TENDER DOCUMENT

FOR

'DESIGN, ENGINEERING, PROCUREMENT & SUPPLY, ERECTION, TESTING, COMMISSIONING
AND
COMPREHENSIVE OPERATION AND MAINTENANCE FOR
5 (FIVE) YEARS OF
5 MWP GRID CONNECTED SOLAR POWER PLANT
AT SUMSUIH, MIZORAM'

Issued
Vide
No.T.11011/1/2025-ZEDA/6 DATED 17/03/2025

ZORAM ENERGY DEVELOPMENT AGENCY (ZEDA)
Above 132 KV Sub-Station, Zuangtui, Aizawl
Phone: 0389 2350664/2350665
Email: zedaaizawl@hotmail.com

Rs. 3,000.00

INDEX

(Govt. of Mizoram undertaking)
ZORAM ENERGY DEVELOPMENT AGENCY
State Nodal Agency of Ministry of New & Renewable Energy (MNRE)
ZEDA building, Above 132 KV Sub-Station,
Zuangtui, P.O. Zemabawk – 796 017,
AIZAWL, MIZORAM

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Dated Aizawl, the 17th March 2025

NOTICE INVITING TENDER

No.T.11011/1/2025-ZEDA/6 The Director, ZEDA hereby invites sealed tender from eligible firms having adequate experience for 'Design, Engineering, Procurement & Supply, Erection, Testing, Commissioning and Comprehensive Operation and Maintenance for 5 (five) Years of 5 MW Grid Connected Solar Power Plant at Sumsuih, Mizoram'

Tender documents, containing detailed terms and conditions and specifications, may be obtained from ZEDA Office, during office hours on payment of Rs 3,000.00 (Rupees Five Thousand only) OR may be downloaded from ZEDA website www.zeda.mizoram.gov.in and Mizoram E-tender website i.e, www.mizoramtenders.gov.in

Last date of submission of tender documents is 25th April 2025 upto 1:00 PM and tenders shall be opened on the same day at 2:00 PM in Office chamber of the Director, ZEDA in the presence of tenderers.

(LALNUNPUII)
Director, ZEDA

Memo No.T.11011/1/2025-ZEDA/6 **Dated Aizawl, the 17th March 2025**

Copy to:

1. The PS to Minister i/c Power & Electricity Department, Mizoram cum Chairman ZEDA Governing Body, for favour of information.
2. The Commissioner & Secretary to the Government of Mizoram Power & Electricity Department, cum Chairman, ZEDA Managing Committee for favour of information.
3. The Engineer-in –Chief, Power & Electricity Department for favour of information and necessary action, and this has reference to his letter No.T.15027/01/2024-EC(P)/W/06 dated 19/01/2025 and No.T.15027/01/2024-EC(P)/W/10 dated 24/02/2025.
4. The Chief Informatics Officer, Information & Communication Technology Department with a request to upload the tender document in the Mizoram Tender Website for wide publicity (soft copy of tender document attached).
5. The Director, Information and Public Relation Department with a request to publish the tender notice in two leading local daily news papers in one issue each.
6. Notice Board

Director, ZEDA

CHECK LIST

Sl. No	Description	Remarks
1	Tender Fee	
2	Earnest Money Deposit	
3	ISO 9001, ISO 14001 and OHSAS 45001 certificates	
4	Site visit certificate	
5	Manufacturer's authorization certificates	
6	Audited Statements, Balance Sheets and Profit & Loss Accounts for the last three financial years (FY 21-22, FY 22-23 & FY 23-24)	
7	PAN Card, GST Registration, EPF Registration and ESI Registration, TAN/TIN No.	
8	Experience Certificates/ Photo copies of Work Orders	
9	BIS/IEC Certificates for SPV Modules	
10	BIS/IEC Certificates for Inverters	
11	Technical Proposals	
12	Guaranteed generation	

SECTION-I

QUALIFYING REQUIREMENTS

In order to be eligible to participate in the tender, the bidder must fulfill the following qualifying requirements. Any discrepancy or departure from the same shall make the bidder ineligible for participating in the tender:

Sl. No	Qualifying Requirements	Complied/ Non Complied
1	The bidder should be a manufacturer of either SPV Module or Power Conditioning Unit of SPV Power Plants having valid BIS/ IEC certificate from MNRE Accredited Laboratory OR The bidder should be a SPV System Integrator having capacity of minimum 10% of the tendered quantity installed. A certificate to the effect issued by the competent authority should be submitted along with tender document.	
2.	A Joint Venture (JV) of a maximum of 2 Firms are allowed. In this case, both the firms must jointly meet the technical eligibility.	
3	The bidder should have minimum 5 years experience of successful installation of Off grid / grid interactive / Hybrid solar power plants.	
4	The bidder/JV partners should have supplied, installed and commissioned Grid Connected/Off Grid/Hybrid Solar Power Plants in India of cumulative capacity of at least 30% of the tendered quantity in the last 5 years. Bidder shall submit, in support to the above, the list of projects commissioned along with their work order and Commissioning certificates issued by State nodal agencies / PSU's / Government departments only. The list of projects supplied, installed & commissioned along with their work order and satisfactory commissioning certificate issued by State Nodal Agency's / PSU's / Government departments only will be accepted in support of the above	
5	The bidders are required to submit Manufacturers Authorisation for all major equipment of the power plant.	
6	All the bidders are advised to acquaint themselves of the site conditions, the soil composition, the topography of the land and if necessary, carry out topographical survey and soil test before submitting their bids. All intending bidders are also advised to visit the site and examine the site conditions, location, surroundings, climate, availability of power, water and other utilities for	

	construction, access to site, handling and storage of materials, weather data, applicable laws and regulations, law and order problems and obtain for itself on its own responsibility all information that may be necessary for preparing the bid. Hence, all bidders must visit the site to acquaint themselves of the site conditions and must present proof of the same in the form of site visit certificate signed by ZEDA official.	
7	The bidder should have valid ISO 9001, ISO 14001 and OHSAS 45001 certificates	
8	Bidder must have cumulative turnover of Rs. 30 crores in the last three financial years (FY 21-22, FY 22-23 & FY 23-24) - Copies of the audited balance sheet and profit & loss account must be submitted along with the technical bid	
9	The bidders are required to submit valid test certificate from MNRE approved/IEC/ NABL accredited laboratories for all major components of solar power plant	
10	The bidder must have valid PAN Card, GST Registration, EPF Registration and ESI Registration, TAN/TIN. Documentary proof against the same dully attested shall be submitted	
11	The firm must not have been debarred / blacklisted / defaulted by any Govt. Dept., Agency, PSUs /institution / agencies / autonomous organizations. As proof of the same the bidder shall submit duly notarized self-certificate by an authorized person of the bidder's company/firm.	
12	It is a zero-deviation tender. Undertaking to be submitted regarding the compliance/acceptance of all the technical specifications and terms & conditions of the tender documents and its corrigendum(s), if any as per **Annexure-A** **All conditional bids will be rejected.**	
13	Bidders are requested to submit technical proposals, such as: (1) Proposed Scheme (2) Evacuation Plan (3) PVsyst Analysis/ Guaranteed Generation of the project In case bidder does not able to present the above requirements, bids of respective bidders shall not be considered.	
14	In order to carry out smooth execution & operation and maintenance, the bidder must submit a list and Curriculum	

	Vitae (CVs) of qualified technical staff on their payroll with their technical qualification.	

Note: 1. Notwithstanding anything stated above, ZEDA reserves the right to assess the capabilities and capacity of the Bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of ZEDA.

2. It is not necessary to select the lowest bidder. ZEDA reserves the right to decide the reasonable price / rate for successful implementation of the project.

3. ZEDA reserves the right for verification of any original documents submitted with the bids. Failure to furnish all information & documentary evidences as stipulated in the bidding document or submission of an offer that is not substantially responsive to the bidding document in all respects shall be summarily rejected

SECTION-II

GENERAL TERMS & CONDITIONS

1. **Definitions:** In writing General Terms & Conditions, the specifications and bill of quantity, the following words shall have the meanings hereby indicated; unless there is something in the subject matter or content inconsistent with the subject.

   "ZEDA" shall mean the Zoram Energy Development Agency represented through the Director.

   "Work" shall mean any work entrusted to the tenderer as mentioned in the scope of work and work order.

   The "Engineer in charge (EIC)" shall mean the Engineer or Engineers authorized by Director, ZEDA for the purpose of this contract. Inspecting Authority shall mean any Engineering person or personnel authorized by ZEDA to supervise and inspect the erection of the SPV Power Plant.

   "The Contractor/Tenderer" shall mean the tenderer awarded with the contract or their successors and permitted assigns. Contract Price shall mean the sum named in or calculated in accordance with the provisions of the contract as the contract price. General Conditions shall mean the General conditions of Contract.

   "Specifications" shall mean the specifications annexed to these General Conditions of contract and shall include the schedules and drawings attached thereto or issued to the contractor from time to time, as well as all samples and pattern, if any,

   "Month" shall mean calendar month. "Writing" shall include any manuscript, typewritten, printed or other statement reproduced in any visible form whether under seal or written by hand.

2. **Cost of tender Documents:** Rs 5,000.00(Rupees Five Thousand) only.

3. ***The bidding documents for the tender should be submitted using <u>three Envelopes</u>.***

   (i) <u>Envelope No.(1)</u> should contain only:-

   (a) Earnest Money Deposit (EMD)

   (b) Document/Tender Fees in the form of Demand Draft payable to Director ZEDA, Aizawl / Money receipt of the tender fees

   (c) The Bidding Documents: This should contain the original Tender/ Bidding document, duly signed & seal on each page of the document.

   This envelope should be super scribed as <u>Qualifying Documents'</u>. **This envelope should also contain all the required documents as mentioned in the Qualifying Requirements**. All rest of the documents excluding rate sheets (price bids) should be placed in <u>this **Envelope No.(1)**</u> marked as

'Qualifying Documents'.

(ii) The Envelope No.(2) should contain the completely filled price bids only, marked as **Price Bids**

(iii) Both these two sealed envelopes should be placed in the Envelope No.(3) {bigger one} which should invariably be super-scribed **"Tender for Design, Engineering, Procurement & Supply, Erection, Testing, Commissioning and Comprehensive Operation and Maintenance for 5 (five) years of 5 MWp Grid connected Solar Power Plant at Sumsuih, Mizoram'**.

4. **Earnest Money Deposit (EMD)**: Earnest Money Deposit (EMD) shall be **Rs 25.0 Lakhs only.** The bidder shall furnish, as part of its bid, EMD in a separate envelope. The EMD shall be in the form of a Demand Draft in favor of "Director, ZEDA".

   Tender without Earnest Money Deposit-is liable to be rejected. It should be ensured by the Bidder that the original DD is submitted with the technical bid.

   Earnest Money Deposit (EMD) submitted by the bidders shall be released to the unsuccessful bidders after finalization of the tender.

   The EMD of the successful bidder will be returned when the successful bidder has signed the contract agreement and has furnished the required performance security in the form of Bank Guarantee amounting to 5% of the contract value with validity of one (1) year from the date of signing of agreement.

   The EMD may be forfeited if:

   a). If the bidder withdraws its bid during the period of bid validity as specified in the bid.

   b). If the bidder does not accept computational/arithmetical error correction made by ZEDA and as explained in "Evaluation criteria" section of the Bid document

5. **Estimated Cost : Rs 2602.50 Lakhs**

6. **Period of Validity of Bid:**

   Bids shall remain valid for a period of 180 days after the closing date prescribed by the ZEDA for the receipt of bids. A bid valid for a shorter period will be rejected by ZEDA.

7. **Evaluation Criteria:** The offers/bids received against the Tender shall be first evaluated as per Qualifying Requirements (QR). Price bids of only those bidder(s)

shall be opened who qualify against these QR and techno-commercial requirements.

Techno-commercially suitable bidders having the lowest price for grid connected solar power plant as specified in price bid shall be considered as L-1 and the 2nd lowest as L-2 and so on. *Other things being equal, the bidder who had quoted the lowest price shall be preferred for placing order*

ZEDA reserves the right to reject or accept any or all tenders wholly or partly without assigning any reason on the grounds considered advantageous to ZEDA, whether it is the lowest tender or not.

In case of any ambiguity in interpretation of any of the provisions of the tender, the decision of "ZEDA" shall be final and binding on the bidders. ZEDA reserves the right to alter and/ or modify the terms, reject any or all tenders without assigning any reason thereof. The decision of ZEDA will be final and binding on the Bidders

8. **Terms of Payments:** Payment towards Design, Engineering, Supply, Construction, Erection, Testing, Commissioning and O&M of 5 MWp of Grid tied solar PV based power plant in Sumsuih, Mizoram shall be made as per the following manner:

   Payments shall be released against each component of Price Bid in the following manner:

   a). Payment for Supply, Erection, Integration, Testing and Commissioning:

   All payment shall be in Indian Rupee. **All the payments will be strictly governed by the fund received from the Government of Mizoram**.

Sl. No	% of Payment	Criteria
1	60% of supply value as per Sl. No 1 of Price Bid	Within 45 days of supply of the BOS and associated project material required for construction, erection, testing and commissioning at site supported with pre-dispatch inspection report, quantity as per Bill of Quantities (BOQ) and receipt of the bidders invoice at ZEDA office with receipt acknowledgement, signed and stamped by ZEDA-authorized representative/EIC at designated site.
2	30% of supply value as per Sl. No 1 of Price Bid & 100% of Erection, Installation, Integration Commissioning of	Within 45 days of successful installation, synchronization and commissioning of systems along with requisite documentation, training programs and Completion certificate issued by ZEDA

	the plant as Sl. No.2 of Price Bid	
3	10% of supply as per Sl.No.1 of Price Bid	After Two months of reliable and trouble-free operation and demonstration of the energy generation by the project as per tender from the date of commissioning of the project.

b) The Contractor is allowed to commission the project work in multiple of minimum 2.5 MWp capacity or as per the instruction of Director, ZEDA in writing.

c) Payment for Operation & Maintenance:

Payment for O&M (for Sr. No. 3 of Price-Bid) shall be released half yearly basis in equal percentages.

9. Warranty: The modules must be warranted for a period of 25 years, and the other balance of systems such as mechanical structures, all the material supplied, electrical works and overall workmanship of the grid connected Solar Power Plant must be warranted for a period of 5 years from the date of Commercial Operation of site. The Contractor must ensure that the goods supplied under the Contract are new, unused and of most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

During the period of Warranty / Guarantee the Contractor shall remain liable to replace any defective parts, that becomes defective in the Plant, of its own manufacture or that of its sub- Contractors, under the conditions provided for by the Contract under and arising solely from faulty design, materials, workmanship or any reason attributable to works carried out by the contractor, provided such defective parts are not repairable at Site. After replacement, the defective parts shall be returned to the Contractors works at the expense of the Contractor unless otherwise arranged.

During the Operation & Maintenance and guarantee period, the Contractor shall be responsible for any defects in the work due to faulty workmanship or due to use of substandard materials in the work. Any defects in the work during the guarantee period shall therefore, be rectified by the Contractor without any extra cost to the ZEDA within a reasonable time as may be considered from the date of receipt of such intimation from the ZEDA failing which the ZEDA reserves the right to take up rectification work at the risk and cost of the Contractor.

Warranty certificate issued by the manufacturers shall be submitted and individual factory test report of manufacturers shall also to be submitted along with invoice. Every item should bear serial number provided by the manufacturer during the manufacturing process. These serial numbers should be submitted by supplier with all the following documents, while submission of bills: -

a). Tax Invoice

b). Factory test reports (In house test report generated during manufacturing)

c). Warranty certificate

If contractor do not rectify/supply the said problem after written notices that the defected equipment shall be rectified/purchased through ZEDA and the same amount may be deducted from the payment of contractor.

