NOTICE INVITING TENDER

NAME OF WORK: SELECTION OF CONTRACTOR FOR SUPPLY OF BOS ITEMS AND I&C OF 1.5MWp GRID CONNECTED GROUND MOUNT SOLAR POWER PLANT

Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

Last date of submission of Tender : 22.03.2023 up to 5.30 PM

Date of Bid Opening : 23.03.2023 up to 11.00 AM

INKEL Ltd.
7/473ZA – 5 & 6, 1st and 2nd Floor, Ajiyal Complex, Kakkanad, Cochin, Pin: 682030 (Kerala) Phone: 0484 2978101
Email: solartender@inkelkerala.com

NOTICE INVITING TENDER

Tender No. : NIQ-11MW-BOS-NMRA dated 07.03.2023

INKEL Limited invites offers from reputed contractors for supply of BOS items and I&C of Grid Connected Ground Mount Solar Power Plants.

Name of work	SELECTION OF CONTRACTOR FOR SUPPLY OF BOS ITEMS AND I&C OF 1.5MWp GRID CONNECTED GROUND MOUNT SOLAR POWER PLANT
Location of work	Near 110kV Substation, Nenmara
	$10^{o}35'38.7''$N, $76^{o}34'58.6''$E
Estimated Cost of the Project	Rs. 1,37,25,000/- (One Crore Thirty Seven Lakhs Twenty Five Thousand Only)
Date of publication of bid	07.03.2023
Pre-bid meeting	15.03.2023 at 11.30 AM Online. Request for meeting link may be sent to sreekumar.pg@inkel.in before 14.03.2023 5.00 PM
Site visit	16.03.2023
Last date & Time of submission of Bid documents	22.03.2023 up to 5.00 PM
Opening of Bids	23.03.2023 at 11.00 AM
Tender Fee	NIL
Earnest Money Deposit	Rs. 50,000 in the form of Demand Draft in favor of INKEL Limited payable at Ernakulam. MSME/NSIC registered bidders are exempted.
Nature of the contract	Supply of identified BOS items, Installation, Testing and Commissioning
Period for completion of installation & commissioning	8 months from the date of site handing over

Prospective bidders shall download tender documents from INKEL website – www.inkel.in.

The bids shall be opened on 23.03.2023 at the office of INKEL Limited, Kakkanad in the presence of the Bidders / their authorized representatives who wish to attend. If the tender opening date happens to be on a holiday or non-working day due to any other valid reason, the tender opening process will be done on the next working day at same time and place.

Tenders/ bids received without the details mentioned in Instructions to the Bidders will not be considered valid and shall be summarily rejected.

More details can be had from the Office of INKEL Limited during working hours from :

Designation :	Assistant Manager -Procurement , RE Dept.
Contact number :	0484-2978101 / 103
Email :	sreekumar.pg@inkel.in

All subsequent Government orders connected to tenders and any revision in the rates of taxes would also be applicable to this tender.

INKEL Limited reserves the right to accept or reject any or all tenders without assigning any reason thereof.

CONTENTS OF THE BID

This bid consists of the following documents:

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Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

PART -I

INSTRUCTIONS TO BIDDERS

DISCLAIMER

1. Though adequate care has taken while preparing the tender document, the Bidders/Applicants shall satisfy themselves that the document is complete in all respects. Intimation of any discrepancy shall be intimated to INKEL Limited immediately. If no intimation is received from any Bidder within seven (7) days from the date of notification of tender/Issue of the tender documents, it shall be considered that the tender document is complete in all respects and has been received by the Bidder.

2. INKEL Limited reserves the right to modify, amend or supplement this tender document including all formats and Annexure.

3. While this tender has been prepared in good faith, neither INKEL LIMITED nor their employees or advisors make any representation or warranty, express or implied, or accept any responsibility or liability, whatsoever, in respect of any statements or omissions herein, or the accuracy, completeness or reliability of information, and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of this tender, even if any loss or damage is caused by any act or omission on their part.

4.

Kakkanad **07.03.2023**

1. INTRODUCTION

1.1. The Tender documents and other details can be downloaded from INKEL website.

1.2. All the Tender documents are to be submitted in hard copy only and in the designated covers/envelopes. **Tenders/bids shall be accepted only through offline mode.**

1.3. The bidders are advised to examine carefully all instructions, conditions, terms, specifications, drawings etc. in the bid documents and details regarding the facilities at work site, approaches, availability of labour, working seasons, geology, climate etc. The bidders are advised to familiarize with the geography and environmental conditions of the districts coming under the regions specified, before preparing the bid documents. In case of any doubt or issue, the bidder may collect whatever information required from the bidding authority. The rates shall be quoted after precisely considering all aspects that may be encountered in the implementation of solar plant. The bidder shall be responsible for the rates discovered through this tender and the rate shall remain firm during the period of contract. The Contractor is not entitled for any claim other than that agreed to in the contract.

1.4. Bidder must meet the minimum eligibility criteria. Bidder will be declared as a qualified bidder based on the eligibility criteria set out in this bid documents.

1.5. The companies whose directors are disqualified under any of the provisions of the companies Act 2013 in the last three years immediately preceding the date of submission of bid will not be entitled to participate in the tender neither as a single company nor as a member in the consortium. The Bidder should submit an undertaking as specified in Annexure-7.

1.6. The bidder should not be an entity punished for committing an act of fraud and none of its directors (in case of a company)/Partners/Owners should have been punished for committing an act of fraud in the last three financial years immediately preceding the current financial year. The Bidder should submit an undertaking as specified in Annexure-7.

2. BID DOCUMENTS

This Request for Quotation (RFQ) includes

a) Notice Inviting Tender (NIT)
b) Part I -Instructions to Bidders (ITB)
c) Part II - General Conditions of Contract (GCC)
d) Part III - Special Conditions of Contract (GCC)
e) Part IV - Scope of Work & Technical specification
f) Part V - Annexures & Formats

3. COST OF BIDDING

3.1. EARNEST MONEY DEPOSIT

3.1.1. The Bidder shall furnish Earnest Money Deposit (EMD) in the form of a Demand Draft drawn in favor of "INKEL Limited", payable at Ernakulam. However, EMD is exempted for NSIC/MSME registered bidders.

3.1.2. 3.2.2. The EMD of unsuccessful bidders shall be returned within 30 days from the date of issuance of Letter of Allocation(s) to the successful bidder on bidder's request.

3.1.3. EMD shall be denominated in Indian Rupees and shall:

3.1.3.1. be in the form of a Demand Draft from a Nationalized Schedule Bank.

3.1.3.2. be submitted in its original form; copies will not be accepted and remain valid for a minimum period of 3 months from the date of original Techno Commercial bid opening, or beyond any period of extension subsequently requested by INKEL.

3.1.4. The EMD shall be forfeited without prejudice to the Bidder being liable for any further consequential loss or damage incurred to INKEL under following circumstances:

3.1.4.1. Hundred Percent (100%) of EMD amount, if a Bidder withdraws/revokes or cancels or unilaterally varies his bid in any manner during the period of Bid Validity specified in the bid document.

3.1.4.2. Hundred Percent (100%) of EMD amount, if the Successful Bidder fails to unconditionally accept the Letter of Allocation within 14 days from the date of its issuance.

3.1.4.3. Hundred Percent (100%) of EMD, if the Successful Bidder fails to execute the agreement as per LOA.

4. ELIGIBILITY CRITERIA

4.1. '**Bidder**' should be a Company/Limited Liability Partnership (LLP) firm/Partnership Firm/ Proprietorship firm in any form submitting the Bid. Any reference to the Bidder includes its successors, executors and permitted assignee.\

4.2. Vendor should have executed contracts of similar within last 7 years from the date of thin notice inviting bids as below:

3.2.1. One similar work amounting to 80% of the PAC of this work **OR**

3.2.2. Two similar works amounting to 60% of the PAC of this work **OR**

3.2.3. Three similar works amounting to 40% of the PAC of this work.

3.2.4. Similar works shall mean supply of BOS items along with installation & commissioning of grid connected ground mount solar power plants.

3.3. The bidder shall have an average annual turnover equal to or more than Rupees One Crores for the last five financial years immediately preceding the bid opening date. The bidders shall submit audited financial statements in support of their financial capability.

5. BID SUBMISSION

5.1. The information and/ or documents shall be submitted by the Bidder as per the formats specified in this RfS document.

5.2. Strict adherence to the formats wherever specified, is required. Non-adherence to formats and/ or submission of incomplete information may be a ground for declaring the Bid as non-responsive. Each format has to be duly signed and stamped by the authorized signatory of the Bidder.

5.3. The Bidder shall furnish documentary evidence in support of meeting Eligibility Criteria as indicated in Clause 3.0 of Part I to the satisfaction of INKEL. Bidder shall also furnish unconsolidated/consolidated audited annual accounts in support of meeting financial requirement, which shall consist of unabridged balance sheet, profit and loss account, profit appropriation account, auditors report, etc., as the case may be of Bidding Company or Financially Evaluated Entity for any of the last 03 (Three) financial years immediately preceding the Bid Deadline which are used by the bidder for the purpose of calculation of Annual Turnover or of last Financial Year in case of Net Worth.

6. BID DUE DATE

The bids shall be submitted within the timelines specified in the NIT.

7. CURRENCIES OF BID

The currency for the bid is Indian Rupee only.

8. LAW OF BID

The laws of India and Kerala will govern this Bid. Any dispute raising out of this bid will be subject to the exclusive jurisdiction of Civil Courts at Ernakulam.

9. CORRECTION OF ERRORS

Bids will be checked for arithmetical errors and will be corrected by INKEL Limited as follows:

“Where there is a discrepancy between amount in figures and in words, the amount in words will govern.”

10. BIDDING PROCESS

10.1. BID FORMATS

The bid in response to this NIT shall be submitted in hardcopy as as follows:

I. Techno Commercial Bid (Non-Financial bid)

a. Cover 1 – comprising:

i. Covering Letter as per Annexure-1.

ii. EMD in the form of Demand Draft.

iii. Bid Agreement as per the format in Annexure-2

b. Cover II – comprising:

i. General particulars of the bidder as per Annexure-3.

ii. Declaration as per Annexure – 4.

iii. 'No-deviation Certificate' as per Annexure-5 shall contain the no-deviation certificate;

iv. Undertaking for no blacklisting or no banning as per Annexure-7

v. Details of offered equipment/materials including technical specifications and filled up data sheet as per Part III.

vi. This cover shall contain the entire tender document signed by the bidder as a token of acceptance of all the terms and conditions of this tender.

vii. Certificates proving the technical and financial eligibility criteria as per clause 3.0 – Part I of this tender document.

viii. Certificate of Incorporation from the Registrar of Companies.

ix. Proof of Address of registration (GST registration Certificate)

c. Cover III – Price Bid (Financial bid)

This cover should contain the "BOQ" - Price bid (Annexure -8).

It may be noted that Non-Financial Bid (Cover I & II) shall not contain any Information/document relating to Financial Bid. If Non-Financial Bid contains any such information /documents, INKEL shall not be responsible for premature opening of the Financial Bid leading to disqualification of the Bidder.

10.2. BID SUBMISSION

10.2.1. Formation of consortium by bidders is not permitted.

10.2.2. A Letter of Application, the form of which is given in Annexure 1, shall accompany the Bid.

10.2.3. The Bidder shall furnish documentary evidence, in support of meeting eligibility criteria as indicated in Clause no. 3.0 of Part I to the satisfaction of INKEL.

10.2.4. The bidder should designate one person to represent the bidder in its dealings with

INKEL. The person should be authorized to perform all tasks including, but not limited to providing information, responding to enquires, signing of bid etc.

10.2.5. Strict adherence to the formats wherever specified, is required. Wherever, information has been sought in specified formats, the Bidder shall refrain from referring to brochures/pamphlets. Non-adherence to formats and / or submission of incomplete information may be a ground for declaring the Bid as nonresponsive.

10.2.6. Each format has to be duly signed and stamped by the authorized signatory of the Bidder.

10.2.7. The bidders shall submit the Bid with agreement in the format given in Annexure 2 of this document, duly signed and attested by two witnesses, in Kerala Government Stamp Paper worth Rs.200/-. The bid agreement in original shall be submitted along with the bid. Bids without agreement or not in proper form will be rejected.

10.2.8. INKEL reserves the right to reject any bid, which does not comply with the above conditions.

10.2.9. **Signing of Bid Document**

The bid including all documents of RfS shall be signed by the bidder / duly authorized representative of the bidder to participate in the bid process.

10.2.10. The tender documents are to be submitted offline only. Online submission will not be accepted. Hardcopy of the entire document comprising three covers as above shall be submitted in a single cover super scribing ***"Tender document for SELECTION OF CONTRACTOR FOR SUPPLY OF BOS ITEMS AND I&C OF 1.5MWp GRID CONNECTED GROUND MOUNT SOLAR POWER PLANT"*** addressed to "**The General Manager – Solar", INKEL Limited** at the following address:

Door No 7/473ZA, 1st Floor Ajiyal Complex
Kakkanad Cochin Pin :- 682030
Phone: 0484-2978101, 0484-2978103

10.3. BID EVALUATION

The bids will be opened on the date & time stipulated in the NIT. The Cover 1 containing Bid agreement will be opened first and verified. The 'Cover 2' containing the Pre-Qualification Bid documents will be opened as per the bidding schedule by the bidding authority or his authorized representative. The 'Cover 3' containing the Price Bid will be opened by the bidding authority or his authorized representative as per the timelines specified in the NIT.

Any Bid which does not conform to all the terms, conditions or specifications of bid documents or not substantially responsive and genuine will be rejected.

The evaluation process comprises the following four steps:

Step I : Responsiveness check of Techno Commercial Bid

Step II : Evaluation of Bidder's fulfillment of Eligibility Criteria

Step III : Evaluation of Price Bid

Step IV : Successful Bidder selection

10.3.1. RESPONSIVENESS CHECK OF TECHNO COMMERCIAL BID

The Techno Commercial Bid submitted by Bidders shall be scrutinized to establish responsiveness to the requirements laid down in the RfS. Any of the following may cause the Bid to be considered "Non-responsive", at the sole discretion of INKEL:

a) Bids that are incomplete, i.e. not accompanied by any of the applicable formats inter alia covering letter, power of attorney supported by a board resolution, Bid Bond, etc.;

b) Bid not signed by authorized signatory and /or stamped in the manner indicated in this RFS;

c) Material inconsistencies in the information /documents submitted by the Bidder, affecting the Eligibility Criteria;

d) Information not submitted in the formats specified in this RFS;

e) Bid being conditional in nature;

f) Bid not received by the Bid Deadline;

g) Bid having Conflict of Interest;

h) More than one Member of a Bidding Company using the credentials of the same Parent Company /Affiliate;

i) Bidder delaying in submission of additional information or clarifications sought by INKEL as applicable;

j) Bidder makes any misrepresentation.

k) Each Bid shall be checked for compliance with the submission requirements set forth in this RfS before the evaluation of Bidder's fulfillment of Eligibility Criteria is taken up. Clause 3.0 of Part I shall be used to check whether each Bidder meets the stipulated requirement.

10.3.2. EVALUATION OF BIDDER'S FULFILMENT OF ELIGIBILITY CRITERIA

Evaluation of Bidder's Eligibility will be carried out based on the information furnished by the Bidder as per the prescribed Formats and related documentary evidence in support of meeting the Eligibility Criteria as specified in Clause 3.0 of ITB and verification of the same. Non-availability of information and related documentary evidence for the satisfaction of Eligibility Criteria may cause the Bid nonresponsive.

10.3.3. EVALUATION OF PRICE BID

Price Bid of the Qualified Bidders shall be opened in presence of the

representatives of such Qualified Bidders, who wish to be present, on a date as may be intimated by INKEL to the Bidders through INKEL website www.INKEL.co.in or E-mail. The evaluation of Price Bid shall be carried out based on the information furnished in Financial Bid (Price Bid). The Price Bid submitted by the Bidders shall be scrutinized to ensure conformity with the RfS. Any Bid not meeting any of the requirements of this RFS may cause the Bid to be considered "Non-responsive" at the sole decision of the INKEL.

10.3.4. SUCCESSFUL BIDDER(S) SELECTION

10.3.4.1. Bids qualifying in Clause 10.3.2 of ITB shall only be evaluated in this stage.

10.3.4.2. Project Cost quoted in all Price Bids of Qualified Bidders shall be ranked from the lowest to the highest for each category.

10.3.4.3. The bidder who has quoted the lowest price for the entire scope of Work will be declared as the successful bidder.

10.3.5. NOTIFICATION TO SUCCESSFUL BIDDERS

10.3.5.1. The name of Successful shall be notified individually through Letter of Allocation (LOA).

10.3.5.2. The Successful Bidders selected as described in Clause 9.3.4 above shall be issued Letter of Allocation (LOA) indicating the allocated capacity & Project Cost etc.

10.3.6. EXECUTION OF AGREEMENT

The successful bidder shall execute an agreement for the work as well as O&M of individual solar PV plants within 10 days from the date of issue of Letter of Award of contract, with INKEL as per the terms and conditions set forth in the Bid document. After execution of the agreement the successful bidder shall be known as 'Contractor'.

11. BID PRICES

11.1. The Bidder shall mention their cost which shall be an all-inclusive price on a "single responsibility" basis covering all the obligations mentioned in the Bidding Documents in respect of supply of BOS items, handling, storage, civil works, erection, testing & commissioning of the plant as per the scope of this tender including Warranty, taxes, duties and insurance. The prices have to be quoted as prescribed in BOQ of this tender. The bidders shall submit a split up of the total prices including necessary taxes in the price bid in the manner and specified format while submitting bid. The bid price shall be up to 2 decimal places only.

11.2. The price shall be all inclusive for the scope of works as mentioned in Part –III. Expenses for conduction Factory Acceptance Testing of LT & HT Panels (as applicable)

shall be accounted for in the price quoted.

11.3. **Taxes & Duties payable:** All Taxes, Duties etc. as applicable and Recoveries and other levies payable by the Contractor under the contract unless otherwise specified elsewhere in this document shall be included in the rates and prices and total bid price submitted by the bidder. The prices shall also include customs duties and any other duty applicable in case the contract includes usage of imported items. The taxes due/collected by the Contractor shall be remitted to the Government in compliance with the existing law of the land. If it is found at a later stage that the collected taxes have not been remitted, INKEL will be at discretion to recover the said amount from the contractor.

11.4. Any claim for reimbursement will be admissible only if such increase has become operative within the period of completion including justified period of extension.

11.5. The bidders should quote all-inclusive prices with basic price and GST separately. The price has to be quoted after considering the current market rate and after passing on the benefit of Input Tax Credit, as per section 171 of the CGST Act 2017.

11.6. Only GST registered companies are eligible to participate in the tender.

11.7. If there is a difference in the Tax rates/Proportion of tax to basic price quoted by each bidder for the same item, the tender will be evaluated on the basis of all-inclusive price (Basic price Plus Taxes). If the Tax rates/Proportion of tax to basic price quoted by the selected bidder/(s) is more than the rate approved by the GST council , the bidder will have to raise invoice based on the prevailing GST rates approved by the council (keeping the Basic rate as the quoted amount) and if the Tax rates/Proportion of tax to basic price quoted by the selected bidder/(s)is Less than the rate approved by the GST council it will be assumed that the all-inclusive amount is inclusive of the taxes at the actual rates approved by the GST council and the bidder will have to raise the invoice based on the actual rates approved by the GST council (within the all-inclusive rate quoted).

11.8. The Contractor/developer shall take care of all his men, machinery, finished work and ensure sufficient protection of work site from flood, fire, earthquake, slip and similar other natural calamities. In such an event, the Contractor/developer shall make his own arrangement for the rectification of damage or loss at his own cost and no compensation shall be paid by INKEL Limited on whatsoever reasons on any account.

12. VALIDITY OF BID

12.1. The Bidder shall submit the Bid, which shall remain valid up to 3 months from the opening of financial bid. INKEL Limited reserves the right to reject any Bid, which does not meet the aforementioned validity requirement.

12.2. INKEL may solicit the Bidders' consent for an extension of the period of validity of the Bid. The request and the response in this regard shall be in writing. A Bidder accepting the INKEL's request for validity extension shall not be permitted to modify prices.

13. ZERO DEVIATION

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

14. RIGHT TO WITHDRAW THE NIT AND TO REJECT ANY BID

14.1. This Tender may be withdrawn or cancelled by INKEL at any time without assigning any reasons thereof. INKEL further reserves the right, at its complete discretion, to reject any or all of the Bids without assigning any reasons whatsoever and without incurring any liability on any account.

14.2. INKEL reserves the right to interpret the Bid submitted by the Bidder in accordance with the provisions of the RfS and make its own judgment regarding the interpretation of the same. In this regard INKEL shall have no liability towards any Bidder and no Bidder shall have any recourse to INKEL with respect to the selection process. INKEL shall evaluate the Bids using the evaluation process specified in RfS, at its sole discretion. INKEL decision in this regard shall be final and binding on the Bidders.

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

14.4. INKEL at its own discretion has the right to reject any or all the bids without assigning any reason whatsoever, at its sole discretion.

15. CLARIFICATIONS AND PRE-BID MEETING

15.1. INKEL will not enter into any correspondence with the Bidders, except to furnish clarifications on tender Documents, if necessary. The Bidders may seek clarifications or suggest amendments to tender documents in writing, through a letter or by e-mail to reach INKEL at the address, date and time mentioned in NIT. The envelopes/communication shall clearly bear the following identification title: "Queries/Request for additional Information: 'SELECTION OF CONTRACTOR FOR SUPPLY OF BOS ITEMS AND I&C OF 1.5MWp GRID CONNECTED GROUND MOUNT SOLAR POWER PLANT".

15.2. The Bidder(s) or their authorized representative(s) is /are invited to attend pre-bid meeting(s), which will take place on date(s) as specified in NIT, or any such other date as notified by INKEL.

15.3. The purpose of the pre-bid meeting will be to clarify any issues regarding the tender including in particular, issues raised in writing and submitted by the Bidders. The questions raised and responses given by INKEL as Minutes of Meeting will be published in the website. Any corrigendum/modifications based on the queries/clarifications will be

released within 5 days before the last date of submission of bid and will form part of the Bid document. No official clarification will be issued based on further queries raised after the pre-bid meeting.

15.4. INKEL is not under any obligation to entertain/respond to suggestions made or to incorporate modifications sought.

16. CORRECTNESS OF BID

It shall definitely be understood that INKEL does not accept any responsibility for the correctness or completeness of the bid.

17. CONFIDENTIALITY

The parties undertake to hold in confidence this tender and Documents and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

a) Their professional advisors;

b) Their officers, contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities;

c) Disclosures required under applicable Law, without the prior written consent of the other parties of the concerned agreement provided that the Successful Bidder(s) agrees and acknowledges that SNO may at any time, disclose the terms and conditions of the tender and tender Documents to any person, to the extent stipulated under the applicable Law.

18. AMMENDMENTS TO BID DOCUMENTS

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

18.2. The clarification(s) / amendment(s) (if any) may be notified in www.inkel.in website at least two (2) days before the proposed date of submission of the bid. If any amendment is required to be notified after this date, the due date may be extended for a suitable period.

18.3. The Bid shall be furnished taking into account the corrigendum or amendments, if any, issued as mentioned above and any failure in doing so will lead to consequences including rejection of bid for which INKEL will not be responsible.

18.4. INKEL will not be responsible or liable of non-receipt of the information regarding amendments in time or otherwise. Bidders must check the website for any such amendment before submitting their Bid.

18.5. All the notices related to this Bid which are required to be published shall be uploaded on website www.inkel.in.

18.6. Notwithstanding anything stated above, INKEL reserves the right to verify the authenticity of the documents submitted for meeting the Qualification Requirements and may request for any additional information / documents. INKEL reserves the right at its sole discretion to contact the Bidder's bank, lenders, financing institutions and any other persons as necessary to verify the Bidder's information/documents for the purpose of qualification.

19. THE BIDDER SHOULD NOTE THAT:

19.1. If any Bidder conceals any material information or makes a wrong statement or misrepresents facts or makes a misleading statement in its Bid, in any manner whatsoever in order to create circumstances for the acceptance of its Bid, INKEL reserves the right to reject such Bid or cancel the Letter of Award, if issued. If such event is discovered after the Effective Date, consequences specified in the Contract shall apply.

19.2. If for any reason the Bid of any Successful Bidder is rejected, or letter of award issued to such Successful Bidder is cancelled, INKEL may:

i. Consider the next lowest Financial Bid from other than the Successful Bidder(s) whose Bids are responsive and valid; or

ii. Annul the bid process; or

iii. Take any such measure as may be deemed fit in the sole discretion of INKEL, as applicable.

19.3. Bid document submitted by the Bidders, within the due date, shall become the property of INKEL and shall not be returned to the Bidders;

19.4. Language of the Bid shall be English only;

19.5. Bidders shall mention the name of the contact person and complete address of the Bidder in the covering letter as per Format.

19.6. INKEL may, at its sole discretion, ask for additional information/ document and/ or seek clarifications from a Bidder after the due date, inter alia, for the purposes of removal of inconsistencies or infirmities in its Bid. However, no change in the substance of the Plant Cost/Quoted Tariff shall be sought or permitted by INKEL.

19.7. Non-submission and / or submission of incomplete data / information required under the provisions of the tender shall not be construed as waiver on the part of INKEL of the obligation of the Bidders to furnish the said data /information.

19.8. INKEL may verify the Bidder's financial data by checking with the Bidder's lenders / bankers/ financing institutions / any other person as necessary.

19.9. The Bidders shall satisfy themselves, on procuring the tender document, that the tender is complete in all respects. Any discrepancy shall be intimated to INKEL at the address provided in the NIT.

19.10. Each Bidder should conduct its own investigations and analysis and should check

the accuracy, reliability and completeness of the information in this tender and obtain independent advice from appropriate sources.

20. BIDDER TO INFORM ITSELF FULLY

20.1. The Bidder shall make independent enquiry and satisfy itself with respect to all the required information, inputs, conditions, circumstances, and factors that may have any effect on its Bid. Once the Bidder has submitted the Bid, the Bidder shall be deemed to have examined the laws and regulations in force in India, the grid conditions, and fixed its price taking into account all such relevant conditions and also the risks, contingencies and other circumstances which may influence or affect the supply of power. Accordingly, the Bidder acknowledges that, on being selected as Successful Bidder, it shall not be relieved from any of its obligations under the tender documents nor shall be entitled to any extension of time for commencement of supply or financial compensation for any reason whatsoever.

20.2. The technical requirements of integrated grid operation are specified in the State Grid Code. The Bidders should particularly acquaint themselves with the requirements of connection conditions, operating code for state grid, scheduling and dispatch code etc. The Bidders are also advised to fully familiarize themselves with the real time grid conditions in Kerala, India. Regarding the interconnection norms, the CEA regulations and CERC regulations shall prevail where there is no specific provisions in the KSERC regulations.

20.3. In their own interest, the Bidders are requested to familiarize themselves with the Electricity Act, 2003, the Income Tax Act 1961, the Companies Act, 2013, CGST Act,2017, the Customs Act, the Foreign Exchange Management Act 1999, IEGC, the Environment Protection Act 1986 and Forest (Conservation) Act 1980, the Land Acquisition Act1984, the regulations framed by regulatory commissions and all other related acts, laws, rules and regulations prevalent in Kerala and India, as amended from time to time. INKEL shall not entertain any request for clarifications from the Bidders regarding the same. Non- awareness of these laws or such information shall not be a reason for the Bidder to request for extension in Bid Due date. The Bidder undertakes and agrees that, before submission of its Bid; all such factors as generally stated above, have been fully investigated and considered while submitting the Bid.

20.4. The Bidder shall familiarize itself with the procedures and time frames required to obtain all Consents, Clearances and Permits required for the supply of power to INKEL. INKEL shall facilitate obtaining Consents, Clearances and Permits required for setting up of the generation facilities and/ or supply of power.

Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

PART -II

GENERAL CONDITIONS OF CONTRACT

1. EXECUTION OF AGREEMENT

1.1. Within 10 days from the date of issue of letter of Award, unless INKEL has granted extension of time for execution of agreement after judiciously considering the merit of the ground urged for the extension, the successful bidder shall sign and execute the Contract agreement with the agreement authority.

