributable to PSPCL
Hours of Backdown during a monthly billing cycle.	Generation Compensation = 100% of [(Average Generation per hour during the month) X (number of backdown hours during the month)] Where, Average Generation per hour during the month (kWh) = Total generation in the month (kWh) ÷ Total hours of generation in the month

The lost generation due to backdown as per above will be pass through and added in actual generation for working out the CUF of the plant.

10.9.3 In case of failure of the Contractor in maintaining proper records and/or documents for claiming the compensations described in this para 10.9 and supply of the same to PGL, no such pass through will be allowed.

Section –X
ANNEXURES

Annexure I

List of Minimum Spares and Tools for each SPV Project Site to be maintained during and at the end of O&M period

S.no	Item Description	Quantity (nos)
1	Power Conditioning Systems	Necessary spares for 5 years of operation with min. 2 sets of spares to be kept at plant site.
2	Miscellaneous (cable, fuses/HRC fuses, screws, soldering material, wall grips, lugs etc please specify)	Required for 5 years of operation

Note: Bidders must get the list of spares being supplied approved from the purchaser before supply.

Annexure-II

UNDERTAKING TO BE FURNISHED BY BIDDERS

We, M/s.

..... with Registered office
at undertake to ensure generation
of electrical energy from the Solar Power Plant of 4MWp each at different locations to be
installed by us in the State of Punjab as per the details / technical specifications given in
Tender document. We have calculated the quantum of electricity likely to be generated with
the Solar Data for all the site(s) as per the attached yield report. We also confirm that we
have inspected the project site(s) also.

Authorized Signatory
Name of the Company with stamp

Annexure-III

CIVIL DRAWINGS & TOPOGRAPHICAL MAPS