10. **Rejection of Materials:** The ZEDA's decision in regard to the quality of the material and workmanship will be final. The Contractor at its own cost and risk without any compensation shall immediately remove any material rejected by the ZEDA from the Site of work.

11. **Construction Power:** The Contractor has to arrange Construction Power at the site for construction purpose at its own cost. Cost of electricity required during construction shall be payable by the bidder. For construction, temporary connection for construction power from DISCOM /suitable supply source shall be arranged by the bidder as per applicable tariff.

    ZEDA shall not provide facility for storage of material, and accommodation for labour at site. The Contractor shall make his own arrangement for the above.

12. **Labour Engagement:** The Contractor shall be responsible to provide all wages and allied benefits to its labour engaged for execution of the project work and also to carry out Operation & Maintenance service. The Contractor shall remain liable to the authorities concerned for compliance of the respective existing rules and regulations of the government for this purpose and shall remain liable for any contravention thereof. *The contractor is encouraged to use local manpower as per the local statutory (labour) requirement, if any.*

13. **Training of ZEDA's Personnel:** On successful commissioning of the Plant, the Bidder shall provide training on Plant operations and maintenance to a team (Engineers and Technician/ Operators) as nominated by ZEDA, within first three months of Operation of Plant.

14. **Authorized Test Centers for test certificates:** The transformers/cables and other Balance of system equipment deployed in the solar PV power Plant shall have valid test certificates for their qualification as per above specified IEC/ IS Standards by one of the NABL Accredited Test Centers in India. In case of equipment for which such Test facilities may not exist in India, test certificates from reputed International Laboratory Accreditation Cooperation (ILAC) Member body accredited Labs abroad (with proof of accreditation) will be acceptable.

15. Plant Performance Guarantee

a). The Plant performance will be evaluated through number of generated Energy generation in any year from each project at substation as per tender (Technical Specification).

b). During O&M contract, the Plant performance will be evaluated based on guaranteed energy generation. Second year onwards linear degradation of the module output (i.e. 0.75% of DC capacity at STC per year) may be considered every year.

c). Bidders are expected to make their own study of solar radiation profile and other related parameters of the area & make sound commercial judgment about the guaranteed energy generation. It shall be the responsibility of the Bidder to assess the corresponding solar insolation value and related factors of solar Plant along with expected grid availability.

d). The performance of Plant may also be verified based on minimum CUF demonstrated at the end of every year from the date of Operational Acceptance till the culmination of the O&M period. During this period, the contractor shall operate and maintain the Plant with full reliability and upkeep.

16. Operation & Maintenance (O&M): The Operation and Maintenance shall be comprehensive. The maintenance service provided shall ensure project functioning of the Solar PV system as a whole and Power Evacuation System to the extent covered in the Contract. All preventive / routine maintenance and breakdown / corrective maintenance required for ensuring maximum uptime shall have to be provided. Accordingly, the Comprehensive Operation & Maintenance shall have two distinct components as described below:

i. **Preventive / Routine Maintenance:** This shall be done by the Contractor regularly and shall include activities such as cleaning and checking the health of the Solar PV system, cleaning of module surface, tightening of all electrical connections, and any other activity including the associated civil works, as mentioned, wear and tear that may be required for proper functioning of the Solar PV system as a whole. Necessary maintenance activities, Preventive and Routine for Transformers and associated switch gears and transmission line also shall be included.

ii. **Breakdown / Corrective maintenance:** Whenever a fault/ failure/ breakdown/ malfunctioning occurs, the Contractor has to attend to rectify the fault & the fault must be rectified within the 48 hours from the time of occurrence of fault, failing which LD will be applicable in line depending upon nature of fault/failure/defect/ breakdown/malfunctioning. The contractor must maintain all the records pertaining to such faults/ failure/ breakdown/ malfunctioning and necessary measures taken. The date of Comprehensive Operation & Maintenance Contract period shall begin on the date of successful demonstration of guaranteed energy generation i.e. operational acceptance. However, operation of the Power Plant means

operation of system as per bid and workmanship in order to keep the project trouble free covering the guarantee period. The contractor must demonstrate the committed CUF at the end of every year in accordance with commitment made in the Techno-Commercial Enclosures of the Bid.

iii. Serviceability Level Agreement(SLA):

(a).Contractor shall make efforts to maintain 100 % serviceability of complete Plant including all other associated infrastructure developed by the Contractor during execution of project as its scope of work.

(b). Contractor shall produce monthly serviceability report for individual components of the plant & associated infrastructure to the ZEDA by 5th of next month.

(c). Contractor shall maintain a Complaint log book, which shall include the timing of logging of complaint including unique Complaint number, time of closure of complaint & its Root Cause Analysis.

(d).Any complaint related to un-serviceability/improper functioning of any & all component of the plant including but not limited to PV Module, PCU, Transformers, switchgears, roads, drainage, water supply lighting system, office infrastructure, CCTV system which is not attended & rectified within 48 hours, shall attract a penalty of Rs. 1000 per 24 hours, which shall be over & above of this document. If such complaint is not rectified within 480 hours from logging of complaint, ZEDA may choose to rectify the same through any other agency at the risk of Contractor and ZEDA shall recover 115% of such cost incurred from subsequent payment to the contractor. Cumulative value of such LD shall be limited to 50% of yearly O&M Cost.

(e). Such rectification work carried out by ZEDA doesn't exempts/relieves Contractor from its responsibility towards subsequent operation, maintenance, repair & replacement of such component/ infrastructure of the Plant or meeting the performance parameters of the Plant.

(f). O&M Routine & Manpower: Contractor shall provide Preventive / Routine Maintenance schedule based on Original Equipment manufacturer and good engineering practices.

17. Project Timelines: Maximum completion period of project shall be 400 days as per the break-up given below. However, "Day 0" shall start from date of award of Work Order/ Letter of Acceptance (LOA)/NTP (notice to Proceed) whichever is earlier.

Timelines for Scope of Work in Days:

Sl. No	Stage	Reference from 1
	Issue of Work Order/ LOA/NTP	Day 0
	Submission of project plan and Approval of Major drawings	0+30

	Supply of major equipment like Modules, Modules Mounting Structures, Units, Inverter, Transformers, BOS etc.	0+270
	Installation of Modules, Transformers all major equipment including MMS, Inverters etc.	0+330
	Complete installation, Power Plant testing and Pre-commissioning of Solar PV	0+370
	Commissioning of Plant along with Completion of Facilities in line with Technical/Functional/Performance Requirement stated under this Tender Document.	0+400

18. **Liquidated Damages:** In case of any delay in the execution of the order beyond the stipulated time schedule decided including any extension permitted in writing, ZEDA reserves the right to recover from the Contractor for the loss incurred due to delay in commissioning or shortfall in guaranteed energy generation.

    Alternatively, ZEDA reserves the right to purchase of the material and completion of the works from elsewhere at the sole risk and cost of the successful bidder/ contractor and recover all such extra cost incurred by ZEDA in procuring the material from resources available including EMD/Bid security or any other sources etc. Further, if any extra cost is incurred by ZEDA due to delay in work completion by the party beyond the completion time as per PO/LOA, the same shall be recovered from the party's Invoice/EMD/BG etc.

    Alternatively, ZEDA may cancel the order completely or partly without prejudice to his right under the alternatives mentioned above.

    If contractor failed to commission the project beyond 45 days of Commercial Operation Date (COD) as mentioned in project timeline for scope of work section, ZEDA reserves the right to terminate the contractor and contractor shall reimburse to ZEDA, the loss incurred

19. **Security Deposit:** An amount equivalent to 2% of the supply value of the Work Order (WO) excluding GST shall be deducted from each payment of supply bill as Security Deposit (SD). 50% of security Deposit (SD) will be released to the contractor at the end of two years from the date of commissioning of the plant; and the balance of 50% shall be released at the end of warranty period i.e, five years from the date of commissioning of the plant.

20. **Third Party Inspection Agency:** A third-party inspection agency ("Third Party Inspectors" or "TPI") may be appointed by ZEDA, at its sole discretion, to conduct any kind of inspection regarding but not limited to procurement, fabrication, installation, hook-up and commissioning during the execution of the Project. The Contractor shall provide necessary access and coordination to conduct such inspections. The extent of third party inspectors' involvement shall be finalized after mutual discussions between the Contractor and ZEDA.

ZEDA or its authorised representatives, reserve the right to inspect the project components, as per project schedule to ensure compliance of the quality of Components/ material as per the specification and data sheet, before dispatch to site. ZEDA at its own discretion will visit the premises for inspection with prior intimation to the Contractor. It is the responsibility of the contractor to inform ZEDA at least 14 days prior to the dispatch of the project equipment.

All administrative expenses for ZEDA or its authorised representatives will be borne by ZEDA for above inspections. However, all the expenses related to testing and inspection at manufacturer/ supplier premises or at project site shall be borne by the contractor only. In case contractor fails to show the compliance for the component under inspection as per Technical Specification & approved drawing /design & same is not approved for mass production or dispatch, in such cases Contractor shall bear the expenses towards visit of ZEDA's team for subsequent visits for inspection of same component.

21. **Insurance:** During the Contract period, i.e., during Construction, all insurance related expenses shall be borne by the Contractor. The goods supplied (including the Solar PV modules) under the Contract shall be fully insured against the loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in such a manner that ZEDA shall not incur any financial loss, as long as the plant continues to remain under the custody of the Contractor.

    Adequate and seamless insurance coverage during construction period and O&M period to cater all risks related to construction and O&M of Plant to indemnify the ZEDA. The insurance during the construction and O&M period shall also cover the Solar PV modules. Insurance certificate of warehouse and / storage facility shall be submitted to ZEDA before the start of the erection and commissioning work.

    In case of any loss or damage or pilferage or theft or fire accident or combination of the said incidents etc. under the coverage of insurance, the Contractor shall lodge the claim as per rules of insurance. Any FIR required to be lodged to local Police Station shall be the responsibility of the Contractor.

    The Contractor shall arrange to supply/ rectify/ recover the materials even if the claim is unsettled for timely completion of the project. The final financial settlement with the insurance company shall rest upon the Contractor.

    In case of any delay of the project attributable to the Contractor, the Contractor himself in consultation with ZEDA should take the extension of insurance. Any financial implications shall, however, be borne by the Contractor.

    The Contractor should arrange for providing insurance coverage to its workmen under Workmen's Compensation Act or similar Rules and Acts as applicable during execution of work for covering risk against any mishap to its workmen. The Contractor shall also undertake a Third-Party Insurance. The ZEDA will not be responsible for any such loss or mishap.

    All other insurance like In - transit insurance (Marine/ Cargo/ others as applicable), Contractor All Risk, Erection All Risk, workmen compensation, third party liability, insurance against theft and acts of god and others as required for the

Construction and O&M of the Plant and to indemnify the ZEDA / equipments/ materials and resources shall be borne by the Contractor. Fire insurance is to be arranged by the Contractor up to the 5 years of O&M of the Contract.

ZEDA shall be named as co-insured under all-insurance policies taken out by the contractor, except for the workmen compensation, third party liability and ZEDA's liability insurances. Also, Contractors' sub-contractor shall be named as co-insured under all insurances taken out by the contractor pursuant to except for Cargo insurance, workmen compensation insurance and ZEDA's liability insurance. All insurers' rights of subrogation against such co-insured for losses or claims arising out of the performance of the contract shall be waived under such policies.

All the insurance cover taken for the construction and O&M period shall be seamless in nature. The insurance are to be suitably taken for the activity/ act which is required to cover all the risks associated to the activity / act. The contractor shall be responsible to take suitable insurance till the completion of the O&M contract and indemnify the ZEDA from all associated risks whatsoever.

22. Transportation, Demurrage, Wharfage etc.: Contractor is required under the Contract to transport the Goods to place of destination defined as Site. Transport to such place of destination in India including insurance, as shall be specified in the Contract, shall be arranged by the Contractor, and the related cost shall be included in the Contract Price.

23. Force Majeure

a) "Force Majeure" shall mean any event beyond the reasonable control of the ZEDA or of the Implementing Partner, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected.

b) If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within fourteen (14) days after the occurrence of such event.

c) The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed.

d) The party or parties affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect thereof upon its or their performance of the Contract and to fulfill its or their obligations under the Contract, but without prejudice to either party's right to terminate the Contract under Sub- Clauses 21(f) and 22(e).

e) No delay or nonperformance by either party hereto caused by the occurrence of any event of Force Majeure shall

i. constitute a default or breach of the Contract

ii. give rise to any claim for damages or additional cost or expense occasioned thereby If and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure.

f) If the performance of the Contract is substantially prevented, hindered or delayed for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of one or more events of Force Majeure during the currency of the Contract, the parties will attempt to develop a mutually satisfactory solution, failing which the dispute shall be resolved

g) Notwithstanding Sub-Clause 21(e), Force Majeure shall not apply to any obligation of the ZEDA to make payments to the Implementing Partner herein.

24. **Jurisdiction of the Court:** Any dispute arising out of the contract shall be subject to the jurisdiction of Gauhati High Court, Aizawl Bench. Aizawl

SECTION-III

PROJECT SCOPE & TECHNICAL SPECIFICATIONS

3.0 Locations:

The Power plant shall be installed on ground at Sumsuih, Mizoram.

Latitude: 23°29.863'N

Longitude: 92°44.640'E

ZEDA will assist to bidder for availing the following during construction and O&M period

- Water supply

- Electricity supply

3.1. Scope of Work: The Scope of Work includes all design, engineering, procurement & supply of equipment and materials, pre dispatch testing at manufacturers works, inspection, packing, forwarding, receipt, unloading, storage at site, associated civil works, services, permits, licenses, installation, incidentals, insurance at all stages, erection, testing and commissioning of Grid Interactive Solar PV Power Plants and performance demonstration with associated equipment and materials along with associated transmission system up to 33kV line which shall be made available at site by Power & Electricity Department, and water supply system within the solar power plant's area on turnkey with 5 (Five) years comprehensive operation and maintenance.

The equipment and materials for Grid Interactive Solar PV Power Plants with associated system (typical) shall include but not be limited to the receipt, unloading, storage, erection, testing and commissioning of all supplied material for the following:

i. **Construction of control room**: Design and construction of Control Room for housing of Inverters & other accessories required for Power Plant shall be the scope of the contractor. The control room shall have requisite testing facilities at site, safety, security requirements and provision for other things that may require for successful operation and maintenance of Plant and equipments.
ii. **Water supply system**: Design, providing and laying of pipes, solar pump(s), storage, fitting necessary accessories for cleaning of solar modules etc.
iii. **Solar Photovoltaic (SPV) Modules** as per the standards and specifications of the Ministry of New & Renewable Energy (MNRE), Government of India.
iv. **Module mounting structures (MMS):** Mounting structures are to be provided with fasteners, array foundation and module interconnection. MMS should be designed such that same level of solar PV modules will be maintained during installation.

v. **Array Junction boxes (AJB),** distribution boxes and Fuse boxes: MCBs, Surge Arrestors with string monitoring (SMB) capabilities and with proper lugs, glands, ferrules, terminations and mounting structures.

vi. **Power Conditioning Unit/ Inverter:** The Grid Tied Solar Inverter should convert DC power produced by SPV Modules into AC power and adjust the voltage and frequency levels to suit the local grid conditions.

vii. **DC and AC cables** of appropriate sizes with adequate safety and insulation conforming to relevant IEC/IS.

viii. **SCADA system**, weather monitoring system, LT & HT Power Interfacing Panels, Plant Monitoring Desk, AC & DC Distribution boards. Data acquisition system with remote monitoring facilities. Provision for specific data transfer to the State Load Dispatch Centre (SLDC) may be provided as per the site/ DISCOM'S requirement.

ix. **Step Up Power Transformer:** Power Transformer of appropriate capacity and voltage ratio to upload solar power generated by inverter to grid network.

x. **Auxiliary transformers**: In relevance with state grid code and inverter manufacturer requirements. Suitable auxiliary transformer (s) shall be supplied. However, LV of Auxiliary Transformer may be taken as output Voltage of Inverter, subject to compliance of DISCOM'S/STU's requirement & system compatibility.

xi. **Metering and protection system**:
LT Power and Control Cables including end terminations and other required accessories for both AC & DC power. Internal 415V inter-connection & indoor feeder panels, to cater auxiliary needs of Plant.
33kV indoor or outdoor panels having incoming and outgoing feeders with VCBs, CTs, PTs, Busbars, cables terminals kits, Main Bus and other protection equipments. Each bay shall consist of VCB, CT, Isolators with earth-switch, Las and PT's etc.