1.2. Failure of the Contractor to comply with the above requirements shall constitute sufficient grounds for cancellation of award of work and re-arrange the work including re-bidding at the risk and cost of the Contractor.

2. ESSENCE OF CONTRACT

Timely completion, quickness and promptness for execution, quality and cost effectiveness for work are considered as the essence of the contract.

3. LANGUAGE OF CONTRACT

The language of contract shall be 'English'.

4. LAW & JURISDICTION OF CONTRACT

This contract will be governed by the laws of India and Kerala. Any dispute arising out of this contract will be subject to the exclusive jurisdiction of Civil Courts at Ernakulam.

5. AMOUNT OF CONTRACT

The amount of Contract will be the amount accepted by INKEL as per the letter of award. The contractor is bound to furnish information and data including the data in support of his quoted amount to INKEL if called upon to do so. The percentage rate of tax as governed by GST shall also be mentioned.

6. PERFORMANCE SECURITY DEPOSIT

6.1. 5% of the total contract value will be recovered from the payment made to the contractor and the same shall be retained till the end of defects liability period. The same will be released after defects liability period considering liquidated damages, if any.

6.2. This 5% amount (clause 6.1 above) can be released against Bank Guarantee for equivalent amount valid till the end of DLP.

7. OPERATIONS & RESPONSIBILITIES OF CONTRACTOR

7.1. Standard electric drawings as well as Control room layout and plan shall of the proposed solar PV plant shall be shared by INKEL after execution of agreement. The Contractor shall consider these standard drawings for plant layout. The contractor has to prepare his drawings and obtain approval from INKEL before proceeding with any work at site.

7.2. The Contractor shall proceed with the works with diligence, expedition, supervision and it shall be carried out to the entire satisfaction of INKEL who shall have full power to order

the Contractor to alter, enlarge or diminish the form, dimensions, portion or quantities of any of the works or to make use of materials and workmanship of different description and qualities from those herein specified. Works are to be properly carried out to the satisfaction of the Engineer-in-charge of INKEL.

7.3. The Contractor shall confirm that he has entered into this Contract on the basis of a proper examination of the data relating to the Facilities provided by the Employer and assessed by himself at the three site locations, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site and of other data readily available to it only after proper due diligence relating to the facilities prior to bid submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Scope of Work.

7.4. The whole work entrusted to the Contractor shall be executed in perfect conformity with the contract documents and such explanatory and detailed drawings and directions as may be furnished from time to time by the Engineer-in-Charge for the guidance of the Contractor.

7.5. The whole work entrusted to him together with any temporary works associated shall be carried out in the most substantial and proper manner with the best materials and workmanship, and to the entire satisfaction of the Engineer-in-Charge and in such order of time as he may direct. The Contractor shall attend to and execute without delay, all orders and instructions, which may from time to time be issued by the Engineer-in-Charge. When the works or appurtenant there of affects the works or the arrangements of other units of work not covered by this specification, working methods shall be discussed with the Engineer-in-Charge and his prior concurrence shall be obtained.

7.6. The Contractor shall submit drawings and specifications for the proposed temporary works for the approval of the Engineer-in-Charge. The Contractor is responsible for design of temporary works. The approval of the Engineer-in- charge does not exempt the Contractor's responsibility for his design for temporary works.

7.7. Preliminary, enabling and temporary works shall generally be limited to

i. Electrification works, communication facilities and water supply works to the site office, camp etc.

ii. Civil Engineering structures connected with the construction of temporary site office , installation of plants and equipment etc. at site.

iii. Any other work of temporary nature carried out at site by the Contractor for the execution of the tendered items of the work as decided by the Engineer-in- Charge.

7.8. In addition to whatever provisions regarding operations, responsibilities and liabilities of the Contractor stated elsewhere in the contract, the following shall also be included:

7.8.1. The Contract is to include the whole work, whether permanent or temporary which are described in or implied by the contract documents which may be inferred to be obviously necessary for the efficiency, stability and completion of permanent works, the performance of all other operations, supply of all materials labour and chargeable expenses and things described in or implied by the contract documents which may be deemed desirable or required for the completion in all respect of the above works to the satisfaction of the Engineer-in-Charge and all such matters shall be deemed as

included in the sum quoted by the Contractor.

7.8.2. Works shown in the drawings and not mentioned in the specifications or described in the specifications without being shown on the drawings shall nevertheless be held to be included in this contract and their execution is to be covered by the quoted sum in the same manner as if they had been expressly shown upon the drawing and described in the specification. If the Contractor has any doubt with regard to any details mentioned in the drawings or in the specifications, he may refer the matter to the Engineer-in-Charge in writing and get the clarifications needed.

7.8.3. The Contractor must take upon himself the entire responsibility for sufficiency of scaffolding, timbering, machinery, tools or implements, and generally of all the resources including labour, materials etc. used for the fulfillment of this Contract. Whether such means may or may not be approved or recommended by the Engineer-in-Charge, the Contractor must accept all risks in the execution of work including risks of accidents, or damages, from whatever cause they arise, until the completion of this Contract.

7.8.4. The Contractor shall carry out all works required as per the specifications in the contract agreement and or as per the latest version of I.S.S or equivalent. He shall furnish all labour, all materials except materials supplied by INKEL, machinery, plant, equipment, and shall supply and install all equipments, test and commission and meet the cost of all expendable items and other charges including incidentals and overheads for completing the works and the cost of design and drawings, if any which he may have to make in carrying out the works.

8. PAYMENT TERMS

8.1. No amount shall be released as mobilization advance.

8.2. 20% shall be released against completion of installation of 1MWp PV Modules.

8.3. 20% against completion of installation of 1.5MWp PV Modules, DC wiring, DCDB installation and DC cable termination at PCU.

8.4. 20% after completion of control room roof.

8.5. 20% against delivery of LT & HT cables and Panels at site.

8.6. 10% after completion of installation in all respect.

8.7. 10% after pre-commissioning and 15 days trial run without any defects.

8.8. The material delivery and subsequent payments shall be made against approved procurement schedule to be finalized during contract agreement finalization.

8.9. The Engineer-in -charge is to be informed about the delivery of material one week in advance by the contractor. The Engineer in charge shall ensure the site acceptance / rejection of the received material at site within three days of delivery of material along with submitting the SAT procedure of the delivered material from the vendor by the contractor. The invoices shall be submitted by the contractor as per the accepted price schedule which is to be verified and made ready for release of payment within 30 days of receipt of the invoices subject to the satisfaction of the above conditions.

8.10. 5% amount shall be deducted from each payment made to the contractor such that a total of 5% of the contract value is retained as Performance Security. The same will be released after defects liability period considering liquidated damages, if any

8.11. Dues from the Contractor: All sums of money found due from the Contractor to INKEL

under this contract, shall be recovered from the bills payable to him and from other assets movable or immovable as per Revenue Recovery Act for the time being in force or in any other manner as INKEL may deem fit.

9. WORK

9.1. Taking over the site and commencement of Work

After executing the agreement or after the date of handing over of site, even if not in full, but in a manner the work can be commenced, the contractor or his authorized agent shall take over the site from the Engineer- in -charge within 10 days and commence the work immediately.

9.2. Commencement and Completion

9.2.1. The work shall be completed within 3 months (maximum) from the date of handing over of site. All the works stipulated under the scope of the Contract shall be completed in all respects, supplies made, services provided and final cleaning up done and required testing shall be completed and commissioned before the expiry of the Time of Completion thus worked out, unless the time of completion is postponed and period of completion is extended by a written letter from the agreement Authority.

9.2.2. The work shall be treated completed only when the Engineer-in- charge issues certificate of completion where the actual date of completion of work will be mentioned. If the contractor fails to complete any part of the work as required for satisfactory completion before taking over and / or the date of completion specified, and fails to remove the surplus materials, INKEL will complete the works and remove the surplus materials etc and the amount incurred for the same will be realised from the contractor from any amount due to him from this work or any other work with INKEL or his assets in appropriate proceedings. The contractor will not have any claim over the surplus materials so removed by INKEL.

9.3. Defects Liability Period

9.3.1. The Contractor is liable to rectify any defect or damage notified by the Engineer - in – Charge, at Contractor's cost during the Defect Liability Period, which shall be 15 months reckoned from the date of handing over the project to INKEL. The Contractor shall guarantee for the performance of the entire components supplied by him during this period. If any defect, cracks, shrinkage or other faults in the works appear at any time prior to the end of the Defects Liability Period, the Engineer may instruct the Contractor to rectify the defects immediately. If the Contractor fails to carry out the directions given by the Engineer-in-Charge and does not rectify the defects within a reasonable time, the Engineer-in-Charge shall make alternate arrangements for making good the defects through other agencies and the cost thereof plus 21% shall be recovered from the Contractor from the amounts payable to the Contractor by way of forfeiting Performance Security deposit or any other means.

9.3.2. The Contractor is bound to furnish information and data including the data in support of his quoted amount to INKEL if called upon to do so.

9.4. Suspension of Work

9.4.1. The Contractor shall not suspend the work without the written consent of the Engineer - in - charge. In the event of suspension of the work on Contractor's own accord without written permission, INKEL shall have the right to recover all losses to INKEL on account of such suspension as per law and even resorting to Revenue Recovery Act provisions.

9.4.2. INKEL shall not be liable to pay any amount to the Contractor towards loss arising from suspension of the works or delay in execution of the Work due to any strike or agitation by the labourers of the Contractor.

9.4.3. INKEL shall have for just and sufficient reasons, the right to suspend the works or to delay the works by an order in writing by the Engineer-in-Charge.

9.4.4. If such suspension is necessary for the proper execution of the works or by reason of weather conditions or by some default on the part of the Contractor or necessary for the safety of the works or any part thereof, or necessary for the safety of adjoining property, or safety of the general public, or workmen or those who have to be at the site, or to ensure safety, or to avoid disruption to traffic and utilities, or to permit fast repairs and restoration of any damaged utilities, the Contractor shall not be entitled to any extra cost incurred during the period of any suspension of work.

9.5. Suspension of Work on Account of Climatic Conditions

9.5.1. The Engineer-in-Charge may order the Contractor to suspend the Work or part of a work or work in a specified location that may be subjected to damage by climatic or weather conditions. The Contractor shall have no claim for compensation for losses in this account.

9.5.2. The care and safeguarding of works, site, men, machinery, materials, tools and plants are the responsibility of the Contractor without any extra payment from INKEL. Losses or damage to INKEL on account of failure from the Contractor in safeguarding from weather and climatic conditions as mentioned above will be realized from the Contractor. Any event of stoppage on account of climatic conditions shall be brought to the notice of the Engineer-in-Charge immediately with reasons for such stoppage.

9.5.3. No claims for extra work/expenditure necessitated on account of stoppage due to the fault of the Contractor will be entertained. INKEL will not be liable for any loss or damages or any other sum of money, if any, sustained by the Contractor on account of climatic and weather conditions. INKEL will pay to the Contractor, all reasonable expenses and grant suitable extension of time arising from suspension of works or delay by such order in writing of INKEL unless such suspension be due to some default on the part of the Contractor.

9.6. Tools, Plant and Equipment

The Contractor shall provide at his own expense all tools, plant and equipment required for the execution and completion of work in all respects as per the contract. The Contractors are advised to take necessary insurance coverage for the tools, plant and equipment used for the project. The Contractor shall furnish as desired by the Engineer-in-Charge all details of tools, plant and equipment mobilized to the site with

date of mobilization. He shall de-mobilise no tools, plant and equipment without the written consent from the Engineer-in-Charge.

Tools

The contractor shall provide tools specified below with number of spares as approved by agreement authority in each location. List of tools is as follows

i. Spanner set
ii. Small cable cutters
iii. Nose pliers
iv. Wire strippers
v. Nut drivers
vi. Screw Driver
vii. Knife
viii. Electric Tester
ix. Clamp meter- AC-DC- clamp on meter/ AC/DC multi-meter (1000V AC&DC 1500V)

9.7. Force Majeure

9.7.1. Force Majeure is defined as a cause which is beyond the control of the Contractor or INKEL which could not be foreseen with a reasonable amount of diligence and which substantially affects the performance of the contract such as,

a. Volcanic eruption, Earthquake, Cyclone, floods or droughts.
b. Civil war or war like operations or Acts classified under invasion of foreign enemies or hostilities, or Rebellion or terrorist action or Riots
c. Epidemics and similar conditions.

9.7.2. No party in the contract shall be liable to the other for any loss and damage occurred due to force majeure condition and shall not apply to the obligations of either party to make payment to the other party under the contract due to occurrence of force majeure conditions.

9.7.3. A notice shall be given to the Engineer-in-Charge within 14 days after the Contractor became aware or should have become aware of the relevant event or circumstances constituting force majeure. Engineer-in-Charge will ascertain the extent of delay due to the event.

9.7.4. The machinery, equipment and other valuable material of the Contractor at work site shall be insured by them so that any loss or damage due to force majeure situation can be taken up by the Contractor with the insurance companies for getting their claims. INKEL will not give any financial assistance on this account.

9.7.5. All equipment, machinery, works etc. which are furnished, installed, constructed and handed over / to be handed over to INKEL under the contract for the completion of the project shall be insured by the Contractor for the period of contract. The entire cost on account of this shall be borne by the Contractor. Losses or damage if occurred to such machinery, equipment and work shall be made good at the risk of Contractor.

9.8. Liquidated Damages / Penalty

9.8.1. Any delay in commissioning a project will adversely affect the total planning which in turn will affect the state and the public exchequer. Hence, for any damage or loss caused to INKEL due to the failure from the part of the contractor in completing the work in all respects within the stipulated period of completion vide Clause 9.2 of Part II (GCC), the contractor shall compensate for the same. The liquidated damages (not as penalty) is to be realised at the end of period of completion. The maximum amount of liquidated damages shall be limited to 10% of accepted contract amount or contract price whichever is higher. The rate of liquidated damages shall be 1% of agreed probable amount of contract or contract price whichever is higher per week of delay subject to a maximum of 10% of agreed probable amount of contract or contract price, whichever is higher. Penalty imposed, if any, shall be deducted from the amount of liquidated damages. If the delay prolongs in excess of 200 days from the agreed date of completion as per the original agreement, the work is liable to be terminated and balance works will be arranged to be completed at the risk and cost of the contractor.

9.8.2. Liquidated Damages for Plant outage due to component failure after handing over.

The contractor shall be liable to pay liquidated damages to INKEL for plant outage resulted from failure of a component supplied by him. If the plant outage is due to component failure and unless it is rectified within 14 days in the case of major component failure from the date of intimation to the contractor, the contractor is liable for LD. The monetary compensation for the plant outage days shall be computed as 4 units per kWp/day multiplied by the approved average annual energy purchase cost of that year and will be deducted from the payments to the contractor till the same is rectified. For the year 2017-18 KSERC has approved the average pooled power purchase cost of INKEL as Rs 3.26/unit. Average pooled cost of power purchase will be revised by KSERC for each year. Monetary compensation shall be computed as the difference between the guaranteed value and actual value (from the meter reading) multiplied by the approved energy tariff rate of that premises.

9.9. Default by the Contractor

If the Contractor neglects or fails to proceed with the works with due diligence and expedition or violates any of the provision of the Contract, the Engineer-in-Charge may give the Contractor a notice identifying deficiencies in performance of the Contract and demanding corrective action within the period of 14 days. After receipt of notice the Contractor shall take immediate action to rectify the mistakes and other deficiencies pointed out by the Engineer-in-Charge and report the matter to him.

9.10. Termination of Contract

9.10.1. If the Contractor fails to take satisfactory corrective action within the time frame specified in the notice ie., 14 days after receipt of the notice, the Agreement authority reserves the right to terminate the contract in whole or in part after issuing seven days' notice to the Contractor based on the recommendation from the Engineer-in-charge seeking explanation from the Contractor why the Contract should not be terminated at his risk and cost. Materials, machinery, tools, plant and equipment,

scaffolding materials etc. available shall not be removed from the site thereafter, without previous sanction from the Engineer-in-Charge. If the Contractor fails to give a satisfactory reply to the notice within the stipulated time of seven days or the reply received is not satisfactory, the Agreement Authority shall terminate the contract either in whole or part without further notice and shall arrange to execute the balance works at the risk and cost of the Contractor. The Contractor shall be issued the letter of termination of the contract intimating that the Work will be rearranged at his risk and cost. The Contractor's amount available with INKEL such as Security Deposit, Retention Money, running account bill payable if any etc. shall not be released to him until the balance works are carried out and the liabilities of the Contractor are fully assessed. All the Bank Guarantees and other security bonds, if any, shall be got extended or encashed if necessary, to protect the interests of INKEL. The amount retained with INKEL and the Bank Guarantees etc. will be credited to INKEL account to make good the losses that may be incurred by INKEL on rearrangement of the works. The list of Contractor's equipment, machinery, tools, scaffolding materials etc. available at site shall be prepared by the Engineer- in-Charge in the presence of the Contractor or his authorised representative and shall be got signed by both parties. INKEL reserves the right to confiscate the above items and sell the same by public auction or any other means and credit the net proceeds to INKEL account towards realisation of the losses that may occur on rearrangement of the works.

9.10.2. If there is any surplus amount available with INKEL after execution of the balance works, INKEL is not bound to pay the surplus amount to the Contractor.

9.10.3. In the event of termination, the Engineer-in-Charge may also take possession of the works, site, plant, equipment and materials brought or placed thereon and cause the balance works to be completed by utilising them through other agencies, at the risk and cost of the Contractor. In such a case, the value of work done through such agencies will be credited to the Contractor at his contract rates.

9.10.4. On completion of such works, if the expenses incurred for carrying out such work, by other agencies as certified by the Engineer-in-Charge are in excess of the value of the work credited to the Contractor, the difference shall be recovered from the Contractor by INKEL from the amount of Security for performance and any other money withheld from the Contractor. In case, this results in expenditure in excess of the total of the amount of security for performance, retention money and other money withheld from the Contractor, INKEL shall have right to make good this amount by resorting to legal proceedings. In addition, he shall also be liable for the imposition of Liquidated Damages under the Contract as per Clause 9.2 of Part III (GCC).

9.10.5. The Engineer-in-Charge may also direct that a part or the whole of such plant, equipment and materials be removed from the site within a stipulated period. If the Contractor fails to do so, the Engineer-in-Charge may arrange them to be sold, holding the net proceeds of such sale to the credit of the Contractor. After completion of the works and settlement of accounts, the lien of INKEL on the Contractor's plant, equipment and balance of materials will be released.

9.10.6. In the event of termination of contract, the Contractor, shall within 30 days thereof, make available to INKEL all the working areas and access thereto, as well as sites

which were in his occupation for the performance of the Contract. He shall also return the tools and plants, if any, given to him by INKEL.

9.10.7. Termination of the contract shall be adequate authority for the Engineer-in-Charge to demand discharge of the obligation from the guarantors of the security for performance.

9.11. Power, Water, Fuel and Lubricants

The Contractor shall make his own arrangements for availing power, providing fuel, water for the works, camps, colonies, street lighting and all other requirements at his cost. The Contractor shall not use trees available in the project site or adjacent forest land for the purpose of firewood.

9.12. Re-Assignment of Work

The work shall not be re-assigned to any one by the Contractor on any reasons.

9.13. Foreclosure

9.13.1. If INKEL does not require the whole or any part of the Work to be carried out at any time after award of the Contract, the Engineer-in-Charge will give notice to the Contractor in writing to that effect. The notice shall be issued 28 days prior to the last date required by INKEL for taking over of the Work or part of the Work. The Contractor shall hand over the works completed and demobilize from the site. The Contractor shall not have any claim to any compensation whatsoever, on account of any profit or advantage which he might have derived had he executed such works.

9.13.2. Thereupon, the Contractor shall be paid at contract rates for works executed as certified by the Engineer-in-Charge for the items which could not be fully utilized because of the foreclosure.

9.13.3. Materials supplied by INKEL except for normal wastage shall be returned to the place from where it was issued.

9.14. Possession Prior to Completion

The Engineer-in-Charge has the right to take possession or use any completed part of the Work. Such possession or use shall not be deemed as acceptance of any work.

9.15. Quality Assurance

9.15.1. The Contractor shall establish a Quality Assurance system for the Work to demonstrate the compliance of such part with the requirement of the contract and specifications. The Quality Assurance system shall be subject to the approval of the Engineer-in-Charge. The system shall be in accordance with the specifications stated in the Contract or with BIS specifications unless otherwise specified anywhere in this Contract. The Engineer-in-Charge shall be entitled to inspect the system and the reports shall be periodically sent to him by the Contractor. Compliance with the Quality Assurance system shall not relieve the Contractor from any of his obligations or responsibilities under the Contract.

9.15.2. The cost of all Quality Assurance operation shall be included in the quoted amount under the price schedule and no extra claim will be entertained. The details of sampling, testing, procedures etc. for different works are given in the Technical Specifications of the Contract. If these details are not stated in the technical

document, BIS specification shall be followed. The Contractor shall provide samples and test without any extra cost and co-operate in the testing of materials if so desired by the Engineer-in-Charge.

9.16. Supervision

9.16.1. INKEL will engage sufficient number of supervisory staff at the site of Work. The Contractor shall provide them necessary facilities and assistance to examine and measure the works. The supervisory staff shall not have power to revoke, alter, enlarge or relax any requirement of the Contract, but may sanction to execute the works authorized by the Engineer-in-Charge. The supervisors will act as the representatives of Engineer-in-Charge and his delegated officers and will have power to give notice to the Contractor or his foreman of non-approval of any work, and such work shall be suspended or use of such material shall be discontinued until the decision of the Engineer-in-Charge or his delegated officer is obtained. The Engineer-in-Charge shall have access at all times to the places of storage and places where materials are being manufactured or processed or equipment are being manufactured for use in work under the Contract to determine whether their manufacture and process are proceeding in accordance with the drawings and specifications.

9.16.2. The work shall be conducted under the general direction and control of the Engineer-in- Charge and his delegated officers and is subject to inspection to ensure strict compliance with the terms of the Contract. Any failure from the part of INKEL to detect or discover errors, faults, defects or the Work not in accordance with the requirement of Contract during the progress of work shall not be deemed as acceptance thereof or waiver of defect.

9.16.3. The Contractor shall execute the whole and every part of the work in the most substantial and workman like manner and in all other aspects.

9.16.4. If any work found as unsound, imperfect or done with unskilled workmanship or any material or article provided are unsound or quality inferior to that in accordance with the Contract, the Contractor shall forthwith rectify, reconstruct or remove in whole or part at his own charge and cost as noticed by the Engineer-in-Charge. In the event of failing to do so within seven days from the written notice from the Engineer-in-Charge, INKEL may have the right to rectify, re-execute, remove or replace such work or material as the case may be at the risk and expense of the Contractor in all respects. The Engineer-in-Charge may reject any work at any stage which he considers to be defective in quality.

9.17. Clean Up

Upon completion of the Work, the Contractor shall remove from the vicinity of the Work all plant, buildings rubbish, unused materials, concrete forms and other like materials belonging to him or under his direction during construction to the satisfaction of the Engineer-in-Charge and in the event of his failure to do so, the same may be removed by INKEL at the expense of the Contractor within 15 days from the date of handing over. The cost on account of clean up shall be included in the quoted rate and no additional extra claim shall be entertained.

9.18. Protection of Work

The Contractor shall maintain all works including Preliminary and Enabling works, Temporary works, Care and Diversion works etc. during the progress of work till taking over, and shall take necessary measures to protect and preserve them in good condition at his own expense. The rates quoted shall include cost on account of this and no extra claims shall be entertained.

10. CONTRACTOR

10.1. Contractor's Nominee

If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies, and if the Contractor is a partnership concern and one of the partners dies, then all sums payable under this contract will be paid to the nominees of the individual Contractor/proprietor if there is one or to his/her legal representative and in the case of partnership, to the surviving partners and the Contractor should fill up the 'Form of Nomination' at the time of executing the agreement and should sign in the presence of two witnesses.

10.2. Management of Work

10.2.1. It is the responsibility of the Contractor to manage the entire works to produce the results as contemplated herein. It is for him to plan, organise and execute the work and manage the labour.

10.2.2. The Contractor shall also comply with the directions of Engineer-in-Charge in respect of planning, organising, execution and management of works. Failure to do so will lead to termination of contract at the risk and cost of Contractor.

10.3. Contractor's Representative

10.3.1. The Contractor may with prior consent of Engineer-in-Charge appoint his representative giving him necessary authority to act on Contractor's behalf under the Contract. The Contractor shall furnish the name and details of such representatives to the Engineer-in- Charge and to his delegated officers well in advance. Without the prior consent of Engineer- in-Charge, the Contractor shall not revoke or replace such appointments.

10.4. Notices, Instructions and Correspondence

The Contractor shall have an office near the Work site where notice of directions and instructions from the Engineer-in-Charge may be served. The Contractor shall have an authorised person present in the office during all times who shall receive such notice on behalf of the Contractor. The Contractor shall furnish the postal address of his site office, e-mail address, telephone and fax numbers. Any notice or instruction to be given to the Contractor under the terms of contract shall be deemed to have been served on him if it has been delivered to his authorised agent or representative at site or sent by registered post to the site office or address of the firm last provided by the Contractor.

10.5. Security of the Site

Unless otherwise stated in the Special Conditions

a) The Contractor shall be responsible for keeping unauthorised persons off the site and

equipment installed

b) Authorized persons shall be limited to the Contractor's personnel, INKEL personnel and personnel of INKEL's Client (KSEBL); and any other personnel notified as authorised personnel of INKEL.

10.6. Fencing and Lighting

The Contractor shall be responsible for the proper fencing, if required, guarding, lighting and watching of all works comprised in the Contract and for the proper provision of temporary road way, footways, guards and fences as far as the same may be rendered necessary by reasons of the work for the accommodation and protection of pedestrians or other traffic and owners and occupants of adjacent property and the public.

10.7. Site Investigations and Representations

The Contractor shall satisfy himself about the nature and location of work, general and local conditions including those bearing upon transportation, disposal, handling and storage of materials, flow through the river at site, availability and nature of labour, availability of water etc. or similar physical conditions at the site, the configuration and condition of ground, the character, quality and quantity of the surface and sub surface materials to be encountered, the character, and capacity of equipment and facilities needed preliminary to and during the execution of the Work and all other matters which can any way affect the Work or the cost thereof under this contract. Any default or failure by the Contractor to acquaint him with all the available information concerning this condition will not relieve him from the responsibility for the execution of the contract. If the drawings, specifications or description of items do not contain particulars of materials and work which are obviously necessary for the proper completion of the Work and the intention to include which is nevertheless to be inferred all such materials and works shall be supplied and executed by the Contractor without extra charge, and INKEL will furnish to the Contractor with responsible expedition after receiving from the Contractor a request in writing thereof, such details as are necessary.

10.8. Liability Due to Damage of Work or Plant

The Contractor shall, during the progress of the Work, properly cover up and protect the work and plant from injury by exposure to the weather, natural calamities such as flood, rain and by any other cause. He shall take every reasonable, proper, timely and useful precaution against accident or injury to the same from any cause. The Contractor shall be and remain answerable and liable to accidents or injuries thereto which may arise or be occasioned by the acts or omissions of the Contractor or his supervisory staff or his workmen or his Sub- Contractors and all losses and damages to the works or plant arising from such accidents or injuries as aforesaid shall be made good in the most complete and substantial manner by and at the sole cost of the Contractor and to the reasonable satisfaction of the Engineer - in - charge. Should any such loss or damage happen to units of works or plant or material falling outside the scope of this contract, the same shall be replaced or compensated for, to the satisfaction of the Engineer-in-Charge.

Until the Work is taken over or deemed to be taken over by the agreement Authority, the Contractor shall be liable for and shall indemnify INKEL in respect of all damages or injury to any person or to any property of INKEL or of others occasioned by the act of the Contractor or members of his organisation including his workmen or his Sub–Contractors

or piece - work Contractor or by defective work or materials but not due to causes completely beyond his control.

10.9. Time Limit for Claims

Any claim arising out of this Contract should be submitted before the agreement Authority within 30 days from the date of occurrence of the event which leads to such claim. The Contractor is precluded from raising any such claim after the expiry of the above period.

11. INKEL

Role of agreement Authority – INKEL Limited.

The agreement Authority is INKEL Limited., represented by an officer of INKEL as authorized by INKEL. Here, The Managing Director, INKEL Limited will be the represented agreement Authority. He / She is represented by General Manager, Senior Manager, Manager and subordinate staffs as per Delegation of Powers prevailing in INKEL. These Officers shall exercise within their delegated power as prevalent in INKEL regarding management, execution, measurement and payment of works; the commitments made by these officers are based on the agreement executed and powers delegated.

11.1. Site Inspection/Acceptance Test

11.1.1. Except as otherwise provided in paragraph (11.1.4) hereunder, all materials and workmanship shall be subject to inspection, examination and testing by the Engineer-in-Charge at any and all times during manufacture and/or construction at any and all places where such manufacture and/or construction are carried out. INKEL shall have the right to reject defective material and workmanship or require its correction/rectification. Rejected workmanship shall be satisfactorily rectified and rejected material shall be replaced with proper material without charge therefore, and the Contractor shall promptly segregate and remove the rejected material from the premises at his own cost. If the Contractor fails to proceed at once with the replacement of rejected material and/or the correction of defective workmanship, INKEL may, by a contract or otherwise, replace such material and/or correct such workmanship and charge the cost thereof to the Contractor and/ or may terminate the right of the Contractor to proceed further as provided under Clause 9.11 of Part II (GCC) of these Specifications. The Contractor and his surety are liable for any damage caused to INKEL resulting from the above.

11.1.2. The Contractor shall furnish promptly and without any additional charge all reasonable facilities, labour and materials necessary for the safe and convenient inspection and test that may be required by the Engineer-in-Charge. All inspection and test by INKEL shall be performed in such a manner as not to unnecessarily delay the work. Special, full-size, and performance tests shall be done as described in the Specification. The Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready for inspection at the time of inspection, as required by the Engineer-in-Charge.

11.1.3. Should it be considered necessary or advisable by INKEL any time before final acceptance of the entire work to make an examination of work already completed by

removing or tearing out the same, the Contractor shall, on request, promptly furnish all necessary facilities, labour and material if such work is found to be defective with respect to the Specifications due to the fault of the Contractor or of his Sub - Contractor who shall defray all expenses of such examination and satisfactory reconstruction.

11.1.4. Inspection of materials and finished articles to be incorporated in the work shall be made at the place of production, manufacture or shipment wherever the quantity justifies it, unless otherwise stated in the Specifications and such inspection and written or other formal acceptance, unless otherwise stated in the Specification, shall be final except, as regards latent defects, departure from specific requirements of the Contract, damage or loss in transit, fraud or such other gross mistake if at all found later. Subject to the requirements contained in the preceding sentence the inspection of materials and workmanship for final acceptance as a whole or in part shall be made at site, nothing contained in this paragraph shall in any way restrict INKEL's right under any warranty or guarantee.

11.1.5. If the Contractor fails to comply with any of the conditions of the Contract or with instructions or decision of the Engineer-in-Charge issued there under, except where otherwise specifically provided in this contract, the Engineer-in-Charge may after giving written notice to the Contractor take necessary steps for the compliance of the said conditions, instructions or decision and any expenditure thus incurred shall be recoverable from the Contractor.

11.1.6. The work during its progress (or) during the defect liability period can also be inspected by the Managing Director (or) his authorized representative(s) and any defects pointed out by him shall be attended by the Contractor under intimation to the Engineer in charge.

11.1.7. SAT Documentation for material approval including RFID reading for the panel shall be submitted two weeks before material acceptance test and if necessary additional test will be added and on acceptance of documents the test will commence.

11.2. Orders after Award

After the Bid has been accepted by INKEL, all orders and instructions to the Contractor shall be given by the Engineer-in-Charge on behalf of INKEL except otherwise provided in the Contract.

11.3. Lien Withhold Payments

INKEL shall have a lien on and over all or any money that may become due and payable to the Contractor under this Contract and also over the Security and Retention deposits/guarantees, in respect of any debt or sum that may become due and payable to the Government and/or INKEL by the Contractor, either alone or jointly with another or others, or either under this or under any other contracts or transactions of any nature whatsoever between the Government and/or INKEL and the Contractor and also in respect of any Government tax or taxes as Governed by GST or other money which may become due and payable to the Government by any other statutory enactment or enactments in force or modifications or substitutions thereof and INKEL shall at all time be entitled to deduct the said debt or sum or tax as Governed by GST due by the Contractor

from the money, Securities like Bank Guarantee or deposit which may become payable/ returnable to the Contractor under this contract.

12. LABOUR

12.1. General

12.1.1. The Contractor shall be bound by the provisions of 'Contract Labour (Regulation and Abolition) Act of India, 1970' and amendment thereof and the Rules framed there under. He shall get himself registered under the Act at the appropriate time. Contractor shall implement the provisions of Act scrupulously.

12.1.2. The Contractor shall also be bound by the applicable contract labour regulations in respect of wage, payment of wages, fixation of wage periods, hours of work, leave, registers to be maintained by the Contractor, display of notices regarding wages, fines and deduction, maintenance of registers, submission of returns etc.

12.1.3. The rates quoted by the Contractor shall include labour costs on the following items as well as other fringe benefits that are fixed to the labour as per the existing provisions of law.

i. Fair wages including Dearness Allowance
ii. Leave wages
iii. Wages for paid holidays (National and festival holidays)
iv. Retrenchment compensation.
v. Workmen compensation
vi. Bonus
vii. Other allowances, if any.

12.1.4. The responsibility for paying wages and other benefits to the labourers is entirely that of the Contractor. INKEL takes no responsibility, towards the wages and other benefits which the Contractors have to pay to the labourers till the completion of the Contract. All the expenditure towards this is deemed to have been included in the rates/amount quoted by the Contractor. The Contractor shall comply with the provision of various labour laws, rules and regulations as applicable in regard to all matters provided therein and shall indemnify INKEL in respect of all claims that may be made against INKEL for non- compliance thereof by the Contractor.

12.1.5. Notwithstanding anything contained herein, the Engineer-in-Charge may take such actions as may be necessary for compliance of the various labour laws and recover the costs thereof from the Contractor.

12.1.6. Any dispute between the labour and the Contractor shall be resolved by the Contractor without loss of time and in case the dispute cannot be resolved in reasonable time, it shall be referred to the Labour Department of the Government for conciliation and settlement of dispute. The decision taken by the Labour Department during conciliation meeting shall be binding on the Contractor. Any extra cost involved as a result of conciliation settlement shall entirely be borne by the Contractor.

12.1.7. All disputes between the Contractor and Labourers shall be classified as Industrial Disputes. In case it is found that the disputes between Labour and Contractor are not resolved in time INKEL may help the Contractor in accelerating conciliation settlement without any commitment on the part of INKEL.

12.1.8. Fair wages not less than the minimum wages that may be fixed from time to time in accordance with the law or Act or Rules there under applicable to the area covered by the Work shall be paid by the Contractor to all labourers and their wage rate shall be prominently displayed in the labour camps and important work sites in Malayalam and English script. All statutory and other increase in wages, customary and fringe benefits that may become payable by the Contractor to his labourers entirely shall be borne by the Contractor and INKEL will not compensate additional expenditure, if any, incurred by the Contractor on such accounts. Payment of wages to the labourers shall be made at regular and reasonable intervals and shall be governed by labour regulations. Proper identity cards shall be issued to the labourers and aquittance records for the payments shall be maintained and made available for inspection by INKEL.

12.1.9. The Contractor shall assume all responsibility for payment of wages and other benefits from time to time till the completion of the Work whether minimum wages have been notified or not.

12.2. Recruitment of Labour

The Contractor shall not employ child labour or criminals or outlaws. While recruiting labourers, the Contractor should give preference to those available in local areas.

12.3. Law and Order

The maintenance of the law and order is the responsibility of the Government. It is the Contractor's responsibility to maintain good relations with the labour and others and to maintain discipline of labour at site. Any problem on maintenance of law & order shall be referred to the appropriate Government authority, for redressal, by the Contractor.

12.4. Labour Reports

The Contractor shall report monthly, within 5 days after the close of each calendar month, on specified forms, the number of persons under different category on their respective pay rolls and such other information as may be required by the Engineer –in- Charge. Labour reports showing the strength of labourers and other details under each category should be submitted every week by the Contractor, if so required by the Engineer-in-Charge.

12.5. Accidents

12.5.1. It shall be the responsibility of the Contractor to take protective measures to prevent accidents on the works. He shall indemnify INKEL against any claim for damages or for injury to persons or property resulting from and in the course of the work and also under the provisions of the Workmen Compensation Act. The Contractor shall take CAR (Contractor's All Risk) policy in order to cover all risk, which may arise from the Contract and produce the certificate before the Engineer-in -Charge and convince the Engineer- in-Charge of the existence of such insurance coverage failing which the payments to the Contractor will be withheld.

12.5.2. On the occurrence of an accident during the course of the work which results in death or which is so serious as likely to result in death, the Contractor shall report the facts stating clearly and with sufficient details, the circumstances of the accident and the subsequent action taken by him, in writing to the Engineer-in-Charge, Labour Commissioner and other concerned authorities within twenty four hours of such accident. In case of fatal accidents, the Contractor shall at once inform

the Commissioner for Workmen Compensation, the details of the accident stating whether he accepts or disclaims the liability. All other accidents on the works involving injuries to persons or damage to property shall also be promptly reported to the Engineer-in- Charge stating clearly and with sufficient details, the facts and circumstances of the accidents and the action taken. In all cases, the Contractor shall indemnify INKEL against all losses or damage resulting directly or indirectly from the Contractor's failure to report in the manner aforesaid. This includes penalties or fines, if any, payable by INKEL as a consequence of failure to give notice under the Workmen's Compensation Act or failure to conform to the provisions of the said Act in regard to such accidents.

12.5.3. In the event of an accident in respect of which compensation may become payable under the Workmen's Compensation Act, the Engineer-in-Charge will retain such amount which he feels sufficient to meet the liability, from the amount due and payable to the Contractor. On receipt of any award of compensation from the competent authority under the said Act, the difference in amount will be adjusted.

12.5.4. The Engineer-in-Charge will have the right to deduct from the amount due to the Contractor any sum required for making good the loss suffered by a worker or workers on any reasons of non-fulfilment of the conditions of the Contract. The Contractor shall primarily be responsible for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his Labourers. The applicable contract labour regulation currently in force and future amendments thereof shall be deemed to be part of this Contract and any breach of this shall be violation of contract.

12.6. Work During Night or on Holidays

12.6.1. Wherever work is carried out at night, adequate lighting of working areas and access paths should be provided by the Contractor, at his cost.

12.6.2. Sufficient notice is to be given by the Contractor to the Engineer-in-Charge regarding the details of work in shifts so that necessary supervision by INKEL could be provided.

12.6.3. To achieve the required progress, the work shall be carried out whenever necessary round the clock in shifts even on holidays. No extra amount on account of any shift work or work on holidays is payable to the Contractor. The work shall be arranged on holidays after getting the permission of the Engineer-in-Charge so that necessary supervision by INKEL could be provided.

12.6.4. When some unavoidable works are to be carried out, on considerations of safety of property, security of personnel, and / or on technical considerations, such works shall be carried out on an emergency basis by the Contractor as per the directions of the Engineer-in-Charge.

12.6.5. The cost of such works shall be borne by INKEL and the Contractor shall be paid accordingly. The decision of the Engineer-in-Charge in all matters in this regard shall be final and binding.

12.7. Other Workmen

The Engineer-in-Charge will have full authority to depute workmen on the worksite to execute other works not included in the contract. The Contractor shall afford reasonable facility during working hours to enable such workmen to carry out other works provided

that such works shall be carried out in such a manner as not to impede the progress of the work included in the contract. The Contractor however shall not be liable for any damage which may happen to such other works, provided he complies with the instructions in connection therewith and provided that the damage is not caused by the Contractor or his workmen.

13. MATERIALS

13.1. General

13.1.1. No material will generally be issued by INKEL for the work to the Contractor. All materials required for the work including cement and steel shall be supplied by the Contractor at site as per the specifications. Materials supplied or brought by the Contractor at site shall not be taken out of the site without the written permission of the Engineer-in-Charge.

13.1.2. If it is intended by INKEL to supply any material, it shall be specifically mentioned in the Special Conditions of Contract or the Engineer-in-Charge may with special sanction of INKEL opt for supply of any material in the interest of maintaining quality and timely execution of work. Any material under the ownership, custody or possession of INKEL should not be used without specific permission from the Engineer-in-Charge or his authorised representative. If there is any misuse or wastage through negligence by the Contractor, the Contractor is liable to pay penalty as decided by the Engineer-in- Charge.

13.2. Storage of material

The Contractor shall at his own expense, provide and furnish sheds and yards in such situations and in such numbers as in the opinion of the agreement Authority and requisite for carrying on the work under this contract for the storage of materials arranged by him or handed over to him by INKEL. The Contractor shall keep at each of such sheds and yards, a sufficient quantity of materials in stock so as to avoid delay in carrying out the works with due expedition.

13.3. Misuse of Materials

No material or equipment under the ownership or possession of INKEL shall be used by the Contractor without written permission from the competent authorities. Any use in contravention to above condition will constitute misuse of material or equipment. If there is any misuse or waste of material through negligence by the Contractor, he shall be liable to pay penalty as decided by the Engineer-in-Charge.

14. ENVIRONMENT

14.1. Safeguards for Environmental Protection

14.1.1. The Contractor is bound to follow the safeguards that are provided herein, in respect of safeguard for environmental protection at no extra cost. The Acts, Rules and Regulations regarding environmental protection enacted from time to time shall be followed at his cost without fail. Preservation of Existing Vegetation

14.1.2. The Contractor will preserve and protect all existing vegetation such as trees on or adjacent to the site which do not interfere with or cause inconvenience to the construction as may be determined by the Engineer-in-Charge. The Contractor will be held responsible for all unauthorised cutting or damaging of trees including

damage due to careless operation of equipment, stockpiling of materials or tracking grass areas by equipment. Care shall be taken by the Contractor, especially in the existing solar plant, in felling trees authorised for removal to avoid any unnecessary damage to vegetation and trees that are to remain in place and to structures under construction by workmen. Cutting and removal of trees, if any, shall be done by the Contractor or his men only after obtaining due permission from the agreement Authority.

14.2. Interference with Public, Public Properties, Other Departments and Safety of Public

14.2.1. All access to work sites and other areas other than those specifically agreed to be constructed by INKEL herein in these specifications, if any, shall be provided by the Contractor at his own expense. INKEL assumes no responsibility for the condition of roads and structures thereon that may be used by the Contractor in performing the work under these specifications or in travelling to and from the site of the work. No Payment will be made to the Contractor by INKEL for any work done in constructing, improving, repairing or maintaining any road or structure thereon for use in the performance of the work under these specifications. All roads subject to interference by work shall be kept open or suitable detours shall be provided by the Contractor during the period of time covered by this Contract for INKEL and others who may be engaged in other construction work in the vicinity of the Work covered by this specification.

14.2.2. The Contractor shall arrange and prosecute the Work under these Specifications so as not to interfere with other works or with existing improvements. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient red lights, danger signals and shall take all necessary precautions for the protection of the Work and the safety of the public. Roads closed to traffic shall be protected by effective barricades and warning and detour signs shall be displayed suitably.

14.2.3. All barricades and obstructions shall be illuminated at night and all lights shall be kept lit from sunset to sunrise.

14.3. Protection of Adjoining Premises, Structures etc.

The Contractor shall protect adjoining sites against structural, decorative and other damage that may be caused during the course of execution of the Work and he shall make good any such damage occurred at his own cost.

15. MISCELLANEOUS

15.1. Toll & Duties

The Contractor shall, unless otherwise specifically provided in the Contract, pay all duties, Seigniorage charges, tolls, quarry fees, Octroi, Royalties and other taxes on all materials and articles that he may use and as governed by the GST.

15.2. Taxes, Duties and Recoveries

15.2.1. The price offered by the bidder shall include all taxes and duties as governed by the GST and other charges imposed outside India under the laws and regulations of the Country of origin on the production, manufacture, sale and transport of the imported equipment, materials and supplies to be used on or furnished under the contract, and on the services performed under the contract. Any variation in the

taxes, duties etc as governed by the GST and other charges mentioned above during the period of contract shall be borne by the Contractor.

15.2.2. The price offered by the bidder shall also include all taxes and duties etc as governed by the GST and that may be levied according to the laws and regulations in force at the time of bidding and during the period of the Contract in India on the equipment, materials, work and supplies (permanent, temporary and consumable) and on the services performed under the Contract. Nothing in the Contract shall relieve the Contractor from his responsibility to pay tax on all profits made by him in respect of the Contract.

15.2.3. Recoveries of Income Tax and any other taxes payable by the Contractor as governed by the GST will be made from the bills due to him and will be regularised on receipt of advice from the assessing authorities and as per rules in force from time to time. All taxes and levies recoverable under the statutes in force from time to time shall be recovered from the Contractor. Clause 11 of Part II of ITB 'Bid Prices', shall also be referred in this connection.

15.2.4. Bidder should submit an undertaking to the effect that if any dispute on payment of taxes from the concerned tax authorities occurs in feature, the bidder shall indemnify INKEL from such liabilities and the contractor will be liable for the additions, loss or cost on account of such discrepancies / disputes.

15.3. Tax Clearance Certificate

INKEL may require the Contractor to produce Income Tax, Agriculture Income Tax and any other applicable tax clearance certificates from the respective authorities and copy of PAN card, before entering into the agreement with him for the Contract and the Contractor will have to produce all such documents as and when called for. Final payment of the Contractor will be made only after the production of all applicable tax clearance certificates and other certificates regarding compounded rate of work, contract tax, concessional rate of sales tax, non-deduction of work contract tax etc as governed by the GST. From the departments concerned and attested copy of PAN Card in the case of Income Tax.

15.4. Insurance

15.4.1. The Contractor shall secure and maintain throughout the duration of this Contract, insurance of such types and in such amounts as may be necessary to protect himself and the interests of INKEL, against all usual hazards or risk of loss. The form and limits of such insurance and the company together with the underwriting thereof in each case, such as will be acceptable to INKEL but, regardless of such acceptance, it shall be the responsibility of the Contractor to maintain adequate insurance coverage at all times. Failure of the Contractor to maintain adequate coverage shall not relieve him of any contractual responsibility.

15.4.2. The Contractor, without limiting INKEL's obligations and responsibilities shall insure:

a) The works, together with materials and plant to the full replacement cost and third-party liability at site.

b) an additional sum of 15% of such replacement cost to cover additional costs and incidental to the rectification of loss or damage including professional fees and cost of demolishing and removing any part of works and of removing debris of

whatsoever nature, and

c) The Contractor's equipment and other things brought to site, for a sum sufficient to provide for their replacement at the site.

d) The insurance against third party liability at site shall be ensured before commencing the execution of work, against any damage or loss or injury which may occur to the equipment being shifted/ installed or to any property or person (including property and employees of the Employer) by or arising out of the execution of works or temporary works in carrying out of the Contract. The insurance coverage shall be revalidated till the certification of project.

e) The insurances under item (a) and (b) shall be in the joint names of Contractor and INKEL and shall cover:

i. the Contractor against all losses or damage, from whatsoever cause arising from the start of work at the site until the date of issue of the relevant taking over certificate in respect of the works or any section or part thereof as the case may be, and

ii. The Contractor for his liability:

1. during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of Defect Liability Period,
2. for loss or damage caused by the Contractor in the course of any operations carried out by him under the terms of the Contract, and
3. for loss or damage caused by the Contractor in the course of any operation carried out by him during execution of works to the neighboring habitats, life and property around the boundary of the site.

15.4.3. If the Contractor fails to effect in force the insurances referred in the above clauses, or any other insurance which he may be required to effect under the terms of the contract, then and in any such case, INKEL may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by INKEL as aforesaid from any amounts due or which may become due to the Contractor, or recover the same as a debt due from the Contractor.

15.5. Performance of this contract, Arbitration / Settlement of Disputes

This contract has to be performed complying with the laws of India and Kerala and any dispute arising out of this contract will be subject to the exclusive jurisdiction of Civil Courts at Thiruvananthapuram.

15.6. Patents and Copyrights

The Contractor shall hold and save INKEL, its officers, agents, servants and employees, harmless from liability of any nature or kind, including costs and expenses for or on account of any copy with or without copyright composition, secret process, patented or unpatented invention, article or appliance, manufactured or used in including their use by the INKEL unless otherwise specifically stipulated in this Contract. The Contractor shall not use any patent invention over which INKEL has a right to use, except with the written permission of the agreement Authority. The agreement Authority may permit the Contractor to use such patent invention on collecting Royalty or otherwise. A

patent invention which has been permitted to be used in respect of one contract shall not be used in any other contract or anywhere else or for any other purpose.

15.7. Right to Information

The Contractor shall be bound to provide all documents/information required by the State Public Information Officer in discharge of his duties under the Right to Information Act.

15.8. Collusion and Bribery

Any bribe, commission, gift or advantage given, promised or offered by or on behalf of the Contractor or his partner, agent or servant or any one on his or on their behalf to any officer, servant, representative or agent of INKEL relating to the obtaining or to the execution of his or any other contract with INKEL shall in addition to any criminal liability which he may incur, subject the Contractor to the cancellation of this and all other contracts and also to payment of any loss or damages resulting from any such cancellation to like extent as is provided in case of cancellation under clause 5.3.11 and INKEL shall be entitled to deduct the amounts so payable from the Contractor. Any question of dispute as to the commission of any offence under the present clause shall be settled by INKEL in such manner and on such evidence or information as INKEL shall think fit and sufficient and the decision of INKEL shall be final and conclusive.

15.9. Observance of Local Rules, Regulation, Laws etc.

The Contractor shall conform to all laws of the land and the regulation and bye-laws of the Local Authority, Corporation, Board or Local Self Government etc. constituted as per the statute of Government of Kerala and Government of India and the Contractor shall strictly abide by all such Laws, Rules and Regulations.

15.10. Interventions by Extraneous Forces / Agencies

INKEL will not be liable for any damage or compensation for holdups or delay in discharge of obligations of INKEL caused by intervention of court or extraneous forces beyond the control of INKEL. If, however, such delays are found to cause delay in completion of Works, and if INKEL is satisfied that the delay or hold up is not due to the fault of the Contractor, INKEL may consider suitable extension of Time Of Completion and/or revision of rates, subject to relevant provisions in the General Conditions of Contract and/or Special Conditions of Contract to compensate the losses that may be incurred by the Contractor in that respect.

15.11. Safety Aspects

The Contractor is bound to follow the applicable safety provisions provided in these specifications and to follow the directions of the Engineer–in-Charge in this respect. The cost for providing safety provisions shall be deemed to be included in the rates agreed to. All safety rules and regulations introduced from time to time by appropriate authorities shall also be followed at no extra cost.

15.12. Co-operation with Other Contractors

When two or more Contractors are engaged in the same premises, they shall work together in a spirit of co-operation and accommodation. The Contractor shall not take or cause to be taken any step or action that may cause disruption, discontentment or disturbance to the works, labour and arrangement of other Contractor(s). In the case of difficulties in coordination amongst the Contractors, the Engineer-in-Charge will direct

the manner in which each Contractor shall conduct his work.

Each Contractor shall, while scheduling his works, take into account the timings for interlinking of works of other Contractors, if such interlinking is necessary for proper fulfillment of the Contract as per Schedule.

15.13. Foreign Exchange

No Foreign Exchange will be provided by INKEL for carrying out the works.

16. SAFETY ENGINEERING AND SAFETY CODE

16.1. General

Accident prevention shall be an essential part of the programme of the Contractor for the work in order to reduce the cost of construction measured in terms of,

a) human life sacrificed;
b) temporary and permanent disabilities to workers;
c) loss of materials resulting from accidents;
d) loss or damage to equipment;
e) the cost of workmen's compensation and insurance; and
f) loss of time due to accidents.

The safety programme should be developed to cope with the particular hazards for each operation such as, blasting, tunnelling, drilling, excavation, transport, handling concrete etc.

16.2. General Safety Programme

The following programme shall be promoted by the Contractor to reduce the accident rate on construction.

a) Render full support to the work force in observing safety measures.
b) Designate a qualified person to organise and monitor safety programme.
c) Develop a public safety programme.
d) Develop a safety programme for each job.
e) Indoctrinate new employees. Educate the employees regarding the hazards of their work and explain to them how they can reduce the accidents to themselves and to other workers.
f) Make safety practices effective.
g) Promote good housekeeping.
h) Maintain adequate first aid facilities,
i) Seek assistance from insurance carrier, if available.

16.3. Safety Equipment

All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the persons employed on the site and maintained in a condition suitable for immediate use and the Contractor should take adequate steps to ensure proper use of equipment by those concerned.

16.4. Display of Safety Provisions

The safety provisions should be brought to the notice of all concerned by display on a notice INKEL at a prominent place at the work spot. The persons responsible for compliance of the Safety Code shall be named therein by the Contractor.

16.5. Inspection by Officers

To ensure effective enforcement of the Rules and Regulations of safety precautions, the

arrangements made by the Contractor shall be open to inspection by the Labour Officer, Engineer-in-Charge or their representatives.

16.6. Safety Acts and Rules

Notwithstanding the above clauses, the Contractor is bound to comply with all Acts, Rules and Regulations in force from time to time regarding safety of person and property.

16.7. Compensation

All works shall be carried out adhering to the provisions of Safety Engineering Code and the rates quoted by the Contractor shall include the costs incidental thereto.

17. MISCELLANEOUS

The Contractors are expected to maintain good relations with their labour/employees and trade unions and any dispute arising between the Contractors and their labour/employees will be considered as Industrial Dispute between the Contractors and their labour/employees and shall be settled by them without any delay failing which the conciliation machinery of Government of Kerala may begin to function. It may even be referred to Labour Department for arbitration. In such an event the award by the Labour Department shall be binding on the Contractors and the Contractors shall implement the award at their cost. It shall be noted that INKEL will not be liable for financial implications due to settlements as aforesaid.

18. HEALTH AND SANITARY PROVISIONS

All Enactments, Rules, Regulations or by-Laws regarding Health and Sanitation, with special reference to First Aid, drinking water, latrines and urinals, drainage and sewerage system, rest room in work places, facilities for children of workers, canteen etc. shall be strictly followed.

19. WORK REVIEW MEETINGS

The Contractor shall present the Programme and status at various review meetings as required.

A. Weekly Review Meeting:

Level of Participation: Representative of INKEL's Engineer-in-charge, INKEL's Client, Contractor's Site In charge and Job Engineers

Agenda:

a) Weekly programme v/s actual achieved in the past week and programme for next week.

b) Remedial Actions and hold up analysis.

c) Client query/ approval

B. Monthly Review Meeting:

Level of Participation: Representative /Senior Officers of INKEL LIMITED, its Client and Contractors.

Agenda:

a) Progress Status/Statistics.

b) Completion Outlook

c) Major hold ups/slippages

d) Assistance required

e) Critical issues.

f) Client query/approval

20. PROGRESS REPORTS

Weekly Progress Report:

This report shall be submitted (e mailed) to the site-in-charge with copy to the Engineer-in-charge as well as representative of INKEL LIMITED on a monthly basis within Ten Calendar days, covering over all scenario of the work. Report shall include but not be limited, to the following:

a) Activities executed/achievements during the week.
b) Scheduled/Actual percentage progress manufacturing/delivery, sub-contracting, construction and overall work.
c) Quantum wise status of purchase order against scheduled shall also be indicated.
d) Areas of concern/problem/hold ups, impact and action plans.
e) Resource deployment status.

Monthly Progress Report:

This report shall be submitted (e mailed) to the agreement Authority as well as representative of INKEL LIMITED on a monthly basis within Ten Calendar days, covering over all scenario of the work. Report shall include but not be limited, to the following:

f) Brief introduction of the work.
g) Activities executed/achievements during the month.
h) Scheduled/Actual percentage progress manufacturing/delivery, sub-contracting, construction and overall work.
i) Quantum wise status of purchase order against scheduled shall also be indicated.
j) Areas of concern/problem/hold ups, impact and action plans.
k) Resource deployment status.