Energy Meters/(Check Meters of 0.2S class accuracy) with all necessary metering rated CT's and PT's at the Solar Power Plant take off point as per CEA Metering Regulation 2006 as amended time to time and state metering code.

xii. **Lightning arrestors** with separate Earthing for entire Plant area as per relevant standards-IEC – 62305. Earthing of the entire Plant as per relevant standards IS:3043-1987.

ix. PVC pipes, cable conduits, cable trays and accessories/trenches for the entire Power Plant.

xiii. Control room equipment related to solar system etc.

xiv. Testing, maintenance and monitoring of equipment, Spares & consumables, as required or recommended, for 5 years O&M period.

xv. **Safety Requirement:** CCTV cameras at Main Entrance and at Control Rooms, Plant Area & Plant perimeter to cover entire area in order to capture any trespassing, theft & pilferage in the Plant area, Fire detection &

protection system in control room, Plant and adequate number & types of fire extinguishers. All safety gadgets during Construction and O&M period including but not limited to, anti-static rubber mats of appropriate grade, PPE, rubber gloves and shoes etc. Standard CCTV system with 30 days memory back-up & sufficient battery back-up to be provided meeting all the conditions of the tender.

xvi. **Data logging and display system:** One Solar Radiation Measurement Station including testing facilities may be provided. The Solar Observatory with associated systems shall include but not be limited to the following:

- Pyranometer to be installed in such a way that they should be under CCTV coverage all the time.
- The pyranometer on module plane to be fixed to the module mounting structure only, to follow the seasonal tilt if employed.
- Ultrasonic Anemometer (wind speed and direction)
- Temperature Sensor – Ambient and module surface
- Power source to the all sensors
- Data Logger
- Data of the Pyranometer must be collected throughout year in not more than 1 min. interval.

xvii. **33KV Termination Arrangements:** Construction of suitable termination arrangement with Energy Meter at 33KV output at switch yard of the Solar Power Plant for taking off and receipt of lines through 33KV transmission lines from existing designated feeder at the Substation. Power evacuation from Array yard (HT Panel) to nearby 33 KV lines is in the scope of work.

xviii. **Complete Design of Power Plant:** Design of Grid Interactive Solar Power Plant and its associated civil, structural, electrical & mechanical auxiliary systems includes preparation of single line diagrams and installation drawings, manuals, electrical layouts, erection key diagrams, electrical and physical clearance diagrams, design calculations for Earth-mat, Bus Bar & Spacers indoor and outdoor lighting/ illumination etc. design memorandum, GTP and GA drawings for the major equipment & Facilities, design basis & calculation sheets, and other relevant drawings and documents required for engineering of all facilities within the solar power plant area are covered under Contractor's scope of work.

In addition to above, the Contractor is required to measure the Solar Radiation and other climatic conditions relevant to measure the Plant performance. This is necessary to study Solar Level and Guaranteed Performance of the Solar Power Plant. The satellite-based analysis is to be combined with direct ground-based measurement equipment in order to achieve the necessary accuracy and

level of detail in the assessment of solar radiation levels and climatic conditions. Estimation and determination of the Plant generation on daily basis in form of look ahead scheduling of power output. Any other equipment / material not mentioned but essentially required to complete the Solar Power Plant in all respect will be in scope of contractor.

3.2. **Operation & Maintenance (O&M):** During the O&M period, the Contractor shall keep the measured daily generation, radiation, fault log data at regular interval and provide the same to ZEDA in electronic form compatible in CSV format. The right to use the data shall remain with ZEDA. Generation data shall be provided in the form of continuous day around generation curve viz a viz radiation data as automatically generated Supervisory Control and Data Acquisition (SCADA) or Centralized Monitoring System (CMS) Report.

Keep men, materials, spares, tools & tackles, logistics and accessories, which are necessary or usual for satisfactory and trouble-free operation and maintenance of the above equipment.

3.3. **Civil & Construction Design:** The items of civil design and construction work shall include all works required for solar PV project and should be performed specifically with respect to following but not limited to:
Conducting Topographical survey of the total area identified for Solar Photovoltaic capacity & complete soil investigation with bore hole details and Pullout tests. Number of Bore holes to be chosen in such a way that it is representative of the whole plot area.

Construction of foundation for mounting structures for SPV panels, considering life of Plant & existing soil/ natural conditions.

Construction of foundation for transformers, switchgears, buildings, equipment etc.

3.4. **Cleaning Arrangements**: A suitable arrangement of water shall be provided by the contractor to ensure to cater the water supply for module cleaning and other needs of SPV power Plant during entire O&M period. Necessary arrangement for module cleaning shall be made available in SPV array yard as per the Drainage systems so that there is no water logging happening from cleaning or any other manmade/natural causes within the Plant.

3.5. **Perimeter lighting**: Fabrication, supply & erection along with required GI Poles, junction boxes, Support, brackets, accessories & LED lights as required.

3.6. **Other Requirements**: Supply of ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes with powder coating paint for internal fixtures, cable fixing clamps, nuts and bolts etc., of appropriate sizes as required

in the Plant. Power Cables laying underground / over ground with proper cable tray arrangements. Entire GI cable tray with proper support and accessories inside equipment room and control room building and other locations as required.

Complete responsibility of total Operation & Maintenance of Solar Photovoltaic Power Plant including entire infrastructure developed as a part of EPC Contract for 5 years from Operational

Acceptance of the Plant, including deployment of necessary staff after the commissioning till final acceptance shall be with the Contractor.

3.7. Documentation: Submission of following documents like, drawings, data design, and engineering information to ZEDA or its authorized representative for review and approval in hard copy and soft copy from time to time as per project schedule.

a) General Arrangement (GA) drawings of the entire project including Main Control Room (office cum control room), Fire protection system.
b) Design basis criteria along with relevant standards (list of standards and respective clause description only.
c) Solar insolation data and basis for generation data.
d) Design calculations and sheets with expected power loss at each stage and backup sheets, if any. Lightning arrestor with area coverage also to be provided.
e) Detailed technical specifications of all the equipments.
f) General arrangement and assembly drawings of all major equipments. Schematic diagram for entire electrical system.
g) Guaranteed Technical Particulars **(GTP) &** General Arrangement **(G.A)** drawings for all types of structures/ components, 33 kV switchgears & other interfacing panels.
h) Relay setting charts.
i) Quality assurance plans for manufacturing and field activities.
j) Detailed site Environmental Health and Safety (EHS) plan, fire safety & evacuation plan and disaster management plan. Detailed risk assessment and mitigation plan

Test reports (for type, acceptance, and routine tests). O&M Instruction's manuals and its drawings. As-built drawings / documents and deviation list from good for construction (GFC) O&M plans, schedules and operational manuals for all equipment etc. Daily/ Weekly site work progress report with catch-up plan(s), as necessary to monitor actual timelines of the project during construction period along with the real time snap shots during the time of construction.

Weekly/ Monthly O&M reports after commissioning of the project

All drawings shall be fully corrected to agree with the actual "as built" site conditions and submitted to ZEDA after commissioning of the project for record purpose. All as-built drawings must include the Good for Construction deviation list.

The contractor shall forward the following to ZEDA within a specified timeline as given below:

i. Schedule for various activities in the form of PERT Chart: within **two weeks** from the issue of PO.

ii. Detailed engineering calculations, Design basis report and complete layout of the Plant within four weeks from the issue of PO.

iii. Equipment data sheets, Guaranteed technical particular of equipment and GA drawings of major equipment like LT Panel, HT Panel and transformer within four weeks from the issue of PO.

iv. The Contractor shall provide a detailed training plan for all operation, maintenance procedures, which shall after approval by ZEDA form the basis of the training program. The contractor shall also provide training to ZEDA's nominated staff.

v. The Contractor shall employ and coordinate the training of contractors' personnel who will be qualified and experienced to operate and monitor the facility and to coordinate operations of the facility with the grid system.

vi. Establishing a system to maintain an inventory of spare parts, tools, equipment, consumables and other supplies required for the facility's hassle free operation.

vii. Adequate and seamless insurance coverage during construction period and O&M period to cater all risks related to construction and O&M of Plant to indemnify the ZEDA. The insurance shall also cover the Solar PV modules & PCU. Insurance certificate of warehouse and / storage facility shall be submitted to ZEDA before the start of the work.

viii. Maintain at the facility accurate and up-to-date operating logs, records and monthly reports regarding the generation, Operation & Maintenance of facility. Contractor shall also submit half yearly invoices to ZEDA before 5th of every sixth month.

ix. Perform or contract for and oversee the performance of periodic overhauls or maintenance required for the facility in accordance with the recommendations of the original equipment manufacturer (OEM).

x. Procurement for spares parts, overhaul parts, tools, equipment, consumables, etc. required to operate and maintain the project in accordance with the prudent utility practices and having regarded to warranty recommendations during entire O&M period.

xi. The Contractor shall clear all the debris / scrap / equipment at the end of the 5 years of O&M period at no extra cost to ZEDA.

xii. Maintain and keep all administrative offices, roads, tool room, stores room, equipment, clean, green and in workable conditions.

3.8. Required Documentation: Complete documentation shall be provided for the design, manufacturing/assembling, testing, installation, commissioning, start-up, operation, maintenance, repair and disposal of the solar plant components.

The successful bidder shall provide the following documentation apart from other mentioned in the tender:

1. Technical datasheets

2. Test reports and commissioning protocols

3. Installation and maintenance manual

4. Factory testing quality protocol

5. Performance Guarantee

3.9. Operation & Maintenance (O&M): The Operation and Maintenance shall be comprehensive. The maintenance service provided shall ensure project functioning of the Solar PV system as a whole and Power Evacuation System to the extent covered in the Contract. All preventive / routine maintenance and breakdown / corrective maintenance required for ensuring maximum uptime shall have to be provided. The contractor shall be entrusted to carry out the total O&M activities of the Solar Photovoltaic Power Plant(s) along with transmission & power evacuation system and other infrastructure developed by the Contractor as a part of scope of work for the 5 (five) years with immediate effect from the date of operational acceptance.

The Turnkey contractor shall be responsible for all the required activities for the successful construction, running, committed energy generation & maintenance of the Solar Photovoltaic Power Plant covering:

a) Deputation of qualified and experienced manpower
b) Successful running of Solar Power Plant for committed energy generation.
c) Co-ordination with STU/SLDC/other statutory organizations as per the requirement on behalf of ZEDA for Joint Metering Report (JMR), furnishing generations schedules as per requirement, revising schedules as necessary and complying with grid requirements updated time to time.
d) Monitoring, controlling, troubleshooting maintaining of logs & records, registers.
e) Supply of all spares, consumables and fixing / application as required
f) Supply & use of spares, consumables, tools, logistics and skilled manpower throughout the maintenance period as per recommendations of the equipment manufacturers and requirement of the Plant & other associated infrastructure developed under the scope of EPC works.
g) Conducting periodical checking, testing, overhauling, preventive and corrective action.
h) Up keeping of all equipment, building, if constructed, Solar PV modules etc.
i) Arranging & updating any licenses/permits required for operation of Solar Plant.
j) Submission of periodical reports to ZEDA on the energy generation & operating conditions of the power Plant.
k) Furnishing generation data monthly to ZEDA by 5^{th} of every month.
l) Contractor shall be responsible for making all the payments to be made to the Government bodies/STU for smooth operation of the project. Renewal of all the permits / clearances in time.
m) Periodic cleaning of solar modules as per the recommendations of OEM & existing site conditions.
n) Repair & replacement of components of Solar Power Plant including all other associated infrastructure developed as a part of EPC Works which has

gone faulty or worn- out components including those which has become inefficient.

o) Comprehensive Repair, Operation & Maintenance all other facilities like CCTV Network, Streetlight Network, Air Conditioning System, Fire Detection & Protection System and other civil, Mechanical, Electrical & plumbing system developed during project as a part of Solar PV Power Plant.

Continuous monitoring the performance of the Solar Power Plant and regular maintenance of the whole system including Modules, PCU's, transformers, outdoor/indoor panels/ kiosks and other infrastructure developed as a part of EPC works in order to extract & maintain maximum energy output from the Solar Power Plant & serviceability from the associated infrastructure.

i. Preventive and corrective maintenance of the complete Solar Power Plant and associated infrastructure developed as a Part of EPC work, including supply of spares, consumables, repair & replacement of wear and tear, overhauling, replacement of damaged modules, inverters, PCU's and insurance covering all risks (Fire & allied perils, earth quake, terrorists, burglary and others) as required, for a period of 5 (Five) years from the date of start of O&M of the project shall be carried out at fixed annual cost, included in O&M cost quoted by the Contractor.
ii. The period of Operation and Maintenance will be deemed to commence from the date of Operational acceptance and successively the complete Solar Photovoltaic Power Plant including all other infrastructure developed as a part of EPC works has to be handed over to the O&M contractor for operation and maintenance of the same. O&M contract shall further be extended on the mutually agreed terms, conditions &period.
iii. All the equipment required for Testing, Commissioning and O&M for the healthy operation of the Plant must be calibrated, time to time, from the NABL accredited labs and the certificate of calibration must be provided prior to its deployment.

3.10. Operation and Performance Monitoring

i. Operation part consists of deputing necessary manpower required to operate the Solar Photovoltaic Power Plant at the full capacity. Standard Operation procedures (SOPs) such as preparation to starting, running, routine operations with safety precautions, monitoring etc., shall be carried out as per the manufacturer's instructions & best engineering practices to have trouble free & optimum operation of the complete system with maximum possible energy generation.
ii. Daily work of the operation and maintenance in the Solar Photovoltaic Power Plant involves periodic cleaning of Modules, logging the voltage, current, power factor, power and energy output of the Plant at different levels along with fault/breakdown log. The operator shall also note down time/failures, interruption in supply and tripping of different relays, reason for such tripping, duration of such interruption etc. The other task

of the operators is to check battery voltage-specific gravity and temperature. The operator shall record monthly energy output, down time, fault logs & their Root Cause Analysis reports etc.

3.11. Warranty: The mechanical structures, all materials supplied by contractor, electrical works and overall workmanship of the grid connected Solar Power Plant must be warranted for a period of 5 years from the date of Commercial Operation.

SECTION-IV

TECHNICAL REQUIREMENT OF SOLAR POWER PLANT

4.0. Bill of Material: The major equipments and materials for 5 MWp Grid Interactive Solar Photovoltaic Power Plant at Sumsuih with associate system (typical) shall include, but not limited to the following by the Contractor. The Contractor must provide the BOM of the Plant as per the design during the time of bidding:

Sl. No	Item Details	Unit
1	Site preparation and leveling as per site requirement	Lot
2	Solar Mono-crystalline/ Mono PERC / Bi-facial modules (Minimum of 545 Wp single module should be used)	Set
3	Module Mounting Structures (MMS) including fasteners and clamps etc	Set
4	Main Junction Boxes with monitoring facilities etc	Lot
5	Solar Module Array to Junction box Interconnection cable (Cu), MC4 Connectors etc	RM
6	Junction box to Inverter Interconnection Cable (Cu/ Al)	RM
7	Connection accessories – lugs, ferrules, glands, terminations etc.	Lot
8	AC Cable (LT/ HT) of appropriate sizes (within Array yard)	RM
9	Power Conditioning Unit PCU) / Inverters of minimum capacity of 1250 KVA of appropriate number	Nos
10	String level monitoring system (SCADA) and ancillaries	Set
11	Step Up Power Transformers of 2 x 3 MVA, with Voltage ratio of 660V to 33000V with all accessories.	Nos
12	Auxiliary Transformer as per site requirement	Nos
13	Circuit breakers, Current Transformer (CT) and Potential Transformer (PT) set at all voltage levels used	Set
14	33 KV Indoor/ outdoor interfacing panels with CT, VCB, PT, Relays etc.	Set
15	Alluminium Armoured 33 KV (XLPE) cable (3 Core/ 1 Core) and associated accessories.	Set
16	AC & DC distribution panels/ boards, PDB, LDB etc. as per requirements	Lot
17	Control and Relay Panel as per requirements	Lot
18	Lightning Arresters of suitable ratings with mounting structures	Nos
19	Earth mat for switch yard, DC field array and equipment as per requirement	Lot

20	Control and power cables as per requirement	Lot
21	Surge Protection devices and Fuses as per requirement	Set
22	Earth cables, GI flats and earthing pits as per requirement	Lot
23	Control Room with Air conditioners etc.	Lot
24	Rubber Mats for specific kV ratings and safety gadgets, PPE etc	Lot
25	Fire extinguisher e- Foam type, CO_2 type, ABC type etc., as applicable	Lot
26	Sand Buckets	Lot
27	Discharge Rods	Lot
28	Power efficient peripheral lighting arrangement for the Plant safety (Either Solar Street lights, High Mast or AC Street lights found suitable for the site or as desired by ZEDA)	Nos
29	Fire – Alarm system and signboards in buildings	Lot
30	Metering Equipment (Meters, and associated CT and PT's)	Set
31	CCTV cameras including monitoring system and back up power so as to provide minimum 30 days uninterrupted recording.	Set
32	Danger sign plates.	Lot
33	Desktop PC (25" LED Monitor, Core i5, 8GB RAM, 1.0TB HDD with Computer Printer	No
34	Construction of 33KV transmission lines for integration of Solar Power to Grid Power as per requirement	No
35	Solar water pump and water supply system within the solar plant area	Lot

4.1 **PV Array Configurations:** The Solar array shall be configured in multiple numbers of sub-arrays, providing optimum DC power to auditable number of sub arrays. The Contractor shall submit their own design indicating configuration of PCU and respective sub arrays and associated bill of material.

UV resistant Cable-ties (suitable for outdoor application) shall be used to hold and guide the cables/wires from the modules to junction boxes or inverters. All the cables were aesthetically tied to module mounting structure.

In case the string monitoring unit (SMU) is mounted on the module mounting structure, Contractor has to take into consideration of the load thus added on the MMS. Accordingly, suitable supporting members for mounting the SMU must be designed and supplied. Separate structure for mounting of SMU can also be proposed.

Every major Component of the Plant should be suitably named/ numbered & marked for ease of traceability, identification and maintenance.

4.2 **String Monitoring Unit (SMU):** All SMUs should be equipped with appropriate functionality, safety (including fuses, grounding, contacts etc.) and protection. The terminals will be connected to copper bus-bar arrangement of proper sizes to be provided. The junction boxes will have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus-bars for easy identification and weather resistant cable ferrules will be fitted at the cable termination points for identification.

The junction Boxes shall have suitable arrangement for the followings:

a). Provide arrangement for disconnection for each of the groups/incomers.

- Provide a test point for each sub-group for quick fault location and to provide group array isolation.

- SCADA Communication device with all necessary equipment for communicating with main SCADA Server.

- Suitable space for workability and natural cooling.

b) The junction boxes shall be dust, vermin, and waterproof and made of thermoplastic in compliance with IEC 62208, which should be sunlight/ UV resistive as well as fire retardant & must have minimum protection to IP65 (Outdoor) and Protection Class-II.

c) Array Junction Box will also have suitable surge protection. In addition, over voltage protection shall be provided between positive and negative conductor and earth ground such as Surge Protection Device (SPD). The maintenance free earthing shall be done as per the relevant standards.

d) Array Junction Box should have adequate ratings of solar DC fuses & isolating miniature circuit breakers at both terminals (+ve as well as -ve), provided in recommendation with the inverter manufacturer. The fuses should be so designed that it should protect the modules from the reverse current overload.

e) At outgoing side DC Disconnector switches of suitable capacity shall be provided.

f) Contractor shall submit all the test reports/ test certificates and compliance certificates during Detailed design Engineering & before installation at site.

4.3 **Power Conditioning Unit (PCU)/Inverter:** The Grid Tied Solar Inverter should convert DC power produced by SPV Modules into AC power and adjust the voltage and frequency levels to suit the local grid conditions.

i. Power Conditioning Unit (PCU)/ Inverter shall consist of an electronic inverter along with associated control, protection and data logging devices.
ii. Power Conditioning Unit PCU) / Inverters of minimum capacity of 1250 KVAof appropriate number or above to be quoted.
iii. The rated power/capacity of the inverters shall be the AC output of the inverter at 50°C.
iv. The inverter should be designed for minimum of 10% additional DC input Capacity. (E.g. Inverter is supplied with rated capacity of 1000 kW shall accept at least 1100 kW of DC power).
v. All PCUs should consist of associated control, protection and data logging devices and remote monitoring hardware and compatible with software used for string level monitoring.
vi. Dimension, weight, cooling arrangement etc. of the PCU shall be indicated by the Bidder in the offer. Type (in- door & out-door) of installation also to be indicated.
vii. Model of the inverter should be finalized by ZEDA after consultation with its client. Registered office and Service center of the PCU manufacturer must be in India.
viii. *The minimum European efficiency of the inverter shall be 98% load as per IEC 61683 standard for measuring efficiency*. The Bidder/ Contractor shall specify the conversion efficiency of different loads i.e. 25%, 50%, 75% and 100% in its technical bid. The Bidder/Contractor should specify the overload capacity in the technical bid.
ix. The PCU shall be tropicalized and design shall be compatible with conditions prevailing at site. Provision of exhaust fan with proper ducting for cooling of PCU's should be incorporated in the PCU's, keeping in mind the extreme climatic condition of the site as per the recommendations of Original Equipment Manufacturer (OEM) to achieve desired performance and life expectancy.
x. The inverters shall have minimum protection to IP 65(Outdoor)/IP 20 or 21(indoor) and Protection Class II.
xi. Nuts & bolts and the PCU enclosure shall have to be adequately protected taking into consideration the atmosphere and weather prevailing in the area.
xii. Grid Connectivity: Relevant CERC regulations and grid code as amended and revised from time to time shall be complied. The system shall incorporate a unidirectional inverter and should be designed to supply the AC power to the grid at load end. The power conditioning unit shall adjust the voltage & frequency levels to suit the Grid.
xiii. All three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency.
xiv. The inverter output should always follow the grid in terms of voltage and frequency. This shall be achieved by sensing the grid voltage and phase and feeding this information to the feedback loop of the inverter. This control variable then controls the output voltage and frequency of the inverter, so that inverter is always synchronized with the grid.

4.4 Operational Requirements for Inverter/ PCU

a) The PCU must have the feature to work in tandem with other similar PCU's and be able to be successively switched "ON" and "OFF" automatically based on solar radiation variations during the day. Inverters must operate in synergy and intelligently to optimize the generation at all times with minimum losses.
b) The PCU shall be capable of controlling power factor dynamically
c) Maximum power point tracker (MPPT) shall be integrated in the power conditioner unit to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor based to minimize power losses. Each DC input should have one DC current sensor so that MPPT accuracy can be achieved. The details of working mechanism of MPPT shall be mentioned by the Bidder in its technical bid. The MPPT unit shall confirm to IEC 62093 for design qualification.
d) The system shall automatically "wake up" in the morning and begin to export power provided there is sufficient solar energy and the grid voltage and frequency is in range.
e) Sleep Mode: Automatic sleep mode shall be provided so that unnecessary losses are minimized at night. The power conditioner must also automatically re-enter standby mode when threshold of standby mode reached.
f) Stand - By Mode: The control system shall continuously monitor the output of the solar power Plant until pre-set value is exceeded & that value to be indicated.
g) Basic System Operation (Full Auto Mode): The control system shall continuously monitor the output of the solar power Plant until pre-set value is exceeded & that value to be indicated.
h) PCU shall have provisions/features to allow interfacing with various sensors, monitoring software and hardware devices. Bidder has to provide all the technical support & necessary information in this regards to ZEDA at the time of commissioning of Power plants.
i) AC current sensor should be closed loop Hall current sensor.

4.5 Protection against faults for PCU: 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. In addition, it shall have following minimum protection against various possible faults:

a. Grounding Leakage Faults: The PCU shall have the required protection arrangements against grounding leakage faults.

b. Over Voltage & Current: In addition, over voltage protection shall be provided between positive and negative conductor and earth ground such as Surge Protection Devices (SPD).
c. Galvanic Isolation: The PCU/inverter shall have provision for galvanic isolation with external transformer, if required.
d. Anti-islanding (Protection against Islanding of grid): The PCU shall have anti-islanding protection. (IEEE 1547/UL 1741/ equivalent BIS standard)
e. Unequal Phases: The system shall tend to balance unequal phase voltage (with 3-phase systems).
f. Reactive Power: The output power factor of the PCU should be of suitable range to supply or sink reactive power. The PCU shall have internal protection arrangement against any sustained fault in the feeder line and against lightning in the feeder line.
g. Isolation: The PCU shall have provision for input & output isolation. Each solid- state electronic device shall have to be protected to ensure long life as well as smooth functioning of the PCU.
h. PCU shall have arrangement for adjusting DC input current and should trip against sustainable fault downstream and shall not start till the fault is rectified.
i. Each solid state electronic device shall have to be protected to ensure long life of the inverter as well as smooth functioning of the inverter.

All inverters/ PCUs shall be three-phase using static solid-state components. DC lines shall have suitably rated isolators to allow safe start up and shut down of the system. Fuses & Circuit breakers used in the DC lines must be rated suitably.

4.6 Internal Surge Protection Device (SPD) shall be provided in the PCU on DC side. It shall consist of Metal Oxide Varistor (MOV) type arrestors. The discharge capability of the SPD shall be at least 10kA at 8/20 micro second or as per IEC 61643-12. During earth fault and failure of MOV, the SPD shall safely disconnect the healthy system. SPD shall have thermal disconnector to interrupt the surge current arising from internal and external faults. In order to avoid the fire hazard due to possible DC arcing in the SPD due to operation of thermal disconnector, the SPD shall extinguish the arc. On AC Side it has to be Minimum Type 3.

4.7 Control and read-out should be provided on the indicating panel integral to the Inverter. Display should be simple and show all the relevant parameter relating to PCU operational data and fault condition in form of front Panel meters / LEDs or two-line LCD Display. It shall include all important parameter such as DC input voltage, DC input current, AC output voltage, AC output current, AC output power, frequency etc. and the same has to be made available to SCADA also.

4.8 The incoming DC feeder of PCU shall have suitably rated isolators to allow safe start up and shut down of the system and its terminals should be shrouded. The DC feeder shall terminate in the fuse box through a suitable fuse rating. The PCU

fuse box shall have one spare terminal with fuse and holder for the future use. The fuse box shall be integral part of the Inverters.

4.9 Standards & Compliances for PCU

i. PCU shall confirm to the following standards and appropriately certified by the labs:

a) Efficiency measurement: IEC 61683
b) Environmental Testing: IEC 60068-2 or IEC 62093
c) EMC, harmonics, etc.: IEC 61000 series, 6-2, 6-4 and other relevant Standards.
d) Construction & Electrical safety: IEC 62109 (1&2), EN 50178 or equivalent
e) Recommended practice for PV - Utility interconnections: IEEE standard 29 - 2000 or equivalent (or undertaking to be submitted along with the bid)
f) Protection against islanding of grid: IEEE1547/ UL1741/ IEC 62116 or equivalent
g) Grid Connectivity: Relevant CEA/ CERC regulation and grid code (amended up to date) or undertaking to be submitted along with the bid
h) Reliability test standard: IEC 62093 or equivalent

Submit all relevant IEC Certificates and Compliance details along with the bid. Bidder has to submit the IEC Certificates & compliance details of inverters.

ii. Desired Technical Specifications of PCU

Sinusoidal current modulation with excellent dynamic response

a) Compact and weather proof housing (indoor/ outdoor)
b) Comprehensive network management functions (including the LVRT and capability to inject reactive power to the grid)
c) AC Output Voltage : 300V-400V
d) Long time AC overloading capacity of 10%
e) Total Harmonic Distortion (THD) <3%
f) No load loss < 1% of rated power and maximum loss in sleep mode shall be less than 0.05%
g) Optional VAR control
h) Power factor Control range: 0.9 (lead - lag)
i) Humidity: 95% Non – Condensing
j) Operating Temperature Range should be -10°C to + 60°C
k) Maximum Input Voltage 1000V DC
l) Maximum Noise level 75 Db
m) Unit wise & integrated Data logging
n) Dedicated Prefabs / Ethernet for networking
o) Filter material should be 60PPI filter screen.
p) Inverter air ventilation should be front lower side inlet and back upper side outlet, to avoid heated air to be circulated back again into the inverter.

iii. Inverter/ Power Conditioning unit must provide protection against:

a) AC/DC Over current
b) Sync loss
c) Over temperature
d) AC/DC bus over voltage
e) Cooling Fan failure (If provided)
f) Short circuit
g) Lightning
h) Earth fault
i) Surge voltage induced at output due to external source
j) Power regulation in the event of thermal overloading
k) Set point pre-selection for Active power & VAR control
l) Bus communication via -interface for integration with SCADA
m) Remote control via telephone modem and/or mini web server
n) Integrated protection in the DC and three phase system
o) Insulation monitoring of the PV array with sequential fault location

iv. Ground fault detector which is essential for large PV generators in view of appreciable discharge current with respect to ground

v. Over voltage protection against atmospheric lightning discharge to the PV array is required

vi. The power conditioner must be entirely self-managing and stable in operation.

vii. A self-diagnostic system check should occur on start up. Functions should include a test of key parameters on start up.

viii. PCU/inverter front panel shall be provided with display (LCD or equivalent) to monitor, but not limited to, the following:

a) DC power input
b) DC input voltage
c) DC Current
d) AC power output
e) AC voltage (all the 3 phases and line)
f) AC current (all the 3 phases and line)
g) Power Factor
h) Ambient Temperature
i) LED Indication - Inverter ON, Grid ON, Inverter UV/OV, Inverter O/L, Inverter O/T etc.