21. TECHNICAL DISCUSSION

In an endeavor to expedite completion of the project, INKEL Limited may instruct the contractor to depute his competent technical personnel for technical discussions with INKEL's engineering Team or INKEL's client at a location convenient to INKEL or its Client (site, INKEL Office or Client Office). The Contractor shall, on receipt of such intimation, depute his technical personnel accordingly. All costs associated with such visits shall be borne by the Contractor.

22. WARRANTY

22.1. The entire electrical works including distribution boards/digital meters/ switchgear etc. and overall workmanship of the SPV power plants/ systems must be warranted against any manufacturing/ design/ installation defects for a minimum period of 18 months from the date of handing over.

22.2. Any component found defective during the warranty period shall be

repaired/replaced free of cost.

23. PERMIT FOR ENTRY AND ACCESS TO WORK

23.1. The contractor shall note that the plant locations are substation premises owned by KSEBL. These sites, based on their category may have special procedure for access to work and might have work time restrictions. Further, classified buildings might have specific set of rules and regulations to be followed during execution of work.

23.2. The contractor, prior to start of work shall obtain all such clearances and permissions for site access and permit to work in coordination with the authorized representative of INKEL Limited.

23.3. INKEL will extend its complete support in obtaining such clearances for ensuring timely completion of work.

24. FACTORY ACCEPTANCE TESTING/INSPECTION

The following materials are to be delivered to site only after obtaining dispatch clearance from INKEL Limited.

i. LT Panel

ii. HT Panel

Dispatch clearance is issued only after conducting Factory acceptance tests of the materials manufactured at the facility of the manufacturer.

The contractor may inform INKEL the proposed date of FAT at least a week in advance. Also, the FAT procedure shall be approved by INKEL.

Expenses for conducting FAT shall be borne by the contractor.

25. SITE ACCEPTANCE TESTING/INSPECTION

Items delivered to site shall be accepted only after acceptance test by INKEL/Client which may include physical verification, dimensional check, verification of nameplates and serial numbers, etc.

26. VISIT TO MANUFACTURER'S FACILITY

INKEL may decide to depute its representative to the works of the contractor's manufacturer/supplier for the purpose of drawing approval, expediting or inspection.

21. SITE VISIT

21.1. The Bidder shall mandatorily visit the site and understand the scope of work clearly before submitting his bid. Site visits shall be conducted only on the dates mentioned in the NIT in the presence of INKEL's representative. Bidders who wish to visit the site shall intimate the same to INKEL at least a day in advance from the date allocated for site visit as per NIT.

Creating Infrastructure
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PART -III

SCOPE OF WORKS
&
TECHNICAL SPECIFICATIONS

1. INTRODUCTION

1.1. Brief Description of the project

1.1.1. INKEL Limited has taken up the design (as per site conditions), supply, erection, testing & commissioning of Grid Tied Ground Mounted Solar PV Power plants at various location in Kerala for KSEBL.

1.1.2. The Supply of major components such as PV Modules, Module Mounting Structure (MMS), Power Conditioning Units (PCU) and Transformer are in the scope of INKEL Limited. Base design and engineering activities of the solar power plant will be carried out by INKEL.

1.1.3. INKEL intends to appoint a contractor for supply of Balance of system and carrying out identified activities under installation and commissioning of this grid connected ground mount solar power plants.

1.1.4. The plant is envisaged to have several other infrastructural support systems such as module cleaning system for SPV modules, plant illumination system, fire alarm system, SCADA, boundary fencing, approach roads, pathways, drainage system etc.

1.2. Location Details:

Place	Near 110kV Substation, Nenmara
District	Palakkad
State	Kerala
Language	Malayalam, English
Time zone	IST (UTC+5:30)
Latitude	$10^{o}35'38.7''$N
Longitude	$76^{o}34'58.6''$E
Pin Code	678508
Ambient Air Temperature	Maximum: 35º C Minimum: 21º C

1.3. Scope of this tender specification

1.3.1. Vendor scope includes supply, installation, testing and commissioning of certain identified activities of the solar photovoltaic power plant.

1.3.2. This scope includes activities but not limited to obtaining approval from INKEL for the datasheets/ drawings/ MQP, manufacture/ testing/ inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery to site, unloading, storage, installation and commissioning of certain AC and DC side activities of power plant identified under this specification.

Note: The above is only a broad outline of vendor scope for the sake of introduction. The detailed vendor scope is elaborated under various other sections of this specification.

1.4. Enclosures to this tender specification (Tender purpose only)

1	Tentative Single line diagram
2	Tentative SPV plant layout with solar array, Control rooms and transformer
3	Tentative layout of control room

4	Tentative SLD of Control room DB
5	Tentative SLD of UPS DB
6	Datasheet of PV Module & PCU
7	GA Drawings of MMS

2. SCOPE OF WORK

2.1. INKEL Scope of supplies and works

For clarity to the vendor, other items and activities within INKEL scope of solar PV plant end of the project are listed below:

a. Supply of Solar PV Modules.
b. Supply of Power Conditioning Unit (PCU)
c. Supply of Power Transformer.
d. Supply of Module Mounting Structure (MMS) including fasteners.
e. Obtaining sanction order from Chief electrical inspectorate

2.2. Bidder Scope of supply, installation and commissioning

All other items and work required for the commissioning of the Solar Power Plant which are not included in Sl. No. 2.1 above are in the scope of the bidder.

#	**Bidder Scope**
1	Supply of Items as per schedule of items as per the indicative Bill of Materials
2	Installation and commissioning work as per indicative schedule of Work

3. TECHNICAL SPECIFICATION FOR SUPPLY, INSTALLATION & COMMISSIONING

3.1. Civil Works

3.1.1. Land development for site activities

The EPC contractor shall be responsible for detailed soil investigation and contour survey at required locations for the purposes of foundation design for the module structure as well as the Control room. He shall also make the site ready by clearing of bushes, felling of trees, leveling of ground (wherever required) etc. for commencing the project. All Civil works required for the installation of a Photo Voltaic plant shall be within the scope of the bidder.

3.1.2. Mounting of Inverters and Inverter Accommodation

The bidder shall provide required materials for mounting the inverters as per manufacturer recommendations. The bidder shall provide canopy to protect inverters against direct sunlight, rain and harsh weather.

The layout of Inverter accommodation shall be designed so as to enable adequate heat dissipation and space availability within the existing infrastructure available in consultation with the Site in charge. The infrastructure shall be kept in adequate

enclosure locked, to avoid public intrusion. One Key of the same shall be given for the custody of the site in charge. All access to the installed infrastructure shall be made in concurrence with the Engineer in charge binding safety.

Suitable Panels and enclosures as per standards and weather proof enclosures as applicable in outdoor installations to be provided for inverters placing in outside systems.

3.1.3. **Illumination System**

Supply and providing of suitable illumination system for inverter accommodation, street lights, and control room area and transformer yard is in bidder's scope. The bidder shall opt for lighting fixtures and accessories based on energy saving concept technology such as LED.

3.1.4. **Building**

3.1.4.1. A control room to be constructed for housing the SCADA unit, HT VCB panel, Battery and UPS for protective relaying and storage for other materials, with minimum of 6m x 10 m size, painted with interior and exterior Emulsion, flooring with industrial floor tiles, doors / windows as specified to have sufficient ventilation, cable trenches etc. as per approved specifications. A toilet cum rest area of 2m x 6m shall also be included in the above area. ie; 6m x 8m for Control room and 2m x 6m for the rest area. The rest area can either be included in the first floor in case of space restriction in the available land. The size of the control room shall be designed to accommodate all the requirement of the solar plant.

3.1.4.2. Vendor shall supply materials and manpower to construct the control room as per approved drawings and other documents

3.1.4.3. Tentative layout is given for tender purpose only. Bidder can choose the design of the control room with suitable dimension accommodating all the features specified in this clause and approval shall be sought for accepting the same during detailed engineering. Layout of control room will be finalized during detailed engineering by INKEL.

3.1.4.4. Contractor shall prepare the detailed civil design of the control room structure based on the requirement mentioned above and the tentative layout provided. The design and drawings of the control room shall be submitted to INKEL for approval and approval shall be obtained before construction.

3.1.5. **Electrification**

Electrification of building shall be carried out as per IS 732 and other relevant standards. Only energy efficient LED light fixtures shall be used. The design of lighting system in the buildings shall be carried out as per IS 3646. The building shall be provided with adequate quantity of light fittings, 5A/ 15A 1 phase sockets, fans etc., controlled by required ratings of MCBs and MCB DBs.

3.1.6. **Fencing**

Suitable fencing shall be provided t by the bidder to cover the entire site area. Bidder has to submit required detail of fencing for approval and Approval shall be obtained from INKEL for type and design of fencing prior to construction.

3.2. Temporary site office

3.2.1. Vendor shall make necessary office arrangements such as portable cabin, furniture, electrical points/ fittings etc. at site during the period of project.

3.2.2. The temporary site office shall have sufficient space for accommodating Engineers of INKEL.

3.2.3. This office shall have sufficient toilet facilities.

3.2.4. In addition to above, adequate sanitation facilities shall be provided for the use of manpower deployed at site.

3.3. Electrical power and water for construction

Vendor shall organize, on their own, necessary electrical power supply such as DG sets and water supply etc. required for construction activities.

3.4. Construction of temporary yards for safe storage of vendor supplied items

Vendor shall, at a suitable location at the site, as decided based on discussions with INKEL site engineer, construct temporary yards for safe storage of vendor supplied items.

3.5. Civil works for transformer yard and foundation construction.

3.5.1. Vendor shall also construct the transformer foundations as well as transformer yard for accommodating 1.6MVA transformer.

3.5.2. Vendor should submit the drawing for approval of INKEL before construction.

3.6. Unloading, safe storage and movement of supply items received at site:

3.6.1. **Items supplied by vendor**

3.6.1.1. Vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc.) for unloading the items (supplied by the vendor) received at site and subsequent movement to storage yards.

3.6.1.2. Similar arrangements shall also be made by vendor for movement of the stored items from storage yards to the exact construction locations within the project site.

3.6.1.3. Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, LRs, delivery challans, material receipt certificates etc.) and shall take approval from INKEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to INKEL.

3.6.1.4. Registers shall be maintained for the yard to keep track of incoming/outgoing items.

3.6.1.5. Safety of items shall be in vendor scope. Accordingly, suitable watch and ward shall be deployed on round-the-clock basis.

3.6.2. **All other items (supplies from INKEL and other vendors)**

3.6.2.1. Receipt and unloading of all materials supplied by INKEL except SPV Modules and MMS will be in the scope of the bidder.

3.6.2.2. Movement of all these items from their respective storage locations to the points of construction is in scope of vendor. Accordingly, vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc.) for this purpose.

3.6.2.3. Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, LRs, delivery challans, material receipt certificates etc.) and shall take approval from INKEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to INKEL.

3.7. Installation of Module Mounting Structure (MMS) and mounting of PV modules

3.7.1. The installation of MMS and installation of PV modules shall be in the scope of the bidder and carried out as per approved drawings and instructions from INKEL.

3.7.2. The contractor shall remove plastic laminations on the module frame if any before installation.

3.8. Laying of DC cables for interconnection of SPV modules and inverters

3.8.1. Supply of SPV modules is in INKEL scope.

3.8.1.1. Type of module : Poly crystalline

3.8.1.2. Capacity : 335Wp

3.8.1.3. Total Capacity as per power plant capacity.

3.8.2. The vendor shall supply the following items for DC cable laying

3.8.2.1. UV rated DC cables 4 or 6sqmm for interconnection of SPV modules and the inverters.

3.8.2.2. DC Distribution boards with fuses SPDs and isolators of suitable ratings as per SLD

3.8.2.3. Suitable MC4 connectors, Y connectors, UV rated cable ties

3.8.2.4. Double Walled Corrugated pipes with suitable connectors and sizes as per requirement.

3.8.2.5. Cable ferrules and tools required for cutting and crimping of cables and connectors and laying the cables

3.8.3. 4sqmm cables shall be used for interconnecting the PV modules for route length up to 40meters. If route length is more than 40meters then 6sqmm cable is to be used for interconnecting the solar PV modules to the inverters

3.8.4. Routing of cable should be as per relevant IS standards

3.8.5. If cable is to be routed between the rows of solar array then cables with HDPE pipes (and Couplers / Joints etc) shall be directly buried under ground as per IS1255.

3.8.6. Cable entry openings of conduits shall be sealed using appropriate sealants

3.8.7. Maximum of seven circuits shall be run through one conduit and fill ratio of 50% space is occupied by cables.

3.8.8. Cable ties, nylon polyamide 6.6 UV stabilized black, UL94 flammability rating V2, operating temperature up to 85 deg C, shall be used to arrest any possibility of movement or sagging. Cable ties shall be of make: 3M, Phoenix contact, Weidmuller, Hellermanntyton, Panduit or other reputed equivalent subject to approval of INKEL.

3.8.9. Solar cables, wherever exposed to direct sunlight (including gaps between tables) and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.

3.9. Underground cable trenches and laying of Power and communication cables

3.9.1. Depth from ground surface to the top of the cable shall not be less than 0.9 meters for 11 kV cables

3.9.2. Depth from ground surface shall not be less than 0.75meters for LT power cables and control cables

3.9.3. Clearance between control and power cables shall not be less than 0.3 meters

3.9.4. Cables should be laid as per IS 1255 latest revision

3.10. Termination of cables at terminals of String Inverters (PCU).

3.10.1. Cables should be laid as per IS 1255 latest revision

3.10.2. The cables should be terminated at the string inverter terminals as per manufacturer recommendations.

3.10.3. Ferrules should be provided for identification of the cables.

3.11. Identification marking of cables using cable tags

3.11.1. Cable tags shall be provided on all power cables at both ends just before entering the equipment enclosure and every 20 m on cable tray or trench run.

3.11.2. Cable tags shall be of rectangular shape.

3.11.3. Cable tag shall be of 2mm thick aluminium with number punched (embossed) on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280.

3.11.4. ID numbering scheme shall be provided to vendor after Purchase order placement. Vendor shall submit the technical details of cable tags for INKEL approval during detailed engineering.

3.12. Installation of string inverters

3.12.1. The string inverter shall be installed as per the layout drawing and instruction manual.

3.12.2. Suitable angular/frame support with concrete foundation shall be provided as required along with canopy to protect the inverters from harsh rain and direct sunlight.

3.12.3. The ground below the inverter shall be provided with gravel to prevent water & mud spillage onto the inverter during rains.

3.13. Installation of electrical panels within main control room

3.13.1. Installation of LT distribution panels

3.13.2. 11kV HT breaker panel: 1 Set

3.13.3. Distribution boards (wall mounted): UPS DB, Auxiliary DB (room utilities), 1 No each + any extra boards as required

3.13.4. SCADA panel and sensors: 1 Set

3.13.5. HMI SCADA control desk with PCs and accessories: 1 set

3.13.6. Single phase auxiliary transformer with rating of 5KVA for auxiliary power.

3.13.7. UPS with battery bank – 1 Nos

3.13.8. Panels shall be moved to the respective positions and placed over the cable trenches in control room, in the exact sequence and locations as per drawings. Drawing shall be provided after placement of purchase order.

3.13.9. HT breaker panel shall be placed on cable trench of main control room, with cable entry openings to match cable trench on bottom side.

3.13.10. Panels shall be suitably grouted using welding/ bolting methods as per relevant standards and recommendation of OEMs. INKEL approval shall be obtained

for the grouting arrangement. All necessary hardware for the same shall be within vendor scope of supply.

3.14. Cable Trench inside control room

3.14.1. Cable trenches shall be provided inside the control room for routing LT and HT cables.

3.14.2. Open trenches after installation of inverter & HT panels shall be covered with removable chequered plate of sufficient thickness.

3.14.3. The cable trench shall be wide and deep enough to accommodate the cables running through the trench as per standards.

3.15. Supply and Installation of cable trays, cable laying/dressing etc. in main control room

3.15.1. Installation of cable trays

3.15.1.1. Vendor shall supply and install cable trays, fittings and accessories within control room for laying 11kV HT, DC/AC LT, control, communication cables etc. Cables trays shall be ladder type with horizontal corner bend pieces and shall have 750mm minimum width, 3mm minimum thickness and 100mm minimum height. Drawings/ make/ part number of these shall be submitted for INKEL approval.

3.15.1.2. Cable trays shall be installed by vendor on MS support angles provided in cable trench

3.15.1.3. Cable trays shall be in three vertical layer arrangements: bottom for 11kV cables, middle for LTAC/DC cables and top for control/data/ communication cables.

3.15.1.4. Suitable cut outs, wherever applicable, shall be made in the cable trays to provide path for the cable to reach the panel.

3.15.1.5. Cable trays shall be double earthed to the earth mat grid of the room.

3.15.2. **Cable routing, laying, dressing**

3.15.2.1. All Cables entering into control room from outside (solar array/ transformer yards) shall be bunched appropriately LT/HT/control category wise. The multiple bunches shall be routed through PVC conduit pipes already provided in the building below the plinth beam of room.

3.15.2.2. Cables (HT, LT, communication, control etc.) shall be laid on cable trays in separate tiers with appropriate spacing as per IS: 1255.

3.15.2.3. Control/ data/ instrumentation cables that run from inverter rooms to marshalling box of inverter transformers shall be routed through HDPE DWC conduit pipes of appropriate size.

3.15.2.4. Cables shall be dressed using appropriate cable ties at appropriate intervals to ensure firmness of their position over the trays.

3.15.2.5. Trefoil clamps shall be used wherever single core cables are used for three phase system. These clamps shall be at appropriate intervals to ensure firmness of bunching of cables.

3.15.2.6. All cable entry openings of conduit pipes, after laying/ termination of the cables, shall be sealed using appropriate sealant to ensure water proof tightness.

3.15.2.7. All cable accessories such as cable conduits/pipes, ties, trefoil clamps, sealants etc for the above purpose shall be in vendor scope of supply.

3.15.2.8. All the supply and installation work as mentioned above shall be as per "Cable installation methodology" section of this specification and as per drawings. Drawings shall be provided after placement of purchase order.

3.16. Laying, termination of LT/HT/aux supply cables main control room and in associated transformer

3.16.1. For all electrical panels viz. PCUs/ LT Panels / HT VCB panels/ UPS/ battery bank /DB boards/ aux transformer and inverter transformers of the inverter rooms, laying and termination of LT/HT/Aux power cables shall be in vendor scope.

3.16.2. For all electrical panels viz. PCUs/ HT breaker panels/ central inverter / UPS/ Battery bank / DB boards / aux transformers/ inverter transformers/ Power Transformer (11KV side) of the control room, laying and termination of LT/HT/Aux power cables etc shall be in vendor scope.

3.17. 11KV HT cable Laying and termination from power transformer to DP structure

The 11kV HT cable laying and termination work between power transformers to the HT VCB panel inside the control room, VCB Panel to DP structure which shall place near to the boundary of solar power plant shall be in the scope of the bidder.

3.18. Laying and installation of Control / data / instrumentation / Communication cables

3.18.1. All the cable installation accessories such as cable trays, cable conduits, cable glands, cable lugs, ferrules, cable ties, bolts, nuts, washers etc. shall be in vendor scope of supply. Cable laying and cable terminations shall be in vendor scope. All necessary resources such as labour, tools and accessories required to carry out laying and termination works etc. shall be in vendor scope.

3.18.2. Vendor shall lay and terminate the RS485 cables to SCADA from all plant equipment e.g. HT panels, ACDBs, transformers, FCBC, UPS etc. These cables shall be laid between the panels of respective inverter/ main control rooms.

3.18.3. Vendor shall lay and terminate the Ethernet cables to SCADA from (a) PCUs, (b) numerical relays of VCB panels. These cables shall be laid between the panels of main control room.

3.18.4. Vendor shall lay and terminate control and instrumentation cables from inverter transformers to SCADA and from HT breakers to SCADA.

3.18.5. Electrical Interconnections of HT breaker panels e.g. outgoer, incomers, Bus PT panels for inverter room and control room HT breakers.

3.18.6. Suitable size ferrules with details shall be provided on either side on either side of each control/ data/ instrumentation cable.

3.18.7. INKEL will provide cable schedules during execution.

3.19. Transformer Erection

3.19.1. Vendor shall erect transformer on RCC foundation as per transformer GA details. Vendor scope of Installation and Commissioning of transformers shall include:

3.19.1.1. Construction of transformer RCC foundations, fencing and gates for

transformer yard in control room and inverter room, Levelling, stone jelly, cable support structures fabrication & foundation works, all earthing related works-excavation etc.

3.19.1.2. Movement of transformer and its accessory parts such as radiators, cable boxes, hardware etc from storage yard and placement on foundation pedestal.

3.19.1.3. Assembly of transformer parts.

3.19.1.4. Cable laying and terminations at LV/HV/Marshalling boxes of transformer.

3.19.1.5. All activities applicable to oil filling and filtration including measurement of oil BDV and PPM. Particularly for inverter transformers, filtration of oil shall be carried out to such an extent as to obtain the desired BDV (>60 kV) and PPM (< 15ppm) values.

3.19.1.6. Testing of transformers as per pre-commissioning checks.

3.19.2. After installation of transformer, vendor shall level/ compact the ground with an appropriate magnitude and direction of slope to facilitate draining of rain water away from transformer yard. Accordingly, to prevent stagnation of water within transformer yard, vendor shall implement suitable civil works in and around the transformer yard. This shall include filling up the land (wherever necessary) with suitable soil and compact the filled-up portions either manually or with rollers, as applicable, as per site conditions, to achieve required compaction/slope.

3.19.3. **General Notes**

3.19.3.1. Vendor shall provide the 100 mm layer of stone gravels in transformer yards as per relevant IS standards / CBIP/ CEIG requirements etc.

3.19.3.2. Vendor shall provide applicable earthing connections to transformers, fencing / gates etc. in the yard as per relevant standards.

3.19.3.3. All other items (if any, other than the above) that are required to meet the technical requirements of transformer yard as per applicable standards / electricity rules shall be incorporated by the vendor.

3.20. Auxiliary AC/DC power supply system

3.20.1. Bidder shall establish an auxiliary AC supply system consisting of 5KVA single phase transformer for various utility power consumption purposes such as main control room lights, ceiling fans, exhaust fans, plant lighting, other electric appliances, auxiliary power supply to VCB panels, transformers etc.

3.20.2. Bidder shall submit detailed SLD diagram of Aux AC system with ELR/CBCT, MCCB, MCB types (TPN, DP, SP)/ Amp/kA ratings for incoming/ outgoing feeders for various electrical loads/utilities for INKEL approval during detailed engineering.

3.20.3. Following DB boards for application in main control room shall be in vendor scope of supply, installation and commissioning:

3.20.3.1. Control Room Auxiliary Power Supply DB (Refer SLD attached).

3.20.3.2. Control Room UPS DB for 230V AC UPS supply to SCADA, weather monitoring system, fire alarm system, emergency loads, central inverter & HT Panels control supply.

3.20.3.3. DC supply if required for control supply shall be provided with a battery pack and DC charger.

3.20.3.4. Above DBs shall be of reputed make such as Legrand, Siemens, Schneider or any other reputed make as approved by INKEL.

3.20.3.5. Installation of all the above items including all necessary cable terminations/ installation shall be in vendor scope.

3.21. Supply and Installation of Weather monitoring system

3.21.1. As part of weather monitoring system (WMS), vendor shall supply, install and commission Pyranometers, Anemometer, Temperature Relative Humidity sensors and data logger with all necessary software and hardware such as power supply/ control/ data/ communication cables, support structures etc. required to integrate with SCADA.

3.21.2. Scope of vendor shall also include erection of all the mounting arrangements including all necessary civil works/ foundations, clamps arrangement etc. as recommended by manufacturer and required at site. Communication cables shall be laid and terminated at both SCADA station at main control room and data logger at weather monitoring station end. Similarly, power supply cables shall be laid between WMS and DB boards in main control room.

3.21.3. Exact location of the weather monitoring station shall be decided during detailed engineering.

3.21.4. The following sensors are to be supplied, installed and wired by the contractor:

3.21.4.1. Ambient air temperature near array field

3.21.4.2. Control room temperature

3.21.4.3. Module back surface temperature

3.21.4.4. Wind speed at the level of the array plane

3.21.4.5. Solar radiation incidental to array plane

3.21.4.6. Solar irradiation

3.22. Supply and Installation of SCADA system

3.22.1. SCADA system supplied shall comprise of data station panels and PC based control desks with software to collect, store, process and report the data parameters of power plant and also to control the operations of the power plant by integrating the various equipment at the segments as follows:

3.22.1.1. Weather monitoring equipment

3.22.1.2. Power conditioning units: DC input / AC output parameters of inverters, grid data, fault status and events logged, etc.

3.22.1.3. Power transformer : Alarm/Trip signals, WTI/OTI temperature values.

3.22.1.4. 11kV HT breaker panels (as per SLD): ON/Trip status of VCB breakers, status of protection relays of transformer, oil / winding temperatures, AC parameters of the plant.

3.22.1.5. 11KV switchyard equipment and associated panels

3.22.1.6. Bi-directional meter data for transmission to SLDC.

3.22.2. The SCADA system should have monitoring software that support MQTT protocol to transmit date to PMKUSUM Portal and KSEBL data center

3.22.3. The SCADA system shall perform the following operations, which include the measurement and continuous recording of:

3.22.3.1. Ambient air temperature near array field
3.22.3.2. Control room temperature
3.22.3.3. Module back surface temperature
3.22.3.4. Wind speed at the level of array plane
3.22.3.5. Solar radiation incidental to array plane
3.22.3.6. Inverter output
3.22.3.7. DC output
3.22.3.8. AC and DC side Power of each inverter
3.22.3.9. Energy delivered to the Grid in kWh
3.22.3.10. System frequency
3.22.3.11. Solar irradiation
3.22.3.12. Voltage of the HT Side
3.22.3.13. Current and voltage of each sub-array/string
3.22.3.14. Power at HT terminal
3.22.3.15. PR ratio
3.22.3.16. Any other parameter considered necessary by supplier based on current prudent practice.

3.22.4. Vendor shall install the SCADA system in the main control room.

3.22.5. Cable laying/ terminations of all SCADA cables at respective rooms/ panels / equipment including cable trench works shall be in vendor scope.

3.22.6. The details list of data points to be monitored will be finalized during detailed engineering.

3.22.7. Desktop PC and wireless modem with licensed OS (Win 8 or above) shall be supplied.

3.23. Supply, Installation and commissioning of Earthing system

3.23.1. Vendor shall submit the calculations for INKEL approval and install the earthing system in line with IS 3043 latest amendments. Tentative Earthing layout as well as earthing schedule is attached as annexure.

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

3.23.3. Each array structure and modules of the PV yard shall be grounded in accordance with the safety regulations on electricity. All the components of the PV plant like modules and inverters etc shall be earthed as per manufacturers recommendations. The materials used for earthing shall be copper or hot dip galvanized iron strips. If GI strips are used joints shall be properly protected against corrosion by applying bituminous compounds as directed by the Engineer-in Charge. Earth electrode shall be copper clad iron rods or stainless-steel rods with chemical treatment for decreasing earth resistance. Earthing shall be designed to dissipate fault current for a period of 3 seconds. The earth electrodes shall be interconnected with hot dip galvanized steel flat of size 25X6 mm thick laid underground. The zinc coating shall be of 70 microns.

3.23.4. The complete earthing system shall be electrically connected to provide return to

earth from all equipment independent of mechanical connection

3.23.5. The equipment grounding wire shall be connected to earth strip by proper fixing arrangement. Each strip shall be continued up to at least 500mm from the equipments.

3.23.6. Earthing system design should be as per the standard practices and should confirm to the 1987 edition of IS 3043.

3.23.7. Masonry enclosure with the earth pit of size not less than 400mm X 400mm (depth) complete with cemented brick work (1:6) of minimum 150mm width duly plastered with cement mortar (inside) shall be provided. Hinged inspection covers of size not less than 300mm X 300mm with locking arrangement shall be provided. Suitable handle shall be provided on the cover by means of welding a rod on top of the cover for future maintenance.

3.23.8. Earthing system must be interconnected through GI strip to arrive equi-potential bonding. The size of the GI earth strip must be minimum 25mm X 6mm.

3.23.9. All metal casing / shielding of the plant shall be thoroughly grounded in accordance with Indian electricity act. The earthing for array and LT power system shall be as required as per provisions of IS.

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

3.23.11. All non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode. The earthing shall be done in accordance with relevant sections of the Central Electricity Authority (Measures relating to safety and Electric Supply) regulations 2010.

3.23.12. Material for earthing like, Earth electrode with back fill compound, GI strips etc. will be part of vendor's scope of supply.

3.23.13. All three-phase equipment shall have two distinct earth connections. An earth bus shall be provided inside the control facility. For each earth pit, necessary test point shall have to be provided. In compliance to Rule 33 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.

3.24. Supply, Installation and commissioning of Lightning protection system

3.24.1. The vendor shall supply, install Lightening protection system covering the entire plant area.

3.24.2. The lightning protection shall be provided for the entire plant as per IS 2309.The air terminations shall be designed by rolling sphere method with 40 mtrs dia. sphere. The inverter control room shall also be protected against lightning as per IS 2309(1989).

3.24.3. Earthing system shall be maintenance free and shall be as per IEC 62305 part 3 comprising of molecularly bonded copper of 99.9% purity on low carbon steel of 3 metres length (1mtr X 3nos) having diameter of 20mm with copper coating thickness of 250 microns with self-coupling peg and bore arrangements with fault current

withstand capacity of 20KA RMS for 1 seconds, universal clamps made of SS304 for clamping. Earth enhancing mineral compound shall be inert to subsoil and shall not pollute the environment and non-corrosive to earth rod. It should be free from hazardous substances. Polypropylene and polyethylene earth rod inspection chamber with heavy duty covers shall be used to cover earth rod. The inspection chamber shall be of minimum size 170X170X 190 mm not protruding from the ground level with a weight bearing capacity of 50kN.The earth rod shall be interconnected with hot dip galvanized steel flat of size 30X3 mm thick laid directly in ground. The zinc coating shall be of 70 microns.

3.24.4. The entire space occupying SPV array shall be suitably protected against lightning by deploying required number of lightning arresters. Lightning protection should be provided as per IEC 62305.

3.25. Identification marking using painting

3.25.1. Following items shall be identified by way of artistic painting in black letters with yellow background. For danger symbol/text, white letters in red background. Identification number/ text to be painted shall be submitted for INKEL approval during detailed engineering for the following.

3.25.1.1. Solar array structures

3.25.1.2. String monitoring boxes

3.25.1.3. Size/ source/ destination of DC cable with arrow mark (power flow direction) to be painted on SMBs and PCUs

3.25.1.4. AC chamber/ DC chamber, Danger text/symbol.

3.25.1.5. PCUs DC chamber back side: SMB ID numbers, cable size (with upward arrow mark, danger text/symbol

3.25.1.6. PCUs AC chamber back side: Transformer ID, cable size.

3.25.1.7. Same way as above, the corresponding panel ID with rating, cable destination with arrow mark in power flow direction, danger text/symbol shall be painted for all VCB panels, Inverter transformers (HV and LV sides).

3.25.1.8. Transformer cable boxes / marshaling boxes.

3.26. Cable markers and cables tags

3.26.1. Cable markers and joint markers for underground cables shall be provided along the route of the cables

3.26.2. Cable tags shall be provided at either of the cable (at the entry point to the panel / equipment to which it is connected / terminated) shall be provided

3.26.3. Cable tags details shall be provided by INKEL during detailed engineering.

3.27. Supply of Cables

3.27.1. Vendor shall supply all cables as per specifications approved by INKEL and single line diagram and cable schedule in this document.

3.27.2. All the supply and installation work as mentioned above shall be as per “Cable specification and installation methodology” section of this specification and as per drawings. Drawings shall be provided after placement of purchase order.

3.27.3. Vendor shall submit the documents for approval of INKEL and should be supplied as per approved documents from INKEL

3.28. Installation and commissioning of solar inverter, LT and HT panel

3.28.1. Vendor shall supply all cables as per specifications approved by INKEL and single line diagram and cable schedule in this document.

3.28.2. Vendor shall submit the documents for approval of INKEL, LT and HT Panels should be supplied as per approved documents from INKEL

3.28.3. The connection between solar inverter and transformer shall be appropriately rated Aluminium cable. It shall have provision to measure bus voltage, current and power feeding the transformer.

3.29. Supply and installation of DP Structure

3.29.1. Output of the HT panel shall be terminated at the DP structure which shall be placed near to plant boundary to facilitate easy evacuation to the KSEBL grid as per SLD/ Approved Drawing

3.29.2. Supply of all materials including civil foundation of the 11kV DP structure is in the scope of the bidder.

3.30. Supply installation and commissioning of Illumination System

3.30.1. The lighting system for outdoor and indoor areas of Solar Power Plant shall be designed in such a way that uniform illumination is achieved. In outdoor yard only equipment /bus-bar areas are to be illuminated and luminaries shall be aimed as far as possible towards transformer and central inverter

3.30.2. Supply and providing of suitable illumination system is in bidder's scope. The bidder shall opt for lighting fixtures and accessories based on energy saving concept technology such as LED.

3.30.3. Bidder may choose to provide stand-alone solar street light system on PV array areas.

3.31. Compliance to fire and Safety Regulations

3.31.1. Adequate firefighting equipment and extinguishing agents of sufficient capacity and quantity must always be available at site and kept ready for immediate use. The firefighting system for the proposed power plant for fire protection shall be consisting of: Portable fire extinguishers in the control room for fire caused by electrical short circuits and Sand buckets in the control room.

3.31.2. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards.

3.31.3. The fire extinguishers shall be provided in the control room housing PCUs as well as on the site where the PV arrays have been installed.

3.31.4. The fire extinguishers shall be suitable for fighting fire of oils, solvents, gasses, paints, varnishes, electrical wiring, live machinery fires and all flammable liquid & gas

3.32. Supply and installation of Energy meters

3.32.1. Vendor shall supply and install energy meters as per KSERC (Grid Interactive Distributed Solar Energy Systems) Regulation, 2020. The supplied meters shall be tested and approved by KSEBL.

3.32.2. Net metering system is to be provided. Net metering means a system consisting of a solar meter and net meter with their associated equipment. Solar meter means a

unidirectional meter to be installed at the delivery point of the solar energy system to measure the solar electricity generated. A solar meter and an import export energy meter suitable for the installed solar plant shall be supplied and installed by the contractor after obtaining testing and sealing from respective TMR Divisions. Meter must be provided with the necessary data cables if required.

3.32.3. Energy meters shall be installed and maintained in accordance with the provisions of The Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 as amended from time to time. The Contractor shall maintain the Metering System as per metering code and CEA guidelines. The defective meter shall be immediately tested and calibrated.

3.32.4. The accuracy class of the energy meters and current and potential transformers will be selected and agreed upon by INKEL so that all levels of energy produced or taken by the Solar Power Plant will be measured accurately, and this equipment has applicable accuracy class. Meters shall be microprocessor based conforming IEC 60687 / IEC 6205211 / IEC 62053-22 / IS 14697.

3.32.5. Meters shall measure active energy (both import and export) and reactive energy (import) by 3 ph, 4 wire principle suitable for balanced / unbalanced 3 phase loads. Tri-vector based energy meter shall have an accuracy class of energy measurement of at least Class 0.2 for active energy and at least 0.2 Class for reactive energy according to IEC 60687 and shall be connected to Class 0.2s CT cores and Class 0.2 VT windings.

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

3.32.7. DLMS compliant & AMR compatible with optical port and RS 232 port, 3 phase,4 wire, HT CT/PT operated, bidirectional accuracy class 0.2S for kWh and class 0.2S for kVARh, -/5A,Static Tri-vector meter with TOD register and having ISI marking.

3.33. HT Panel Relay testing

All protective relays, Current transformers, Potential transformers and energy meters have to be tested by KSEBL/Electrical inspectorate. Bidder has to remit the necessary testing charges to KSEBL/Inspectorate and compliance reports have to be submitted to INKEL. If any of the components is found defective or fails during testing, the same has to be replaced by the bidder.

3.34. Protection Devices of the HT Panel

The HT panles shall be tested & inspected by KSEB relay testing division before commissioning. Necessary fees for the same shall be paid by the contactor.

3.35. Pre-Commissioning Inspection / Checks / Tests

Vendor shall be responsible for carrying out pre-commissioning tests as per Inspection requirement table.

3.36. Trial run and Performance Guarantee test

Vendor shall provide support arrangements and required personnel on site for carrying out trial run and Performance Guarantee test

3.37. Construction of open well /tube well

3.37.1. Vendor shall construct open well / tube well and lay pipes along the length of the array with tapping and flexible hoses for cleaning of solar modules

3.37.2. Suitable pumps and water tanks along with electrical works for cleaning shall also be provided by the vendor.

3.38. Miscellaneous

3.38.1. Vendor shall supply all items such as tools, tackles and other materials which are necessary to complete the works mentioned in the scope of vendor and not mentioned in INKEL scope.

3.38.2. Vendor has to handover tools required for Operation and maintenance of the power plant.

4. CABLE SPECIFICATION AND INSTALLATION METHODOLOGY

4.1. Codes and Standards

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.

4.1.1. IS:513 Cold rolled low carbon steel sheets and strips.

4.1.2. IS:802 Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.

4.1.3. IS:1079 Hot Rolled carbon steel sheet & strips

4.1.4. IS:1239 Mild steel tubes, tubulars and other wrought steel fittings

4.1.5. IS:1255 Code of practice for installation and maintenance of

4.1.6. power cables upto and including 33 KV rating

4.1.7. IS:1367 Part-13 Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).

4.1.8. IS:2147 Degree of protection provided by enclosures for low voltage switchgear and control gear

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

4.1.10. IS:2629 Recommended practice for hot dip galvanizing of iron & steel

4.1.11. IS:2633 Method for testing uniformity of coating on zinc coated articles.

4.1.12. IS:3043 Code of practice for Earthing

4.1.13. IS:3063 Fasteners single coil rectangular section spring washers.

4.1.14. IS:6745 Methods for determination of mass of zinc coating on zinc coated iron & steel articles.

4.1.15. IS:8308 Compression type tubular in- line connectors for aluminium conductors of insulated cables

4.1.16. IS:8309 Compression type tubular terminal ends for aluminium conductors of insulated cables.

4.1.17. IS:9537 Conduits for electrical installation.

4.1.18. IS:9595 Metal - arc welding of carbon and carbon manganese steels -

recommendations.

4.1.19. IS:13573 Joints and terminations for polymeric cables for working voltages from 6.6kv up to and including 33kv performance requirements and type tests.

4.1.20. BS:476 Fire tests on building materials and structures

4.1.21. IEEE:80 IEEE guide for safety in AC substation grounding

4.1.22. IEEE:142 Grounding of Industrial & commercial power systems

4.1.23. DIN 46267 (Part-II) Non tension proof compression joints for Aluminium conductors.

4.1.24. DIN 46329 Cable lugs for compression connections, ring for Aluminium conductors

4.1.25. VDE 0278 Tests on cable terminations and straight through joints

4.1.26. BS:6121 Specification for mechanical Cable glands elastomers and plastic insulated cables.

4.1.27. Indian Electricity Act

4.1.28. Indian Electricity Rules.

4.1.29. Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

4.2. Cable specifications

4.2.1. General

4.2.1.1. Irrespective of utilization voltage and current rating all type of power cables shall be minimum of 1100 V grade PVC/XLPE insulated conforming to IS: 1554 / IS 694. The control and power cable has to be laid separately. All LT XLPE cables shall conform to IS: 7098 Part I & II. All wires used on the LT side shall conform to IS and should be of appropriate voltage grade.

4.2.1.2. Cable inside the control facility/ switch yard shall be tagged and laid galvanized cable trays or mounted on mild steel supports duly painted. For Substation buildings, the Cables laid through the existing constructed trenches, shall be marked separately and the work shall be executed without damaging the existing infrastructure under authorization of operator on Duty. For laying/termination of cables latest BIS/IEC Codes/standards shall be followed.

4.2.1.3. The cables shall be adequately insulated and UV protected for the voltage required and shall be suitably color coded for the required services. Bending radii for cables shall be as per manufactures recommendations and IS: 1255. Cables shall also confirm to IEC 60189 for test and measuring methods.

4.2.1.4. Cables used on the DC side shall be of 1.8kV grade.

4.2.2. Cables

4.2.2.1. For the array level DC cabling, 1.8kV XLPE or XLPO insulated and sheathed, UV stabilized single core flexible copper cables shall be used; multi-

core cables shall not be used.

4.2.2.2. For DC cabling from SMB to PCU, XLPE Al. cables of 1.8kV grade or above shall be used.

4.2.2.3. For the AC cabling, PVC or XLPE insulated and PVC sheathed single or, multicore flexible copper/aluminium cables shall be used, Outdoor AC cables shall have a UV - stabilized outer sheath

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

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

4.2.2.6. The DC cables from the SPV module array shall run through a UV-stabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm

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

4.2.2.8. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50cm; The minimum DC cables size shall be 6.0mm2 copper; The minimum AC cable size shall be 4.0mm2 copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wire.

4.2.2.9. The following colour code shall be used for cable wires

4.2.2.10. DC positive: red (the outer PVC sheath can be black with a red line marking

4.2.2.11. DC negative: black

4.2.2.12. AC single phase: Phase: red; Neutral: black

4.2.2.13. AC three phase: phases: red, yellow, blue; Neutral: black Earth wires: green

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

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

4.2.2.16. Bending radii for cables shall be as per manufactures recommendations and IS: 1255. Cables shall also conform to IEC 60189 for test and measuring methods.

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

4.2.3. **DC cables**

4.2.3.1. Should have Multi Strand Annealed high conductivity copper conductors.

4.2.3.2. The cables shall be adequately insulated and **UV protected** for the voltage required and shall be suitably color coded for the required services and confirm to IEC 69947.

4.3. Cable installation

4.3.1. Cable installation shall be carried out as per IS: 1255 and other applicable

standards.

4.3.2. For Cable unloading, pulling etc. following guidelines shall be followed in general:

4.3.3. Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e., with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.

4.3.4. While laying cable, ground rollers shall be used at every 2-meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Engineer in Charge.

4.3.5. Cables shall be laid on cable trays strictly in line with cable schedule

4.3.6. Power and control cables shall be laid on separate tiers in line with approved guidelines /drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, HT cables shall be laid on topmost tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every two meters. All multi core cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with self-locking type nylon cable straps with de-interlocking facilities. For horizontal trays arrangements, multi core power cables and control cables shall be secured at every five-meter interval. For vertical tray arrangement, individual multi core power cables and control cables shall be secured at every one meter by nylon cable strap. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by aluminium strips at every five-meter interval and at every bend.

4.3.7. Bending radii for cables shall be as per manufacturer's recommendations and IS: 1255.

4.3.8. Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.

4.3.9. No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Vendor

shall identify and accordingly procure the cable drum length.

4.3.10. In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.

4.3.11. Wherever few cables are branching out from main trunk route troughs shall be used.

4.3.12. Wind loading shall be considered for designing support as well Cable trays wherever required.

4.3.13. Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.

4.3.14. The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Contractor shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.

4.4. Separation

At least 300mm clearance shall be provided between:

- HT power & LT power cables,
- LT power & LT control/instrumentation cables,

4.5. Segregation

4.5.1. Segregation means physical isolation to prevent fire jumping.

4.5.2. All cables associated with the unit shall be segregated from cables of other units.

4.5.3. Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set.

4.5.4. In switchyard, control cables of each bay shall be laid on separate racks/trays.

4.6. Cable tags

Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags. Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench

runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags.

4.7. Protection of unarmored cables

While crossing the floors, unarmored cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray.

4.8. Cable Terminations & Connections

4.8.1. The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Engineer in Charge. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Contractor shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site.

4.8.2. Work shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Engineer in Charge.

4.8.3. The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets.

4.8.4. Control cable cores entering control panel/switchgear/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with self-locking type nylon cable ties with de interlocking facility to keep them in position.

4.8.5. All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, -etc along with cable numbers and coiled up after end sealing. Supply of ferrules is in Vendor’s scope.

4.8.6. All cable terminations shall be appropriately tightened to ensure secure and reliable connections

5. INSPECTION REQUIREMENT TABLE

The vendor shall be responsible for carrying out following minimum tests / Checks and any other tests as per requirements of INKEL / KSEBL / Electrical Inspectorate for synchronizing with the grid and post commissioning operation of the plant.

Inspection Requirement Table

A	Basic Checks	
	A1	Tightness checks
		1. Terminations of AC/DC power cables, PCUs, Inverter transformers, Aux transformer,UPS/ FCBC/Battery banks, Aux AC/DC DB boards, 11kV HT panels, LV side of Inverter transformer, SCADA panels etc. 2. Terminations of Control/ Instrumentation/ Data/ Communication cables wherever applicable. 3. Terminations of earthing at all electrical equipment/ panels of control room 4. Terminations of earthing of inverter transformers 5. Terminations of earth chambers of vendor scope. Note: For M10 and above, torque wrench settings shall be followed for reference.
	A2	Electrical continuity checks
	A3	Megger (5kV) checks for all HT (11kV) cables
	A4	Hi-pot testing for all HT (11kV) cables prior to connection to the panels/ transformer
	A5	Megger (1kV) checks for all 1.1kV grade cables
	A6	AC/DC supply checks at TBs of all electrical panels/ DBs/ Transformer.
B	Pre-Commissioning electrical tests	
	B1	Power conditioning units (with the support of PCU service engineer at site)
		1. DC side open circuit voltage and verification with SMB side measurements 2. Vendor to provide technician support to PCU service engineer for all other pre-commissioning tests as per OEM checklist 3. Functioning of duct fans (operation, direction of rotation)
	B2	Inverter transformers
		1. Oil filtration: Equipment of adequate evacuation/ heating/ oil circulation capacity shall be deployed at site for this purpose. Filtration shall be carried out adequately in order to achieve the BDV, ppm, tan delta values within the limits as per relevant standards and as measured by NABL accredited laboratory. The machine shall have built-in BDV measuring set up for in-situ checking of BDV during filtration process. DG if required for oil filtration shall be arranged by vendor. 2. IR tests LV-HV, HV-E, LV-E 3. Fault simulation checks (at VCB breaker panels) :- OTI,WTI, PRV, LOLA etc 4. Alarm, trip settings (S1, S2) for WTI, OTI 5. Oil level at conservator (to be topped up, if required)
	B3	Current Transformers

		1. IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2. Ratio tests / primary injection
	B4	Potential Transformers
		1. IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2. Voltage ratio test 3. Polarity test
	B5	11KV HT Panel
		1. IR tests 2. Contact resistance measurement (CRM) 3. Timing test: close/ open/ close-open 4. Functional checks: breaker open/close, spring-charged motor 5. Remote operation from SCADA panels: open/close, command/status, lamp indications
	B6	Numerical relays at HT panels
		1. Relay calibration using applicable kit/ software 2. IDMT, DT curves with timing/pickup settings in all relays basedon gradation across from downstream to upstream taking into account settings at substation 3. Overcurrent/ earth fault pickup/ tripping time tests
	B7	CT ratio / PT ratio to be set in meters/relays
		1. All MFM meters 2. Protection relays
	B8	ACB breaker settings (with the help of PCU service engineer)
		1. Over load, Short time fault, ground fault
	B9	Earth resistance measurements for all chambers of vendor scope
		1. With electrode connected to grid 2. Without connecting electrode to grid
	B10	UPS/ Battery banks
		All functional checks: battery charging/ battery output parameters etc. as per OEM checklists
	B11	Tests on Lightning Arresters
C	Coordination activities by Vendor	
		1. All necessary testing kits/ instruments shall be arranged as per the requirements of inspection agency. Basic instruments such as digital multimeter, 5kV digital megger with PI feature, earth resistance meter, VCB open/close timing test kit, clamp meters etc shall be organized at site at the time of inspection. Competent electrical technician shall also be made available at the site. 2. Vendor shall implement all the observations of KSEBL / CEI related to solar power plant and the power evacuation infrastructure installed by the bidder.

D	Commissioning of power plant
	1. Vendor shall organize all necessary tools/ measuring instruments required to operate the various electrical equipment at the time of commissioning: Digital megger 5KV with PI feature, Earth resistance tester, Phase sequence meter, Clamp meters etc., discharge rods, PPE, safety gadgets (helmets, shoes etc.). 2. It is the responsibility of the vendor to interact technically with upstream contractors for successful charging of 11kV grid line followed by charging of 800V/11kV transformer at SPV plant end 3. Vendor shall participate actively in the commissioning until it is established that there is successful export of power from all the PCUs at full load and through the 11kV transmission line.
E	Trial run and Performance Guarantee test
	After commissioning and completion of all works including clearing of all punch points, trail run of the plant will be commenced for 7 consecutive days based on acceptance by KSEBL/ INKEL. Immediately after trial Performance Guarantee test shall start for a period of 30 days. During trial run and PG test vendor shall deploy manpower, operate and maintain the plant and ensure that there are no breakdowns in any equipment, all required tools and spares are available.

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Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

PART -IV

ANNEXURES
&
FORMATS

LIST OF ANNEXURES

ANNEXURE – 1 : COVERING LETTER

(on the letterhead of the company)

From,
(Insert address of the bidder)

To
The General Manager – Renewable Energy
INKEL Limited
Kakkanad

Sub: Selection of contractor for Supply of BOS items and I&C of 1.5MWp grid connected ground mount solar power plant.

Dear Sir,
We, the undersigned……..[insert name of the 'Bidder'] having read, examined and understood in detail the tender document for Supply of BOS items and I&C of 1.5MWp grid connected ground mount solar power plant, hereby submit our bid comprising of price bid and non-financial Bid. We confirm that neither we nor any of our Parent Company / Affiliate/Ultimate Parent Company has submitted bid other than this bid directly or indirectly in response to the aforesaid tender.

1. We give our unconditional acceptance to the tender, dated……and tender documents attached thereto, issued by INKEL Limited, as amended. This shall also be construed as a token of our acceptance to the tender documents including all its amendments and clarifications uploaded on www.inkel.in website. We shall ensure that we execute such tender documents as per the provisions of the tender and all provisions of such tender documents shall be binding on us.
2. **EMD**
   We have enclosed EMD of Rs. 50,000/- , in the form of Demand drafts dated ……[Insert dates of DD].We have claimed for EMD exemption and has attached supporting documents.
3. We have submitted our Price Bid strictly as per Annexure- 8 of this tender, without any deviations, conditions and without mentioning any assumptions or notes for the Price Bid in the said format(s).

4. **Acceptance**
   We hereby unconditionally and irrevocably agree and accept that the decision made by INKEL LTD. in respect of any matter regarding or arising out of the tender shall be binding on us. We confirm that there are no litigations or disputes against us, which materially affect our ability to fulfil our obligations with regard to execution of projects of capacity offered by us.
5. We are enclosing herewith the Cover-I (Covering Letter, bid agreement and EMD) Cover-II (Non-Financial bid documents) and Cover III (Price Bids) containing duly signed formats, each one duly sealed separately as desired by you in the tender for your consideration.
6. It is confirmed that our Bid is consistent with all the requirements of submission s stated in the tender and subsequent communications from INKEL LTD. The information submitted in our Bid is complete, strictly as per the requirements stipulated in the tender and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our Bid. We confirm that all the terms and conditions of our Bid are valid for acceptance for a period of six months from the opening of financial bid. We confirm that we have not taken any deviation so as to be deemed non responsive.

Dated the_____day of_____, 2020

Thanking you,
Yours faithfully,

Name, Designation and Signature of Authorized Person

ANNEXURE – 2: PRELIMINARY AGREEMENT

(AGREEMENT TO BE EXECUTED BY THE BIDDER AND TO ACCOMPANY THE BID IN KERALA GOVERNMENT STAMP PAPER WORTH Rs.200/-)

Articles of agreement executed on this the……day of……. two thousand……. Between …… ……, (hereinafter referred to as "INKEL.") of the one part and Sri……. (here enter name and address of the Bidder) (herein after referred to as "the bounden") of the other part.

WHEREAS in response to the invitation for Bid as per Notification No……. dated…….and subsequent amendments thereto, the bounden has submitted INKEL, a Bid for the ……specified therein subject to the terms and conditions contained in the said Bid documents.

NOW THESE PRESENTS WITNESS AND it is hereby mutually agreed as follows:

In case the Bid submitted by the bounden is accepted by INKEL with or without modifications and the Contract for the execution of ..... is awarded to the bounden, the bounden shall within 15 days of Letter of Award execute an agreement with INKEL incorporating all the terms and conditions under which the 'INKEL accepts his Bid.

In case the bounden fails to execute the agreement and furnish PBG as aforesaid incorporating the terms and conditions governing the Contract INKEL shall have power and authority to recover from the bounden any loss or damages caused to INKEL by such breach as may be determined by INKEL, the deficit amount may be recovered from the bounden and his properties movable and immovable and also in the manner hereinafter contained. All sums found due to INKEL under or by virtue of this agreement shall be recoverable from the bounden and his properties movable and immovable under the provisions of the Revenue Recovery Act for the time being in force as though such sums are arrears of land revenue and also in such other manner as INKEL may deem fit.

In witness whereof Shri/Smt. ……. (here enter name and designation) for and on behalf of INKEL and Shri/ Smt.……the bounden have here unto set their names the day and year shown against their respective signatures.

Signed by Shri. / Smt. …….
(Date)

In the presence of witnesses:

1. 2.

ANNEXURE – 3: GENERAL PARTICULARS OF THE BIDDER

(on the letterhead of the company)

1	Name of the Bidder	
2	Registered Office Address	
3	Telephone	
4	E-mail	
5	Website	
6	Authorized contact person(s) with name, designation, Address and mobile phone no., e-mail address to whom all references shall be made	
7	Year of incorporation	
8	Bidder PAN Number	
9	Bidder GST Number	
10	Have the Bidder ever been debarred by any Govt. Dept. /Undertaking for undertaking any work?	
11	Reference of any document information attached by the bidder other than specified in the tender	

ANNEXURE – 4: DECLARATION BY BIDDER

(on the letterhead of the company)

I/We,…… …… ……. hereby declare that I am not in any way related to any employee of INKEL Limited who is in charge of or having control of this work. I agree that if, at any stage, it is found that this declaration is untrue, the contract entered will stand cancelled. It is understood that the relationship with INKEL LTD. referred to herein will be restricted to my Father, Mother, Son, Daughter, Brother, Sister, Direct Uncle, Nephew, Father-in-law, Mother-in- law, Brother-in-law, Sister-in-law, and First Cousins of the Officer concerned.

Place:

Date: Signature of bidder

ANNEXURE – 5: NO DEVIATION CERTIFICATE

(On the Letter Head of company)

Bid No……. dtd…….

To

The Managing Director,

INKEL LIMITED

Dear Sir,

We understand that any deviation/exception in any form from our bid against the above-mentioned reference number may result in rejection of our bid.

We, therefore, certify that we have not taken any exceptions/deviations anywhere in the bid and we agree that if any deviation is mentioned or noticed, our bid may be rejected.

Yours faithfully,

(Signature of Authorized Signatory)

Name:

Designation:

Company seal:

Note: This "No Deviation Certificate" should be written on the letter head of the bidder indicating BID No. duly signed and stamped with date by a person competent and having the power of attorney to bind the bidder.

ANNEXURE – 6: BID SUBMISSION CHECKLIST

Cover 1
Covering Letter
EMD
Bid Agreement
Cover 2
The entire tender document signed and sealed by the bidder as a token of acceptance of all the terms and conditions of this tender.
General Particulars, Declaration by the bidder, No deviation certificate, Undertaking by bidder for No blacklisting & No Banning
List of works completed along with supporting documents to prove eligibility criteria
Documents to prove financial eligibility criteria - Annual Turnover or Net Worth Certificate issued by a Chartered Accountant, Audited financial statements for the at least 3 years (Annual Turnover, Balance sheet, profit and loss account)
Certificate of Incorporation from the Registrar of Companies, partnership deed or LLP/ Sole Proprietor registration, as applicable and relevant
GST Registration Certificate
All other documents as per the tender document.
Cover 3
Price Bid (BOQ) as per Annexure 7

The above checklist is a reference for the minimum list of documents to be submitted as part of the bid. It is the bidder's responsibility to ensure that all relevant documents as per terms & conditions of the bid are submitted in the designated covers.