4.10 Documentary Requirements & Inspection

a) The bill of materials associated with PCU's should be clearly indicated while delivering

the equipment.

b) The Contractor shall provide to the ZEDA, data sheet containing detailed technical specifications of all the inverters and PCUs, Type test reports and Operation & Maintenance manual before dispatch of PCUs.
c) The ZEDA or its authorized representative reserves the right to inspect the PCUs/ Inverters at the manufacturer's site prior to dispatch.

4.11 DC Cable and Wires

a) All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions including High temperatures, UV radiation, rain, humidity, dirt, salt, burial and attack by moss and microbes for 10 years and voltages as per latest IEC standards. (Note: DC cables for outdoor installations should comply with the TUV 2PfG 1169/09.07 for service life expectancy of 25 years)

b) Insulation: Outer sheath of cables shall be electron beam cross-linked XLPO type and black in color. In addition, Cable drum no. / Batch no. to be embossed/printed at every one meter. Cable Jacket should also be electron beam cross linked XLPO, flame retardant, UV resistant and black in color. DC positive current carrying cables should have marking of red line on black outer sheath.

c) All the DC cables from SMU to Inverter must be Single Core cable.

d) DC cables used from solar modules to array junction box shall be solar grade copper (Cu) with XLPO insulation and rated for 1.1kV only. However, the cables used from array junction box to inverter can be XLPE Aluminium with 1.1kV rating as per relevant standards.

e) Wires with sufficient ampacity and parameters shall be designed and used so that maximum voltage-drop at full power from the PV modules to inverter should be less than 1.5%. Successful Bidder/Contractor shall provide voltage drop calculations in unlocked excel sheet.

f) Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. Necessary bimetallic connectors have to be used for connecting Cu bus bar and Al cables or vice-versa. All wires used on the LT side shall conform to the relevant standards and should be of appropriate voltage grade. Only copper conductor wires (up to Array Junction Box) compliant with IEC 60228, Class 5 of reputed make shall be used.

g) All high voltage cables connecting the main junction box/string inverters to the transformers should be PVC insulated grade conforming to IS 1554 and cables shall also conform to IEC 60189 for test and measuring the methods.

h) Cable terminations shall be made with suitable cable lugs & sockets etc., crimped properly and passed through brass compression type cable glands at the entry & exit point of the cubicles.

i) All cable/wires shall be provided with UV resistant printed ferrules for DC side however, for HT cables, punched/ embossed aluminium tags are required. The marking on tags shall be done with good quality letter and number ferrules of proper sizes so that the cables can be identified easily.

j) The wiring for modules interconnection should be weather resistant. However, for crossing with road, drain and trenches etc., the cable must pass through GI / Hume pipe of appropriate size with proper protection at ends to prevent any damage inflected by the edge of the pipe.

k) Type test reports and Data sheets of individual cable sizes (HT & LT) shall be submitted for approval by ZEDA.

4.12 Switchboard box / DC Distribution Box (DCDB) / AC Distribution Box (ACDB) panels

a) Successful Bidder/Contractor shall provide sufficient no. of switchboards / DCDB/ACDB wherever required.

b) All boxes/ panels should be equipped with appropriate functionality, safety (including fuses, grounding, etc.) and protection.

c) The terminals will be connected to bus-bar arrangement of proper sizes to be provided. The panels/ boxes will have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables.

d) Adequate rating fuses & isolating MCB/ MCCB should be provided.

e) The panels/ boxes shall have suitable arrangement for the followings:

- Provide arrangement for disconnection
- Provide a test point for quick fault location
- To provide isolation
- The current carrying rating of the boxes/ panels shall be suitable with adequate safety factor.
- The rating of the boxes/ panels shall be suitable with adequate safety factor to inter connect to the local/ internal grid.
- Thermal/ heat dissipation arrangement/ Vent for safe operation.
- Adequate number of spare terminals to receive suitable runs and size of cables required for the Inverter/Transformer rating

f) The boxes/ panels must be grounded properly to ensure all safety related measures for safe operation. The parts of panel, wherever applicable, must be insulated properly.

g) All the panels to be manufactured with sufficient space for working and must have temperature suitability up to 85° C with separate cable and busbar alley.

h) The boxes/ panels shall be dust, vermin, and waterproof and made of thermoplastic/ metallic in compliance with IEC 62208, which should be sunlight/ UV resistive as well as fire retardant & must have minimum protection to IP 65(Outdoor)/ IP 20(indoor) and Protection Class II.

i) All panels/ boxes shall be provided with adequately rated bus-bar, incoming control, outgoing control etc. as a separate compartment inside the panel to meet the requirements of the Chief Electrical Inspector General (CEIG)/CEA. All live terminals and bus bars shall be shrouded.

4.13 Lightning Protection for PV Array

a) The source of over voltage can be lightning or other atmospheric disturbance. Main aim of over voltage protection is to reduce the over voltage to a safe level before it reaches the PV or other sub-system components as per NFC 17 - 102. Contractor to provide ESE type lightening Arrestor or as per latest guidelines, placed at strategic locations to protect the Plant from lightening and shall not cause any shadow on the solar modules.

b) Necessary foundation / anchoring for holding the lightning conductor in position to be made after giving due consideration to shadow on PV array, maximum wind speed and maintenance requirement at site in future.

c) The Contractor shall submit the drawings, calculations and detailed specifications of the PV array lightning protection equipment to ZEDA for approval before installation of system.

d) The lightning conductor shall be earthed through flats and connected to the grounding mats as per applicable Indian Standards with earth pits. Three earth pits shall be provided for each lightning arrestor. Each lightning conductor shall be fitted with individual earth pit as per required Standards including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, watering pipe using charcoal or coke and salt as required as per provisions of IS.

e) The lightning conductor must ensure three zone protections level or as per requirement.

4.14 Solar Photovoltaic Power Plant Electrical System: The technical requirements of design & engineering, testing at works, supply, installation testing & commissioning of all electrical equipment required for the Solar Photovoltaic Power Plant starting from the local control panel of Plant and up to the Grid tie up with the State grid including all control protection, metering equipment, step up transformers, voltage transformer, indoor/ outdoor switchgears and balance of equipment complete in all respect shall be of high standard and quality meeting the requirement of respective Indian standard (following table). All the type test reports along with Material Dispatch Clearance Certificate (MDCC) and MSDS for all applicable product & equipment and cables are to be submitted by the Contractor prior to the dispatch of the same. Contractor has to provide the type test report for all the equipment used under this contract. If the equipment is not type tested, the Contractor has to ensure conduction of such test and supply the type test Report to the ZEDA without any additional cost.

IS/ IEC Reference	Specification
IEC-298, IS-3427	A.C. Metal - enclosed and control gear for rated voltages above 1KV
IS-8623	Specification for Low Voltage Switchgear and Control gear assemblies
IS-13118/ IEC-56	Specification for High Voltage AC Circuit Breakers.
IEC-529	Degrees of Protection.
IS-5578 & 11353	Making and arrangement for switchgear bus bar main connections and auxiliary wiring.
IS-325	Specification for 3 Phase Induction motors.
IS-2629	Recommended practice for hot dip galvanizing of iron and –steel
IEC-137	Bushing for AC Voltages
IS-3347	Porcelain Transformer Bushings.-
IS-5561	Terminal Connectors
IS-3156	Voltage Transformers
IS-2705	Current Transformers
IS-3231	Electric relays for power protection
IS-13010	Watt hour meters
IS-13779	Static Energy Meters
IS-8686	Static Protection Relays
IS-1248	Electrical measuring instruments
IS-2099	High Voltage Porcelain Bushings
IS-10118	Minimum clearances for Outdoor Switchgear
IEC-694	Common Clauses for High Voltage Switchgear, and Control gear
IEC-60255 & IEC-61330	Numerical Relays

4.15 Power Transmission System, Metering, Protection, Monitoring & Control System, Transmission line /Conductor

a) Standards for design, manufacture, stage testing, inspection and testing before dispatch, packing and delivery of Aluminium Conductor Steel Reinforced (ACSR Raccoon Conductor) specified hereunder for their satisfactory operation. The power conductors shall conform to the following Indian Standards, which shall

mean latest revisions, amendments/changes adopted and published, unless otherwise specified herein.

b) General Technical requirements for cables:

i. The cables shall be suitable for laying on racks, in ducts, trenches, conduits and underground (burned) installation with chances of flooding by water.
ii. 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 as specified elsewhere in this specification.
iii. Copper/Aluminium conductor used in power cables shall have tensile strength as per relevant standards. Conductors shall be multi-stranded.
iv. XLPE insulation shall be suitable for continuous conductor temperature of 90 deg. C and short circuit conductor temperature of 250 deg. C.
v. The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS:5831.
vi. For single core armoured cables, armouring shall be of aluminium wires. The aluminium used for armouring shall be of H4 grade as per IS: 8130 with maximum resistivity of 0.028264 ohmsq.mm/meter at 20deg.C.
vii. For multi core armoured cables armouring shall be of galvanized steel.
viii. The minimum area of coverage of armouring shall be 90%.

4.16 Step-Up Transformer

a) The transformer shall be copper wound, 3 phase, natural cooled, core type construction, and oil immersed and shall be suitable for outdoor applications with the capacity of appropriate ratings and voltage ratio.

b) The Contractor shall provide the complete turnkey design, supply, erection, testing and commissioning of transformers and transformer substation to step-up the output of the inverter to 33KV voltage level (as per site requirement) at the location of the inverter. The power from inverter room/s shall be collected at a common location i.e Solar Main Control Room (MCR) from where it shall be transmitted to the designated substation through underground transmission cables at 33 KV voltage level (as per site requirement). However, the detailed scheme of design lies with the Contractor and must submit the same to ZEDA for approval prior to construction.

c) Power Transformers utilized shall be 3 phase, Oil Filled, 50 Hz and associated Switchgear of approved make. RTCC panel, as per design, will be provided in control room. It is recommended to have standard ratings of transformer used. Contractor is to provide the type test reports for the transformer(s) used. The vector group of transformer(s) must be in line with the system requirement and follow the prevailing grid codes at the location of Site.

d) All the transformers shall be suitable for outdoor installation with 3 phase 50Hz in which the neutral is effectively earthed and they should be suitable for service under fluctuations in supply voltage up to plus 10% to minus 15%.

4.17 General Standards of Step Up Power Transformer.

a) The equipment and accessories covered by this specification shall be designed, manufactured and tested in accordance with the latest relevant standards and codes of practice published by the relevant Indian Standards (IS) as applicable.
b) All electrical equipment and installation shall confirm to the latest Indian Electricity Rules as regards safety, earthing and other essential provisions specified for installation and operation of electrical plants. Relevant national and international standards in this connection can be followed in order to improve the efficiency and safe operations.
c) All working parts, insofar as possible, are to be arranged for convenience of operation, inspection, lubrication and ease of replacement with minimum downtime. All parts of equipment or of spare equipment offered shall be interchangeable.
d) The quality of materials of construction and the workmanship of the finished products / components shall be in accordance with the highest standard and practices adopted for the equipment covered by the specification.
e) All items of equipment and materials shall be thoroughly cleaned and painted in accordance with relevant Indian Standards. The finish paint shall be done with two coats of epoxy based final paint of colour Shade RAL 7032 of IS: 5 for indoor equipment.
f) Any fitting or accessories which may not have been specifically mentioned in the specification but which are usual or necessary in the equipment of similar plant or for efficient working of the Plant shall be deemed to be included in the contract and shall be provided by the Contractor without extra charges. All plant and apparatus shall be complete in all details whether such details are mentioned in the specifications or not.

h) Efficiency: The percentage loading for the maximum efficiency shall be clearly stated at unity power factor as well at 0.9 and 0.9 power factor (lead and lag).

i) Insulation: The dielectric strength of the winding, given insulation and the bushings shall conform to the values given in IS: 2026 (Part 111)/1981 (or its latest amendment) for highest system voltage and shall be suitable for the impulse test/power frequency test voltages.

j) Factory Assembly and Tests: The transformer shall be completely assembled and tested at the Factory. Routine and Acceptance tests as per specification/ standards are to be conducted and no deviation in respect of conducting these tests will be acceptable. No extra charges for these tests will be paid. Test charges shall be part of cost of the equipment. If ZEDA selects to send a representative, all tests shall be carried out in his presence. Type test certificate shall be furnished before start of supply.

k) Routine Tests: Each completed transformer shall be subjected to following routine tests as per IS: 2026 Part. I & III (latest amendment). No extra charges for any of the tests shall be paid. No deviation shall be acceptable. If the supplier

desires, he may not fix radiators on transformers (other than the one which is to be type tested) during routine testing. However in that case, radiator manufacturer's test certificate shall be furnished for reference of inspecting officer with undertaking that supplier shall be responsible for proper alignment/fixing of radiator on transformer at site.

i. Measurement of resistance of each winding.
ii. Measurement of turn's ratio between HV-LV windings at each tap.
iii. Checking of polarity and phase relation-ships for each winding.
iv. Measurement of no load loss and no load current.
v. Positive phase sequence impedance/short circuit impedance between HV-LV windings on minimum, maximum and normal taps.
vi. Separate source voltage withstand test.
vii. BDV test on transformer oil.
viii. Induced over voltage withstand test.
ix. Measurement of neutral unbalance current.
x. Regulation at rated load at unity, 0.90 and 0.80 lagging power factor.
xi. Load losses measured at rated frequency by applying voltage sufficient to produce the rated relevant current in one winding with the other winding short circuited.
xii. Measurement of insulation resistance.
xiii. The total losses shall comprise of the No Load Losses, load losses at rated output duly converted at 75°C average winding temperature and shall also be indicated in the test report. Load losses shall be that corresponding to rated load on HV & LV winding.
xiv. Routine dielectric tests as per IS: 2026(Part. I & III), 1981 and any amendments thereto.
xv. Check complete transformer against approved outline drawing, provision for all fittings, finish oil level etc.

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

i. Insulation resistance test.

ii. Ratio and polarity test.

iii. Dielectric test on oil.

iv. Physical check

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

m) Further Tests: The ZEDA reserves the right of having other reasonable tests carried out at his own expenses either before dispatch or during performance guarantee period from Govt. approved/ Govt. recognized lab to ensure that the transformer complies with the requirements of this specification after due intimation to the supplier. In case the equipment is not found meeting the

requirement of Technical Specification of Tender Document, all expenses incurred for such testing will be on supplier's account and the material shall be replaced by the supplier at site free of cost

n) Frequency and System Voltage: The transformer shall be suitable for continuous operation with a frequency variation of ± 2.5% from normal of 50Hz without exceeding the specified temperature rise. The system shall be designed for a suitable voltage range as per the Grid code of the state standard. However the flux density requirements shall be as per this specification.

o) Installation & Commissioning: Mainly following activities are required to be carried out before commissioning of Power Transformers:-

i. Assembling of Power Transformer accessories as per GA drawing.
ii. Testing activities in presence of ZEDA such as
iii. Ratio Test
iv. Megger Value
v. Magnetic balance.
vi. Oil BDV
vii. Earth Resistance
viii. Buchhloz Relay checking.
ix. WTI/OTI/MOLG (oil level) checking.
x. Checking of points of leakage of oil from Transformer body/Radiator/Valve
xi. Setting of Relays in Panel

4.18. Auxiliary transformer: The transformer used for auxiliary distribution within the Plant must be in accordance with the reference standards. The ratings of the transformer shall be suitably designed by the Contractor in line with Discom's requirement in order to maximize the net Energy generation from the Plant. The guaranteed technical particulars of the auxiliary transformer must be supplied along with the bid. The Contractor shall also provide the list of auxiliary loads considered for the project. Sizing of Auxiliary transformer should be done keeping in mind the Discom's requirement.