ANNEXURE – 7: UNDERTAKING FOR NO BLACKLISTING & NO BANNING

To
The Managing Director,
INKEL LIMITED

I/ We hereby declare that presently our Company/Limited Liability Partnership/ Partnership Firm/ Sole Proprietorship is having unblemished record and is not declared ineligible for corrupt/fraudulent practices by any State/Central Government/PSU on the date of Bid Submission.

I / We further declare that presently our Company/Limited Liability Partnership/ Partnership Firm/ Sole Proprietorship is not blacklisted and not declared ineligible for reasons other than corrupt/fraudulent practices by any State/Central Government/PSU on the date of Bid Submission.

If this declaration is found to be incorrect then without prejudice to any other action that may be taken, our security may be forfeited in full and the tender if any to the extent accepted may be cancelled.

Sign and Seal of the Bidder

ANNEXURE – 8: PRICE BID FORMAT (BOQ)

Name and Full Address of the Bidder:				
Sl No	**Description**	**Basic Price**	**GST**	**Total**
1	Supply of BOS items as per Scope of work and technical specification for commissioning of 1.5MWp grid connected solar power plant.			
2	Installation and commissioning work as per Scope of work and technical specification for 1.5MWp grid connected solar power plant.			
	Total (In Figures)			
	Total (In Words)			

Sign and Seal of the Bidder

NOTE:

Price shall be for carrying out the entire works as per the Scope of Work and Technical Specifications and all related works for executing everything necessary to complete the project satisfactorily in all respects as detailed in the Tender document.

ANNEXURE – 9 : INDICATIVE BILL OF MATERIAL FOR SUPPLY

INDICATIVE BILL OF MATERIALS FOR 1.5MWp PROJECT			
Sl No	**ITEM**	**SPECIFICATION**	**MAKE**
1	DC Cables	4/6 sqmm UV Rated DC Solar Cable 1.8KV	Seichem/Polycab/KEI
2	MC4 Connectors	TUV approved IP67/IP68 rated suitabke for 1500V system voltage	Reputed
3	Cable Tie	UV Resistant suitabel for outdoor application	Reputed
4	Ferrules/Tags	UV Rated for string identification at inverter DC input and at PV array Level (+ve and -ve to be marked separately for each string)	Reputed
5	HDPE Pipes	HDPE DWC pipe ID 50 mm (or suitable sizes)	Reputed
6	HDPE pipe couplers and joints	Suitable for above	Reputed
7	DC DB for each inverter	1500V, 10A Fuses (Positive & Negative) Type II DC SPD's 1500V, 40A DC Isolators	Fuse - Mersen/ Eaton DC SPD - Phoenix/ Mersen Isolator - Chint/Eaton/FEEO
8	LT AC Cable	1.1kV Al XLPE Armoured Cable sizes as per cable schedule	Polycab/Havells/KEI/Gloster
9	Cable Lug	Bimetallic lugs of suitable size as required	Comet/Dowells/Jainson
10	Cabling Clamps	As per cable size	Reputed
11	Indoor cable termination kit	Suitable for supplied cables including glands and lugs	Raychem/3M
12	LT Panel	7 in 1 out, with 6 Nos 250A 4P MCCBS at input and 1 No of 1500A, 4P draw out type ACB at output, Cu. Bus bar, CTs, PTs, relays, meters and other accessories as per SLD. The MCCBs and ACB is to be rated for 800V operating voltage	Switchgear - L&T/ABB/Schnieder CT - Reputed Relays - L&T/Alstom/ABB Meters - L&T/Schnieder/Rishab
13	Mounting accessories for LT panel	C Channels/L Angles, nuts, bolts and accessories	Reputed
14	Indoor cable termination kit	Suitable for supplied cable including glands and lugs	Comet/Dowells/Jainson
15	Outdoor termination kit	Suitable for supplied Cable including glands and lugs for termination at transformer LT side	Comet/Dowells/Jainson
16	Accessories for transformer erection	As per standard practice compying to IS & KSEB standards	Reputed
17	Outdoor HT cable termination kit	Heat shrinkable suitable for supplied HT Al XLPE Cable for termination at Transformer HT side	Raychem/3M

18	HT Panel with metering	With 630A draw out type VCB, Bus bar, CTs, PTs, relays, meters and other accessories as per SLD with metring cubicle housing ABT compliant Bidirectional Meters	Switchgear - L&T/ABB/Schnieder CT - Reputed Relays - L&T/Alstom/ABB/Siemens/C&S Meters - L&T/Schnieder/Rishab Bi-directional energymeter - L&T/Secure
19	Indoor HT cable termination kit	Heat shrinkable suitable for supplied HT Al XLPE Cable for termination at HT Panel	Raychem/3M
20	HT Cable	11kV (E) Aluminium Armoured XLPE Grade Cable	Polycab/Havells/KEI/Gloster
21	11 kV DP Structure	With suitable foundation, Surge arresters, Insulators, AB switch and all accessories as per KSEB specifications	Reputed
22	Outdoor HT cable termination kit	Heat shrinkable suitable for supplied HT Al XLPE Cable for termination at DP Structure	Raychem/3M
23	SCADA System for Monitoring of the SPV Plant with sensors for weather monitoring & sending data to SLDC	As per Part 3 clause 3.21 & 3.22	Reputed
24	Sensors	1 no. wind sensor, 1 no. pyranometer, 1 no. module temperature sensor, 1 no. ambient temperature sensor inclusing necessary civil work	Reputed
25	UPS	5kVA UPS with 72V, 150Ah Battery Bank. Battery shall be mounted on corrossion free Battery stand.	Reputed make with service facility in Palakkad district
26	Auxillary Supply Transformer	5kVA, Single Phase	Reputed
27	Auxiliary Power DB	Vertical DB as per SLD	Legrand/L&T/Havells/C&S
28	UPS DB	As per UPS SLD	Legrand/L&T/Havells/C&S
29	Control room Electrification	20W LED tube light	Philips/Havells/Wipro
		Ceiling Fans	Usha/Orient/Bajaj/Crompton
		5A Plug points	Legrand/Anchor/GM
		15A Plug points	Legrand/Anchor/GM
		Switch board with switches as required	Legrand/Anchor/GM
		Exhaust Fan (250mm)	Khaitan/Havells/Usha/Bajaj
		Wires, conduits and accessories	Polycab/KEI/Vguard
30	Pump control DB	Minimum capacity suitable for 1HP Borewell Pump or for higher capacity as per site	Kirloskar/CRI/Vgurard
31	Auxiliary Power Supply Cable	1.1kV, 3.5Cx25 sqmm Al Armoured cable	Polycab/Havells/KEI/Gloster

32	GI strip	50X8 mm for earthing of all components in control room and connection to earth pit	Reputed
		25X3 mm for earthing of Module Mounting Structure in the field and connection to earth pit	Reputed
		50X8 mm for earthing of Transformer body earthing	Reputed
		50X8 mm for earthing of inverter	
		25X3 mm for earthing of all other equipments and metallic parts at site	Reputed
33	Earthing Cable	Cu flex Yellow-Green wire for equipment earthing in control room minimum size shall be 4.0 Sq.mm. All eqipments to be doubly earthed	Polycab/Havells/KEI/Gloster
34	Earthing Cable	1CX95 sqmm Cu flex Yellow-Green wire for inverter earthing	Polycab/Havells/KEI/Gloster
35	Cu. strip	25X3 mm for earthing of Transformer Neutral	Reputed
36	Neutral CT for Transformer SBEF Protection	Class 5P10	Reputed
37	Earth pit	Chemical earthing kit with Cu. Bonded earth elecrode and all accessories for Control Room earthing	Reputed
		Plate Earthing	
38	All other earthing materials as per specification	As per relevant IS standard of specification document.	Reputed
39	Lightning Protection System	As per specifications for entire power plant area	Reputed
40	Control Cables	As per Control Cable Schedule	Polycab/Havells/KEI/Gloster/Torrent/Lapp
41	Rubber Mat	Infront of all Electrical equipment in control room	Reputed
42	Fire Extinguisher	Liquefied CO2 fire extinguisher upright type of capacity 10 kg having IS: 2171 -7, IS: 10658 marked.	Reputed
43	First Aid Box		Reputed
44	Sign Boards	Danger boards, warning stickers as per standard	Reputed
45	Cable Route Markers	Along LT, HT & communication cables buried underground.	Reputed
46	Outdoor Lights	20W LED Luminary covering the control room outdoor area and transformer yard	Philips/Havells/Wipro/Bajaj
47	Bolts, nuts, channels, angles and other accessories	For fixing all the materials supplied except PV Modules and Inverters (All outdoor Fasteners to be SS 304 grade)	Reputed
48	Open well/Bore well with suitable pump and water tank		
49	Pressure pump & plumbing lines with valves and pipes for PV module washing		
50	Miscellaneous Items	Any other items necessary for completion of work as per specifications	Reputed

ANNEXURE – 10: INDICATIVE SCHEDULE OF WORK OF I&C

ANNEXURE - 10 INDICATIVE SCHEDULE OF WORK FOR INSTALLATION AND COMMISSIONING OF 1.5MWp GRID CONNECTED GROUND MOUNT SPV POWER PLANT AT NENMARA			
1	Installation of Module Mounting Structure (15X2 Table) with all materials for civil works such as excavation, augering, concreting, curing and so on. (1 AU is equivalent to activity for 1 Table). The land shall be levelled and compacted before installation of MMS	AU	150
2	Laying of 335Wp Solar PV Modules onto MMS (1 AU is equivalent to activity for 1 PV Module)	AU	4500
3	Construction of control room with all materials for civil works including plastering and painting	AU	1
4	Series interconnection of SPV modules to form strings and dressing of cables using cable ties (1 AU is equivalent to activity for 1 DCDB 25 strings per DCDB)	AU	6
5	Routing of 1Cx 6 or 4 sqmm cable from string at array level to DCDB along the purling and laying through HDPE pipe below ground in trenches as required and dressing of cables using cable ties (1 AU is equivalent to activity for 1 DCDB)	AU	6
6	Closing of cable trenches in solar array field including sand filling and brick laying (1 AU is equivalent to activity for 1 DCDB)	AU	6
7	Termination of 1C X 6 or 4 sqmm cables at PCU end (1 AU is equivalent to activity for 1 DCDB) & DCDB end	AU	6
8	Erection of 25 in 24 out DCDB on to the DCDB mounting stand (1 AU is equivalent to activity for 1 DCDB)	AU	6
9	Erection of 250kW PCU on to the PCU mounting stand with canopy (1 AU is equivalent to activity for 1 PCU)	Nos.	6
10	Supply & Installation of materials for Inverter mounting (1 AU is equivalent to activity for 1 PCU)	Nos.	6
11	Making end termination with brass compression gland and bimetallic lugs for 1CX 6 or 4 Sq.mm cable as required according to specification at Inverter DC side (Cable from DCDB to inverter).	Set	6

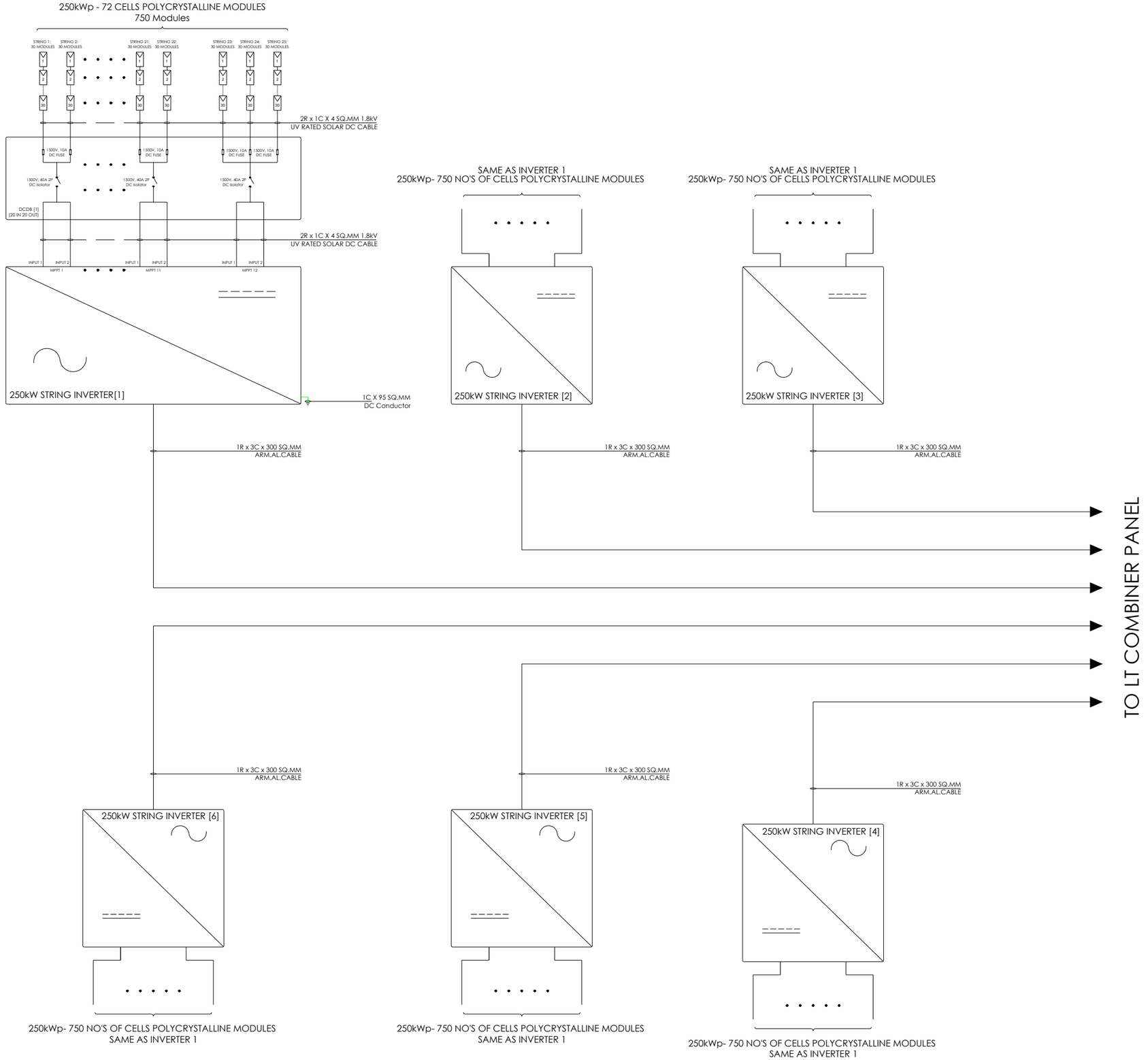
12	Making end termination with brass compression gland and bimetallic lugs for 3CX150 Sq.mm Arm. Aluminium cable of 1.1 KV grade as required according to specification at Inverter AC level(Cable from Inveter to LT Panel).	Set	6
13	Laying of 6 runs of 3CX300 Sq.mm Arm. Aluminium cable in ground including excavation, sand cushioning, providing protective covering and refilling the trench etc. as required according to specification from transformer to LT Panel.	Set	1
14	Making end termination with brass compression gland and aluminium lugs for 3C X 300 Sq.mm Arm. Aluminium cable of 11KV grade as required according to specification at transformer LV cable box.	Set	1
15	Construction of Transformer Yard with necessary land levelling and grading complete with all requirements such as metallic fencing, oil drain, bitumen surface layer, etc as per KSEB standards	Set	1
16	Construction of Transformer foundation plinth as per approved diagram following all civil practices such as compacting, curing, finishing, plastering & Painting.	Nos.	1
17	Erection, testing and commissioning of 1600KVA capacity Outdoor type 11000/LV, 3phase, ONAN, Vector DYN11, Oil type transformer with off circuit tappings of -5% & +5% in steps of 2.5, changeable by taplinks provided, with cable box on HT side for accomodating 3C x 300 sqmm 11kV Arm. Aluminium cable and cable box on LT side for accomodating 6Runs X3CX400 sqmm	Nos.	1
18	Making outdoor cable end termination with heat shrinkable termination kit complete with all accessories including lugs suitable for 3C X300 sq.mm, XLPE aluminium conductor cable of 11 KV grade as required	Set	1
19	Laying of one no. of 3C X 300 sq.mm, XLPE power cable of 11 kV grade cable in ground including excavation, sand cushioning, providing protective covering and refilling the trench etc. as required according to specification from transformer to HT Panel inside control room with all accessories as required (Transformer to HT Panel).	Set	1
20	Making indoor cable end termination with heat shrinkable termination kit complete with all accessories including lugs suitable for 3C X300 sq.mm, XLPE aluminium conductor cable of 11 KV grade as required.	Set	1
21	Erection testing and commissioning of 11kV Indoor HT Panel with metering along with all accessories	Set	1
22	Transporting and testing of CT-PT, indoor type, along with Bi Directional meter at KSEB testing lab (Excluding statutory fee), including all over heads.	Set	1
23	Making indoor cable end termination with heat shrinkable termination kit complete with all accessories including lugs suitable for 3C X300 sq.mm, XLPE aluminium conductor cable of 11 KV grade as required (Outgoing from HT Panel).	Set	1

24	Erection, testing and commissioning of 11kV DP Structre	Set	1
25	Laying of one no. of 3C X300 sq.mm, XLPE power cable of 11 kV grade cable in ground including excavation, sand cushioning, providing protective covering and refilling the trench etc. as required according to specification from HT Panel inside control room to DP Structure.	Set	1
26	Making outdoor cable end termination at DP Structure with heat shrinkable termination kit complete with all accessories including lugs suitable for 3C X300 sq.mm, XLPE aluminium conductor cable of 11 KV grade as required	Set	1
27	Laying and termination of RS485 cable from PCU to PCU for daisy chain looping with in HDPE conduit in ground including excavation, sand cushioning, providing protective covering and refilling the trench etc. as required (1 AU is equivalent to activity for 1 PCU)	AU	8
28	Laying and termination of communication cables in HDPE counduit in ground including excavation, sand cushioning, providing protective covering and refilling the trench etc. as required from PCU to SCADA panel in control room (1 AU is equivalent to activity for 1 PCU)	AU	8
29	Laying and termination of communication cables in HDPE counduit in ground including excavation, sand cushioning, providing protective covering and refilling the trench etc. as required from Weather Station to SCADA panel in control room	AU	1
30	Installation of other Electrical and Electronic equipment such as Aux Supply DB, SCADA, UPS with corresponding batteries and DBs, within inverter rooms and main control room (1 AU is equivalent to activity for 1 room)	AU	1
31	Erection, testing and commissioning of 11kV Panels		
32	Installation of cable trays in main control room	AU	1
33	Laying, termination and dressing of aux supply, control and communication cables in control rooms and in associated transformer yards as per cable schedule	AU	6
34	Installation of Weather sensors in the field (1 no. wind sensor, 1 no. pyranometer, 1 no. module temperature sensor, 1 no. ambient temperature sensor inclusing necessary civil work	AU	6
35	Installation of SCADA system inside the control room including RTU Panel, PC and accessories	AU	6

36	Wiring from each sensor to the SCADA panel	AU	6
37	Installation of Single Phase 5kVA Auxillary Transformer	AU	1
38	Earthing for solar PV Modules, Module mounting structure, inverters in the field	AU	1
39	Earthing system for control room equipment and 2000 kVA 11kV /LV transformer	AU	1
40	Identification marking of cables using cable tags (1 AU is equivalent to activity for 1 room)	AU	1
41	Identification marking of Solar array support structures, earth pits using painting (1 AU is equivalent to activity for 1 room)	AU	1
42	Identification of all equipment in Control room and 11KV transformer yards, earth pits marking using painting (1 AU is equivalent to activity for 1 room and associated transformer yard)	AU	1
43	Placement of Cable route markers along all cable trenches	AU	1
44	Placement of Display boards and sign boards	AU	1
45	Laying of Electrical insulation mats in Control room (Both in front and back of panels) (1 AU is equivalent to activity for 1 room)	AU	1
46	Installation of Miscellaneous Items such Lighing items for control room and other areas.	AU	1
47	Pre-commissioning inspections / checks / tests, MRT tests for Control room	AU	1

48	Commissioning and synchronization of power plant (1 AU is equivalent to activity for 1 room)	AU	1
49	Installation of PV Module cleaning system by laying PVC pipes, accessories, valves and other fittings along the PV field to ensure water availability throughout the PV array area	AU	1
50	Installation of borewell/ open well including all standard fittings and accessories (Electrical & Mechanical)		
51	Unloading and storage of materials for the project delivered by the Biddder and transportation within the site for installation/storage	AU	1
52	Unloading and storage of transformers and inverters for the project delivered by the INKEL and transportation within the site for installation/storage	AU	1

ANNEXURE – 11: TENTATIVE SINGLE LINE DIAGRAM



ELECTRICAL DETAILS

DC SYSTEM RATING @ STC	1500kWp		
AC SYSTEM RATING @ STC	1500kW		
MODULES USED	[4500] 72 CELLS POLYCRYSTALLINE - 335Wp		
POWER RATING @ STC	335Wp	MODULE EFFICIENCY	17%
VOC @ STC	46.27Vdc	MPP.V	37.90Vdc
ISC @ STC	9.41A	MPP.I	8.85A
MAX. ARRAY VOLTAGE	1500Vdc		

DC & AC SPD's are inbuilt within the inverter

INVERTER	[6] 250kW STRING INVERTER		
MAX. MPPT OPERATING VOLTAGE	1500V	MAX. INPUT CURRENT	30A per MPPT
MAX. AC POWER/ AC OUTPUT VOLTAGE	250kW/ 800V	MAX.OUTPUT CURRENT	180.5A

KSEB SIGN & SEAL

INKEL SIGN & SEAL

Client:
Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom, Thiruvananthapuram-695 004

Project By:
INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 1500kWp SPV System at 110kV Substation, Nenmara

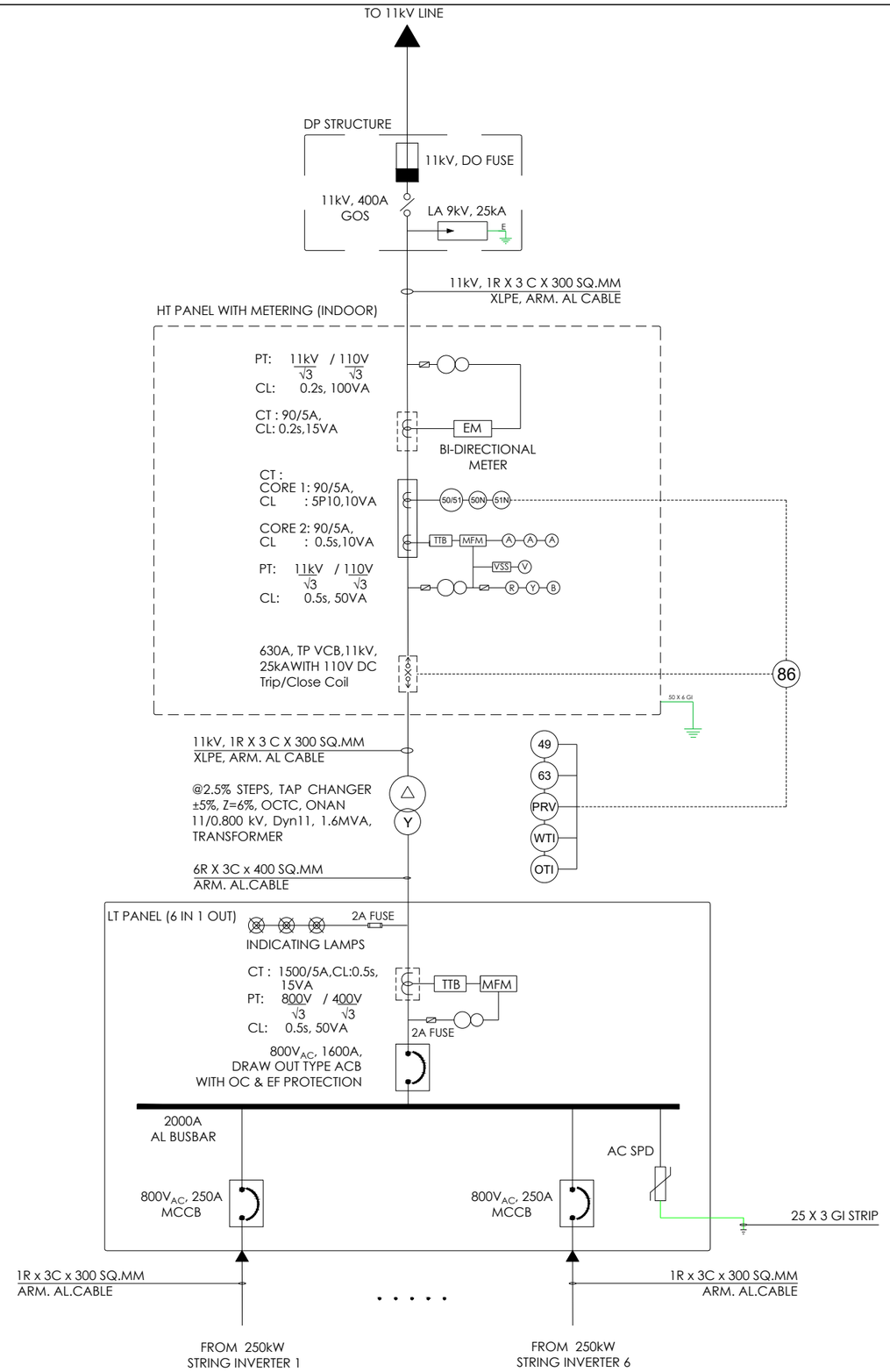
Notes:

Title: DC SLD (E1 of 2)
Issued For: Approval

Drawing No.	Scale	Date
IL-KSEB11MW-NMRA-COM-007	NTS	07/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

Rev.	Description	Date
1.0	For Approval	07/03/2023



LEGEND

	DROP OUT (DO) FUSE
	AIR BREAK (AB) SWITCH
	POTENTIAL TRANSFORMER
	AIR CIRCUIT BREAKER (ACB)
	LIGHTING ARRESTER
	TRANSFORMER
	CURRENT TRANSFORMER
MFM	MULTI FUNCTION METER
A	DIGITAL AMMETER
27	UNDER VOLTAGE PROTECTION RELAY
59	OVER VOLTAGE PROTECTION RELAY
50	INSTANTANEOUS OVER CURRENT RELAY
49	WINDING TEMP HIGH TRIP OIL TEMP HIGH TRIP
63	BUCHOLZ RELAY
51	AC INVERSE TIME OVER CURRENT RELAY
86	MASTER TRIP RELAY
51N	NEUTRAL AC INVERSE TIME EARTH OVER CURRENT RELAY
50N	NEUTRAL INSTANTANEOUS OVER CURRENT RELAY
	VACUUM CIRCUIT BREAKER (VCB)
OTI	OIL TEMPERATURE INDICATOR
WTI	WINDING TEMPERATURE INDICATOR
TTB	TEST TERMINAL BLOCK
PRV	PRESSURE RELEASE VALVE

ELECTRICAL DETAILS

DC SYSTEM RATING @ STC	1500kWp		
AC SYSTEM RATING @ STC	1500kW		
MODULES USED	[4500] 72 CELLS POLYCRYSTALLINE - 335Wp		
POWER RATING @ STC	335Wp	MODULE EFFICIENCY	17%
VOC @ STC	46.27Vdc	MPP.V	37.90Vdc
ISC @ STC	9.41A	MPP.I	8.85A
MAX. ARRAY VOLTAGE	1500Vdc		

DC & AC SPD's are inbuilt within the inverter

INVERTER	[8] 250kW STRING INVERTER		
MAX. MPPT OPERATING VOLTAGE	1500V	MAX. INPUT CURRENT	30A per MPPT
MAX. AC POWER/ AC OUTPUT VOLTAGE	250kW/ 800V	MAX.OUTPUT CURRENT	180.5A

AC CABLE SCHEDULE

DESCRIPTION	CABLE SIZE	AVG. LENGTH	VOLTAGE DROP
INVERTER 1- 6 TO LT PANEL	3C X 300 SQ.MM AC ARM. AL CABLE	120	0.74%
LT PANEL TO TRANSFORMER	3C X 400 SQ.MM AC ARM. AL CABLE	50	1.13%
TRANSFORMER TO EVACUATION POINT	3C X 300 SQ.MM AC ARM. AL CABLE	100	0.02%

KSEB SIGN & SEAL

INKEL SIGN & SEAL

Client:
KSEB കേരളത്തിന്റെ ഊർജ്ജം
Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom, Thiruvananthapuram-695 004

Project By:
inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA
INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 1500kWp SPV System at 110kV Substation, Nenmara

Notes:

Title: AC SLD (E2 of 2)

Issued For: Approval

Drawing No.	Scale	Date
IL-KSEB11MW-NMRA-COM-008	NTS	07/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

Rev.	Description	Date
1.0	For Approval	07/03/2023

ANNEXURE – 12: TENTATIVE SPV PLANT LAYOUT WITH SOLAR ARRAY

LEGENDS	
	PROPOSED AREA FOR MODULE PLACEMENT
	EXISTING OLD BUILDING
	EXISTING CANAL
	EXISTING TOWER
SYSTEM INFORMATION	
PV MODULE MODEL	72 CELLS POLYCRYSTALLINE - 335Wp (KSEB APPROVED MAKE)
NO. OF MODULES	4500
INVERTER	[6] 250kW STRING INVERTER
SURFACE	GROUND MOUNTED STRUCTURE
AZIMUTH	0°
TILT	10°
LOCATION CO-ORDINATES	10°35'38.8" N, 76°35'00.9" E

KSEB SIGN & SEAL

INKEL SIGN & SEAL

Client:
KSEB
കേരളത്തിന്റെ ഊർജ്ജം
Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom,
Thiruvananthapuram-695 004

Project By:
inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA
INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 1500kWp SPV System at 110kV Substation, Nenmara

Notes:

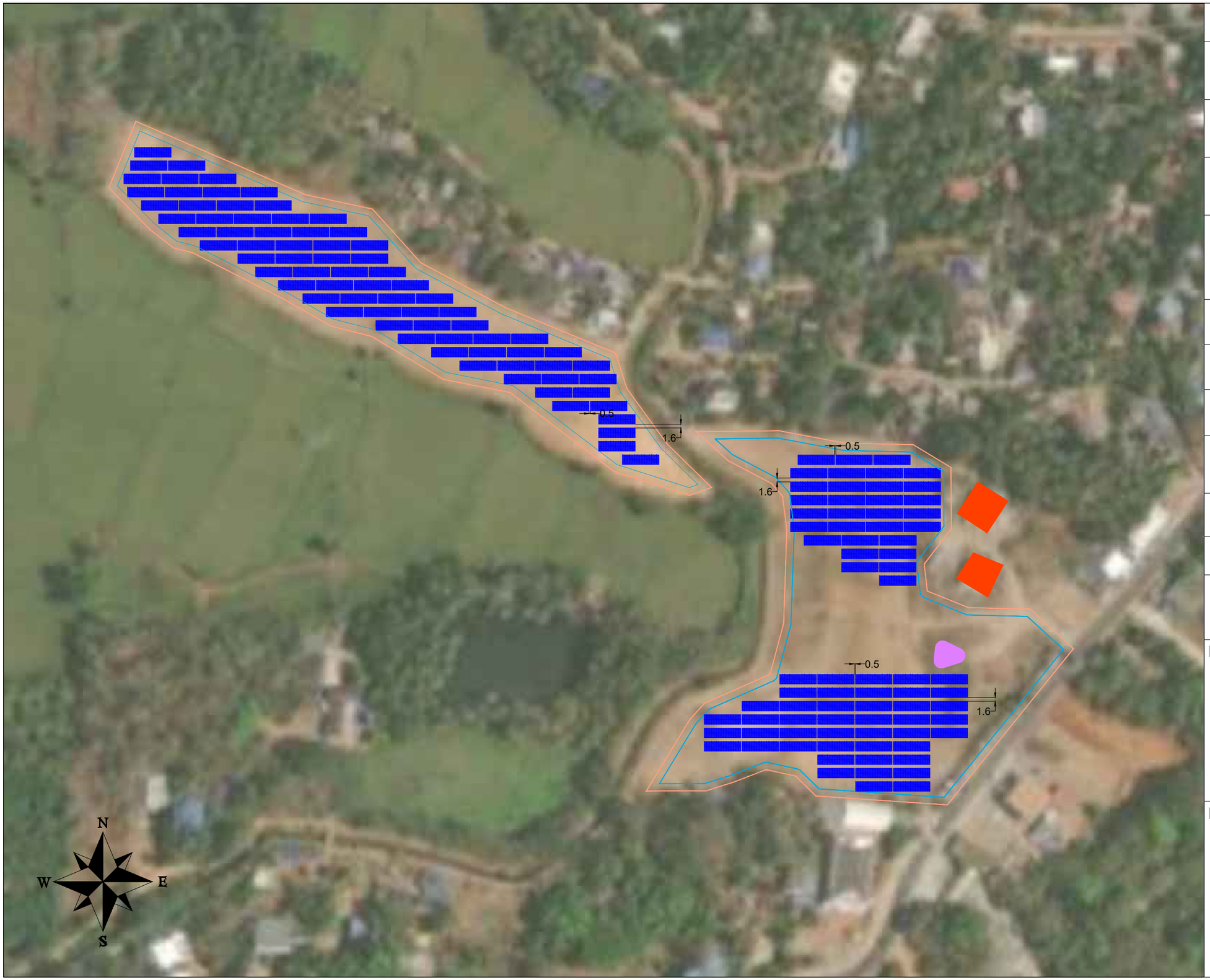
Title: Site Overview (PV1 of 4)

Issued For: Approval

Drawing No.	Scale	Date
IL-KSEB11MW-NMRA-COM-003	NTS	07/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

Rev.	Description	Date
1.0	For Approval	07/03/2023



LEGENDS	
	PROPOSED AREA FOR MODULE PLACEMENT
	PV MODULE

SYSTEM INFORMATION	
PV MODULE MODEL	72 CELLS POLYCRYSTALLINE - 335Wp (KSEB APPROVED MAKE)
NO.OF MODULES	4500
DC SYSTEM CAPACITY	1500kWp
INVERTER	[6] 250kW STRING INVERTER
SURFACE	GROUND MOUNTED STRUCTURE
AZIMUTH	0°
TILT	10°
LOCATION CO-ORDINATES	10°35'38.8'' N, 76°35'00.9'' E

KSEB SIGN & SEAL

INKEL SIGN & SEAL

Client:
KSEB
കേരളത്തിന്റെ ഊർജ്ജം
Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom,
Thiruvananthapuram-695 004

Project By:
inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA
INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 1500kWp SPV System at 110kV Substation, Nenmara

Notes:

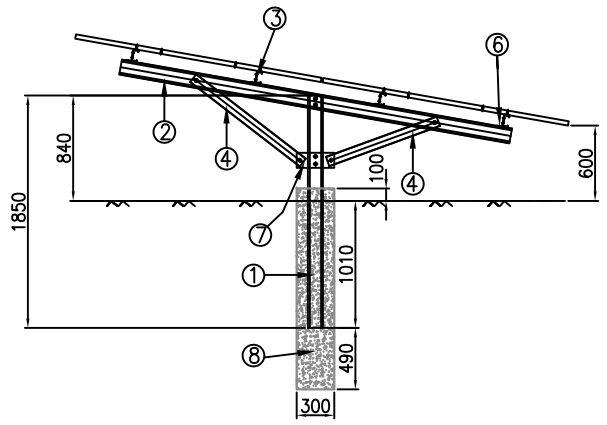
Title: PV Layout (PV2 of 4)

Issued For: Approval

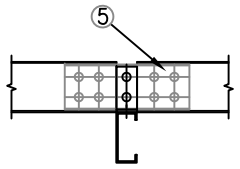
Drawing No.	Scale	Date
IL-KSEB11MW-NMRA-COM-004	NTS	07/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

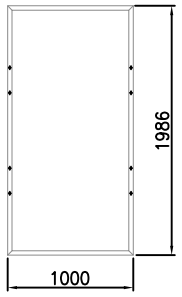
Rev.	Description	Date
1.0	For Approval	07/03/2023



Module Mounting Structure Side View



TYP. SPLICE (PURLIN TO PURLIN JOINER) CONNECTION



PV MODULE DETAILS

Details of Structure Materials

Sl. No.	Item	Section Sizes
1	Column	Lipped C Channel 120x50x15x2.5mm
2	Rafter	Lipped C Channel 120x50x15x2mm
3	Purlin	Lipped C Channel 100x40x15x2.5mm
4	Side bracing	Lipped C Channel 80x40x15x2.0mm
5	Splice purlin	Lipped C Channel 90x30x15x2.0mm
6	Connecting Angle	L Angle 90x60x2.0mm
7	Bracing con. plate	300x120x6mm
8	Foundation Grade	M20

BILL OF MATERIALS PER TABLE

ITEM	DESCRIPTION	LENGTH	QTY	TOTAL LENGTH PER TABLE
COLUMN	C120x50x15x2.5mm	1850	6	11100
RAFTER	C120x50x15x2mm	3156	6	18936
PURLIN	C100x40x15x2.5mm	15280	4	61120
BRACING 1	C80x40x15x2.0mm	1102	6	6612
BRACING 2	C80x40x15x2.0mm	938	6	5628
PURLIN CLEAT	L90x60x2.0mm	150	24	3600
PURLIN SPLICE	90x30x2.0mm	300	8	2400
BRACING PLATE	300x120x6.0mm	300	6	1800

NOTES:

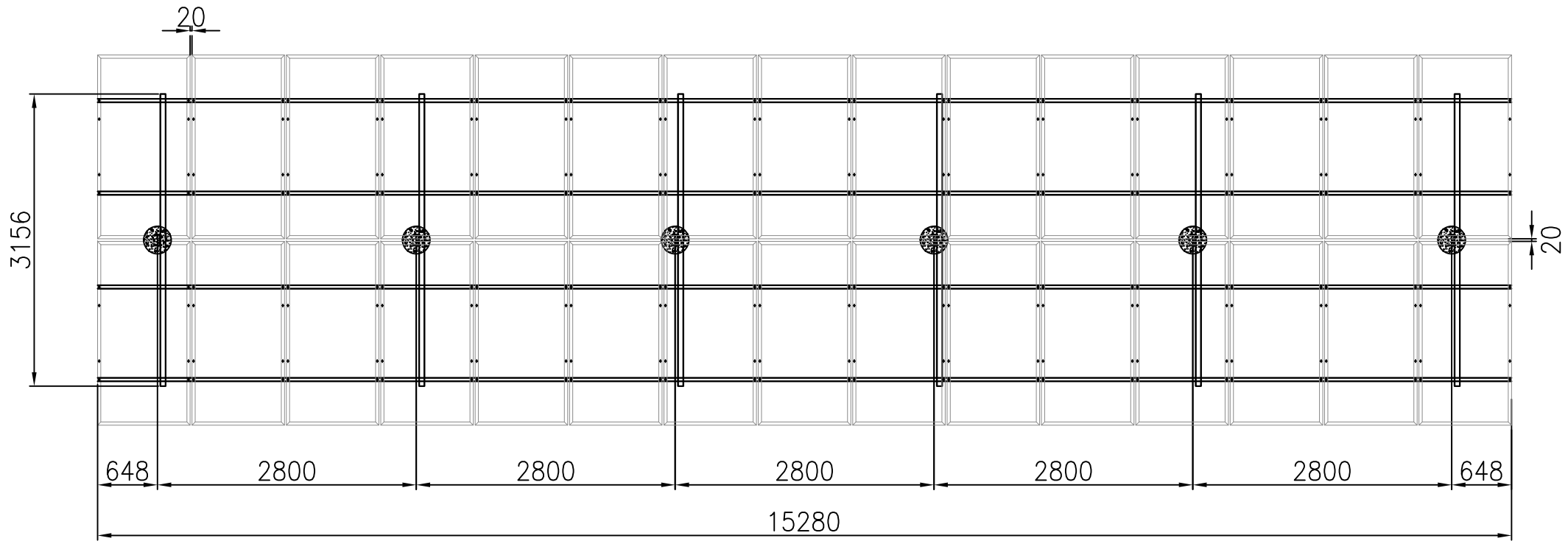
1. All dimensions are in mm unless otherwise specified.
2. Structure material - Hot dip Galvanized Steel as per BIS 2062 specifications having galvanization thickness as per BIS 4759 - amended up to date.
3. Material for the steel members - mild steel with yield strength of 250Mpa.
2. Minimum distance between ground level and lower edge of PV Module : 0.6 m.
3. Design wind speed - 150km/h.
4. PV Module Tilt angle : 12 degrees.
5. Tolerance on module mounting structure dimensions : +/- 5%.
6. Foundation depth will be modified according to site conditions.
7. No. of PV Modules per Table - 30 Nos. (15X2)

PLACE FOR APPROVAL STAMP - KSEBL

PLACE FOR SEAL & SIGNATURE - INKEL LIMITED

Nevil Jose
Sr. Manager-Solar
INKEL Limited

INKEL LIMITED * Regd. Office: Door No. 7/473ZA-5&6, 2nd Floor, Ajiyal Complex KAKKANAD, KOCHI-682030 *



2x15 Module Mounting Structure Top View

REV.	DATE	DRAWING STATUS	DSGN.	DRWN.	CHKD.	APPRD.
0	28.12.2022	SUBMITTED FOR APPROVAL	NJ	NJ	PR	NJ

CLIENT: THE CHIEF ENGINEER (RENEWABLE ENERGY & ENERGY SAVINGS)
KERALA STATE ELECTRICITY BOARD
VYDYUTHI BHAVANAM, PATTOM, THIRUVANANTHAPURAM - 695004
Phone: 0471 - 2447404, 2514385, E-mail: cerees@kseb.in

PROJECT: Design as per site conditions, erection, testing & commissioning of Grid tied Solar Photo Voltaic (SPV) Projects in the land owned by KSEBL with a total installed capacity of 11MWp in total 21 locations including Operation & Maintenance of the plant for the first 5 years from the date of commissioning as part of the feeder level solarization of PMKUSUM scheme

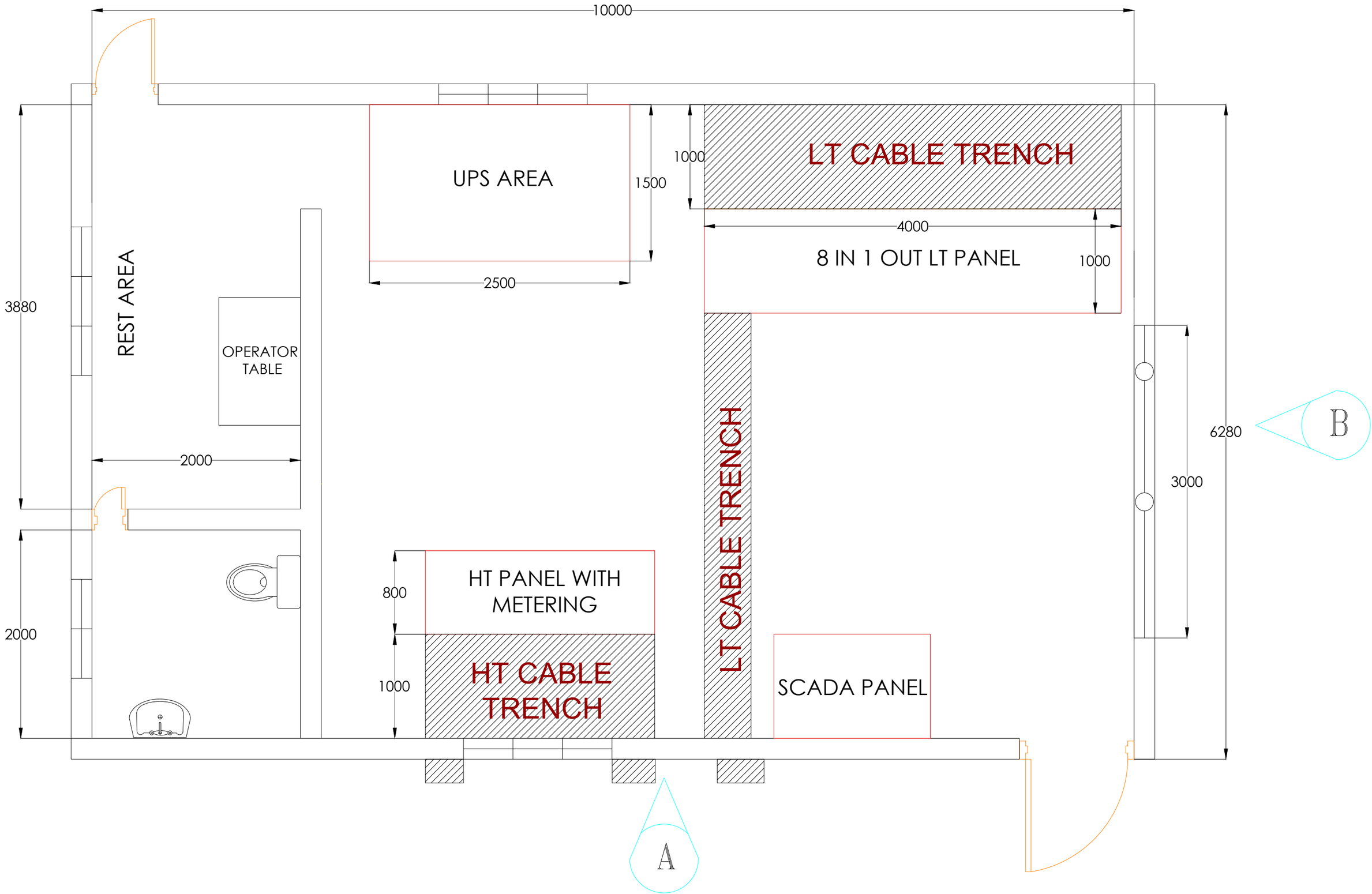
SITE/LOCATION:

DRAWING TITLE: MODULE MOUNTING STRUCTURE - GA DRAWINGS

INKEL LIMITED
Door No. 7/473ZA - 5 & 6, 2nd Floor Ajiyal Complex, Kakkanad, Cochin Pin: 682030
Phone: 0484-2978101, 0484-2978103
E-mail: Inkelcentre@Inkelkerala.com

APPROVED	NJ	DRAWING NO:			
CHECKED	PR	IL-KSB11MW-CIV-001			
DRAWN	NJ	DATE	SHEET NO	SCALE	REVISION
DESIGNED	NJ	28.12.2022	01 OF 01	N.A	0

ANNEXURE – 13: TENTATIVE LAYOUT OF CONTROL ROOM



Client:

Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom,
Thiruvananthapuram-695 004

Project By:

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 2MWp SPV SYSTEM

Notes:
1. All dimensions are in mm unless otherwise specified.

Title: Control Room Layout

Issued For: Approval

Drawing No.	Scale	Date
IL-KSEB11MW-COM-001	NTS	04/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

Rev.	Description	Date
1.0	For Approval	04/03/2023

ANNEXURE – 14: TENTATIVE POWER CABLE SCHEDULE

TENTATIVE POWER CABLE SCHEDULE - 1.5MWp			
Sl No	**Circuit**		**Cable Size**
	From	**To**	
1	PV Strings to Inverter 1 (Typical for 8 nos. of inverter)		
1.1	PV Array	MPPT 1	2RX1CX4.0 SQ.MM CU. UV rated Solar Cable upto string route lengths upto 40m. 2RX1CX6.0 SQ.MM CU. UV rated Solar Cable above 40m.
1.2	PV Array		
2.1	PV Array	MPPT 2	
2.2	PV Array		
3.1	PV Array	MPPT 3	
3.2	PV Array		
4.1	PV Array	MPPT 4	
4.2	PV Array		
5.1	PV Array	MPPT 5	
5.2	PV Array		
6.1	PV Array	MPPT 6	
6.2	PV Array		
7.1	PV Array	MPPT 7	
7.2	PV Array		
8.1	PV Array	MPPT 8	
8.2	PV Array		
9.1	PV Array	MPPT 9	
9.2	PV Array		
10.1	PV Array	MPPT 10	
10.2	PV Array		
11.1	PV Array	MPPT 11	
11.2	PV Array		
12.1	PV Array	MPPT 12	
12.2	PV Array		
12.3	PV Array		
2	PV Strings to Inverter 2 (Same as Inverter 1)		
3	PV Strings to Inverter 3 (Same as Inverter 1)		
4	PV Strings to Inverter 4 (Same as Inverter 1)		
5	PV Strings to Inverter 5 (Same as Inverter 1)		
6	PV Strings to Inverter 6 (Same as Inverter 1)		
7	Inverter 1	LT Panel	1RX3CX150 SQ.MM, 1.1kV, XLPE AL. ARM CABLE
8	Inverter 2	LT Panel	1RX3CX150 SQ.MM, 1.1kV, XLPE AL. ARM CABLE
9	Inverter 3	LT Panel	1RX3CX150 SQ.MM, 1.1kV, XLPE AL. ARM CABLE

10	Inverter 4	LT Panel	1RX3CX150 SQ.MM, 1.1kV, XLPE AL. ARM CABLE
11	Inverter 5	LT Panel	1RX3CX150 SQ.MM, 1.1kV, XLPE AL. ARM CABLE
12	Inverter 6	LT Panel	1RX3CX150 SQ.MM, 1.1kV, XLPE AL. ARM CABLE
13	LT PANEL	TRANSFORMER	6RX3CX400 SQ.MM, 1.1kV, XLPE AL. ARM CABLE
14	TRANSFORMER	HT PANEL	1RX3CX300 SQ.MM, HT, XLPE, AL. ARM CABLE
15	HT PANEL	DP STRUCTURE	1RX3CX300 SQ.MM, HT, XLPE, AL. ARM CABLE
16	UPS DB	LT PANEL 1	1RX3CX2.5 SQ.MM CU. FLEX CABLE
17	UPS DB	LT PANEL 2	1RX3CX2.5 SQ.MM CU. FLEX CABLE
18	UPS DB	HT PANEL	1RX3CX2.5 SQ.MM CU. FLEX CABLE
19	UPS DB	SCADA PANEL	1RX3CX2.5 SQ.MM CU. FLEX CABLE
20	UPS DB	TRANSFORMER 1	1RX3CX2.5 SQ.MM CU. FLEX CABLE
21	UPS DB	TRANSFORMER 2	1RX3CX2.5 SQ.MM CU. FLEX CABLE
22	Auxiliary Power DB	PUMP CONTROL	1RX3CX2.5 SQ.MM CU. FLEX CABLE
23	Auxiliary Power DB	UPS	1RX3CX4 SQ.MM CU. FLEX CABLE
24	UPS	UPS DB	1RX3CX4 SQ.MM CU. FLEX CABLE
25	Auxiliary Power DB	Internal Wiring	--

NOTE:

This Cable schedule is indicative only. Bidder is to prepare his quote based on tender specification and site requirements.

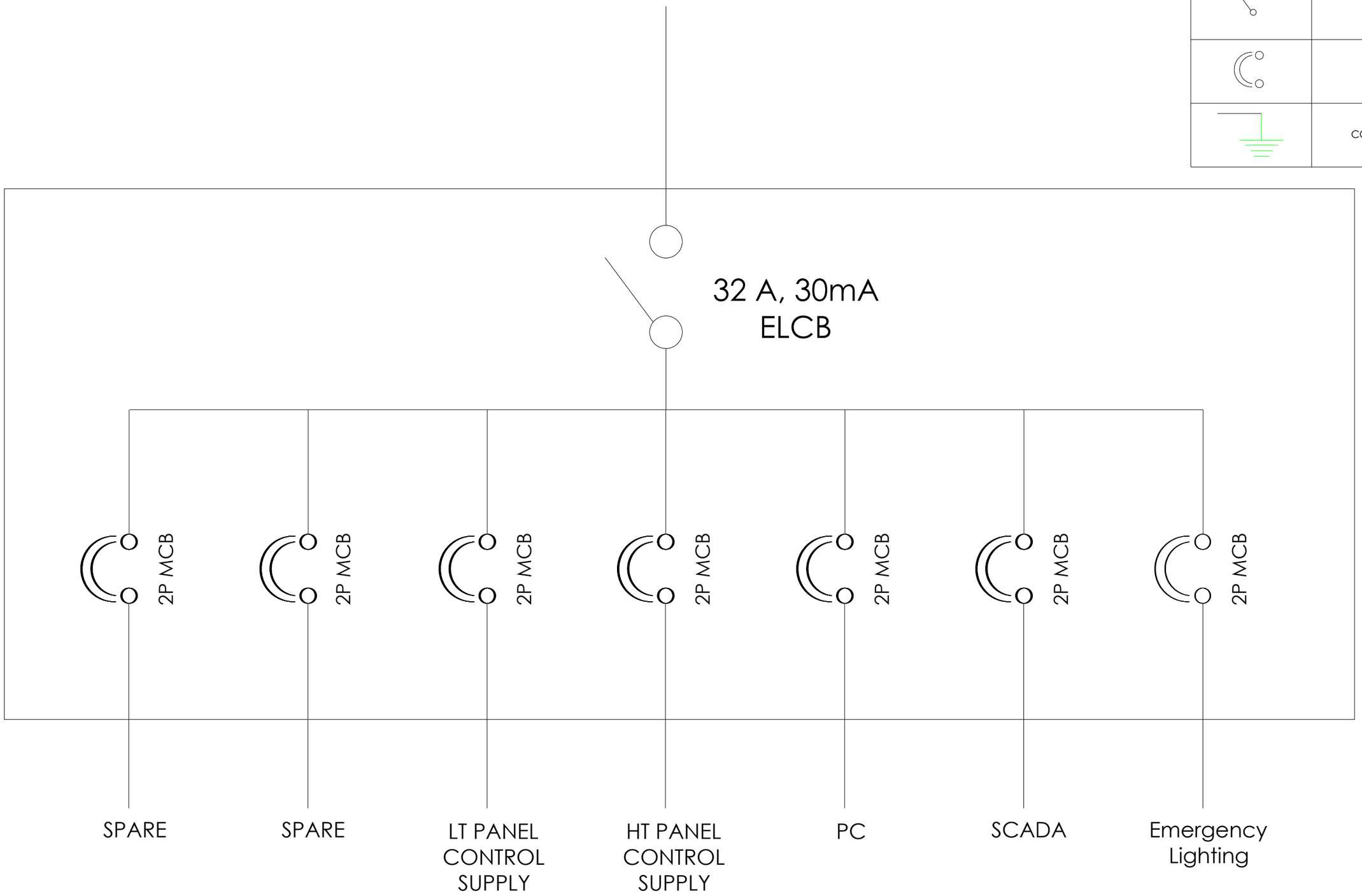
ANNEXURE – 15: TENTATIVE COMMUNICATION CABLE SCHEDULE

TENTATIVE CONTROL & COMMUNICATION CABLE SCHEDULE - 1.5MWp			
Sl No	Circuit		Cable Size
	From	To	
1	Inverter 1	Inverter 2	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
2	Inverter 2	Inverter 3	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
3	Inverter 3	Inverter 4	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
4	Inverter 4	Inverter 5	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
5	Inverter 5	Inverter 6	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
6	Inverter 6	Inverter 7	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
7	Inverter 7	Inverter 8	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
8	Inverter 8	Inverter 9	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
9	Weather Station	SCADA RTU	4CX1.0 SQ.MM. SHIELDED ARMOURED COMM. CABLE
10	LT PANEL	SCADA RTU	4CX1.0 SQ.MM. SHIELDED COMM. CABLE
11	HT PANEL	SCADA RTU	16CX1.0 SQ.MM. SHIELDED COMM. CABLE
12	TRANSFORMER MARSHALING KIOSK	SCADA RTU	16CX1.0 SQ.MM. SHIELDED COMM. CABLE
13	TRANSFORMER MARSHALING KIOSK	HT PANEL	16CX1.0 SQ.MM. SHIELDED COMM. CABLE
14	TRANSFORMER MARSHALING KIOSK	LT PANEL	16CX1.0 SQ.MM. SHIELDED COMM. CABLE
15	HT PANEL	LT PANEL	1RX3CX2.5 SQ.MM CU. FLEX CABLE
16	HT Panel Metering Cubicle	SCADA RTU	2RX2CX0.5 Sq.mm Cu Cable
17	Neutral CT 1	LT PANEL	1RX2CX2.5 SQ.MM CU. FLEX CABLE
18	Neutral CT 2	LT PANEL	1RX2CX2.5 SQ.MM CU. FLEX CABLE

NOTE:
This Cable schedule is indicative only. Bidder is to prepare his quote based on tender specification and site requirements.