4.19. Instrument Transformer

a) The instrument transformers i.e. current and voltage transformers shall be single phase transformer units and shall be supplied with a common marshalling box for a set of three single phase units. The tank as well as top metallic shall be hot dip galvanized or painted Grey colour as per RAL9002.

b) The instrument transformers shall be oil filled hermetically sealed units. The instrument transformers shall be provided with filling and drain plugs.

c) Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block. The insulators shall have cantilever strength of more than 500kg.

d) Current Transformer, Voltage Transformer, Circuit Breaker and Relays should match site requirements.

4.20 Current Transformer (CT)

a) Current transformers may be either of the bushing type or wound type. The bushing types are normally accommodated within the transformer bushings and the wound types are invariably separately mounted. The location of the current transformer with respect to associated circuit breaker has an important bearing upon the protection scheme as well as layout of, substation. Current transformer class and ratio is determined by electrical protection, metering consideration.

b) Technical specifications - Current ratings, design, Temperature rise and testing etc. should be in accordance with IS: 2705 (part I to IV)

c) Type and Rating

i. The current transformer should be of indoor/ outdoor type, single phase, oil immersed, self cooled and suitable for operation in 3 phase solidly grounded system.
ii. Type test certificate for the proposed CT shall be provided to the Contractor before dispatch.
iii. Each current transformer should conform to the latest IEC standards and particulars under the site conditions for the system under design.

4.21. Voltage Transformer (VT/ PT)

a) Voltage transformers shall be electro-magnetic (EMU) type and shall comprise of compensating reactor, intermediate transformer, and protective and damping devices. The oil level indicator of EMU with danger level marking shall be clearly visible to maintenance personnel standing on ground.

b) The secondary shall be protected by 3A HRC cartridge type fuses for all windings. In addition fuses shall also be provided for protection and metering windings. The secondary terminals shall be terminated on stud type non-disconnecting terminal blocks via the fuse inside the terminal box of degree of protection IP 55. The access to secondary terminals shall be without the danger of access to high voltage circuit.

c) The accuracy of metering core shall be maintained through the entire burden range up to 75 VA on all three windings without any adjustments during operations.

d) The PTs should be single phase oil immersed self -cooled type suitable for outdoor.

e) The core should be of high grade non-ageing electrical silicon laminated steel of high permeability. The PTs should be hermetically sealed to eliminate breathing and prevent air and moisture entering the tank.

f) Contractor has to provide the type test certificate for the proposed VT before dispatch.

4.22. Metering Bay

a) The current & potential transformers shall be of outdoor type single phase, 50 Hz, oil immersed self-cooled suitable for operation in the climate conditions specified shall be complete in all respects.

b) The instrument transformers shall be hermitically sealed to eliminate breathing and entering of air and moisture in the tank. Provision of pressure releasing device is not permitted.

c) The CT core, to be used for protective relays shall be of accuracy class, specified or appropriate class suitable for back up, over current and earth fault, differential, bus bar and other protections as prescribed.

d) Applicable Standards:

Unless otherwise modified in this specification, CT-PT Metering Sets shall comply with the following Indian Standard Specification (latest version):

IS: 2705-1992 Specification for current transformers.

IS: 3156-1992 Specification for voltage transformers.

IS: 5621-1980 Specification for Hollow insulators and accessories IS: 2099-1986

Specification for insulators/ bushing

IS: 3347-1986 Specification for the dimension of Porcelain transformer

IS: 335-1983 Specification for new insulating oil

e) The core of instrument transformers to be used for metering and instrumentations shall have saturation factor, low enough to avoid damage to the instruments, in the event of maximum short circuit current.

f) Nuts and bolts (or screws used for fixation of interfacing porcelain bushings for taking out terminals) shall be provided on flanges, cemented to the bushing and not on the porcelain i.e. Flange type bushing for CT/PT, shall be provided.

g) For gasket joints, wherever used, Nitrile Butyl rubber gaskets shall be used. The gasket shall be fitted properly with adequate space for accommodating the gasket under compression._

h) The metering sets shall be supplied with first filling of insulating oil conforming to IS: 335 (including latest amendment).

i) The outer surface of metal tank shall be Hot Dip Galvanised, whereas, the inner portion shall be painted with oil resistive, insoluble paint. The ZEDA reserves right for stage inspection during manufacturing process of tank/CT/PT.

j) The external surfaces of tanks of CT-PT sets shall be painted with one coat of primer and two coats of synthetic enamel paint of shade No.631 of IS: 5, the internal surfaces of the tank shall be painted with two coats of suitable heat resistant oil insoluble paint.

k) The instrument transformers shall be suitable for mounting on steel structures or concrete pedestals.

I) For load shading single phasing is adopted in the system. The offered CT-PT set shall be suitable for working under such abnormal operation condition.

m) The CT - PT sets shall be three nos. of single phase PTs. The primary winding of 3 single phase PT shall be connected in star formation in the tank with common neutral of brought outside the tank through 3 KV bushing for earthing.

n) The secondary terminal box shall have cable gland/ flange suitable to receive two Nos. control cable of size 6x4 sq.mm and 4x2.5 sq.mm at the bottom of the secondary box for metering connections to secondary winding of CT-PT circuits respectively.

o) The CT - PT Set shall have 3 Nos. incoming and 3 Nos. outgoing outdoor type bushing complete with 6 Nos. bimetallic terminal connectors suitable for Dog/Panther Conductor.

4.23. Circuit Breakers

a) The circuit breakers shall be capable of rapid and smooth interruption of currents under all conditions completely suppressing all undesirable phenomena even under the most severe and persistent short circuit conditions or when interrupting small currents or leading or lagging reactive currents. The circuit breakers shall be 'Restrike-Free' under all operating conditions. The details of any device incorporated to limit or control the rate of rise of re-striking voltage across, the circuit breaker contacts shall be stated. The over voltage across, the circuit breaker contacts shall be stated. The over voltage caused by circuit breaker while switching inductive or capacitive loads shall not exceed 2.5 times the highest phase to neutral voltage. The actual make and break times for the circuit breakers throughout the ranges of their operating duties shall be stated in the offer and guaranteed

b) Applicable Standards: The materials shall conform in all respects to the relevant Indian Standard Specifications/ IEC Standards, with latest amendments.

c) The arc quenching chambers shall have devices to ensure almost uniform distribution of voltage across the interrupters.

d) Appropriate & adequate Capacity of relevant AC voltage rating indoor air Circuit Breaker as per the IEC 60898 / IEC 62271 - 100 or equivalent Indian Standards along with control circuit and protection relay circuit, fuses, annunciations and remote operating and controlling facility from the Main Control Room.

e) Circuit breaker shall be C2/Ml class under all duty conditions and shall be capable of performing their duties without opening resistor. The circuit breaker shall meet the duty requirement of any type of fault or fault location and shall be suitable for line charging and dropping when used on 6kV effectively grounded or ungrounded systems and perform make and break operations as per the stipulated duty cycles satisfactorily.

f) The circuit breaker shall be capable for breaking the steady & transient magnetizing current corresponding to transformers. It shall also -be capable of breaking line charging currents as per IEC- 62271-100 with a voltage factor of 1.4

g) The rated transient recovery voltage for terminal fault and short line faults shall be as per IEC:62271-100.

h) The Contractor may note that total break time of the breaker shall not be exceeded under any duty conditions specified such as with the combined variation of the trip coil voltage, pneumatic pressure etc. While furnishing the proof of the total break time of complete circuit breaker, the Contractor may specifically bring out the effect of non-simultaneity between same pole and poles and show how it is covered in the guaranteed total break time.

i) Contractor shall indicate the noise level of breaker at distance of 50 to 150 m from base of the breaker.

j) While furnishing particulars regarding the D.C. component of the circuit breaker, the Contractor shall note that IEC-62271-100 requires that this value should correspond to the guaranteed minimum opening time under any condition of operation.

k) The critical current which gives the longest arc duration at lock out pressure of extinguishing medium and arc duration shall be indicated.

l) Contractor has to provide the type test reports for the CB before the dispatch.

m) All the duty requirements specified above shall be provided with the support of adequate test reports.

4.24. Operating Mechanism of Circuit Breakers

a) Circuit shall be vacuum type with electrically spring charged mechanism.

b) The operating mechanism shall be anti-pumping and trip free (as per IEC definition) electrically under every method of closing. The mechanism of the breaker shall be such that the position of the breaker is maintained even after the leakage of operating media and / or gas. The circuit breaker shall be able to perform the duty cycle without any interruption.

c) Electrical tripping shall be performed by shunt trip coil. Provision shall also be made for local electrical control. 'Local / remote' selector switch and close & trip push buttons shall be provided in the breaker central control cabinet. Remote located push buttons and indicating lamps shall also be provided. The VCB coil DC supply through appropriately rated battery bank and charger to be supplied by the Contractor.

d) Operating mechanism and all accessories shall be in local control cabinet. A central control cabinet for the three poles of the breaker shall be provided along with supply of necessary tubing, cables etc.

e) Mounting and supporting structure for Circuit Breaker: The circuit breakers should be self supporting type. However, if necessary for the purpose of minimum ground clearance the circuit breakers should be mounted on raised steel structures which should be included in the scope of supply of circuit breaker. Bidder/Contractor to obtain the necessary information and data required for design of foundations of the circuit breaker be obtained from the CB supplier.

f) Max. Impact loading in terms of equivalent static load both compression and upward due to opening/closing of the breakers. It shall be clearly stated whether these forces shall act simultaneously or at different timing.

g) Necessary connecting materials such as clamps, bolts, nuts, washers etc. and fixing bolts for mounting the equipment on the supporting structures wherever required should be obtained from the circuit breaker supplier.

h) General parameters: Vacuum type Circuit Breaker:

i) Co-ordination of rated voltages, short circuit breaking current and rated normal current for guidance as per IS 13118 for rated voltage 33 kV and above Circuit Breaker Protection against

i. Over Current
ii. Earth fault
iii. Under voltage & over voltage protection
iv. Under frequency & over frequency
v. SF6 gas pressure low (where applicable)
vi. DC supply failure

4.25. Isolators

a) The isolators and accessories shall conform in general to IEC 62271-102 (or equivalent Indian standard) except to the extent explicitly modified in specification.

b) Each isolating switch should have the following particulars under the site conditions for the system under design (typical values for 36 kV system are given).

4.26. Indicating and Integrating Meters/Instruments:

a). All indicating instruments shall be of switchboard type, back connected, suitable for flush mounting and provided with dust and vermin proof cases for tropical use and finished in suitable colour. All instruments shall have practical laboratory means for adjustment of accuracy. The limits of errors for ammeters/voltmeters shall be those permissible for class 1.5 instruments as per IS:1248.

b). A.C. Static HT Tri Vector Meter: A.C. Static HT Tri Vector Meter shall be installed as per JERC9M&M)'s norms and shall be intimated while placement of order. The meters shall be located at eye level to facilitate observations of readings correctly.

c). The ammeters and voltmeters shall be suitably scaled to indicate the current/voltage for all the rating of current/voltage transformers. A phase selector switch with four/six position shall be used to measure the current/voltage of each phase/line. The Contractor shall provide test certificate and calibration certificate along with the supply of the instrument.

d). The meters shall be located at normal eye level to facilitate observation of readings correctly.

4.27. Surge Arrestors

a). The surge arrestors (SAs) shall conform in general to IEC 60099-4 or IS: 3070 except to the extent modified in the specification. Arresters shall be of hermetically sealed units, selfsupporting construction, suitable for mounting on lattice type support structures. Contractor shall furnish the technical particulars of Surge arrestor.

b). The SA's shall be of heavy duty station class and gapless Metal Oxide type without any series or shunt gaps. The SAs shall be capable of discharging over- voltages occurring during switching of unloaded transformers, and long lines.

c). Arrestors shall be complete with insulating base for mounting on structure. Suitably enclosed for outdoor use and requiring no auxiliary

or battery supply for operation shall be provided for each single pole unit with necessary connection.

d). The surge arrestors shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with IEC-60099-4.

e) Each lightning arrestors should have the following particulars under the site conditions for the system under design:

4.28. Codes and Standard

IS: 2309: Code of Practice for the protection of building, room and allied structures against lightning.

NFC 17-102: Lightning Protection with Early Streamer Air Termination rod

4.29 Complete Solar Array with associated structure shall be protected from Direct Lightning Stroke. Lightning Protection for solar array shall be achieved with any or both of the following two systems as per specification provided in the following section;

(1) Single Rod Air Terminal (Faraday Rods),

(2) Early Streamer Emission (ESE) Air Terminal.

Suitable earthing and equi-potential bonding shall be ensured for the air termination rods as per applicable standard/Equipment manufacturer guidelines. Current carrying parts and accessories such as clamps, fasteners, down conductor, Test links and earth termination etc. shall be preferably procured from OEM of Air Terminals if it is supplied by them as part of lighting protection system.

4.30. Lightning Protection System for solar array with single rod air terminal: Solar array of Plant shall be protected from direct lightning strike with straight or angled air termination rods of suitable class as per IS:2309 to be fixed with the module mounting structure (MMS). Air termination rods shall have minimum two clamps to be fixed with MMS and must be capable of carrying full lightning current. Contractor shall ensure proper fixing of the clamps with MMS to allow lightning current to pass through the clamp without damage and to sustain the rods during high velocity wind. Contractor shall submit the calculation to determine the no. and location of air termination rods to be fixed on structure to provide the lightning protection to each solar module and structure. Earth riser shall be connected to that part/pole of MMS which is nearest to air termination rod.

4.31. Lightning Protection System for solar array with E.S.E air terminal: Solar array shall be protected from direct lightning stroke with Early Streamer Emission (ESE) air terminal in accordance to NF C 17-102 (Latest revision). Number and location of ESE air terminal shall be decided during detail engineering. For this

purpose, design calculation and AutoCAD drawing of the layout of ESE terminal shall be submitted to ZEDA for approval. ESE air terminal shall be type tested in any national/international approved lab for advance triggering time (AT) and lighting Impulse current test and type test report shall be submitted to ZEDA for approval.

a). Each ESE air terminal shall be provided with separate earthling termination and test link for equi-potential bonding of Lighting Protection System as per OEM guidelines/NFC 17 -102. Each ESE air terminal shall be equipped with lightning stroke counter to be fixed at suitable height in serial on the down conductor.

b). ESE air terminal shall be erected on isolated foundation to be approved by ZEDA. If required, Suitable guy wire shall be used to support the mast of ESE terminal against the wind.

4.32. Location and layout of ESE terminal shall be in such a manner that it cast no shadow on the PV Modules during 08:30 AM to 04:30PM.

4.33. Lightning Protection System for Inverter Control Room (ICR) and MCR Contractor needs to provide the Lightning Protection for each inverter, Switchyard building and Main Control Room building in accordance to IS:2309.

4.34. Protective Relays

a). The Solar PV system and the associated power evacuation system interconnections should be protected as per IEC 61727 Ed.2, norms. Over current relays, differential protection relays (for grid tie power Transformer only) and earth fault relays have to be essentially provided. All relay should be numerical type & should also be remote operation and control enabled from the control room.

b). All the relays must be solid state type and based on open access communication protocol. The numerical relays shall have RS 485 port for communication.

c). The operating voltage of the relays shall be 110 V DC/220 V DC as per battery bank rating.

d). Necessary battery bank shall also be provided in order to supply uninterrupted power to relays and control & protection circuit of the Plant.

e). Detailed Design calculations shall be provided on fault power computations and the philosophy of protective relaying with respect to short circuit kA calculations. Design, drawing and model of protection relay shall be approved by ZEDA

f. The Contractor must submit the relay setting chart as a part of design documents in coordination with the connecting substation.

4.35. Earthling for PV Array

a. The photovoltaic modules, BOS and other components of power Plant requires adequate earthing for protecting against any serious faults as guided by IEC60364.

b. The earthing system shall be designed with consideration of the earth resistivity of the project area. The earth resistivity values shall be measured prior to designing the earthing system. Unless otherwise specified, earthing system shall be in accordance with IS:3043 and IEEE 80, Indian Electricity Rules, Codes of practice and regulations existing in the location where the system is being installed.

c. The permissible system fault power level also shall be kept in consideration while designing the earthing system. Each array structure of the PV yard, LT power system, earthing grid for switchyard ,all electrical equipment ,control room ,PCU, All junction boxes, ACDB & DCDB ,all motors and pumps etc .shall be grounded properly as per IS 3043 - 1987. All metal casing / shielding of the Plant shall be thoroughly grounded in accordance with Indian electricity act / IE Rules.

d. The earthing for array and LT power system shall be made of 3.0 inches long 40 mm diameter perforated GI pipe / chemical compound filled, double walled earthing electrodes including accessories, and providing masonry enclosure with cast iron cover plate having pad-locking arrangement, watering pipe using charcoal or coke and salt as required as per provisions of IS: 3043.

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

f. Each string/ array and MMS of the Plant shall be grounded properly.

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

h. Earthing Mesh is to be prepared and installed in entire power Plant.

i. The array structures are to be connected to earth pits as per IS standards.

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

k. The complete earthing system shall be mechanically & electrically connected to provide independent return to earth.

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

m. The Contractor should submit the earthing system design calculations along with the system layout for Owner approval prior to the installation of the system.

n. Unless otherwise specified, the earthing system primary and secondary grid conductors, equipment connections shall be constructed with galvanized iron flat. However the earthing of transformer neutrals, plc and inverter terminals and electronic earthing shall be provided using copper earthing conductor only.

4.36. Isolator and Isolator-cum-Earthing Switches

a. The Isolators and Isolator-cum-Earthing Switches shall comply with the requirements of the IS: 9921 and IEC: 129 (latest edition) except specified herein. The Insulators shall comply with the requirements of IS: 2544 and IEC: 168-1988 (latest edition).

b. The isolators shall be double break, outdoor, gang operated type, with blades rotating in horizontal plane. The design shall be for upright mounting. If required, and the Isolators shall be convertible for right or left hand control with minimum labour and replacement of part. The live parts shall be so designed that as far as possible, sharp points, edges and other corona producing surface are eliminated. Except the Insulator caps and bases, all other live parts shall be min-ferrous. Bolts, Screws and Pins shall be provided with locking arrangement and shall be of the best materials.

c. Each pole shall have three Pedestal type of Insulator's stacks. Necessary arrangements shall be provided for proper alignment of the contacts. Gang operated links shall be so designed that all phases shall make and break simultaneously.

d. The design of Isolators and Isolator-cum-Earthing Switches shall be provided for positive control of blades in all positions with minimum mechanical stress on the Insulators. Fixed guides shall be so provided that proper setting of contacts shall be obtained, when a blade is out of alignment even by 25mm in either direction. All movable parts which may be in current path shall be shunted by flexible copper conductor of adequate cross-section and capacity, which shall be furnished under bill of material.

e. The length of the handle for manual operation shall not be more than one meter and shall be stated on the drawing. The rotating parts shall have a smooth movement.

f. The clearance of 4000 mm from live parts to ground as per provision of I.E. Rules shall be considered while manufacturing of isolators & to decide location of operating mechanism box. Height of structure of isolator from ground is to be considered as 2900 mm including 150mm for muffing.

4.37 Contacts:

a. The moving & fixed contacts shall be made of hard drawn electrolytic grade copper strips and shall be heavy duty self- aligning &high-pressure type preferably which applies pressure to the contact surfaces after the blades are fully closed and release the pressure before they start to open. High pressure

type contacts shall wipe the contact surfaces, while opening and closing. The contacts shall be so designed that wiping, action shall not cause securing or abrasion on the contact surfaces. The wiping action shall be sufficient to remove oxide film, formed during the operation of the switches. The pressure shall be developed by rotation of the entire blade.

b. The temperature rise of contacts due to the flow of rated short circuit current for a period of 3 seconds shall not cause any annealing or welding of contacts.

c. The moving contacts, if provided, shall close first and open last so that no damage is caused due to arcing whatever to the main contacts. The Contractor shall give full details of such contacts with necessary drawings.

d. The arcing contacts, if provided shall close first and open last so that no damage is caused due to arcing whatever to the main contacts. The tender shall give full details of such contacts with necessary drawings.

e. The female contact and its tensioning by spring shall be such that there will, always, be a positive contact with adequate pressure to give enough contact surface for the passing of current. The springs provided should not go out of alignment or get entangled with the male contact during operation. The details of springs shall be furnished on the G.A. drawing.

4.38. Earthing Blades

a. The Isolators controlling the transmission line (underground transmission cables) shall be equipped with earthing blades. The Earthing blades shall be counter balanced to ensure easy operation.

b. Line earth switch shall consist of three Earthing links per Isolator which will normally rest against the frames, when the connected Isolator is in closed position. The Earthing links of all three phases shall be suitable for fitting on either side of the Isolator.

c. Short time current withstand capacity of earthing blades of Isolator Earthing Switch shall be same as that of the main blades of Isolator. The material of the earthing Isolator, Each earthing blade shall be provide with flexible copper connections of adequate length of not less than 60mm2 are for connection between the operating shall and the base frame.

d. The rated making capacity of earthing switches shall be as specified in the applicable standard of isolators.

4.39. Insulators

a. Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC:137. Hollow column insulators shall be manufactured and tested in accordance with IEC: 60233/1S: 5261. The support insulators shall be manufactured and tested as per IS: 2544 / IEC: 600168/IEC: 600273. The insulators shall also conform to IEC 815 as applicable. Contractor shall furnish the technical particulars of all type of insulators used.

b. Porcelain insulator shall comply IS: 731-1976 or equivalent international standard and shall be homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Hollow porcelain should be in one integral piece in green & fired stage.

c. Contractor may offer silicone rubber housed composite type insulator as an alternative to the above porcelain insulator with equivalent creep age distance.

d. Data sheets for the insulators with cantilever strength and compression strength, etc. shall be submitted.

e. Insulators shall be rated for not less than 6kN for bus bar supports and 4kN for isolators.

4.40. Bus Bar

a. The outdoor bus-bars and equipment connections shall be of suitable size as per norms of Discoms/customer.

b. The bus-bars and the connection jumpers shall be supported on post insulators wherever required.

c. The ACSR bus bars are an over ground system of wires strung between two supporting structures and supported by strain type insulators. The stringing tension may be limited to 500- 900 kg depending upon the size of the conductor used. These types of bus bars are suitable for earthquake prone areas. All the bus bars are to be provided with insulating sleeves with appropriate colour code.

d. Bus bar Material - The materials in common use for bus bars and connections of the strain type are ACSR conductor or as per requirement.

e. Since aluminium oxides rapidly, great care is necessary in making connections. In the case of long spans expansion joints should be provided to avoid strain on the supporting insulators due to thermal expansion or contraction of pipe.

f. The bus bar sizes should meet the electrical and mechanical requirements of the specific application for which they are chosen.

Note: Unless otherwise specified, all equipment and materials shall confirm to the latest applicable Indian Standards. Equipment complying with any other International Standards will also be considered if it ensures performance of equipment equal to a superior to Indian Standard.

4.41. Control & Relay Panel

a). General Requirement:

i. The control & relay panel shall be free standing, simplex type, floor mounting type, fabricated from 2 mm thick MS sheet for main enclosure and 1.6 mm thick MS sheet for internals and partitions. The main enclosure shall be mounted on a base frame fabricated out of 100x50 ISMC mild steel section.

ii. The enclosure external finish colour shade shall be decided by the ZEDA, The internal surface shall have a glossy white finish all over.

iii. The control & relay panel shall contain the following metering and protection devices:

• Metering, Indications & Controls

• Ammeter:

• Ammeter selector switch

• Voltmeter:

• Voltmeter selector switch

• Load manager to display the following parameters: MW, MVA, MVArh, MVAr Coso,Hz,

• Indication lamps for R, Y, B phases, Breaker 'ON' (R), Breaker 'OFF' (G), Breaker 'TRIP' (A), Spring charged (W), Trip Circuit Healthy(B)

• TNC switch, spring return to neutral position shall be provided for circuit breaker operation.

• Local / Remote selection switch for circuit breaker operation

• Semaphore indicators (LED type) for CB and Isolator 'Open' & 'Close' positions

• Mimic diagram for the systems with aluminium strips and 'ON"OFF' indications for isolators

4.42. Low/ High Voltage Switchgear Panels

a. The LT/ HT switchgear panels shall be designed as per the relevant IS codes and as per the approved design for the panel. All the parts of the panel must be rated as per the relevant rated voltage level. All the panels must have multifunction meters (MFM) flushed with the surface of the panels. However, the outgoing feeder can have Tri vector meter (TVM) for the energy accounting.

b. The Power Control Centre (PCC)/ Switchgear shall be rated for the maximum output of the supply transformer feeding the system. The short circuit withstand rating (1 sec) at rated voltage of the switchgear shall be relevant to the existing electrical system short circuit ratings.

c. The configuration of the PCCs shall be as per the Single Line Diagram of the system.

d. Power Control Centers (Construction)--

(i) Single front / compartmentalized, modular design, degree of protection IP52 with provision of extension on both sides.

(ii) Incomer feeders: mains incomer - Electrically operated draw out type Air Circuit Breakers (ACBs)/ Vacuum Circuit breakers (VCBs), as applicable.

(iii) Outgoing feeders: Moulded Case Circuit Breakers (MCCBs)/ electrically operated draw out type Air Circuit Breakers (ACBs) / Vacuum Circuit Breakers (VCBs), as applicable.

(iv) The color finish shade of switchgear enclosure for interior shall be glossy white & for exterior it shall be light grey, semi glossy shade 631 of IS: 5. if a different exterior shade is desired by the ZEDA, the same shall be intimated to the supplier.

(v) The PCC shall be fabricated out of CRGO sheet steel; 2 mm thick for the outer shall all-round. The internal walls and separators shall be of 1.6 mm thick CRGO sheet steel.

(vi) The gland plates shall be 3 mm thick.

4.43. Control Circuit

a). Control supply for breaker closing / tripping - 110VDC

b). Air Circuit Breaker spring charge motor - 240 V AC, 1phase

c). Moulded Case Circuit Breakers - 240 V AC, 1phase

d). Indications, annunciation - 110VDC

e). Space heater, sockets, etc. - 240 V AC, 1phase

4.44. Bus Bar & Cable Cavity

i. The material for main bus bars and tap off bus bars shall be electrolytic grade aluminum with properly color coded HR PVC sleeved insulation.
ii. Bus bar shall be suitable for short circuit rating and current suitable for all connected load.
iii. Cable entry for incoming and outgoing cables shall be from Bottom.
iv. A suitable gland plate shall be supplied for termination of power, control and instrumentation cables.
v. Whenever feeders are housed in multi-tier configuration, these tiers shall be segregated by sheet metal barriers.
vi. Earthing: Earthing bus bar shall be terminated at both ends of the switchgear to suit the connections to outside earthing conductor. All components inside the module are required to be earthed individually and are to be looped and connected to the horizontal earth bus. All the

noncurrent carrying parts of the panels, e.g., enclosure, must be connected to earth as per the regulations.

4.45. Terminals:

i). CT circuit - Isolating link type terminals with shorting facility

ii). PT circuit - clip on type terminals

iii). Spare contacts shall be wired up to terminal block. 10% spare terminals shall be provided for each module.

4.46. Specific Requirement

1. All ACBs/VCBs, as applicable, shall be 4 pole, electrically-operated, draw-out type, with closing coil, spring charge motor, trip coil, TNC switch for close and trip, manual closing and tripping push buttons, door IX test and service position micro switches, emergency P.B., safety shutters, etc. The circuit breaker shall be provided with anti-pumping feature.
2. ACBs/ VCBs, as applicable, shall be complete with microprocessor release and shall be provided with over current, short circuit and earth fault protections.
3. Minimum10% spare feeders of each rating shall be provided in the switchgear.
4. All current transformers shall have 5/lA secondary and all meters shall be suitable for 5/lA operation.
5. All indicating lamps shall be of LED cluster type. ACB feeders shall be provided with ON, OFF, AUTOTRIP, SPRING CHARGED, TEST, SERVICE, TRIP CIRCUIT HEALTHY indications.
6. All indicating instruments, including MFM, shall be flush mounting, Digital type and of standard size.
7. Window annunciator with hooter and accept, test, reset button shall be provided. Necessary auxiliary relays for contact multiplication shall be provided in the panel.
8. The maximum temperature of the bus bars, droppers and contacts at continuous current rating under site reference ambient temperature of 50° C shall not exceed 105°C.
9. Instrumentation: Switchgear instrumentation shall be provided as follows:

   i. Mains Incomer - Voltmeter with selector switch

   ii. Ammeter with selector switch

   iii. Power Factor meter

   iv. Frequency meter

   v. TVM + MD meter

   vi. Potential indicating lamps

   vii. Outgoing Feeders

viii. Ammeter with selector switch on all feeders

4.47. General Technical Specifications (LT/ HT Switch gear Panel)

1. The panel shall be self-supporting, free standing, floor mounted, modular type with construction having degree of protection of IP 54 as per IS2147.
2. The panel shall be fabricated from 14 SWG CRCA sheet steel for frame & load bearing surfaces. Partitions may be fabricated from 16 SWG CRCA if no components are mounted on them.
3. 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
4. Stiffeners shall be provided at corners & between modules to make panel rugged. The stiffeners will necessarily be required for relay compartments or doors where heavy components are mounted.
5. The openable covers will be provided with lift off type hinges, quarter turn door locks and flexible copper wire for earth connection.
6. The panel shall be dust and vermin proof. Synthetic or neoprene gaskets shall be provided at allopenings.
7. The panel shall be of dead front construction suitable for front operated and back maintained functioning.
8. Panel shall be provided with fluorescent lamp of 20W capacity operated by door operated limit switch. Panel shall also have space heaters and thermostat arrangement.
9. Panel shall be provided with 3 pin switch socket combined unit of 5 Amp capacity.
10. Lifting hooks shall be provided at the top of the panel.
11. The hardware components used in the panel shall be hot dipped galvanized.
12. The control components shall be fixed on mounting plate by drilling &tapping.
13. Aluminium anodized legend plates shall be provided for all the components. For components mounted on front face, legend plate from inside shall also be provided.
14. Pre-treatment process shall be done before painting / powder coating the panel.
15. Panel shall have provision of drawing pocket.
16. The panel shall be designed to ensure maximum safety during operation inspection, connection of cables and maintenance. Inside panel, checking and removal of components shall be possible without disturbing other units.
17. Cable entries will be from bottom. The opening of cable entry shall be covered by 3 mm thick gland plates.
18. The panel shall be provided with all necessary components / devices and instruments as per the recommended schematic diagram and functional requirements.

19. The components such as protective relays, auxiliary relays, push buttons, switches, instruments shall be flush mounted on the front side of a panel.

20. The control wiring shall be done with PVC insulated flexible copper wire. For CT secondary circuits 2.5 sq.mm wire shall be used. For control wiring 1.5 sq.mm wire will be used.