ANNEXURE – 16: TENTATIVE SLD OF CONTROL ROOM DB

LEGEND	
	MCB/ ISOLATOR
	AC MCB
	CONNECTED TO EARTH



Client:

Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom,
Thiruvananthapuram-695 004

Project By:

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 2MWp SPV SYSTEM

Notes:
1.

Title: Control Room Layout

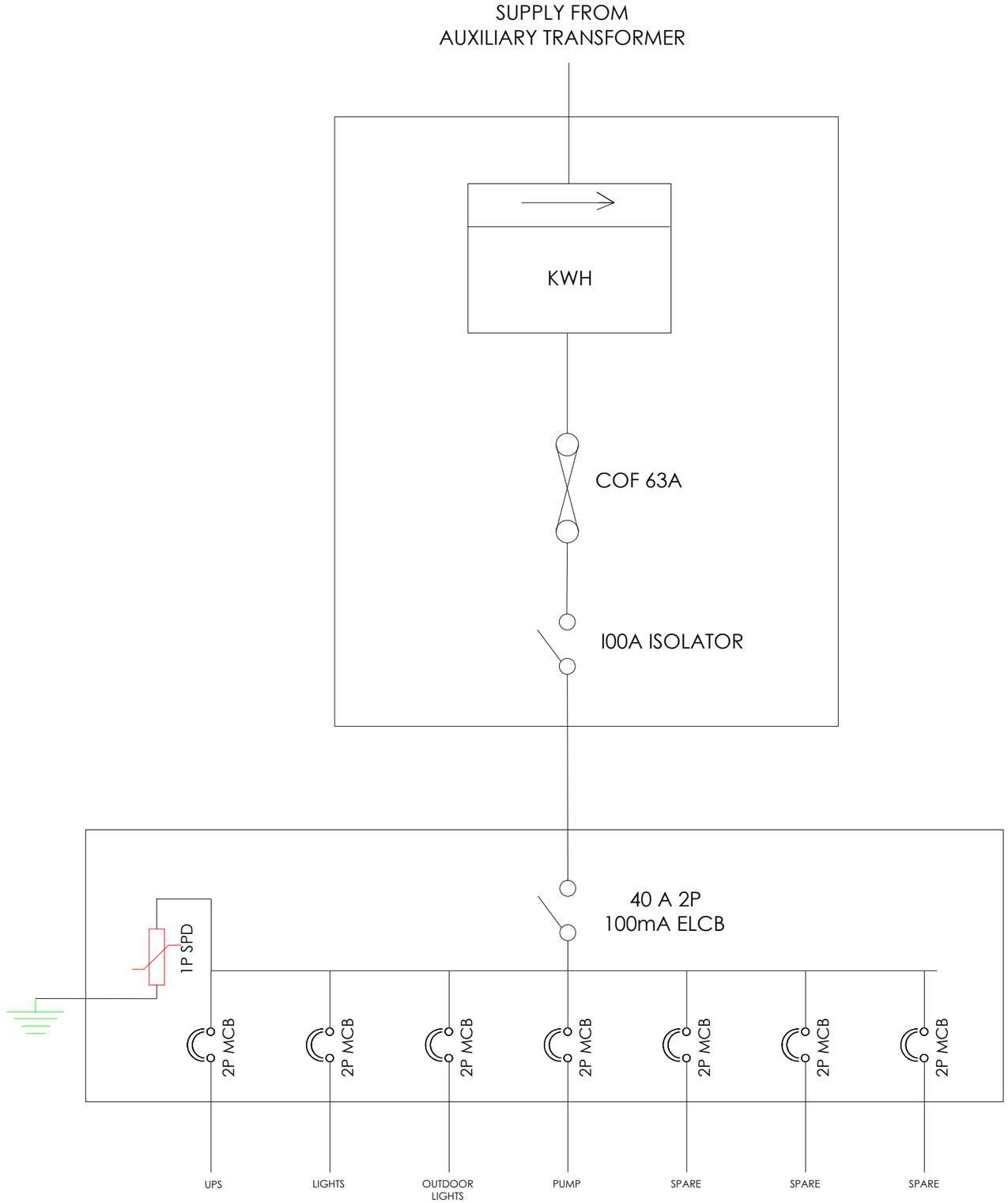
Issued For: Approval

Drawing No.	Scale	Date
IL-KSEB11MW-COM-003	NTS	04/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

Rev.	Description	Date
1.0	For Approval	04/03/2023

ANNEXURE – 17: TENTATIVE SLD OF UPS DB



LEGEND

	SPD
	DC MCB/ DC ISOLATOR
	AC MCB
	CUT OUT FUSE
	CONNECTED TO EARTH

Client:

Kerala State Electricity Board Limited
Vydyuthi Bhavanam, Pattom,
Thiruvananthapuram-695 004

Project By:

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 2MWp SPV SYSTEM

Notes:
1.

Title: SLD - AUXILIARY DB

Issued For: Approval

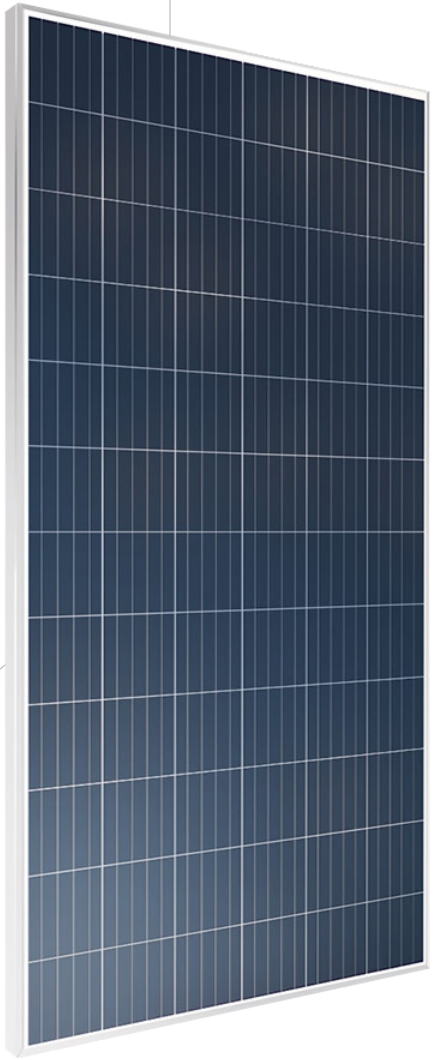
Drawing No.	Scale	Date
IL-KSEB11MW-COM-002	NTS	04/03/2023

Design By	Checked By	Approved By
NJ	PR	NJ

Rev.	Description	Date
1.0	For Approval	04/03/2023

ANNEXURE – 18: DATASHEET OF SOLAR MODULE

RAYZON SOLAR



Solar Modules
POLY 250W - 335W

SPARKLE

PRODUCT | KEY FEATURES

- AR Coated Tempered Glass Anti-Reflective Module Surface
- Excellent Module Efficiency
- Positive Power Tolerance Up to 5W
- Pre and Post EL Checking to ensure defect free modules
- Ip68 Junction Box for Long Term Endurance
- Ensure safety parameters through Safety test
- Quality and Reliability assurance in standard weather condition

THE INDUSTRY'S BENCHMARK

Rayzon Solar is an internationally renowned leading solar energy cost effective befitting solutions provider having core competency in high efficiency PV module manufacturing and providing wide range EPC solutions. PV modules are the best in class in terms of power output and long-term reliability.

PRODUCT CERTIFICATES

IECEE CB Scheme | IEC 61215 | IEC 61730-1 / 2 | IEC 61853-1 | ISO 9000

IEC 62716 | IEC 61701 | IEC 62804 | IS 14286 | QUALITY APPROVED

MADE IN INDIA

- 27 YEARS — Industry leading linear power output warranty*
- 10 YEARS — Product warranty on materials and workmanship

TECHNICAL DATA

PERFORMANCE UNDER STANDARD TEST CONDITIONS (STC) (irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.)

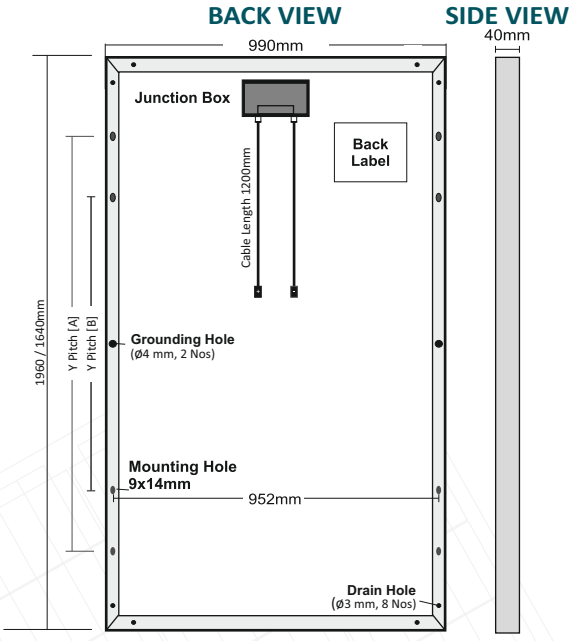
	250W	260W	265W	270W	300W	310W	315W	320W	325W	330W	335W
Nominal Maximum Power (Pmax)											
Optimum Operating Voltage (Vmp)	31.27	31.52	31.99	32.10	37.51	37.81	37.94	38.40	38.60	38.85	39.00
Optimum Operating Current (Imp)	8.00	8.25	8.29	8.43	8.00	8.20	8.31	8.35	8.43	8.50	8.60
Open Circuit Voltage (Voc)	37.50	37.74	37.86	38.7	45.00	45.29	45.36	45.50	45.64	45.79	46.15
Short Ciruit Current (Isc)	8.56	8.83	8.95	8.96	8.56	8.77	8.88	8.95	8.97	9.04	9.09
Module Eff(%)	15.4	16.0	16.3	16.6	15.5	16.0	16.2	16.5	16.7	17.0	17.26

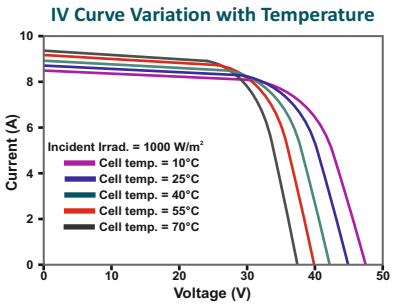
PERFORMANCE UNDER NOCT (NOCT irradiances of 800 W/m², ambient temperature of 20°C, Wind speed 1m/sec)

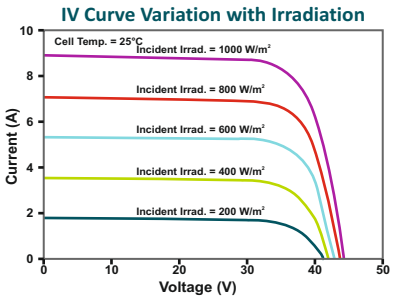
Nominal Maximum Power (Pmax)	181.48	188.73	192.36	195.99	217.77	225.03	228.66	232.29	235.92	239.55	243.18
Optimum Operating Voltage (Vmp)	28.53	28.76	29.18	29.94	34.22	34.49	34.61	35.03	35.21	35.44	35.58
Optimum Operating Current (Imp)	6.36	6.56	6.59	6.70	6.36	6.52	6.61	6.64	6.70	6.76	6.84
Open Circuit Voltage (Voc)	34.61	34.83	34.94	35.72	41.53	41.80	41.86	41.99	42.12	42.26	42.59
Short Ciruit Current (Isc)	6.87	7.08	7.18	7.19	6.87	7.03	7.12	7.18	7.19	7.25	7.29

Mechanical Specifications

Dimensions (L x W x T in mm)	1640 x 990 x 40	1960 x 990 x 40
Weight(kg)	19.2	21.48
No Of Cell	60 [10x6]	72 [12x6]
Aluminum Frame [40HS]	Silver Anodized Aluminum Alloy	Silver Anodized Aluminum Alloy
Front Cover (Tempered Glass)	3.2mm	3.2mm
Encapsulate	(EVA) Ethylene Vinyl Acetate Sheet	(EVA) Ethylene Vinyl Acetate Sheet
Back Sheet	Composite Film	Composite Film
Junction Box with 3-Bypass diode	4 terminal Junction Box (IP68)	4 terminal Junction Box (IP68)
Application Class Rating	Class A	Class A
Safety Class Rating	Class II	Class II
Mechanical Load Test (as per IEC & UL)	5400 Pa-Front; 2400 Pa-Back	5400 Pa-Front; 2400 Pa-Back
Mounting Holes Pitch (Y)-mm	[A] 820	[A] 1360, [B] 980
Mounting Holes Pitch (X)-mm	952	952







*All dimensions are in mm with +/-1% tolerance.

MAXIMUM OPERATING CONDITIONS

Operating Temperature:	-40°C to +85°C
Maximum System Voltage:	1000V
Maximum Series Fuse Rating:	20A

TEMPERATURE COEFFICIENTS

Current Temperature Coefficients α(Isc) :	0.021%/Ċ
Voltage Temperature Coefficients β(Voc) :	-0.291%/Ċ
Power Temperature Coefficients ϒ(Pmax) :	-0.397%/Ċ

Caution: Please read safety and installation instructions before using the product. ***Warranty:** Linear power warranty for 27 years up to 2.5% for 1st year degradation and 0.67% from year 2 to year 27. Please read Rayzon warranty documents thoroughly. **Disclaimer:** specifications included in the datasheet are subject to change without prior notice owing to conditions innovation on the product Development and R&D Activities. RAYZON GREEN ENERGIES reserves the right to make any adjustment to the information described here, Dataset contained in this specification do not form a representative of a single module data. @T&C Apply.

ANNEXURE – 19: DATASHEET OF STRING INVERTER

HITACHI
Inspire the Next

Grid Tied Solar Inverters

Central Inverters (250 kW to 2.5 MW)
String Inverters (1.1 kW to 255 kW)

Generating
3 GW+
Renewable Power in Indian Solar Sector

Highly Efficient Conversion Technology

About Hitachi Hi-Rel Power Electronics

Hitachi, with more than 100 years of legacy worldwide, offers the advanced, efficient & world class power electronics products in India through its 100% owned subsidiary company - Hitachi Hi-Rel Power Electronics Private Limited, which is recognized as a pioneer in power electronics and belongs to Industrial products business unit of Hitachi Ltd., Japan.

With a vision to be recognized as the most trusted Power Electronics Company by supplying superior products and services, Hitachi has garnered a significant level of trust in market segment and continues to offer world class power electronics products, value added services & customized solutions.

Hitachi deals with a varied range of products, such as industrial UPS, IT & Infra UPS, medium & low voltage variable frequency drives, grid tied solar central & string inverters, air compressors and railway inverters. Hitachi serves entire gamut of Industries, particularly in mission critical applications for Refineries, Petro-Chemicals, Power Generation, Steel & Metals, and Process Industries as well as Critical Data Processing Applications. It has a pan India dominance. It's sales network & service infrastructure expands out to the world with the ability to reach out to clients across South East Asia, Middle East and Africa.

- Pioneer in power electronics with 3 decades+ experience
- Leading manufacturer of UPS, Drives, Solar Inverters, Air Compressors & Railway Inverters
- World class and most modern manufacturing works at Sanand in Gujarat, India
- Gandhinagar Facility
- In-house R&D facility, recognized by DSIR, Govt. of India
- Serving entire gamut of industries, predominantly in mission critical applications
- Approval from leading consultants and EPC vendors
- ISO 9001:2015, ISO 14001:2015 & ISO 45001:2008 certified company with export house status
- Global & Pan India presence
- Dedicated & decentralized 24x7 after-sales-service
- Offers products with greater energy efficiency & lower carbon footprint
- At the forefront of Social Innovation in India's Power and Solar Sector

Hitachi's Presence in Indian Solar Domain

The government of India recognizes the need of sustainable, eco-friendly and innovative recyclable resource based energy solution and with nearly 300 sunny days in India, the government through National Solar Mission is mobilizing infrastructure to create 100 Giga Watts of solar electricity generation capacity by 2022.

Hitachi Solar Inverter is a potent example, which being at the heart of Solar power generating system is bringing Social Innovation in the Indian power sector by providing the critical technological link which enabled conversion of DC to AC to help solar power distribute through the national grid. Thus, promoting clean, renewable energy and reducing the dependency on polluting fossil fuel based power generation.

With over 3 GW installation base in India, Hitachi Grid Tied Solar Inverters are among the best available Grid Tied Solar Inverters which are high performance inverters, highly advanced & reliable, highly efficient, easy to install, safe, helping you achieve better ROI with higher yields and lower maintenance cost.

- World class and most modern manufacturing works at Sanand in Gujarat, India
- Gandhinagar Facility
- Successful track record of more than 25 years in designing and manufacturing of highly efficient power electronics products
- Commissioned >3 GW grid tied solar inverters in India and >5 GW Globally
- Generating unmatched energy yield through 3 level advance PWM technology
- Prompt availability of spares and components locally in India
- Most acclaimed service support through branch offices across the country

Hitachi envisions a very green future, a future where by 2022, solar power can indeed form the backbone of India's energy security and independence and we help light up millions of lives by progressively contributing to the renewable energy vision of 'power for all' vision of the Indian government.

Let's Solarize…for a better brighter world

Grid Tied Solar String Inverters

HIVERTER Si Series

String Inverter Technology

Intelligent Power Management

- LVRT / ZVRT protections
- Self-power reducer in case of over frequency
- Fully adjustable reactive power & power factor for different grids
- Real time MPPT algorithm

Built-In Protection Functions

- Over current, Over load
- O/ V & U/V protection
- Anti-islanding, Current leakage
- Over temperature protection
- Over frequency, Under frequency
- SPD Type III, Type II (Optional for 20-33 kW models)

Humanized Functions

- Audible & visible alarming function
- Remote system connection or disconnection
- Remote firmware upgrade
- Remote monitoring
- Separate section for power & termination

Highlights

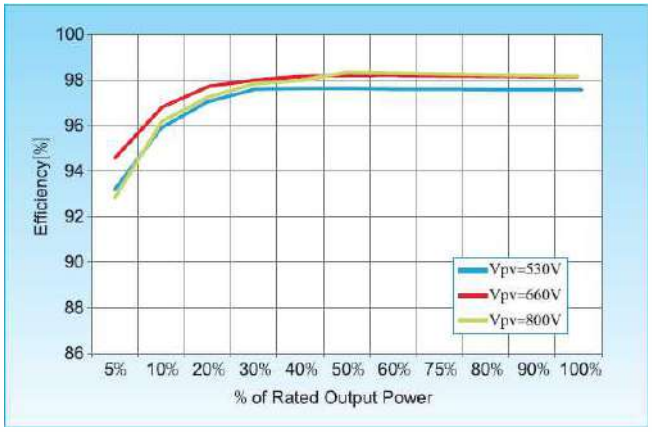
- Wide DC input range from 250V to 1300V
- Highest AC output range +/- 25%
- Upto 12 MPPT Independent MPPT to ensure optimal energy harvest
- MPPT accuracy is up to 99.9%, Max euro efficiency is 98.80%
- Wide ambient temp range -25°C to 60°C
- IP 65 protection for Indoor & outdoor application
- DC power overloading up to 150%
- Low sensitivity to the grid disturbance to avoid unnecessary breakdown
- User friendly interface like RS485 / USB / Bluetooth (Optional: Wi-Fi / GPRS / PLC)
- Easy to read LCD display with all operational status & necessary data
- Reactive power controller
- Type I + II SPD Optional
- String current monitoring available

Globally Renowned Component Partners

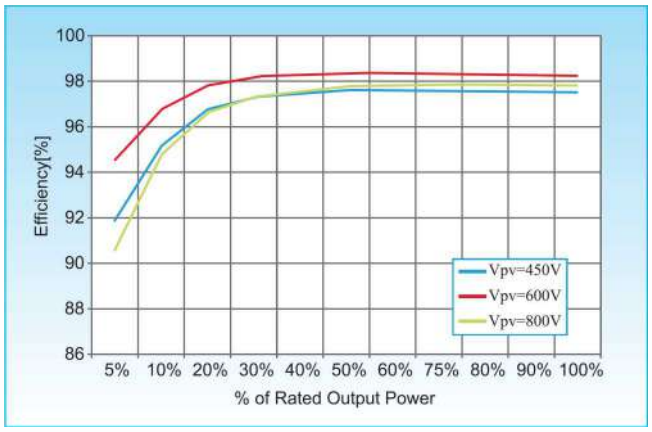
MOSIGBT	IC	Fuse	Current Transducer
FAIRCHILD SEMICONDUCTOR, infineon	ON Semiconductor, Texas Instruments	Littelfuse, COOPER Wheelock	LEM

Capacitor	Diode	Relay	MCU
NIPPON CHEMI-CON, nichicon, Rubycon	Microsemi, IXYS UK WESTCODE	Panasonic, FUJITSU	RENESAS

Efficiency Curve



(HIVERTER Si - 50 kW to 70 kW Models)



(HIVERTER Si - 20 kW to 33 kW Models)

High-yield

- Max 98.80% efficiency
- Real time precise MPPT algorithm for max harvest
- Wide input voltage operation range from 250 V to 1300 V

All in one, Flexible and economical system solutions

- DC switch
- Built-in PV combiner
- Power management unit
- Optimum selection for big PV plants, commercial buildings.
- Inbuilt type II DC surge protection device
- Inbuilt type II AC surge protection device

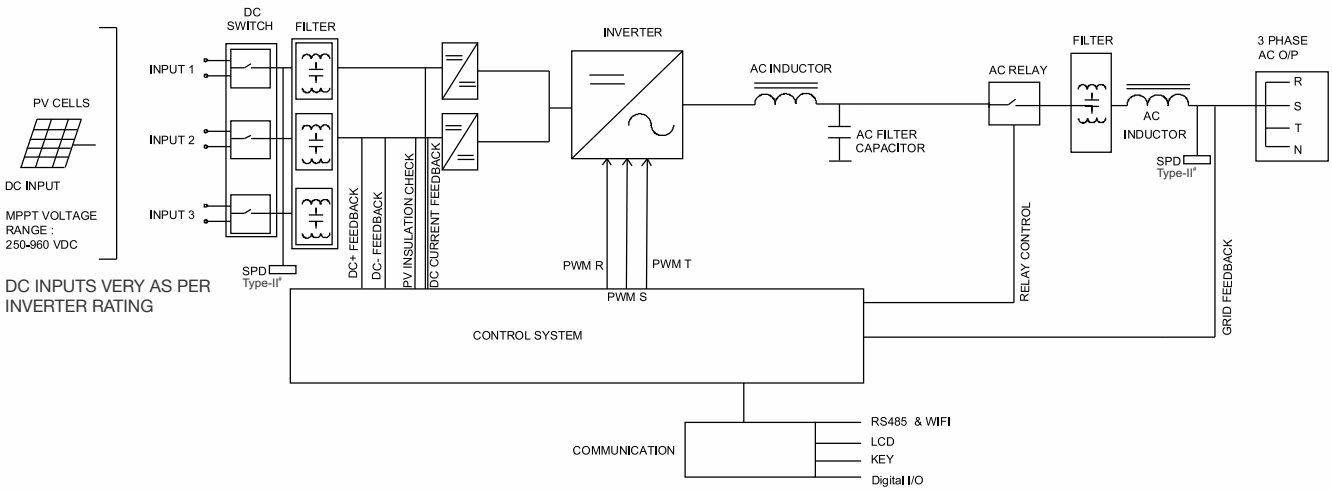
Low maintenance cost

- Rust-free aluminum covers
- Flexible monitoring solution
- Multi-function relay can be configured to show various inverter information

Intelligent grid management

- ZVRT support
- Reactive power adjustable
- Self-power reducer when over frequency
- Remote active / reactive power limit control

Single Line Diagram



Grid Tied Solar String Inverters

HIVERTER Si Series

Highlights

- Best suitable for heavy industries and large commercial establishments in India
- Wide range of 1.1 kW to 255 kW Inverters offers more flexibility as per project design
- Real time precise MPPT algorithm to ensure highest efficiency up to 98.6%
- Intelligent grid management features
- First of its kind IV curve diagnostics feature
- A robust IP65 enclosure allowing hassle free outdoor installations
- Low maintenance cost
- Safety assured through its anti islanding, RCMU, ground fault monitoring

Advantages

More Reliability

- Usage of only higher voltage level capacitor
- Support four uni-polar output relays (effective heat dissipation, longer life)

Higher Efficiency

- “T” type 3 level topology provides higher efficiency

More Convenience

- All information is available on a 4” large screen
- Availability of four separate buttons give easy operation
- Equipped with compact ACDB & DCDB (optional*)

Safer

- Equipped with leakage current detection components
- Use professional solar AC connectors as output

Better Monitoring

- RS485 / Wi Fi / GPRS / Ethernet
- Local data is recorded in SD card for 25 years
- IV curve scanning technology, catch MPPT easily and quickly

Better Appearance

- Die-casting housings
- Go through anti-corrosion and anti-rust protection processes

Technical Specifications

Solar String Inverter - 250 kW to 255 kW (3Ph.)

HIVERTER-Si Series Three Phase		Si-250K-HV	Si-255K-HV
Input (DC)	Max. input voltage	1500V	
	Rated input voltage	1080V	
	Start-up voltage	550V	
	MPPT operating voltage range	180V- 1000V	
	Full power MPPT voltage range	800V-1300V	
	Number of MPP trackers	12	
	Number for DC inputs	24	
	Max. input current per MPPT	30A x 12	
	Max. input short circuit current per MPPT	50A x 12	
Output (AC)	AC output power	250kVA@30°C / 235kVA@40°C / 220kVA@50°C	255kVA@30°C / 235kVA@40°C / 220kVA@50°C
	Max. output current	180.5A	184A
	Nominal grid voltage	3/PE, 800Vac	
	Grid voltage range	640Vac-920VVac	
	Nominal frequency	50/60Hz	
	Grid frequency range	45~55Hz / 55~ 65Hz (According to local standard)	
	Active power adjustable range	0-100%	
	TH Di	<3%	
	Power factor	1 default (adjustable±0.8)	
Performance	Max. Efficiency	99.01%	
	European weighted efficiency up to	98.80%	
Protection	DC reverse polarity protection	Yes	
	Anti-islanding protection	Yes	
	Leakage current protection	Yes	
	Ground fault monitoring	Yes	
	PV-array string fault monitoring	Yes	
	Zero voltage ride through	Yes	
	DC switch	Yes	
	Anti-PID protection	Optional	
	AFC!	Optional	
	Protection class/Overvoltage category	I/III	
	Input/Output SPD	PV: type II standard, AC: type II standard	
Communication	Communication	RS485 /USB /Bluetooth, Optional: WiFi /GPRS /PLC	
General Data	Ambient temperature range	-30°C ~ +60°C	
	Self-consumption at night	<2W	
	Topology	Transformer less	
	Degree of protection	IP66	
	Allowable relative humidity range	0-100%	
	Max. operating altitude	4000m	
	Noise	≤60 Db	
	Weight	99kg	
	Cooling	Smart forced air cooling	
	Dimension (L*W*H)	1100.5 x 713.5 x 368mm	
	Display	LCD & Bluetooth + APP	
Standard	EMC	EN 61000-6-2, EN 61000-6-4	
	Safety standard	IEC62109-1/2, IEC62116, IEC61727, IEC-61683, IEC60068 (1,2,14,30)	