21. Earthing bus bar of suitable cross section shall be provided throughout the length of panel.

22. The panel shall be fully wired all the terminals shall be brought out for cable connections. 10% spare terminals shall be provided on each terminal block. Separate terminal block shall be provided for different voltages. All wire shall have P.V.C. ferrules as per wiring diagram.

23. Proper shrouding to incoming and outgoing terminals shall be provided to ensure safety during operation, inspection and maintenance.

24. Indicating lamps shall be with multiple LEDs & shall be suitable for the voltage specified.

25. All the components in the panel shall be properly labelled. The labels shall be made of non-rusting metal or engraved PVC material properly fixed by screws.

26. The panel layout shall be made in such a way that it will always facilitate easy removal and reconnection of control cables without disturbing other wiring.

27. Centre lines of control switches, push buttons and indicating lamps shall be matched so as to give neat appearance. Similarly top lines of indicating instruments and relays shall also be matched.

28. The panel shall be provided with electrolytic grade aluminium bus bar of suitable cross section so as to maintain max current density of 0.8AMP/Sq.mm.

29. Bus bars shall be provided with colour coded heat shrinkable insulating sleeves.

30. Bus bars shall be supported by high quality epoxy insulators provided at specified distances so as to withstand to the given fault level.

31. The bus bar chambers shall be provided with suitable ventilation arrangements so as to limit the maximum temperature of 85°C while carrying rated current.

32. Proper clearance of minimum 25 mm shall be maintained between phase bus bars and between busbars.

33. The panel shall be inspected at manufacturer's works before dispatch to site at the discretion of ZEDA.

34. All routine tests shall be carried out on the panel in presence of ZEDA or their representative or its representative. These tests shall include following:

i. Verification of components ratings and operation.

ii. High voltage measurement test.

iii. Insulation Resistance measurement.

iv. Control testing

35. Approval on following drawings shall be obtained before manufacturing the panels

i. General arrangement drawing

ii. Wiring Diagram.

iii. Detail bill of material

iv. 33 KV Transmission Line as per site requirement

v. Contractor shall provide 33 kV underground transmission cables and metering on Turnkey basis as per site requirement.

In case, the Contractor is using bus duct at the incoming/ outgoing terminals, appropriate arrangement has to be made in the LT/HT panel for the incorporation. Construction of bus ducts shall be as per relevant IS standards. Bus ducts must be provided with the space heaters and silica gel as recommended.

36.0. Technical specification for 33 kV shall be followed as per relevant standards existing in setting up of interconnection network with Grid's substation.

4.48. Metering System (Only Energy meter at Array yard is to be supplied)

1. Check energy meter shall be provided as approved by state under the metering scheme, to measure the delivered quantum of energy to the grid for sale. The responsibility of arranging for the meter, its inspection/calibration/testing charges etc. rests with the Contractor. All charges incurred on Meter testing, shall be borne by the Contractor. ABT energy metering system is to be approved by state (ABT meter is not in scope of supply of bidder).
2. Meter must be provided with the necessary data cables.
3. Separate metering system has to be provided for L.T. (incoming) and H.T. (outgoing) supply.
4. The Contractor shall provide ABT compliant meters at the interface points.
5. Interface metering shall conform to the Central Electricity Authority (Installation and Operation Meters) Regulation 2006 and amendment thereof Commercial settlement of solar Photovoltaic Grid Interactive based power project.
6. Meter shall be suitable for interfacing for synchronizing the built-in clock of the meter by GPS time synchronization equipment existing at the station either through a synchronization pulse received from the time synchronization

equipment or through a remote PC synchronized to GPS clock shall also be in the scope of Contractor.

7. All charges for testing and passing of the meter with relevant government agency shall be borne by contractor, the ZEDA will assist Contractor for necessary document as and when required. Contractor has to intimate the required documents at least 7 days prior of such requirements.

8. ABT compliant Energy Meters shall have technical specification as given below (not limited to specified requirement, Contractor can provide Meter with latest facilities):

4. Meters shall be microprocessor-based conforming to IEC 60687 /IEC 6205211/ IEC 62053-22 /IS14697

5. Meters shall carry out measurement of active energy (both import and export) and reactive energy (import) by 3-phase, 4 wire principle suitable for balanced/unbalanced 3 phase load

6. Meters shall have an accuracy of energy measurement of at least Class 0.2 for active energy and at least Class 0.5 for reactive energy according to IEC 60687, and shall be connected to Class 0.2 CT cores and Class 0.2 VT windings or as per state grid regulations. The active and reactive energy shall be directly computed in CT & VT primary ratings.

12. Meters shall compute the net MWh and MVArh during each successive 15-minute block metering interval along with a plus/minus sign, instantaneous net MWh, instantaneous net MVARh, average frequency of each 15 minutes, net active energy at midnight, net reactive energy for voltage low and high conditions at each midnight.

13. Each energy meter shall have a display unit with a seven digit display unit. It shall display the net MWh and MVARh with a plus/minus sign and average frequency during the previous metering interval; peak MW demand since the last demand reset; accumulated total (instantaneous) MWh and MVARh with a plus/minus sign, date and time; and instantaneous current and voltage on each phases.

14 All the registers shall be stored in a non-volatile memory. Meter registers for each metering interval, as well as accumulated totals, shall be downloadable. All the net active/reactive energy values displayed or stored shall be with a plus /minus sign for export/import.

15. At least the following data shall be stored before being over-written for the following Parameters

Sl. No	Parameters	Details	Min No. of Days
1	Net MWh	15 min block	90 days in meter
2	Average frequency	15 min block	90 days in meter
3	Net MVARh for >103%	15 min block	90 days in meter

4	Cumulative net MWh	At every mid night	30 days in meter/ 90 days in PC.
5	Cumulative net MVARh for >103%	At every mid night	30 days in meter/ 90 days in PC.

16. Shall have a built in clock and calendar with an accuracy of less than 15 seconds per month drift without assistance of external time synchronizing pulse.

17. Date/time shall be displayed on demand. The clock shall be synchronized by GPS time synchronization equipment existing at the station provided by Contractor

18. The meter shall be suitable to operate with power drawn from the VT supplies. The burden of the meters shall be less than maximum 2VA.

19. The power supply to the meter shall be healthy even with a single- phase VT supply. An automatic backup, in the event of non-availability of voltage in all the phases, shall be provided by a built in long life battery and shall not need replacement for at least 10 years with a continuous VT interruption of at least 2 years. Date and time of VT interruption and restoration shall be automatically stored in a non-volatile memory.

20. Even under the absence of VT input, energy meter display shall be available and it shall be possible to download data from the energy meters.

21. Meters shall have an optical port on the front of the meter for data collection from either a hand held meter reading instrument (MRI) having a display for energy readings or from a notebook computer with suitable software.

22. The meter shall have means to test MWh and MVARh accuracy and calibration at site in-situ and test terminal blocks shall be provided for the same.

23. The ZEDA shall have the right to carry out surprise inspections of the Metering Systems from time to time to check their accuracy.

4.49. SCADA and Remote Monitoring System

1. The Plant may be automatically operated and shall be controlled by microprocessor based control system SCADA and should be Open Platform Communications (OPC) compliant. There shall be simultaneous data logging, recording and display system for continuous monitoring of data for different parameters of different sub systems, power supply of the power Plant at DC side and AC side.

2. An integrated SCADA may be supplied which should be capable of communicating with all inverters and provide information of the entire Solar PV Grid interactive power Plant.

3. The SCADA may be string level monitoring compatible and shall have features of remote access to the real time data. SCADA shall have features for generating the day a head schedule of generation based on historical data/suitable logic. Also, system must be capable of sending the telemetry data to the local SLDC via GPRS/ GSM/ suitable mode.

4. Computer-aided data acquisition unit shall be a separate & individual system comprising of different transducers to read the different variable parameters, A/D converter, multiplexer, de-multiplexer, interfacing hardware and software which will be robust & rugged suitable to operate in the control room Environment.

5. Reliable sensors for solar insolation, temperature, and other weather and electrical parameters are to be supplied with the data logger unit.

6. The Bill of Materials associated with the equipment must clearly indicate especially the detailsabout the PC and Printers, etc.

7. The Data Acquisition System should be housed in a desk made of steel sheet.

8. All data shall be recorded chronologically date wise. The data file should be MS Excel/ CSV compatible. The data, if needed, can be accessible remotely through authorized access. The data logger shall have internal reliable battery backup and data storage capacity to record all sorts of data simultaneously round the clock. All data shall be stored in a common work sheet chronologically and representation of monitored data shall be in graphics mode or in tabulation form. All instantaneous data can be shown in the Computer Screen. Provision should be available for Remote Monitoring.

9. SCADA shall measure and continuously record electrical parameters and provide following data (but not limited to) at a 5-15 minute interval.

   (i) Energy export to grid at 33kV

   (ii) Main combiner box parameters

   (iii) Inverter level parameters

   (iv) Parameters at LV terminal

   (v) Power characteristics of HT side

   (vi) Ambient temperature near array field

   (vii) Module surface temperature

   (viii) Wind Speed and direction

   (ix) Solar irradiation/isolation

   (x) Any other parameter considered necessary by supplier based on current prudent practice

10. SCADA shall have feature to be integrated with the local system as well remotely via the web using either a standard modem or a GSM/WIFI modem. The Contractor shall provide compatible software and hardware so that data can be transmitted via standard modem.

11. This will be the Contractor's responsibility to apply and get the suitable connection for SCADA, office & control room on behalf of the ZEDA & all the expenditures including payment of periodic bills of Internet provider shall be met by the Contractor.

12. SCADA shall be provided with reliable power supply along with backup supply for at least one hour to cater to outage of grid.

13. The SCADA shall be compatible to the requirements for measuring and reporting the performance-ratio (PR) of the Plant.

14. The Contractor shall provide all administrative rights/ privileges/passwords of the SCADA system to the ZEDA. The ZEDA have rights over the data generated in the Plant.

15. The Contractor shall submit the data sheet with technical specifications of the SCADA system.

16. The PC/ workstation shall be of Industrial type, rugged & robust in nature to operate in a hostile environment. The PC will have minimum Intel processor (4th generation) having 2 X 1TB HDD with 4 GB RAM. The PC shall also have 21" LED Colour monitor, DVD Drive with Writer, USB drive, Scroll Mouse and UPS for 4 hours Power back up. The Contractor can suggest the workstation best used for the purpose.

17. The printer shall be of industrial type, rugged & robust in nature and of reputed make. The printer shall be equipped for printing, colour scanning, copying and fax.

4.50 Power and Control Cables specifications on AC side

1. The size of each type of cable selected shall be based on minimum voltage drop; however the maximum drop shall be limited to 2%. Due consideration shall be made for the de-rating of the cables with respect to the laying pattern in buried trenches / on cable trays, while sizing the cables.

2. All cables shall be supplied in the single largest length to restrict the straight-through joints to the minimum number.

3. Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. All cable/wires shall be marked with good quality letter and number ferrules of proper sizes so that the cables can be identified easily. The ferrules used must be UV resistant. However, for HT cables, embossed ferrules can be used.

4. Cable terminations shall be made with suitable cable lugs & sockets etc., crimped properly and passed through brass compression type cable glands at the entry & exit point of the cubicles.

5. Irrespective of utilization voltage and current rating all AC power cables shall be minimum of 1100 V grade XLPE insulated Cable. All LT XLPE cables shall confirm to IS: 7098 Part 1 & 11. AllHT XLPE Cables Shall conform IS: 7098 PART- 3 & 1EC -60287, IEC-60332. The control & power cable has to be laid separately.

6. The cables shall be adequately insulated for the voltage required and shall be suitably colour coded for the required service. Bending radii for cables shall be as per manufacturer's recommendations and IS:1255.

7. Cables inside the equipment room, control room and in the switchyard shall be laid in Galvanized Cable Trays mounted on mild steel supports duly painted, in

constructed trenches with RCC raft and sidewalls or bricks sidewalls and provided with removable RCC covers.

8. All the communication cables (RS 485, fiber optics etc.) must be supplied with type test reports and shall be laid in accordance with the relevant IS codes. It must be laid so that there is no interference with the power cables.

9. Type test reports and Data sheets of individual cable sizes (HT & LT) shall be submitted for approval by ZEDA. Drum numbers and drum length details shall be submitted with each consignment

4.51. AC Power Evacuation System

CODES AND STANDARDS

IS: 1255 Code of practice for installation and maintenance of power cables Up to and including 33KV rating.

IS: 9537 Conduits for electrical installation.

IS: 13573 Joints and termination for polymer cables for working voltages from 6.6KV up to and including 33KV performance requirements and type tests.

VDE 0278 Tests on cable terminations and straight through joints.

BS 6121 Specification for mechanical cable glands for elastomers and Plastic insulated cables.

Indian Electricity Act

Indian Electricity Rules

SECTION-V

PRICE BID

Sl. No	Item description	Amount in Rs.	GST in %	GST in Rs.	Total in Rs
1	Site preparation				
2	Design, Engineering, Procurement & Supply of Solar PV Modules, Balance of System including Module Mounting Structures, String Monitoring Units (SMU), Step Up Power Transformer, Auxiliary Transformer Inverters, Cables, SMU's connectors, Circuit Breakers, Earthing, Lightning Arrester (LA), Periphery Lighting, Camera, SCADA, wiring of complete system etc, and any other item (s) required for successful Erection, Commissioning and Operation of the 5 MWp Grid Connected Solar Power Plant at Sumsuih as per tender.				
3	Supply of solar water pumping system, preparation of sump and reservoir for water supply system within the solar plant area				
4	Erection, Installation, Integration of Solar Power Plant with Grid Power and Commissioning of the 5 MWp Grid Connected Solar Power Plant at Sumsuih as per tender.				
5	Comprehensive Operation and Maintenance of 5 MWp Grid Connected Solar Power Plant at Sumsuih for the first consecutive five years				
TOTAL					

(Total amount in words)

Seal and Signature of the Company

Annexure-A

UNDERTAKING OF THE TENDERER

I/We have read carefully and examined the notice inviting tender, schedule, General terms and conditions of the contract and project scope and technical specifications, Schedule of Rates and other documents and Rules referred to in the tender document for the supply.

I/We hereby tender my/our rates for the execution of the work for ZEDA as specified within the time stipulated in the schedule in accordance with all aspects with the terms and conditions, specifications, designs, drawings and instructions of the tender documents and its corrigendum(s), if any.

I/We agree to keep the tender open for 180 days from the due date of submission thereof and not to make any modifications in its terms and conditions. A sum of Rs..... Lakh is hereby forwarded as earnest money in the form of crossed demand draft payable to Director, ZEDA at Aizawl. If I/We, fail to commence or complete the work ordered in specified time I/We agree that the ZEDA shall, without prejudice to any other right or remedy, be at liberty to forfeit the said Earnest Money absolutely. The said Earnest Money shall be retained by ZEDA towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be required by ZEDA.

I/We hereby declare that I/We shall treat the tender documents, specifications and other records connected with the work as secret/confidential and shall not communicate information derived there-from to any person other than a person to whom I/We have authorized to communicate the same or use the information in any manner prejudicial to the safety of ZEDA/the State Govt.

I/We shall abide to all the laws and shall be responsible for making payments of all the taxes, duties, levies and other Govt. dues etc. to the appropriate Govt. Departments.

Our GST registration no. is _____ and PAN No. under the Income Tax Act is _____ I/We shall be responsible for the payment of the respective taxes to the appropriate authorities and should I/we fail to do so, I/we hereby authorize ZEDA to recover the taxes due from us and deposit the same with the appropriate authorities on their demand.

Dated: Signature
Place: Name of Tenderer with seal
Witness
Signature:
Name:
Postal Address: