TIRUCHIRAPPALLI SMART CITY LIMITED

SMART CITY MISSION

Bid Document

Design, Supply, Installation & Commissioning of 2.4Mwp Ground Mounted Solar Power plant (Package – I) at Panchappur in Tiruchirappalli City Corporation.

Roc No: E1/10127

TenderNoticeNo:193/2020-21 Serial No.02

Tender Inviting Authority

The Managing Director,
Tiruchirappalli Smart City Limited,
58, Bharathidasan salai
Cantonment
Tiruchirappalli.
Telephone No: 0431- 2415329
E-Mail: Commr.trichy@tn.gov.in

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TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – I

Project Review, Brief Scope of the work, Bid Information, Qualifying Requirement (QR) for Bidders, Address for Communication

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SECTION-I

1. Project Overview

The Managing Director, Tiruchirappalli Smart City Limited (TSCL), The Employer, invites bids from eligible bidders on two stages – Two envelop bid system in the prescribed forms and formats, for the work of Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur in Tiruchirappalli City Corporation as per the Scope of Work mentioned hereinafter. A qualified bidder needs to set up the total capacity of 2.4 Mwp (DC) Power Plant, as per the Scope of Work mentioned hereinafter.

1.1 Design, Engineering, Procurement & Supply, Packing & Forwarding, Transportation, Unloading, Storage at site, Site development, Construction, Erection & Installation of equipment, Testing & commissioning of system at Tiruchirappalli city Corporation in Panchappur thereafter of the said 2.4 MW (DC) Ground Mounted Solar PV Power Plant at Panchappur, Tiruchirappalli city Corporation in the state of Tamil Nadu (India), The selected bidder has to demonstrate assured performance of the Plant as specified in the bidding documents.

2. Brief Scope of Work

2.2.1 Solar panels including module mounting structures and fasteners.

2.2.2 All power conditioning systems including junction boxes, Inverters/ PCU, DC and AC circuit breaker(s)

2.2.3 Supply and erection of weather monitoring station including solar radiation sensors.

2.2.4 All associated electrical works and equipment required for interfacing at 33 kV plant cabling (i.e., power and auxiliary, breakers, isolators, lightning arrestor(s), LT/ HT/ other panels, protection system, LT cables, earthing of transformer & PV plant etc., but not limited to as per technical specifications.

2.2.5 Design and implementation of Plant string level monitoring scheme (current, voltage, fault etc.) with compatible software, hardware and cabling for accessing the live SCADA data remotely at a location in Tiruchirappalli city. Use of Y Connectors is allowed for up to two string level monitoring.

2.2.6 Install and setup a communication infrastructure to provide telemetry data to the State load dispatch center (SLDC) in compliance to CERC/ SERC norms/ specifications

2.2 Design, Procurement & Supply and erection of the following, in all respect:

2.3 All associated civil works, including design and Engineering, for:

2.3.1 Construction of module mounting structure foundations, transformer and other power equipment foundations, cable trenches for cable routing and earthing pits.

2.4 Setting up of a comprehensive Fire Detection & Protection system

2.5 Supply of mandatory spares.

2.6 Demonstration of performance of the Plant as per the requirement specified in the bidding documents.

2.7 Comprehensive operation & maintenance of the SPV Plant for 10 (ten) years after successful commissioning and performance demonstration, as detailed in technical specification including supply and storage of all spare parts, consumables, repairs/ replacement of any defective equipment etc.

2.8 Obtaining all associated statutory and regulatory compliances and approvals for successful construction, commissioning and operation of Plant.

2.9 The detailed scope of work is given in Section V: Technical specifications of this bidding documents.

3. Bid Information

3.1 The bidding documents which include detailed scope of work, Instruction to bidders, Specifications, Terms & conditions, formats etc., can be downloaded from www.tntenders.gov.in

3.2 No hard copies of bidding documents shall be issued for this NIT. Brief details of the NIT are as follows:

Document Number: Roc No.E1/10127

Tender Notice No: 193/2020-21 S.No.02.
Document availability Date & Timing: 01.02.2021 3.00p.m

Last Date & Time of Submission of Bid: .02.02.2021 3.00p.m.

Bid Opening: 02.02.2021 4.00 p.m.

Tender/Bid processing Fees: 25,000/-

3.3 All Bids must be accompanied by Bid processing fees & EMD

A **EMD of INR 12,50,000/- (INR Twelve lakhs and Fifty thousand only)** in the form of Demand Draft to be drawn in favour of "The Managing Director, Tiruchirappalli Smart City Limited" Payable at Tiruchirappalli. Bid processing fee of INR **25,000**/- (**Rupees Twenty-Five Thousand only**) in form of DD drawn in favour of "The Managing Director, Tiruchirappalli Smart City Limited" payable at Tiruchirappalli city. /EMD as mentioned in the Bank Guarantee sheet (as per Format 12(a)) for Packages quoted by the bidder.

3.4 ANY BID NOT ACCOMPANIED BY EMD & BID PROCESSING FEE OR NOT FOUND IN ACCEPTABLE FORMAT PRESCRIBED IN THIS TENDER DOCUMENT AND BID PROCESSING FEES IN A SEPARATE SEALED ENVELOPES SHALL BE REJECTED AS BEING NON – RESPONSIVE AND RETURNED TO THE BIDDERS WITHOUT BEING PROCESSED FURTHER.

4. Qualifying Requirements (QR) for Bidders:

Bidder shall meet the qualifying requirement stipulated hereunder:

4.1 General

4.1.1 The Bidder for Participation in the Selection process, may be a single entity or a group of entities (the "Consortium"), coming together to execute the project. The Bidder' used herein would apply to both single entity and consortium.

4.1.2 In the event the Bidder is a consortium, it shall, comply with the following additional requirements:

4.1.3 Number of members in a consortium shall not exceed 2 (Two) including the Lead Member

4.1.4 The members of the consortium shall nominate one member as the lead member

4.1.5 The members of the consortium shall be responsible for successful implementation of the project throughout the terms of the contract.

4.1.6 The lead member shall be authorized and shall be fully responsible for the accuracy and veracity of the representations and information submitted by the members respectively from time to time in the response to this Bid.

4.1.7 The consortium agreement should be submitted with the bid.

4.1.8 The agreement should be on stamp paper and duly notarized., members should be jointly and severally responsible.

4.1.9 The consortium should jointly fulfill Eligibility Criteria & pre-qualification criteria mentioned in the document

4.1.10 The consortium agreement should clearly mention the roles and responsibilities of each company in the consortium and percentage share of each member.

The consortium agreement should mention the lead partner in the consortium.

4.1.11 The Bidder should be a body incorporated in India under the Companies Act, 1956 or 2013/NGO/Proprietorship/Partnership/LLB firm & Shall be in operation for the last five years. Copy of Registration certificate to be enclosed

4.1.12 The Bidder should be MNRE Channel Partner with a minimum rating of 3 C/ Shall be TEDA Empanelled vendor.

Copy of Valid Channel Partner Certificate/ Valid TEDA Empanelment letter shall be enclosed.

4.1.13 The Bidder should be an ISO 9001:2015 & ISO 14001:2015 certified firm for Design, Installation, Commissioning, Operation & Maintenance of grid connected solar power plant.

Copy of Valid ISO Certificates shall be enclosed

4.1.14 The Bidder should be a registered first-class contractor in Tiruchirappalli City Municipal Corporation/Tamil nadu PWD/TEDA.Copy of the Valid First-class registration certificate shall be enclosed.

4.1.15 The Bidder should have at least one of its registered office/Branches/Service centers in Tiruchirappalli city District, Tamil Nadu, India (Proof of Registered office/Branches/Service Centre shall be enclosed)

4.1.16 The Bidder shall furnish GST registration Certificate

4.1.17 The Bidder should have executed civil works such as Trench Works/Drain Works/building Works of value not less than 10 % of Total Epc contract value in any of the Government Departments/PSU's/ULB's (Copy of work order along with satisfactory completion report shall be Furnished).

4.2 Technical Eligibility Criteria

4.2.1 The bidder should have Designed, supplied, Installed and commissioned/ supervised commissioning of Solar Photo Voltaic (SPV) based grid connected power Plant(s) of following cumulative installed capacity of 600 Kw or more in Central Government/State Government/Local Body/PSU's & must be in operation for the last six months prior to the date of issue of the document.

4.2.2 The Bidder shall submit, in support to the above, the list of projects commissioned along with their work order/ LOI/Commissioning certificates and the letter from Client/Employer /Owner confirming satisfactory performance of the Plant.

4.2.3 The Bidder shall be EA Electrical 'A' Grade license holder issued by the Tamilnadu Electrical Inspectorate.

Copy of the Valid license shall be enclosed.

4.2.4 All test certificates as per the standards mentioned in the document shall be enclosed

4.3 Financial Eligibility Criteria

4.3.1 The minimum average annual turnover of the Bidder in the preceding three (3) financial years as on the date of Technical bid opening, shall be INR 10.00 Crores (Ten crores).

Turnover certificate from the Charted Accountant Shall be enclosed

4.3.2 The net worth for the last year should be positive

Net worth certificate from practicing Charted Accountant shall be enclosed

4.3.3 The Bidder will provide a copy each of audited annual report of previous three financial years for ascertaining their turnover and Net Worth along with Bank Statements for the purpose of verification.

4.3.4 In case the bidder is not able to furnish its audited financial statements on standalone entity basis, the unaudited unconsolidated financial statements of the bidder can be considered acceptable provided the bidder furnishes the following further documents for substantiation of its qualification:

- Copies of the unaudited unconsolidated financial statements of the bidder along with copies of the audited consolidated financial statements of the Holding Company.
- A Certificate from the CEO/CFO of the Holding Company, stating that the unaudited unconsolidated financial statements form part of the Consolidated Annual Report of the company.

In case where audited results for the last preceding financial year are not available, certification of financial statements from a practicing Chartered Accountant shall also be considered acceptable, provided the bidder provides the detailed Financial Statements certified by the Management of the company.

4.3.5 The Bidder shall submit a Bank solvency of INR 4 Crores addressed to the The Managing Director, Tiruchirappalli Smart City Limited: If the bidder is registered contractor in any other firm like TEDA etc.

Original bank solvency certificate shall be submitted

4.3.6 Solvency shall be obtained from Scheduled Commercial banks only.

4.4 Not withstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder / his collaborators / associates / subsidiaries / group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Employer reserves the right to reject any or all bids or cancel/ withdraw the Notice Inviting Tender (NIT) without assigning any reason whatsoever and in such case no bidder/ intending bidder shall have any claim arising out of such action.

Issuance of Bidding Documents to any Bidder shall not construe that such Bidder is considered to be qualified. Bids shall be submitted online along with the requisite hard copy (originals) of documents submitted at the address given below.

All photocopies shall be duly notarized and certified as true copy.

5. Address for Communication:

Bidders are requested to keep themselves updated with the website of TN Tenders on regular basis for any Amendment / Clarification / Notification in respect to this NIT. No separate notification or information will be issued in print media or individually. Intimation regarding notification on the above shall be updated on www.tntenders.gov.in

TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – II

INSTRUCTIONS TO BIDDER (ITB)

SECTION – II – Instructions to Bidder (ITB)

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1. Introduction

1.1 Organization

Tiruchirappalli Smart City Limited (TSCL) is a Special purpose vehicle registered under companies act to implement & execute projects of Tiruchirappalli smart city.

TSCL would focus on infrastructure development to sustain the development of Tiruchirappalli.

1.2 Project

Solar PV Power Plant of 2.4Mwp (DC) capacity is to be set up at Panchappur Tiruchirappalli. The Project shall be funded and owned by Tiruchirappalli Smart City Limited (TSCL, hereinafter called as "Employer").

The Solar Power generated from the Project shall be wheeled to Tiruchirappalli city Corporation's water pumping/STP/ Any other location specified by the employer. The Bidder selected based on this Tender (hereinafter referred as "Contractor") shall execute the project on turnkey basis. The details of the facilities to be set up by the Contractor in the present instance and for which Bids are hereby invited are described in this bidding document. The overall responsibility of complete "Scope of Works" as mentioned in this bidding document as per the specification mentioned in the Section V: Technical Specifications(TS), and are required for successful installation, commissioning and operation of the project in all respect including those which are not mentioned explicitly in this bidding document, rests with the Bidder.

Bids are invited in the prescribed Bid Formats as defined under Section VI: Forms and Formats, for the Scope of Work described in the NIT document. Following are the details:

Item	Description
Tender Notice No:	193/2020-21 S.No.02
Roc No	E1/10237
Description of the Project	Design , Supply , Installation & Commissioning of 2.4 Mwp solar power plant at (Package-I) Panchappur in Tiruchirappalli City Corporation.
Date & time of Pre-Bid Meeting and Venue	**20.01.2021 11.00a.m Hours**, Conference Hall, Tiruchirappalli City Corporation, 58, Bharathidasan Salai, Cantonment, Tiruchirappalli - 620001.
Last date and time for submission of Bids (Online and Physical)	**02.02.2021 3.00p.m.**
Date of opening of Techno-commercial Bid (Online & Physical) Date of opening of Price Bid	**02.02.2021 4.00p.m.**
Last date for receiving queries	25.01.2021

Bid validity	90 days from the date of opening of Techno-Commercial	
Tender Processing Fees	INR **25,000/-** in favour of "The Managing Director, Tiruchirappalli Smart City Limited payable at Tiruchirappalli ".	
EMD	INR **12,50,000/-** in favor of "The Managing Director, Tiruchirappalli Smart City Limited payable at Tiruchirappalli"/ EMD in the form of DD or as mentioned in the Bank Guarantee sheet (as per Format 12(a)) for Packages quoted by the bidder/EMD as mentioned in the Bank Guarantee sheet (as per Format 12(a)) for Packages Quoted by the bidder. .	
Validity period	180 days from the date of submission of Bids	
Bank guarantee against Mobilization Advance, if required by the contractor	NOT APPLICABLE	
Integrity Pact Bank Guarantee (IPBG)	NOT APPLICABLE	
Performance guarantee For EPC Contract and Operation & Maintenance	I.	The Contractor shall furnish within 14 days from the date of issue of Letter of Intent (LOI), an unconditional and irrevocable bank guarantee for due Performance as per Format attached and which shall be for 2.0% of the total Contract Value (i.e., total sum of all the supply contract, erection, installation & Commissioning of the plant contract) and shall be valid up to 90 days beyond defect liability period.
	II.	Within One (1) Month prior to the Expiry of the Performance BANK Guarantee of EPC Contract, the Contractor shall furnish an unconditional and irrevocable bank guarantee against O&M for due Performance as per Format provided under Section- VI of this Tender Document and which shall be for 100.0% of the total 1 Year O &M Value of the contract and valid till completion of 12 months from the date of Completion O & M. The Bank guaranteed shall be subsequently renewed ill the completion of O & M period. During O & M period failure to rectify the fault shall lead to encashment of BG as per GCC & SCC clause.
Address for correspondence	**The Managing Director, Tiruchirappalli Smart City Limited, 58, Bharathidasan salai, Cantonment, Tiruchirappalli - 620001, E-mail:Commr.trichy@tn.gov.in.**	

1.3 Local Conditions

The Bidder is advised to visit the site and ensure the suitability of land for the proposed Solar Plant site and examine the site conditions, traffic, location, surroundings, climate, availability of power, water and other utilities for construction, access to site, handling and storage of materials, weather and insulation data, applicable laws and regulations, and obtain for itself on its own responsibility all information, as per their understanding, as may be necessary for preparing the Bid and entering into the Contract Agreement. All the expenses of visiting the Site for assessment of land for the subject Solar Power Plant Site and its associated costs shall be borne by the Bidder.

1.3.1 The employer and any of its personnel or agents shall have right to enter upon its premises and lands for the purpose of inspection or otherwise.

1.3.2 Failure to visit the or failure to study the Bidding documents shall in no way relieve the successful Bidder from furnishing any material or performing any work in accordance with the Bidding documents.

1.3.3 The Time for Completion of the project as specified in the bidding documents shall not be extended unless otherwise agreed by the Employer or its authorized representatives.

1.3.4 The Bidder must conduct its own inspection of the specified land for Project Site, access to the Project Site and surroundings at its own cost in order to make a proper estimate of the works to be performed under consideration of site-specific constraints. This applies in particular to the transportation & storage of equipment to the Project site and the scope of site works. The Bidder shall also inspect the site and the access to site from the point of manufacturer to make sure that its equipment is suitable for the available access and the site terrain.

1.3.5 **It shall be deemed that by submitting a Bid, the Bidder has:**

- Made a complete and careful examination of the Bidding documents Received all relevant information requested from the Employer Acknowledged and accepted the risk of inadequacy, error or mistake in the information provided in the Bidding documents or furnished by or on behalf of the Employer relating to any of the matters referred to in Clause 1.2 above Satisfied itself about all matters, things and information including matters referred to in the Abridged Bid Information, necessary and required for submitting an informed Bid, execution of the Project in accordance with the bidding documents and Performance of all of its obligations mentioned there under
- Acknowledged and agreed that inadequacy, lack of completeness or incorrectness of information provided in the Bid documents or ignorance of any of the matters referred to in Clause 1.3.2 herein shall not be a basis for any claim for compensation, damages, extension of time for Performance of its obligations, loss of profits etc., from the Employer, or a ground for termination of the Contract Agreement; and
- Agreed to be bound by the undertakings provided by it under and in terms hereof.

1.3.6 Any data provided by the Employer to the bidder is for information only. The Employer shall not be liable for any omission, mistake or error on the part of the Bidder in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to the Tender Document or the Bidding/Tendering Process, including any error or mistake therein or in any information or data given by the Employer. It is the bidder's responsibility, with his expertise and experience, to satisfy himself with the correctness of the data and prevailing site conditions.

1.3.7 **Local Regulatory Frame Work:**

It shall be imperative for each Bidder to fully inform itself of all local conditions, laws and factors which may have any effect on the execution of the Contract as described in the Bidding Documents. The Employer shall not entertain any request for clarification from the Bidder, regarding such local conditions.

It is the responsibility of the Bidder that such factors have properly been investigated and considered while submitting the Bid proposals and that no claim whatsoever including those for financial adjustment to the Contract awarded under the Bidding documents shall be entertained by the Employer and that neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by the Employer.

2.0 General Instructions

2.1 General Instruction to the bidders

2.1.1 The current documents with all sections, annexure and formats form the bidding document, which is open to all prospective Bidders, requesting a proposal for implementation of the Project from the eligible bidders on a fixed price basis. A Contractor would be selected through competitive bidding process for execution of the Project. The Employer expects Bidders to confirm compliance to NIT terms, conditions and specifications at the time of submission of Bids, failing which the Bids are liable to be rejected. Hence, the Bidders in their own interest are advised to submit their Bids complete in all respects conforming to all terms and conditions of this Bidding documents.

2.1.2 Bids shall be evaluated by Tiruchirappalli Smart City Limited (TSCL), based on the information/ documents furnished in the Bids submitted by the Bidders. Hence, Bidders are advised to ensure that they submit appropriate and relevant supporting documentation along with their proposal in the first instance itself. Bids not complying with the requirements of this Tender Document are liable to be rejected without any further opportunity.

2.1.3 All Bids must be accompanied by a Bid processing fees and EMD of value as specified in the document, in the form and manner as specified in the NIT document and must be delivered along with Bid.

2.1.4 It is mandatory for every bidder to submit their bid online. However, the bidder must also submit all the requisite original specified documents in hard form to the address specified on or before the date specified at ITB Clause 1.2, along with the online submission of the documents. In case of any discrepancy between the online and offline submitted documents, the documents uploaded online shall prevail.

2.1.5 The specification provided with this bidding documents outlines the functional requirements. The Bidder must submit a Proposal based upon their own design, meeting the functional requirements specified in the bidding documents, though this does not necessitate the Employer's approval for such design as assumed by the bidder for purpose of bidding

2.1.6 Bidders shall deploy the latest state-of-the-art technology and must ensure that the goods supplied are new, unused and of most recent or current models and incorporate all recent improvements in design and materials for the implementation of the Project.

2.1.7 The Bidder shall upload the digitally signed (by Authorized Signatory) 'Bid document along with its Amendments, Clarifications & Addendums if any as token of acceptance along with the other prescribed documents. Bids received without such documents prescribed above and not complying with the terms and conditions of bidding documents shall be ignored.

2.1.8 Mere submission of bid does not construe that the Bidder has been short-listed or qualified.

2.1.9 This is a **ZERO deviation bidding documents**. The Bidders shall ensure compliance of all provisions of the bid documents and submit their bid accordingly and shall submit an undertaking that they have not taken any deviations. Bids with any deviation to the bid conditions shall be liable for rejection.

2.1.10 The Employer reserves the right to reject any Bid submitted with deviations beyond the one that is specified and mentioned in the NIT and no time shall be given in any circumstance after opening of Technical Proposal for submission of documents which are missing with Bid.

2.1.11 Incase of change in ownership of the Contractor, all the Agreements and Contracts signed with the Employer will stand true and valid with the new Ownership of the Contractor.

2.2 Cost of Bidding

The Bidder shall bear all costs in relation to its Bid and consequent bidding process activities. The Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process. Bid processing fees to be submitted along with the bid shall be in the form of DD drawn in favour of "The Managing Director, Tiruchirappalli Smart City Limited" payable at Tiruchirappalli.

2.3 Understanding the Bid Document

2.3.1 The Bidder shall be deemed to have carefully examined the general conditions, specifications and schedules and also to have satisfied himself as to the nature and character of the Plant and equipment to be supplied and installed under the Contract, for the proposed Solar Power System(s), site conditions and all relevant matters & details.

2.3.2 The Bidder should ensure that all information listed under this NIT has been attached / enclosed in appropriate envelopes. Failure to furnish relevant information and documentary evidences as stipulated in the Bid documents or submission of Bid that is not substantially responsive to the NIT document in all respects may be summarily rejected.

2.4 Clarification of bidding document

A Bidder requiring any clarification of the Bidding documents may notify the Employer in writing or by facsimile or by e-mail at the Employer's contact details as indicated in this document latest by date & time of pre – bid as specified in ITB Clause No. 1.2.

2.5 Amendment of Bidding Documents

2.5.1 The Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a particular Bidder, modify the Bidding documents.

2.5.2 Any amendment, if any, will be notified on website www.tntenders.gov.in

2.5.3 Employer at its discretion, may extend the deadline for the submission of Bids with reasonable time, in order to allow the prospective Bidder(s) to prepare their Bids.

2.6 NOT USED

2.7 Withdrawal of Invitation to Bid

While the Employer has floated this Tender Document and has invited prospective Bidders to submit their proposals, the Employer shall always be at the liberty to withdraw this invitation to bid at any time before its acceptance.

2.8 Authorized Representative of Bidder

2.8.1 All the Bidders are requested to mention the name of their authorized representative, if any, with full address in the Bid.

2.8.2 In case the representative is changed during the bidding process such changes shall be notified by the Bidder, failing which, Employer shall not accept any responsibility. Any change in name of the authorized signatory shall be accompanied by written letter from authorized representatives

2.9 Financial Proposal and Currencies

2.9.1 The Bidders shall quote the prices inclusive of levied taxes, duties and levies etc. except for O&M proposal. The bidder shall provide the breakup of taxes, duties and levies etc. as per formats given under "Appendix 5: Format for Financial Proposal".

2.9.2 The Bidder shall indicate the price in Financial Proposal in Indian National Rupee (INR) only, in both figure and words.

2.9.3 Arithmetical errors, if any, shall be rectified on the basis described as: If there is any discrepancy found between unit price and mentioned total price, then the unit price will prevail and the total price shall be corrected. The total price will be obtained by multiplying the unit rate and quantity. If there is any discrepancy in the words and figure quoted, price mentioned in words will prevail.

2.9.4 In case the bidder has mentioned the taxes, duties & other levies wrongly in the financial bid format other than the applicable, the taxes, duties & other levies mentioned by bidder will be considered for the purpose of evaluation. However, taxes, duties & other levies shall be paid/reimbursed based on the documentary evidence submitted by the bidder subject to maximum of which has been mention by the bidder and considered during evaluation.

2.9.5 In case, any of the item/ component from the entire supplies, is imported by the bidder, then the price breaks up of those items shall be mentioned separately along with the applicable taxes and duties. Further, in case any concession/ exemption is desired to be availed by the bidder in accordance with the provisions under GCC Clause-13 and as per applicable law/ rules regulations, then same shall be mentioned by the bidder in their financial bid.

2.10 Bank Guarantees

2.10.1 Bidder shall be required to submit Bid Security as specified in the ITB Clause No. 1.2.1. The Bank Guarantee (s) shall be in favour of **"The Managing Director, Tiruchirappalli** Smart **City Limited" payable** at **Tiruchirappalli from** any scheduled commercial bank The Employer shall not be liable to pay any interest on the EMD.

2.10.2 The Bank Guarantee submitted should have the clear time validity in all respect as specified in respective clause (s). If, by any reason, it is required to extend the Bank Guarantee, bidder shall undertake to renew the Bank Guarantee at least one month before the expiry of the validity failing which Employer will be at liberty to encash the same. Employer shall notify the bidder for submission of renewal of bank guarantee.

2.10.3 A Bid submitted without the Bid processing fees and EMD shall not be considered and shall be summarily rejected.

2.10.4 The validity of EMD shall be as per ITBClause1.2.1.

2.10.5 The Bid Security shall specifically bind the Bidder to keep its Bid valid for acceptance and to abide by all the conditions of the NIT documents in the event of the Employer desiring to award the work to the said Bidder.

2.10.6 The EMD in respect of the Successful Bidder shall be released on bidder's request after receipt of the Performance Bank Guarantees as per ITB Clause 1.2.1 in the format prescribed under Section VI at "Format for Performance Bank Guarantee" and after confirmation received by Employer from the issuing bank.

2.10.7 NOT USED

2.10.8 The Employer shall have an unqualified discretion not to release the EMD and forfeit the full value in case:

(i) If a Bidder engages in a corrupt practice, fraudulent practice, coercive practice, or restrictive practice;

(ii) The bidder withdraws the bid after opening of bids by Employer.

(iii) In the event where the Bidder, is chosen as the Successful Bidder, fails to provide following within the specified time limit under ITB clause 1.2.1

- Unconditional acceptance of Letter of Intent (LOI) issued by Employer. However zero date for Contract shall start from the date of issue of LOI/NTP.

- To sign the Contract Agreement within 21 days from release of LOI and/or To furnish the Performance Bank Guarantee.

(iv) Integrity Pact (IP) Agreement & IPBG: **NOT APPLICABLE.**

(v) Performance Bank Guarantee for O&M: The Successful Bidder has to carry out comprehensive O&M for 10 (ten) years w.e.f. date of Operational Acceptance (i.e., after successful commissioning and performance demonstration). The Successful Bidder shall submit a Bank Guarantee at time and of amount as specified in ITB Clause No. 1.2.1 against the "O&M Performance Guarantee" and which the Contractor has to maintain for the specified period of O&M.

2.11 Third Party Inspection Agency

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

2.11.2 Employer or its authorized representatives, reserve the right to inspect the project components, as per project schedule to ensure compliance of the quality of Components/ material as per the specification and data sheet, before dispatch to site. Employer at its own discretion will visit the premises for inspection with prior intimation to the Contractor. It is the responsibility of the contractor to inform Employer at least 14 days prior to the dispatch of the project equipment. All administrative expenses for Employer or its authorized representatives, will be borne by Employer for above inspections. However, all the expenses related to testing and inspection at manufacturer/ supplier premises or at project site shall be borne by the contractor only.

2.12 Applicability of Labour Laws

2.12.1 NOT USED

2.12.2 The Bidder shall ensure payment of wages in compliance with Minimum Wages Act of the state of Tamilnadu, and shall comply with all labour laws applicable to it under Indian law Right to accept and to reject any or all Bids.

2.12.3 Not withstanding anything contained in this Tender Document, the Employer reserves the right to accept or reject any Bid and to annul the bidding process and reject all Bids at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons there for.

2.12.4 The Employer reserves the right to reject any Bid and forfeit the EMD at any time if a material misrepresentation is made or uncovered.

2.12.5 Such misrepresentation/improper response shall lead to the disqualification of the Bidder. If such disqualification / rejection occurs after the Bids have been opened and the lowest Bidder gets disqualified / rejected, then the Employer reserves the right to:

(i) Invite the remaining Bidders to submit Bids; or

(ii)Take any such measure as may be deemed fit in the sole discretion of the Employer, including annulment of the bidding process.

2.12.6 Incase,it is found during the evaluation or at any time before signing of the Contractor after its execution and during the period of subsistence thereof, that one or more of the Qualifying Requirements have not been met by the Bidder or the Bidder has made material misrepresentation or has given any materially incorrect or false information, the Bidder shall be disqualified forthwith, if not yet appointed as the Contractor either by issue of the LOI or entering into of the Contract Agreement, or if the Successful Bidder has already been issued the LOI or has entered into the Contract Agreement, as the case may be, the same shall, notwithstanding anything to the contrary contained therein or in this NIT, be liable to be terminated, by a communication in writing by the Employer to the Successful bidder, without the Employer being liable in any manner whatsoever to the Bidder or Contractor, as the case may be. In such an event, the Employer shall forfeit and appropriate the EMD / Performance Bank Guarantee (PBG), without prejudice to any other right or remedy that may be available to the Employer.

2.12.7 The Employer reserves the right to verify all statements, information and documents submitted by the Bidder in response to the Bid documents. Failure of the Employer to undertake such verification shall not relieve the Bidder of its obligations or liabilities hereunder nor will it affect any rights of the Employer there under.

2.13 Eligibility Criteria /Qualifying Requirements (QR)

Bidders are required to fulfil the qualifying criteria for both technical and financial as specified the "Section – I:" of this Tender Document.

3.0 Preparation and Submission of Bid

3.1 Language of the bid

The bid prepared by the Bidder and all correspondence and documents related to the bid exchanged between the Bidder and the Employer shall be written in English language, provided that any printed literature furnished by the Bidder may be written in another language, as long as such literature is accompanied by a translation of its pertinent passages in English language in which case, for purposes of interpretation of the bid, the translation shall govern.

3.2 General Terms

3.2.1 A Bidder is eligible to submit only one Bid for the Project. A Bidder shall not be entitled to submit another Bid either individually or in a Consortium/JV etc.

3.2.2 Not withstanding anything to the contrary contained in this Tender Document, the detailed terms specified in the draft Contract Agreement shall have overriding effect; provided, however, that any conditions or obligations imposed on the Bidder hereunder shall continue to have effect in addition to its obligations under the Contract Agreement.

3.2.3 The Bid should be furnished in the formats mentioned in the tender document which shall be duly signed by the Bidder's authorized signatory, provided that the pass – phrases will be submitted in separate sealed envelope only.

3.2.4 The Bidder should submit a power of attorney as per the format at "Power of Attorney for signing of Bid" authorizing the signatory of the Bidder for signing and submission of the Bid.

3.2.5 As this is zero deviation bidding process, any condition or qualification or any other stipulation contained in the Bid may render the Bid liable to rejection as a non-responsive Bid. The complete Bid shall be without alterations, interlineations or erasures, except those to accord with instructions issued by the Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

3.2.6 The bidding document including annexures, if any, are transmitted to the Bidders solely for the purpose of preparation and the submission of a Bid in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Bid. The Employer will not return any Bid or any information provided along therewith.

3.2.7 The Successful bidder i.e., Contractor, shall ensure submission of PF code number if applicable, allotted by Regional PF Commissioner along with the Performance bank guarantees. Failure to do so is likely to result in the offer being rejected.

3.2.8 Bidder to note that Price Bids of those bidders shall be opened who are found technically qualified (as per IFB Clause 4) and are found reasonably responsive to Employer's tender terms and conditions and scope of Works.

3.2.9 All the firms/companies of the consortium shall fill in & submit all the forms cited in Section VI of this document

3.3 Format and Signing of Bid

3.3.1 The Bidder shall provide all the information sought under this NIT.The Employer will evaluate only those Bids that are received in the required formats and complete in all respects.

3.3.2 The Bid shall be typed or written in indelible ink and signed by the authorized signatory of the Bidder who shall also initial each page, in blue ink. All the alterations, omissions, additions or any other amendments made to the Bid shall be initialled by the person(s) signing the Bid.

3.4 Documents Comprising the Bid

3.4.1 Following documents shall be submitted in the mode defined as per below:

A. Documents to be submitted Offline (in Original) Bidding Envelope:

The bidding envelope shall contain the following sticker:

Package of Projects	Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at STP Panchappur near Madurai By-Pass road in Tiruchirappalli City Corporation.
Reference Number	_____
Contents	Covering Envelope, Pass Phrase Envelope -1- Technical Bid & Pass Phrase Envelope -2 - Financial Bid.
Submitted by Authorized Signatory Bid Submitted To	The Managing Director Tiruchirappalli Smart City Limited (TSCL) 58, Bharathidasan Salai, Cantonment Pin: 620001. Tamil Nadu, India

i) **Covering Envelope** must contain the following:

- Processing Fee in the form DD/Pay Order of requisite amount as mentioned in the Bid Information Sheet
- EMD as mentioned in the Bank Guarantee sheet (as per Format 12(a)) for Packages quoted by the bidder.
- Bid Letter/Covering Letter as per Format Appendix-1,

- Power of Attorney as per Appendix-15,

- Board Resolution (The certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary / Director)
- All bidding documents (NIT including Blank formats, Amendment, Clarification).
- EMD [as per format 12(a)] / DD
- DD towards tender processing fees
- Appendix 2: Details of Bidder
- Appendix 4: Details of Power Plant Performance Guaranteed parameters
- Appendix 6: Details of qualified technical staff for EPC and O&M separately.
- Appendix 7: Declaration of Compliance
- Appendix 8: No Deviation Certificate
- Appendix 9: Declaration on Bidder's relation to Directors
- Appendix 10: Execution Timeline
- Appendix 15: Power of Attorney for signing of Bid
- Documents relevant to Eligibility of the bidder:
- Consortium Agreement, If applicable

I. All documents related to eligibility of bidder which are required to fulfil the qualifying criteria as specified the "Section – I: IFB clause 4" of this Tender Document.
II. List of projects commissioned, commissioning certificates for reference project(s),

III. Financial eligibility documents

IV. Technical Specifications (TS) Technical document with all relevant enclosures as mentioned in the Section

V. Guaranteed Technical Particular/ Data Sheet for Solar PV Module

VI. Guaranteed Technical Particular/ Data Sheet for Power Conditioning Unit

VII. Guaranteed Technical particulars of step-up transformer

VIII. Guaranteed Technical Particulars

IX. Guaranteed Technical Particulars of Power Cables (DC & AC) as per Suppler GTP.

X. Guaranteed Technical Particulars of HT panels as per supplier GTP

XI. Power evacuation SLD

XII. SLD of the Plant (Details of wiring including cable size, module, Inverters, Array Junction Box, Earthing etc shall be mentioned in SLD)

XIII. Site Plan

XIV. Schematic diagram of DP structure yard, VCB, & Transformer

XV. Structure Diagram

XVI. Array Junction box diagram

XVII. Physical layout

Failure in submission of above details in offline/hard copy shall lead to rejection of bids.

ii) **Pass-Phrase Envelope-1**: Containing Pass Phrase for Technical Bid duly signed and stamped by the authorized signatory in sealed envelope

iii) **Pass-Phrase Envelope-2**: Containing Pass Phrase for Financial Bid duly signed and stamped by the authorized signatory in sealed envelope

Note:

1. The pass – phrases shall not be uploaded online.

2. Copy of Financial Proposal should not be submitted offline.

3. Documents Submitted Online

The bidders shall strictly follow the instructions mentioned in the electronic form in respective technical bid and financial bid while filling the form. All documents of the www.tntenders.gov.in which should contain the following:

[Note: -If the Bidder submits the Document offline as specified in Clause 3.4.1 A, but fails to submit online Bid then the Bid shall be considered non-responsive, However the EMD shall be returned subject to request letter received from the Bidder side but the Processing fee is non-returnable.]

1. "Technical Bid"

The Bidder shall upload technical bid containing the **scanned copy** of following documents duly signed and stamped on each Page by the authorized person in SEQUENCE for each as mentioned below.

- All bidding documents (NIT including Blank formats, Amendment, Clarification).
- Scanned copy of EMD [as per format 12(a)]
- Scanned copy of DD towards tender processing fees
- Appendix 1: Bid Letter/Covering Letter
- Appendix 2: Details of Bidder
- Appendix 3: Bid Evaluation (BEC)
- Appendix 4: Details of Power Plant Performance Guaranteed parameters
- Appendix 5: Format for Financial Proposal
- Appendix 6: Details of qualified technical staff for EPC and O&M separately.
- Appendix 7: Declaration of Compliance
- Appendix 8: No Deviation Certificate
- Appendix 9: Declaration on Bidder's relation to Directors
- Appendix 10: Execution Timeline

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- Appendix12 (e): Checklist for Bank Guarantee Verification
- Appendix 15: Power of Attorney for signing of Bid
- Documents relevant to Eligibility of the bidder:

I. All documents related to eligibility of bidder which are required to fulfil the qualifying criteria as specified the "Section – I: IFB clause 4" of this Tender Document.

II. List of projects commissioned, commissioning certificates for reference project(s), III.

Financial eligibility documents

IV. Technical Specifications (TS) Technical document with all relevant enclosures as mentioned in the Section

V. Guaranteed Technical Particular/ Data Sheet for Solar PV Module

VI. Guaranteed Technical Particular/ Data Sheet for Power Conditioning Unit

VII. Guaranteed Technical particulars of step-up transformer

VIII. Guaranteed Technical Particulars

IX. Guaranteed Technical Particulars of Power Cables (DC & AC) as per Suppler GTP.

X. Guaranteed Technical Particulars of HT panels as per supplier GTP

XI. Power evacuation SLD

XII. SLD of the Plant (Details of wiring including cable size, module, Inverters, Array Junction Box, Earthling etc shall be mentioned in SLD)

XIII. Site Plan

XIV. Schematic diagram of DP structure yard, VCB, & Transformer

XV. Structure Diagram

XVI. Array Junction box diagram

XVII. Physical layout

Failure in submission of above details in offline/hard copy shall lead to rejection of bids.

B. Financial Bid

The BOQ table of the Financial Bids shall have to be filled online in the Electronic Form provided at the TN Tenders Portal only.

Financial bids shall not be submitted in offline. Submission of Financial bis in offline shall lead to rejection of Bids.

3.5 Bid due Date/ Last date of submission

3.5.1 Bids should be submitted on or before the bid due date as specified in ITB Clause No. 1.2.1 at the address provided in ITB Clause 1.2.1 in the manner and form as detailed in this document.

3.5.2 The Employer may, in its sole discretion, extend the bid due date by issuing an Amendment/ Addendum in its website in accordance with ITB Clause No. 2.5.3, uniformly for all Bidders.

3.6 Late Bids

Bids received by the Employer after the specified time on the bid due date shall not be eligible for consideration and shall be summarily rejected. In case of an unscheduled holiday being declared on the prescribed closing/ opening day of the Bid, the next working day shall be treated as the scheduled prescribed date of closing/ opening of the Bid.

3.7 Confidentiality

Information relating to the examination, clarification, evaluation and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process of evaluation and selection or is not a retained professional advisor advising the Employer in relation to or matters arising out of, or concerning the bidding process. The Employer will treat all information, submitted as part of the Bid, in confidence and will require all those who have access to such material to treat the same in confidence. The Employer may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or the Employer.

3.8 Correspondence with the Bidder

The Employer shall not entertain any correspondence with any Bidder in relation to acceptance or rejection of any Bid

3.9 Bid Opening and Evaluation of Bid

3.9.1 The Employer shall open, examine and evaluate the Bids in accordance with the provisions set out in this document.

3.9.2 To facilitate evaluation of Bids, the Employer may, at its sole discretion, seek clarifications in writing from any Bidder regarding its Bid.

3.9.3 After the receipt of Bids the Employer may, at its discretion, send a team of engineers, if necessary, to inspect the engineering facilities, to ensure suitability and satisfactory working conditions at the Bidder's works/ yards(s) and equipment listed to be used by the Bidder for the work. The Bidder shall ensure that the aforesaid team shall at all the times have access to visit and inspect works, equipment etc. All the administrative expenses for Employers' personnel shall be borne by the Employer. However, all other expenses for such inspections shall be borne by contractor only.

3.9.4 The Employer will examine the Bid to determine whether they are complete, whether any computational errors have been made, whether required securities have been furnished, whether the documents have been properly signed, and whether the bid is generally in order.

3.9.5 Prior to the detailed evaluation, the Employer will determine the substantial responsiveness of each Bid to the bidding documents. A substantially responsive Bid is one which conforms to all the terms and conditions of the bidding documents without material deviations. Deviations from or objections or reservations to critical provisions such as those concerning EMD/ EMD, Applicable Law and Taxes and Duties will be deemed to be a material deviation. The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself without recourse to extrinsic evidence.

3.9.6 If the Bid is not substantially responsive as per the conditions stated under ITB Clause 3.10, it will be rejected by the Employer and may not subsequently be made responsive by the Bidder by correction of nonconformity.

3.9.7 The Employer will evaluate and compare Bids which have been determined to be substantially responsive.

3.9.8 Following factors shall be required for evaluation of Bid:

I. The Evaluated Bid Value (EBV) shall be calculated using the following parameters

A. EPC Contract Price inclusive of Taxes, i.e., Contract Value (Sum total of price for all sections/ parts thereof)

B. NPV of annual O&M Price exclusive of taxes quoted for 10 (ten) years as given in Appendix 3:

Bid Evaluation criteria.

II. The Bid with the lowest Evaluated Bid Value shall be considered as L-1. The bid with next lowest value shall be considered as L-2 and so on.

III. For evaluation of Bids, the quoted price *including GST* and other taxes for EPC Works & NPV of 10 years of O&M price (excluding taxes), as applicable and quoted by the bidder in the financial proposal, shall be considered.

3.9.9 I. The first envelope (Technical Bid) of only those bidders will be opened by TSCL whose required documents are received at TSCL office on or before the due date and time of bid submission.

II. Documents (as mentioned in the previous clause) received after the bid submission deadline specified in the Bid Information Sheet shall be rejected and returned unopened if super-scribed properly with address, to the bidder.

3.9.10 In first stage, only Techno-commercial bids will be opened and The Employer will carry out Techno-commercial evaluation of bids received based on qualifying requirements specified in the bid documents. Techno-commercial evaluation will be carried out of bids which are found to be substantially responsive. Based on this evaluation, the eligible bids will be shortlisted for financial bid opening. In second stage, Financial bids will be opened and the financial bid evaluation will be carried as per clause 3.9.8 of ITB given above. After financial bid evaluation, the bidders shall be shortlisted in the ascending order of price bid quoted.

3.10 Tests of Responsiveness

3.10.1 Prior to evaluation of Bids, the Employer shall determine whether each Bid is responsive to the requirements of the NIT. A Bid shall be considered responsive only if:

1. Bid is received by the bid due date and time including any extension thereof;
2. Bid is signed, stamped, sealed and marked as stipulated in ITBClause3.4;
3. Bid is accompanied by the DD for Tender processing fees and EMD as specified in ITB Clause 1.2.1.
4. It is accompanied by pass – phrases for both Techno – commercial and Finance bid, the power(s) of attorney and Board Resolution as specified in Appendices, as the case may be;
5. It contains all the information (complete in all respects) as requested in this NIT (in formats same as those specified);
6. It does not contain any condition or qualification or deviations and has “No Deviation Certificate” required as per the format (Appendix 8: No Deviation Certificate)

3.10.2 The Employer reserves the right to reject any Bid which is non-responsive and no request for alteration, modification, substitution or withdrawal shall be entertained by the Employer in respect of such Bid.

3.11 Modification and Withdrawal of Bids

The Bidder may modify or withdraw its Bid after the Bid's submission, provided that written notice of the modification or withdrawal is received by the Employer prior to the deadline prescribed for submission of Bids.

3.11.1 A withdrawal notice may also be sent by fax/ Email but followed by a signed confirmation copy by post not later than the deadline for submission of Bids.

3.11.2 No Bid shall be modified after the scheduled time of Bid Submission or any time there after

3.11.3 No Bid shall be withdrawn in the interval between the scheduled date of opening of Techno-Commercial bid and the expiration of the period of Bid validity specified by the Bidder. Withdrawal of a Bid during this interval will result in the Bidder's forfeiture of its EMD.

3.12 **Not Used**

3.13 Contacts during Bid Evaluation

Bids shall be deemed to be under consideration immediately after they are opened and until such time the Employer makes official intimation of award/ rejection to the Bidders. While the Bids are under consideration, Bidders and/ or their representatives or other interested parties are advised to refrain from contacting by any means, the Employer and/ or their employees/ representatives on matters related to the Bids under consideration.

3.14 Employment of Officials / Ex-Official of the Employer

Bidders are advised not to employ serving employees of the Employer. It is also advised not to employ ex-personnel of the Employer within the initial two years period after their retirement/ resignation/severance from the service without specific permission of the Employer. The Employer may decide not to deal with such firm(s) who fail to comply with the above advice.

3.15 Declaration on Bidder's Relation to Directors

The Bidders are required to certify in prescribed format "Appendix 7: Declaration of Compliance", whether he/they is/are related to any of the Directors/Senior Personnel of the Employer in any of the ways mentioned in the Certificate. It is clarified that any such affirmative certificate shall not, by itself, prejudice consideration of the Bid.

3.16 Letter of Intent ("LOI") and Notification to Proceed ("NTP")

3.16.1 After selection of the Successful Bidder, a Letter of Intent (the "LOI") shall be issued, in duplicate, to the Successful Bidder and the Successful Bidder shall acknowledge the LOI within seven (07) days of the issuance of the LOI. The Successful Bidder shall not be entitled to seek any deviation from the Contract, as may have been amended by the Employer prior to the bid submission date.

3.16.2 On receipt of the acknowledgement of the LOI by the Successful Bidder and compliance with the conditions specified in ITB Clause 3.9, the Employer shall sign the Contract with the Successful Bidder. Non-Receipt of acknowledgement letter or unwillingness to sign the contract will result in forfeiture of their EMD.

3.17.1 The Successful Bidder shall submit the Bank Guarantees as per ITB Clause1.2.1 for the Project. The Performance Guarantee of the Successful Bidder should be submitted to the Employer in the form of a bank guarantee as prescribed in "Appendix 12(c): Format of Bank Guarantee for Performance Bank Guarantee", as specified in ITB Clause 1.2.1.

3.17.2 The bank guarantee by the Contractor will be given from bank specified in "Schedule1:Specified list of banks" only.

3.17 Performance Bank Guarantee

3.18 Fraudulent Practices

The Bidders may please note that the Employer shall not entertain any correspondence or queries on the status of the Bids received against this NIT. Bidders are advised not to depute any of their personnel or agents to visit the Employer's office for making such inquiries.

Any effort by a Bidder to influence the Employer on the Bide valuation, bid comparison or Contract award decision may result in the rejection of the Bidder's Bid.

3.19 Special Instructions to Bidders for e- bidding / e – tendering (To be filled from existing e tender rules)

3.19.1 Submission of Online Bids is mandatory for thisTender

Tender Bidding Methodology: It is Single Stage–Two Envelope process.

For participating in this tender online, the following instructions are to be read carefully. These instructions are supplemented with more detailed guidelines on the relevant screens of the ETS.

Digital Certificates

For integrity of data and authenticity/ non-repudiation of electronic records, and to be compliant with IT Act 2000, it is necessary for each user to have a Digital Certificate (DC) also referred to as Digital Signature Certificate (DSC), of Class III or above, issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer http://www.cca.gov.in].

Registration:

To use the Electronic Tender portal www.tntenders.gov.in, vendors need to register on the portal. Registration of each organization is to be done by one of its persons who will be the authorized to coordinate for the e-tendering activities. For further details, please visit the website/portal, a and follow further instructions as given on the site.

Important Note:

1. Interested bidders have to download official copy of the NIT & other documents after login into the Portal of tntenders.gov.in. If the official copy of the documents is not downloaded from Portal of TN Tenders within the specified period of downloading of NIT and other documents, bidder will not be able to participate in the tender.
2. To minimize teething problems during the use of ETS (including the Registration process), it is recommended that the user should peruse the instructions given under 'ETS User-Guidance Centre' located on ETS Home Page, including instructions for timely registration on ETS. The instructions relating to 'Essential Computer Security Settings for Use of ETS' and 'Important Functionality Checks' should be especially taken into cognizance.
3. Please note that even after acceptance of your registration by the Service Provider, to respond to a tender you will also require time to complete activities related to your organization, such as creation of users, assigning roles to them, etc.

TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – III

General Conditions of Contract (GCC)

SECTION – III

General Conditions of Contract (GCC)

Table of Contents

A. CONTRACT AND INTERPRETATION

1. Definitions and Abbreviations

The following words and expressions shall have the meanings hereby assigned to them:

"**Adjudicator**" means the person or persons named as such in the SCC to make a decision on or to settle any dispute or difference between the Employer and the Contractor.

"**Applicable Law**" means any statute, law, regulation, ordinance, notification, rule, regulation, judgment, order, decree, bye-law, approval, directive, guideline, policy, requirement or other governmental restriction or any similar form of decision of, or determination by, or any interpretation or administration having the force of law in the Republic of India and the State Government, by any Government Authority or instrumentality thereof, whether in effect as of the date of this Contract or thereafter.

"**Affected Party**" means Employer or the Contractor whose performance has been affected by an event of Force Majeure.

"**Bid**" shall mean the Techno Commercial and the Financial Proposal submitted by the Bidder along with all documents/credentials/attachments Annexure etc., in response to this IFB, in accordance with the terms and conditions hereof.

"**Bidder**" shall mean Bidding firm/Consortium of firm's submitting the Bid including its successors, executors and permitted assigns.

"Bid Price" shall mean the price bid submitted by the bidders comprising of 1) EPC Price bid (Firm value of the financial proposal as the sum of individual Bid value of supply, erection and civil works including all Taxes and Duties) and 2) O&M Price bid excluding all Taxes and Duties.

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

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

"**Commissioning**" A project shall be considered commissioned if all equipment as per rated capacity & installation methodology (as per Section-VI, Technical Specification) have been installed and energy has flown into grid.

"**Completion of facilities**" means that the Facilities (or a specific part thereof where specific parts are specified in the SCC) have been completed operationally and structurally and put in a tight and clean condition, and that all work in respect of Pre-commissioning of the Facilities or such specific part thereof has been completed; and Installation, Testing & Commissioning has been completed for all individual components of the Infrastructure as per Technical Specifications.

"**Contract**" means the Contract Agreement entered into between the Employer and the Contractor, together with the Contract Documents referred to therein; they shall constitute the Contract, and the term "the Contract" shall in all such documents be construed accordingly.

"**Contract Documents**" means the documents listed in the Form of Contract Agreement.

"Contract Value" means the firm value of the quoted price by the successful bidder specified in its financial proposal as the sum of individual contract value of supply, erection and civil works under different work packages specified in the financial proposal, subject to such additions and adjustments thereto or deductions there from, as may be made pursuant to the Contract excluding taxes, duties levies etc., as applicable.

"**Contractor**" means the Bidder whose bid to perform the Contract has been accepted by the Employer and is named as such in the Contract Agreement/LOI/NTP, and includes the legal successors or permitted assigns of the Contractor.

"Contractor's Equipment" means all Plant, facilities, equipment, machinery, tools, apparatus, appliances or things of every kind required in or for installation, completion and maintenance of Facilities that are to be provided by the Contractor, but does not include Plant and Equipment, or other things intended to form or forming part of the Facilities.

"**Contractor's Representative**" means any person nominated by the Contractor and approved by the Employer to perform the duties delegated by the Contractor.

"**Day**" means calendar day of the Gregorian calendar.

"**DISCOM**" means Power Distribution Company of the state, responsible for distribution of Electrical power in the region and associated activities.

"Defect Liability Period" means the period of Sixty (60) months from the date of completion of the Facilities or a part thereof, during which the Contractor must repair any defect identified by the Project Manager / Engineer In charge after commissioning of the Plant. All the expenses to repair the defects shall be borne by the contractor and no additional cost charged to the Employer.

"Effective Date" means the date of issue of LOI/ NTP Date mentioned in contract agreement from which the Time for Completion shall be determined.

"**Employer**" Tiruchirappalli Smart City Limited (TSCL),having its registered office at Tiruchirappalli city Corporation , 58, Bharathidasan Salai, Cantonment, Tiruchirappalli - 620 001, Tamilnadu India and includes the legal successors or permitted assigns of the Employer and also its authorised representative.

"Facilities" means the Plant and Equipment to be supplied and installed, as well as all the Installation Services including all infrastructure as mention in scope of works mentioned in detail under Section V: Technical Specification of this IFB, to be carried out by the Contractor under the Contract.

"**Final Acceptance**" Final Acceptance" means acceptance of Facilities by the Employer at the end of First Year of O&M period, as stated in this NIT, from the date of Operational Acceptance

or demonstration of minimum annual CUF whichever comes later which certifies the Contractor's fulfilment of the Contract in respect of Functional and Plant Performance Guarantees of the Facilities.

"**GCC**" means the General Conditions of Contract hereof.

"**GHI**" means Global Horizontal Irradiance.

"Guarantee Test(s)" means the test(s) specified in the Technical Specifications to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Technical Specifications.

"IEC" means International Electro-technical Commission.

"Installation Services" means all those services ancillary to the supply of the Plant and Equipment for the Facilities, to be provided by the Contractor under the Contract; e.g., transportation and provision of marine or other similar insurance (s), inspection, expediting, site preparation works (including the provision and use of Contractor's Equipment and the supply of all use structural and construction materials required), installation including civil and allied works etc., testing, pre-commissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training of Employer's Personnel etc.

"**kWh**" means Kilo-Watt-hour.

"**MWp**" means Mega-Watt Peak.

"**Month**" means calendar month of the Gregorian calendar

"NIT" means Notice inviting Tender.

"NTP" means Notice to Proceed.

"O&M" means Comprehensive Operation and Maintenance of the Facilities.

"Operational Acceptance" means the acceptance by the Employer of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor's fulfilment of the Contract in respect of Functional and Plant Performance Guarantees of the Facilities period shall commence after Operational Acceptance of the Facilities by the Employer.

"Plant" means permanent plant, equipment, machinery, apparatus, articles and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts), but does not include Contractor's Equipment.

"**PR**" means Performance Ratio.

"Pre-commissioning" means the testing, checking and other requirements specified in the Technical Specifications that are to be carried out by the Contractor in preparation for Commissioning.

"**Project Manager/Engineer-in-Charge (EIC)**" means the person appointed by the Employer to perform the duties delegated by the Employer.

"**SCC"** means the Special Conditions of Contract.

"Site" means the land and other places upon which the Facilities are to be installed, and such other land or places as may be specified in the Contract as forming part of the Site.

"**Subcontractor,**" including vendors, means any person to whom execution of any part of the Facilities, including preparation of any design or supply of any Plant and Equipment, is sub-contracted directly or indirectly by the Contractor, and includes its legal successors or permitted assigns.

"Tender Document" means all the Sections of this documents (i.e. Section-I to VI), including its Annexures, Addendums, Clarifications, Amendments (if any) issued by TSCL.

"Tax" means the taxes/ duties/ levies/ octroi etc. as applicable and put in force by the state Government / central Government/ Local Bodies/ Statutory bodies etc. from time to time.

"Time for Completion" means the time within which Completion of the Facilities as a whole (or of a part of the Facilities where a separate Time for Completion of such part has been prescribed) is to be attained in accordance with the stipulations in the SCC and the relevant provisions of the Contract.

"TS" means Technical Specification

2. Use of Contract Documents & Information

2.1 All documents, as mentioned in the GCC Clause 57, forming part of the Contract (and all parts thereof) are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole.

2.2 The Contract (s) will be signed in three (3) originals and the Contractor shall be provided with one signed original and the rest will be retained by the Employer.

2.3 The Contractor shall provide/ submit, free of cost to the Employer all the engineering data, drawings and descriptive materials with the bid, in at least two (2) copies to form a part of the Contract immediately after LOI.

2.4 The Contractor shall not, without the Employer's prior written consent, disclose the Contract or any provision thereof or any specification, plan, drawing, pattern therewith to any person other than person employed by the Contractor in Performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend strictly for purpose of Performance only.

2,5 The Contractor shall not, without Employer's prior written consent, make use of any document or information except for purpose of performing the Contract.

2,6 Any document with respect to this project other than the Contract itself, shall remain the property of the Employer.

3. Interpretation

3.1 **Language**

The bid prepared by the Bidder and all correspondence and documents related to the bid exchanged between the Bidder and the Employer shall be written in English language, provided that any printed literature furnished by the Bidder may be written in another language, as long as such literature is accompanied by a translation of its pertinent passages in English language in which case, for purposes of interpretation of the bid the translation shall govern.

3.2 **Singular and Plural**

The singular shall include the plural and vice versa, except where the context otherwise requires.

3.3 **Headings**

The headings and marginal notes in the NIT are included for ease of reference, and shall neither constitute a part of the Contract nor affect its interpretation.

3.4 **Persons**

Words importing persons or parties shall include firms, corporations and government entities.

3.5 **Entire Agreement**

The Contract constitutes the entire agreement between the Employer and Contractor with respect to the subject matter of Contract and supersedes all communications, negotiations and agreements (whether written or oral) of parties with respect thereto made prior to the date of Contract. The various documents forming the Contract are to be taken as mutually explanatory.

3.6 **Amendment**

No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each party hereto.

3.7 **Independent Contractor**

I. The Contract does not create any agency, partnership, joint venture or other joint relationship between the parties hereto.

II. Subject to the provisions of the Contract, the Contractor shall be solely responsible for the manner in which the Contract is performed. All employees, representatives or Subcontractors engaged by the Contractor in connection with the Performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of the Employer. Nothing contained in the Contract or in
any subcontract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives or Subcontractors and the Employer.

III. Under no circumstances the sub-contractor shall claim or shall put any binding to the Employer and at all times the sub-contractor must be managed by the Contractor. The Employer shall not be responsible for any claims at any time by the Contractor in relation to the sub-contractor.

3.8 **Not Used**

3.9 **Non-Waiver**

3.9.1 Subject to GCC Clause 3.9.2 below, no relaxation, forbearance, delay or indulgence by either party in enforcing any of the terms and conditions of the Contract or the granting of time by either party to the other shall prejudice, affect or restrict the rights of that party under the Contract, nor shall any waiver by either party of any breach of Contract operate as waiver of any subsequent or continuing breach of Contract.

3.9.2 Any waiver of a party's rights, powers or remedies under the Contract must be in writing, must be dated and signed by an authorized representative of the party granting such waiver, and must specify the right and the extent to which it is being waived.

3.10 **Severability**

If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.

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

3.11 **Country of Origin**

"Origin" means the place where the materials, equipment and other supplies for the facilities are mined, grown, produced or manufactured and from which the services are provided.

4. Notices

4.1 Unless otherwise stated in the Contract, all notices to be given under the Contract shall be in writing, and shall be sent by personal delivery, airmail post, special courier, facsimile or e-mail to the address of the relevant party by the authorized representative of the party set out in contract coordination procedure to be finalized and mutually agreed for the execution of the contract and all the communication pertaining to project shall be in accordance with the procedure with the following provisions.

4.1.1 Any notice sent shall be confirmed within two (2) days after receipt.

4.1.2 Any notice sent by facsimile or e-mail shall be deemed to have been delivered on date of its dispatch and personal delivery deemed to have been delivered on date of delivery.

4.1.3 Either party may change its postal, cable, telex, facsimile or e-mail address or addresses for receipt of such notices by ten (10) days' notice to the other party in writing.

4.2 Notices shall be deemed to include any approvals, consents, instructions, orders and certificates to be given under the Contract.

5. Governing Laws

5.1 The Contract shall be governed by and interpreted in accordance with laws in force in India. The Courts of Tiruchirappalli shall have exclusive jurisdiction in all matters arising under the Contract.

5.2 The contract must be interpreted and read under the influence of Indian Contracts Act, 1872 and all amendments as on date.

6. Settlement of Disputes

6.1 **Adjudicator**

6.1.1 If any dispute of any kind whatsoever shall arise between the Employer and the Contractor in connection with or arising out of the Contract, including without prejudice to the generality of the foregoing, any question regarding its existence, validity or termination, or the execution of the facilities-whether during the progress of the facilities or after their completion and whether before or after the termination, abandonment or breach of the contract-parties shall seek to resolve such a dispute or difference by mutual consultation. If the parties fail to resolve such a dispute or difference by mutual consultation, then the dispute shall be referred in writing by either party to the Adjudicator, with a copy to the other party.

6.1.2 The dispute adjudication board (DAB) shall consists of either one or three suitably qualified member ("the Members").

6.1.3 If the DAB consists of three members, each party shall nominate one member for the approval of the other party. The parties shall consult both the members and shall agree upon third member, who shall be appointed as Chairman of DAB.

6.1.4 The Adjudicator shall give its decision in writing to both parties within twenty-eight (28) days of a dispute being referred to it. If the Adjudicator has done so, and no notice of intention to commence arbitration has been given by either the Employer or the Contractor within fifty – six (56) days of such reference, the decision shall become final and binding upon the Employer and the Contractor. Any decision that has become final and binding shall be implemented by the parties forthwith.

6.1.5 Should the Adjudicator resign or prolonged absence from work assigned due to unforeseen circumstances, or should the Employer and the Contractor agree that the Adjudicator is not fulfilling its functions in accordance with the provisions of the contract, a new Adjudicator shall be jointly appointed by the Employer and the Contractor. Failing agreement between the two within twenty eight (28) days, the new Adjudicator shall be appointed at the request of either party or by the Appointing Authority specified in SCC. The adjudicator shall be paid fee plus reasonable expenditures incurred in the execution of its duties as adjudicator under the contract. This cost shall be divided equally between the Employer and the Contractor.

6.2 Arbitration

6.2.1 If either the Employer or the Contractor is dissatisfied with the Adjudicator's decision, or if the Adjudicator fails to give a decision within twenty-eight (28) days of a dispute being referred to it, then either the Employer or the Contractor may, within fifty-six (56) days of such reference, give notice to the other party, of its intention to commence arbitration, as hereinafter provided, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given.

6.2.2 Any dispute in respect of which a notice of intention to commence arbitration has been given, in accordance with GCC Sub-Clause 6.2, shall be finally settled by arbitration. Arbitration may be commenced prior to or after completion of the Facilities.

B. Subject Matter of Contract:

7. Scope of Facility

7.1 Unless otherwise expressly limited in the Technical Specifications, the Contractor's obligations cover all Plant and Equipment for 2.4Mwp (DC) Solar PV power Plant with cells & Modules, including spares and the Performance of all services required for the design, the manufacture (including procurement, quality assurance, construction, installation, associated civil, structural and other construction works, Pre-commissioning and delivery) of the Plant and Equipment and the installation, commissioning, completion of facilities and carrying out guarantee tests for the Facilities in accordance with the plans, procedures, specifications, drawings, codes and any other documents as specified in the Technical Specifications along with interconnecting underground transmission system at 11 kV voltage level up to campus transformer including O&M of the complete facilities for ten years. Such specifications include, but are not limited to, the provision of supervision and engineering services; the supply of labor, materials, equipment, spare parts (as specified in GCC Sub-Clause 7.3 below) and accessories; Contractor's Equipment; construction utilities and supplies; temporary materials, structures and facilities; transportation (including, without limitation, loading, unloading and hauling to, from and at the Site); insurance and storage, except for those supplies, works and services that will be provided or performed by the Employer, as set forth in GCC Clause 9.

7.2 The Contractor shall, unless specifically excluded in the Contract, perform all such work and/or supply all such items and materials not specifically mentioned in the Contract but that can be reasonably inferred from the Contract as being required for attaining Completion of the Facilities as if such work and/or items and materials were expressly mentioned in the Contract.

7.3 Contractor is required to provide the list of all the spares required to maintain the facility for O&M period. Contractor agrees to supply such spare parts, as recommended or otherwise required for the effective and hassle free operation and maintenance of the Facilities. However, the contractor, based on its previous experiences & OEM's recommendations, is to provide a list of spares including specifications, supplier details and indicative price, as recommended by him and OEM. The contractor shall keep and maintain the inventory of such spares for the hassle free operation during the complete O&M period without additional cost to Employer. Also, at the end of penultimate year of the O&M contract, contractor shall supply a list of all recommended spares as per the operational requirement of the plant and with reference to the mean time between failures (MTBF), along with detailed specifications, supplier details and tentative cost for future purchase. The price of such spare parts shall include the breakup of taxes and duties as applicable towards purchase and supply of spare parts. Employer, at its discretion, will purchase the spare as required for future operation.

8. Contractor's responsibility

8.1 The Contractor shall design, procure, manufacture (including associated purchases and/ or subcontracting), install, commission and complete the Facilities, carry out the Guarantee tests with due care and diligence in accordance with the Contract along with interconnecting transmission system up to designated transformer at the campus including the O&M of the complete facilities for ten years. All necessary clearance for operation of the plant shall be obtained by the Employer. The contractor shall facilitate documentation required for clearance from various state / central government agencies. Fees/charges payable to sate/central agencies shall be paid by the employer

8.2 The Contractor confirms that it has entered into this Contract on the basis of proper examination of the data relating to the Facilities provided by the Employer and assessed by himself at the site location, after proper due diligence relating to the Facilities prior to bid submission. The Contractor acknowledges that any failure to obtain or 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.

8.3 The Contractor shall acquire, on behalf of Employer, in the employers' name, all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located that are necessary for the setting up of the Plant & operation of Plant till its desired life as mentioned under the Contract, including, but not limited to, entry permits for all imported Employer's Equipment (if any). In this regard, any document required from Employer shall be intimated at least 10 days prior to submission. Contractor has to ensure safe keeping of the documents and diligent use. It is the responsibility of the contractor to safe keep and return all the approvals, permits, licenses, certificates and other relevant document generated as a result of the setting up of project and O&M process to the Employer

8.4 **In the matter of connectivity of Plant to Designated Substation, Contractor shall fill up the application &obtain necessary approvals from state / central government agencies.**

8.5 The Contractor shall acquire in its name all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located that are necessary for the Performance of the Contract, including, but not limited to, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Employer under GCC Sub-Clause 9 hereof and that are necessary for the Performance of the Contract.

8.6 Contractor shall also seek for any exemption applicable for the project as per the orders released from GOI time to time in appropriate Formats including all the required attachments. In this regard, contractor shall be responsible to take all necessary certificates as a proof of exemptions on behalf of Employer. However, all the documents required from Employer, as needed for the process, will be provided by Employer. The demand of such documents shall be made to the Employer in at least 10 days advance.

8.7 The Contractor shall comply with all laws in force at the place, where the Facilities are installed and where the Installation Services are carried out. The laws will include all national, provincial, municipal or other laws that affect the Performance of the Contract and binding upon the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, including the Subcontractors and their personnel.

8.8 Any plant, material, spares & spares inventory and services that will be incorporated in or be required for the facilities and other supplies shall have their origin as defined under GCC Clause 3.11 (Country of Origin)

8.9 Unless otherwise specified in the Contract or agreed upon by the Employer and the Contractor, the Contractor shall provide/ deploy sufficient, properly qualified operating and maintenance personnel; shall supply and make available all raw materials, spares, other materials and facilities; and shall perform all work and services of whatsoever nature, to properly carry out Pre-commissioning, Commissioning and Guarantee Tests, all in accordance with the provisions of "Scope of Works and Supply by the Employer" to the Contract Agreement at or before the time specified in the program furnished by the Contractor under GCC Clause 18 hereof and in the manner thereupon specified or as otherwise agreed upon by the Employer and the Contractor.

9. Employers' responsibility

9.1 **Not applicable**

9.2 If requested by the Contractor and up- on Employer's sole discretion, the Employer shall use its best endeavors to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service undertakings that such authorities or undertakings required for the Contractor or Subcontractors or the personnel of the Contractor or Subcontractors, as the case may be, to obtain.

9.3 The Employer shall be responsible for the operation of the Facilities after Completion and proper hand over of the site by contractor, in accordance with GCC Clause 26 and However, the Contractor, under the O&M Contract, shall be responsible for the care and custody of the facility as per GCC Clause 26.9.

C. Payments

10. Contract Price

10.1 The contract price mentioned under Appendix 5: Format for Financial proposal by successful bidder at the time submission of bids shall be firm and shall not be subject to price variation.

10.2 Subject to GCC Sub-Clauses 8.2 hereof, the Contractor shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.

10.3 Contract price will be, if needed, adjusted in accordance with the provisions of GCC Clause 29.

11. Terms of Payment

11.1 The terms of Payment shall be as specified in SCC Clause 14. The procedures to be followed in making application for and processing payments shall be those outlined in the same SCC Clause.

11.2 No payment made by the Employer herein shall be deemed to constitute acceptance by the Employer of the Facilities or any part(s) thereof.

11.3 Employer shall make best efforts to release the payment in line with SCC Clause 14, within 15 calendar days of receiving invoices along with complete set of supporting & compliance documents from Contractor, certified by Engineering in-charge or any other authority appointed by Employer for this purpose.

12 Issuance of Bank Guarantees

The Contractor shall provide the Bank Guarantees specified below in favor of the Employer at the times, and in the amount, manner and form specified below.

12.1 **Mobilization Advance Bank Guarantee: Not Applicable**

12.2 Not Applicable

12.3 Performance Bank Guarantee during EPC

12.3.1 The Contractor shall, within fourteen (14) days of the issue of LOI, provide Bank Guarantee (s) for the due Performance of the Contract for an amount and validity mentioned under ITB Clause 1.2.1. However, in case of delay in demonstration of the Performance Test (PR test) and Operational Acceptance, the validity of all the contract Performance Bank Guarantees (PBG) shall be extended by the period of such delay beyond initial validity of the PBG.

12.3.2 The Performance Bank Guarantee shall be denominated in the currency as mentioned in theITB Clause 2.9.2 of this NIT and shall be in the form of unconditional and irrevocable bank guarantee in the prescribed Format provided in Appendix 12(b): Format of bank guarantee for Performance security during EPC under Section-VI: Forms and formats.

12.3.3 The Bank Guarantee submitted against the Performance Bank Guarantee shall be essentially from any of the scheduled commercial banks.

12.4 Performance Bank Guarantee during O&M or "O&M Bank Guarantee "

The contractor shall, at the time of Operational Acceptance and at the end of Epc Contract period, shall provide Bank Guarantee for the due performance under the Operation and Maintenance of the Plant. The value and validity of the O&M Bank Guarantee shall be as per ITB Clause 1.2.1. The Bank Guarantee must be submitted in the "Format 12(c): Format of Bank Guarantee for the Performance during O&M" specified under Section VI: Forms and Formats.

12.4.2 The Bank Guarantee submitted against the O&M Bank Guarantee shall be essentially from any of the scheduled commercial bank

13.0 Taxes and Duties

13.1 Except as otherwise specifically provided in the Contract, the Contractor shall bear and pay all taxes, duties, levies and charges assessed on the Contractor, its Sub-contractor or their employees by all municipal, state or national government authorities in connection with the Facilities in and outside of the country where the Site is located.

13.2 Notwithstanding GCC Sub-Clauses 13.1 above, the Employer shall bear the GST payable to the Government.

13.3 Not applicable

13.4 Not Applicable

13.5 Any new tax introduced or revision in respective applicable tax rates /Duties like safeguard or antidumping duty after the date of techno – commercial bid opening, shall be paid/reimbursed by the employer subject to submission of requisite documentary evidence by the bidder.

13.6 Direct transaction shall mean those equipment/material which are dispatched from the Contractor's works to the Employer's stores/site. The prices of the bought-out items i.e., those equipment/material which are dispatched from the subcontractor's works to the Employer's stores/site (Sale in transit) shall be quoted inclusive of GST. All other taxes such as GST, duties & levies including GST on work contract (applicable on erection as well as Civil & Allied works portion of the contract) and all taxes, duties including custom duty as applicable on the material used for such Erection as well as Civil & Allied works Packages of the contract shall be included in the bid prices and no separate claim in this regard will be entertained by the Employer. The contractor shall show the amount of GST in the invoice and shall certify that the tax has been deposited with the appropriate authority

D. Project Implementation:

14.1 Copyright & Patent

14.2 The copyright in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contractor by any third party, including suppliers of materials, the copyright in such materials shall remain vested in such third party. The Employer shall however be free to reproduce all drawings, documents, specification and other material furnished to the Employer for the purpose of the contract including, if required, for operation and maintenance of the facilities.

14.3 The Contractor shall indemnify the Employer against third party claims of infringement of patent, trademark or industrial design rights arising from use of goods or any part thereof in India.

15.0 Confidential Information:

15.1 The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this GCC Clause 15.

15.2 The Employer shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Employer for any purpose other than the design, procurement of Plant and Equipment, construction or such other work and services as are required for the Performance of the Contract.

15.3 The obligation of a party under GCC Sub-Clauses 15.1 and 15.2 above, however, shall not apply to that information which

- Now or hereafter enters the public domain through no fault of that party
- Can be proven to have been possessed by that party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other party hereto.
- Otherwise lawfully becomes available to that party from a third party that has no obligation of confidentiality.

15.4 The above provisions of this GCC Clause 15 shall not in any way modify any undertaking of confidentiality given by either of the parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof. The provisions of this GCC Clause 15 shall survive termination, for whatever reason, of the Contract

16 Geological discoveries

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site where the services are performed, be deem to be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent the personnel or any other persons from removing or damaging any such article or thing and shall immediately upon the discovery thereof and, before removal, acquaint the Employer of such discovery any carry out, at the expense of the Employer, the Employer's orders as to the disposal of the same.

17.0 **Representatives**

17.1 **Project Manager / Engineer- In –Charge (EIC):**

If the Project Manager/ EIC is not named in the Contract, then within seven (7) days of the Effective Date, the Employer shall appoint and notify the Contractor in writing of the name of the Project Manager/ EIC. The Employer may from time to time appoint some other person as the Project Manager/ EIC in place of the person previously so appointed, and shall give a notice of the name of such other person to the Contractor without delay. The Employer shall take reasonable care, unless unavoidable to see that no such appointment is made at such a time or in such a manner as to impede the progress of work on the Facilities. The Project Manager/EIC shall represent and act for the Employer at all times during the currency of the Contract. All notices, instructions, orders, certificates, approvals and all other communications under the Contract shall be given by the Project Manager/ EIC, except as herein otherwise provided.

All notices, instructions, information and other communications given by the Contractor to the Employer under the Contract shall be given to the Project Manager/ EIC, except as herein otherwise provided.

17.2 **Contractor's Representative & Construction Manager**

17.2.1 If the Contractor's Representative is not named in the Contract, then within seven (07) days of the Effective Date, the Contractor shall appoint the Contractor's Representative and shall request the Employer in writing to approve the person so appointed. If the Employer makes no objection to the appointment within seven (07) days of submission, the Contractor's Representative shall be deemed to have been approved. If the Employer objects to the appointment within seven (07) days giving the reason therefor, then the Contractor shall appoint a replacement within seven (07) days of such objection, and the foregoing provisions of this GCC Sub- Clause 17.2.1 shall apply thereto.

17.2.2 The Contractor's Representative shall represent and act for the Contractor at all times during the tenure of the Contract and shall give to the Project Manager/ EIC all the Contractor's notices, instructions, information and all other communications under the Contract.

17.2.3 All notices, instructions, information and all other communications given by the Employer or the Project Manager/ EIC to the Contractor under the Contract shall be given to the Contractor's Representative or, in its absence, its deputy, except as herein otherwise provided.

17.2.4 The Contractor shall not revoke the appointment of the Contractor's Representative without the Employer's prior written consent, which shall not be unreasonably withheld. If the Employer consents thereto, the Contractor shall appoint some other person as the Contractor's Representative, pursuant to the procedure set out in GCC Sub-Clause 17.2.1.

17.2.5 The Contractor's Representative may, subject to the approval of the Employer(which shall not be unreasonably withheld), at any time delegate to any person any of the powers, functions and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the Contractor's Representative, and shall specify the powers, functions and authorities thereby delegated or revoked. No such delegation or revocation shall take effect unless and until a copy thereof has been delivered to the Employer and the Project Manager/EIC.

17.2.6 Any act or exercise by any person of powers, functions and authorities so delegated to him or her in accordance with this GCC Sub-Clause 17.2.5 shall be deemed to be an act or exercise by the Contractor's Representative.

17.2.7 Notwithstanding anything stated in GCC Sub-clause 17.1 and 17.2.1 above, for the purpose of execution of contract, the Employer and the Contractor shall finalize and agree to a Contract Co-ordination Procedure and all the communication under the Contract shall be in accordance with such Contract Co-ordination Procedure.

17.2.8 From the commencement of installation of the Facilities at the Site until Final Acceptance, the Contractor's Representative shall appoint a suitable person as the construction manager (hereinafter referred to as "the Construction Manager"). The Construction Manager shall supervise all work done at the Site by the Contractor and shall be present at the Site throughout normal working hours except when on leave, sick or absent for reasons connected with the proper Performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed to act as his or her deputy.

17.2.9 The Employer may by notice to the Contractor object to any representative or person employed by the Contractor in the execution of the Contract who, in the reasonable opinion of the Employer, may behave inappropriately, may be in- competent or negligent, or may commit a serious breach of the Site regulations and safety. The Employer shall provide evidence of the same, whereupon the Contractor shall remove such person from the Facilities.

17.2.10 If any representative or person employed by the Contractor is removed in accordance with GCC Sub-Clause 17.2.4, the Contractor shall, where required, promptly appoint a replacement.

18. **Project Implementation**

18.1 Work Schedule

Within fourteen (14) days after the date of Issue of LOI, the Contractor shall prepare and submit to the Project Manager/ EIC a detailed program of Performance of the Contract, made in the form of PERT Chart and showing the sequence in which it proposes to design, manufacture, transport, assemble, install, test, pre-commission and commission the Facilities. The program so submitted by the Contractor shall accord with the Time Schedule indicated in SCC and any other dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate with prior intimation to the Project Manager/EIC or when required by the Project Manager/EIC, but without modification in the Time for Completion given in the SCC and any extension granted in accordance with clause for extension of time, and shall submit all such revisions to the Project Manager/ EIC.

18.2 **Progress Report**

18.2.1 The Contractor shall monitor progress of all the activities specified in the work schedule referred in GCC Sub-Clause 18.1 above, and submit the progress report to the Project Manager as per the Contract Co-ordination procedure.

18.2.2 The progress report shall be in a form acceptable to the Project Manager/EIC and shall also indicate: (a) percentage completion achieved compared with the planned percentage completion for each activity; and (b) where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken.

18.2.3 If at any time the Contractor's actual progress falls behind the scheduled program, or it becomes apparent that it will so fall behind, the Contractor shall, at the request of the Employer or the Project Manager/ EIC, prepare and submit to the Project Manager/ EIC a revised program, taking into account the prevailing circumstances, and shall notify the Project Manager/ EIC, of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion. If any extension thereof entitled under GCC Sub-Clause 54.1, or any extended period as may otherwise be agreed upon between the Employer and the Contractor, Contractor shall submit the revised plan for completion of Facility accordingly.

18.3 Maintenance of Records of Weekly Progress Review Meeting at Site The Contractor shall be required to attend all weekly site progress review meetings organized by the 'Project Manager/ EIC' or his authorized representative. The deliberations in the meetings shall inter- alia include the weekly program, progress of work (including details of manpower, material, tools and plants deployed by the Contractor vis-à-vis agreed schedule), inputs to be provided by Employer, delays, if any and recovery program, specific hindrances to work and work instructions by Employer.

The minutes of the weekly meetings shall be recorded in triplicate in a numbered register available with the 'Project Manager/ EIC' or his authorized representative. These recordings shall be jointly signed by the 'Project Manager/ EIC' or his authorized representative and the Contractor and one copy of the signed records shall be handed over to the Contractor.

19 Subcontracting

19.1 The Contractor shall not, without the prior consent in writing of the Employer, assign or sublet or transfer its Contract in whole or in part, its obligations to perform under the Contract or a substantial part thereof, other than raw materials, or for any part of the work of which makers are named in the Contract, provided that any such consent shall not relieve the Contractor from any obligation, duty or responsibility under the Contract.

19.2 The Contractor shall notify the Employer in writing of all sub contracts awarded along with contact details of their representative under the Contract if not already specified in his Bid. Such notification in its original Bid or later shall not relieve the Contractor from any liability or obligation under the Contract.

19.3 In case, the Contractor engages any Sub-Contractor to carry out a part of the work, the Sub-Contractor should have requisite Government License for carrying out such part of the work.

20. Design and Engineering

20.1 Specifications and Drawings

20.1.1 TheContractorshallexecutethebasicanddetaileddesignandengineeringworkincompliance with the provisions of the Contract, or where not so specified, in accordance with good and sound engineering practice.

20.1.2 The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Project Manager/ EIC or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Employer.

20.1.3 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Employer, by giving a notice of such disclaimer to the Project Manager/ EIC.

20.2 **Codes and Standards**

Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date of bid submission shall apply unless otherwise specified.

20.3 Approval / Review of Technical Documents by Project Manager

The Contractor shall prepare list of documents as per technical specifications and furnish to the Project Manager for Approval of the same and Review of work schedule. Any part of the Facilities covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager's approval thereof.

20.3.1 Within ten (10) days after receipt by the Project Manager of any document requiring the Project Manager's approval, the Project Manager shall either return one copy thereof to the Contractor with its approval endorsed thereon or shall notify the Contractor in writing of its disapproval thereof and the reasons therefor and the modifications that the Project Manager proposes.

20.3.2 The Project Manager shall not disapprove any document, except on the grounds that the document does not comply with some specified provision of the Contract or that it is contrary to good engineering practice.

20.3.3 If the Project Manager disapproves the document, the Contractor shall modify the document and resubmit it for the Project Manager's approval. If the Project Manager approves the document subject to modification(s), the Contractor shall make the required modification(s), and upon resubmission with the required modifications the document shall be deemed to have been approved.

20.3.4 The procedure for submission of the documents by the Contractor and their approval by the Project Manager shall be as per the Contract Co-ordination procedure.

20.3.5 If any dispute or difference occurs between the Employer and the Contractor in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification(s) thereto that cannot be settled between the parties within a reasonable period, then such dispute or difference may be settled in accordance with GCC Clause 6.0 (Settlement of Dispute) hereof. If such dispute or difference is referred as per GCC clause 6.0, the Project Manager shall give instructions as to whether and if so, how, Performance of the Contract is to proceed. The Contractor shall proceed with the Contract in accordance with the Project Manager's instructions, provided that if the Arbitration upholds the Contractor's view on the dispute, then the Contractor shall be reimbursed by the Employer for any additional costs incurred by reason of such instructions and shall be relieved of such responsibility or liability in connection with the dispute and the execution of the instructions as the Arbitration shall decide, and the Time for Completion shall be extended accordingly.

20.3.6 The Project Manager's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager.

20.3.7 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Project Manager an amended document and obtained the Project Manager's approval thereof, pursuant to the provisions of this GCC Sub-Clause 20.3.

20.3.8 If the Project Manager requests any change in any already approved document and/or in any document based thereon, generally shall be taken care by the contractor if the change is not causing any major financial impact.

21. Procurement

21.1 Plant and Equipment

The Contractor shall procure and transport all the Plant and Equipment in an expeditious and orderly manner to the Site to achieve completion of activities as per schedule to enable commissioning of the Project by the scheduled commissioning date.

21.2 Transportation

The contractor shall ensure that all the plant and equipment required to complete the Facility at site, are procured and dispatched on FOR site basis. The Contractor shall at its own risk and expense transport all the Plant and Equipment and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances.

21.3 **Packing and Marking**

21.3.1 The Contractor shall be responsible for securely protecting and packing the plant&equipment as per prescribed standards in force to withstand the journey and ensuring safety of materials and also arrival of materials at destination in original condition and good for contemplated use. Packing case size & weight shall take into consideration the remoteness of the goods final destination and absence of heavy material handling facilities at all points in transit.

21.3.2 Packing lists of materials shall be provided in each package to facilitate checking up of the contents at the destination.

21.3.3 In order to import any items, associated with the Solar PV Power Project, from abroad or from any other state in India, Contractor shall have to arrange any clearance, permission, if required at his own risk, from any Government (Government of State & Government of India) or any Government (Government of State & Government of India) controlled organization for transportation of materials from manufacturing shop to delivery at Site. Necessary certificates, if so required, shall be issued by the Employer within reasonable time after getting written request from the Contractor along with the necessary documents substantiating necessity of such approvals. Contractor shall take necessary insurances to ensure safe transit. All packing material is the property of the Employer and shall be immediately deposited by the Contractor to the Employer's Store at project Site.

21.4 **Storage of Equipment**

The plant and equipment thus procured under the scope of the contract must be kept in safe custody till put under operation. All the spares, as required for the trouble free O&M of Plant, must be kept under secure storage during O&M period.

22. Materials and Workmanship

22.1 All materials shall be of the best quality and workmanship capable of satisfactory operation under the operating and climatic conditions as may be specified. Unless otherwise specified, they shall conform in all respect to the latest edition of the relevant IS codes specification wherever Indian specifications apply or IEC codes or equivalent internationally accepted standard.

22.2 The Contractor shall supply & deliver all equipment and materials for installation at site. The Contractor shall arrange for transportation, loading & unloading and safe storage of materials at project site at his own cost & risk.

23. Installation

23.1 Tools & Tackles

The Contractor shall provide technically suitable tools and tackles for installation & erection of Plant & Machineries conforming to relevant BIS safety and technical standards for proper execution of work. The Employer, in no way, shall be responsible for supply of any tools and tackles for implementation of the work and also to carry out operation & maintenance activities.

23.2 Setting up/Supervision/Labor

23.2.1 Bench Mark:

The Contractor shall be responsible for the true and proper setting-up of the Facilities in relation to bench marks, reference marks which are mutually agreed upon by the contractor and employer.

If, at any time during the progress of installation of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forthwith notify the Project Manager of such error and, at its own expense, immediately rectify such error to the satisfaction of the Project Manager.

23.2.2 Contractor's Supervision:

The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full- time superintendence of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

23.2.3 **Labour:**

The Contractor shall provide and employ on Site in the installation of the Facilities such skilled, semi- skilled and unskilled labor as is necessary for proper and timely execution of the Contract. The Contractor is encouraged to use local labor that has the necessary skills.

Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation, first aid facility and catering of all labor, local or expatriate, required for the execution of the Contract and for all payments in connection therewith.

The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the entry of all labour and personnel to be employed by contractor on the Site.

The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labour of its Subcontractors.

The Contractor shall, in all dealings with its labour and the labour of its Subcontractors currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labor.

23.3 **Contractor's Equipment**

23.3.1 All equipment brought by the Contractor on to the Site shall be deemed to be intended to be used exclusively for the execution of the Contract. The Contractor shall not remove the same from the Site without the Project Manager's consent that such Contractor's Equipment is no longer required for the execution of the Contract.

23.3.2 Unless other wise specified in the Contract,upon completion of the Facilities, the Contractor shall remove from the Site all Equipment (indicated under GCC Clause: 23.3.1) brought by the Contractor onto the Site after obtaining a permission from Project Manager/In-charge to do so.

23.4 **Site Regulations and Safety**

The Contractor shall have to provide necessary and adequate safety measures including Personal Protective Equipment (PPE) and precautions to avoid any accident, which may cause damage to any equipment / material or injury to workmen. The contractor, if required, will provide necessary safety training to workmen. The Employer shall not be responsible for any such accidents. Also, contractor shall engage sufficient security guards to protect Facility from any theft and unauthorized access to Site

23.5 **Site Clearance**

23.5.1 **Site Clearance in Course of Performance**

In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, packaging material, rubbish & debris and temporary installations from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract.

23.5.2 **Site Clearance after Completion**

After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, packaging material, rubbish & debris and temporary works & installations of any kind from the Site, and shall leave the Site and Facilities clean and safe.

23.5.3 **Disposal of Scrap**

The Contractor shall with the agreement of the Employer promptly remove from the site any 'Scrap' generated during Performance of any activities at site in pursuance of the Contract. The term 'Scrap' shall refer to scrap/ waste/ remnants arising out of the unpacking of equipment, construction debris, breakage of modules, fabrication of structural steel work and piping work at the project site in the course of execution of the contract and shall also include any wastage of cables during the termination process while installing the cables.

The disposal of such Scrap shall vest with the Contractor for the items supplied by the Contractor and issued by Employer under this contract for installation and construction without any additional cost to the Employer. The removal of scrap shall be subject to the Contractor producing the necessary clearance from the relevant authorities (Custom, Excise etc.), if required by the law, in respect of disposal of the scrap. The liability for the payment of the applicable taxes/duties shall be that of the Contractor.

The Contractor shall also indemnify to keep the Employer harmless from any act of omission or negligence on the part of the Contractor in following the statutory requirements with regard to removal/disposal of scrap. The Indemnity Bond shall be furnished by contractor as per Format enclosed as Appendix 17 of Section- VI: Forms and Formats. Further, in case the laws require the Employer to take prior permission of the relevant Authorities before handing over the scrap to the Contractor, the same shall be obtained by the Contractor on behalf of the Employer.

23.5.4 **Watch&Ward**

The Contractor shall provide and maintain at its own expense watch and ward wherever necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

24. Inspection & Testing

24.1 The Employer or its authorized representative shall have, at all time, access to the Contractor's premises and also shall have the power, at all times, to inspect and examine the materials and workmanship of project work during its manufacture, shop assembly and testing. If part of the Plant is required to be manufactured in the premises other than the Contractor's, the necessary permission for inspection shall be obtained by the Contractor from the Employer or his duly authorized representative.

24.2 The Employer shall have the right to serve notice in writing to the Contractor on any grounds of objections, which he may have in respect of the work. The Contractor has to forthwith take necessary actions to remove the cause to the complete satisfaction of the Employer otherwise, the Employer at its liberty may reject all or any component of plant or workmanship connected with such work.

24.3 The Contractor shall issue request letter to the Employer or its authorized representative for testing of any component of the Plant, which is ready for testing at least 07 days for indigenous material and 15 days for the material source from outside India in advance from the date of actual date of testing at the premises of the Contractor or elsewhere. However, the Employer at its own discretion may waive the inspection and testing in writing under very special circumstances. In such case, the Contractor may proceed with the tests which shall be deemed to have been made in the Employer presence, and it shall forthwith forward two sets of duly certified copies of test results and certificates to the Employer for approval. The Contractor, on receipt of written acceptance from the Employer, may dispatch the equipment for erection & installation.

24.4 For all tests to be carried out, whether in the premises of the Contractor or any Sub-Contractor, the Contractor, shall provide labor, materials, electricity, fuel, water, stores, apparatus and instruments etc. free of charge as may reasonably be demanded to carry out such tests of the plant in accordance with the Contract. The Contractor shall provide all facilities to the Employer or its authorized representative to accomplish such testing.

24.5 The Employer or his authorized representative shall have the right to carry out inward inspection of the items on delivery at Site and if the items have been found to be not in line with the approved specifications, shall have the liberty to reject the same.

24.6 If Employer desires, testing of any component(s) of the Plant be carried out by an independent agency. The inspection fee, if any, shall be paid by the Employer. However, the Contractor shall render all necessary help to Employer whenever required free of charge. In case results of such test are found to be negative, Employer shall reject such material and the cost of such testing shall also be recovered from the contractor.

The Contractor has to provide the necessary testing reports to the Employer as and when required.

25. Authorized Test Centers for test certificates

The PV modules/ inverters/ cables and other Balance of system equipment deployed in the solar PV power Plant shall have valid test certificates for their qualification as per above specified IEC/ IS Standards. In case of module types/ equipment for which such Test facilities may not exist in India, test certificates from reputed ILAC Member body accredited Labs abroad (with proof of accreditation) will be acceptable.

26. Commissioning and Completion of the Facilities

26.1 As soon as installation of the Facilities has, in the opinion of the Contractor, been completed as specified in the Technical Specifications, excluding minor items not materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Employer (Project Manager/ EIC) in writing to witness the pre- commissioning of the facility.

26.2 As soon as all works in respect of Pre-commissioning are completed and, in the opinion of the Contractor, the Facilities is ready for Commissioning, the Contractor shall so notify the Project Manager in writing. The Contractor shall commence Commissioning of the facilities as per the GCC Sub – Clause 26.3.

26.3 Commissioning of the Facilities shall be completed by the Contractor as per procedures detailed in the Technical Specifications and in the presence of the Project Manager or the representatives of the employer.

26.4 If the Project Manager notifies the Contractor of any defects and/or deficiencies, the Contractor shall then correct such defects and/or deficiencies, and shall repeat the procedure described in GCC Sub- Clause 26.2.

26.5 If the Project Manager is satisfied that the Facilities have reached Completion, the Project Manager shall, within seven (7) days after receipt of the Contractor's repeat notice, issue a Completion Certificate stating that the Facilities have reached Completion as at the date of the Contractor's repeat notice.

26.6 If the Project Manager is not so satisfied, then it shall notify the Contractor in writing of any defects and/or deficiencies within seven (7) days after receipt of the Contractor's repeat notice, and the above procedure shall be repeated.

26.7 If the Project Manager fails to issue the Completion Certificate and fails to inform the Contractor of any defects and/or deficiencies within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 26.2 or within seven (7) days after receipt of the Contractor's repeated notice under GCC Sub-Clause 26.3, or if the Employer makes use of the Facilities, then the Facilities shall be deemed to have reached Completion as of the date of the Contractor's notice or repeated notice, or as of the Employer's use of the Facilities, as the case may be.

26.8 As soon as possible after Completion, the Contractor shall complete all outstanding minor items so that the Facilities are fully in accordance with the requirements of the Contract, failing which the Employer will undertake such completion and deduct the costs thereof from any monies owing to the Contractor.

26.9 Upon Completion, commissioning and successful demonstration of the PR test, the contractor shall be responsible for the care and custody of the Facilities, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof for the agreed duration of operation and maintenance as stipulated and mutually agreed terms and conditions.

27. Guarantee Test and Operational Acceptance

27.1 Functional Guarantees

27.1.1 The Contractor guarantees that during the Guarantee Test,theFacilities and all parts there of shall attain the Functional Guarantees specified under Technical Specifications, subject to and upon the conditions therein specified.

2 7 . 1 . 1 If, for reasons attributable to the Contractor, the guaranteed level of the Functional

2 Guarantees specified under Technical Specifications are not met either in whole or in part, the Contractor shall, within a mutually agreed time, at its cost and expense make such changes, modifications and/ or additions to the Plant or any part thereof as may be necessary to meet such Guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall seek the Employer's consent to repeat the Guarantee Test. If the level of the specified Functional Guarantee parameters, as demonstrated even during repeat of the Guarantee Test(s), are outside the acceptable shortfall limit, the Employer may at its option, either

- Reject the Equipment and advise immediate replacement to suit the provisions of Technical Specification without any additional cost or;
- Reject the Equipment and recover the payments already made, or;
- Terminate the Contract and recover the payments already made, or;
- Accept the equipment after levy of liquidated damages in accordance with the provisions specified.

27.2 **Plant Performance Guarantee Test**

The Plant Performance Guarantee (as mentioned in TS) Test shall be conducted by the Contractor after Commissioning of the Facilities to ascertain whether the Facilities or the relevant part(s) can attain the Functional Guarantees specified in the Contract Documents. The Contractor's and Project Manager's advisory personnel shall attend the Guarantee Test. The Employer shall promptly provide the Contractor with such information as the Contractor may reasonably require in relation to the conduct and results of the Guarantee Test (and any repeats thereof). The detailed procedure for Performance Guarantee Test shall be carried out as per procedure laid down in Section V – Technical Specifications.

27.3 **Operational Acceptance**

27.3.1 Operational Acceptance shall occur in respect of the Facilities when:

- The Contractor has completed the supply installation, testing & commissioning of all the components of the Plant along with its associated infrastructure which is to be developed as per terms of "Technical Specification" of the Tender Document.
- The Plant Performance Guarantee Test (PR Test) in accordance with the procedure specified in Section V – Technical Specifications has been successfully completed and the Functional Guarantees are met;
- The Contractor has paid the liquidated damages, if any, specified in GCC Clause 34 hereof;

27.3.2 At any time after any of the events set out in GCC Sub- Clause 27.3.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate in the form provided in the Bidding Documents or in another form acceptable to the Employer in respect of the Facilities or the part thereof specified in such notice as at the date of such notice.

27.3.3 The Project Manager shall, after consultation with the Employer, and within thirty(30)days after receipt of the Contractor's notice, issue an Operational Acceptance Certificate.

27.3.4 If within thirty(30)days after receipt of the Contractor's notice, the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Operational Acceptance Certificate, the Facilities shall be deemed to have been accepted as at the date of the Contractor's said notice.

27.3.5 Subsequent to Operational Acceptance of the Facilities by the Employer and within 10 days of the commencement of the O&M period, the Contractor shall furnish an Indemnity Bond as per Appendix 18 of Section VI: Forms and Formats which is to be executed by the contractor for the Plant handed over by Employer for performance of its O&M Contract (Entire Solar Photo Voltaic Plant).

27.4 **Final Acceptance**

Final Acceptance shall occur in respect of the Facilities when:

The Plant have achieved the Operational acceptance and served the O&M for the period stipulated under the contract agreement; and

- All the contractors' liabilities under the O&M contract have been satisfied; and
- Contractor has provided the list of recommended spares with detailed specification, source and price for further procurement; and
- The Contractor has paid the liquidated damages, if any, as specified in SCC Clause 25 thereto;

27.4.2 At any time after the events set out in GCC Sub – Clause 27.4.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of Final Acceptance Certificate in the form provided in the Bidding Documents or in another form acceptable to the Employer in respect of the Facilities or the part thereof specified in such notice as at the date of such notice.

27.4.3 The Project Manager shall, after consultation with the Employer, and within thirty(30)days after receipt of the Contractor's notice, issue Final Acceptance Certificate.

27.4.4 If within thirty(30)days after receipt of the Contractor'snotice,theProject Manager fails to issue the Final Acceptance Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Final Acceptance Certificate, the Facilities shall be deemed to have been accepted as at the date of the Contractor's said notice.

27.4.5 The O&M contract period may further be extended for a suitable period as per mutually agreed terms and conditions. The contractor is allowed to submit his intent at the time of Final acceptance.

28. Inter-changeability

All the parts shall be made accurately to applicable Standards and specification so as to facilitate replacement and repairs. All corresponding parts of similar apparatus shall be inter-changeable.

29. Power to Vary or Omit Work

29.1 No alterations, amendments, omissions, additions, subtractions, or variations of the work (hereinafter referred to as "variation") under the contract shall be made by the Contractor except as directed by the Employer

29.2 If any suggested variations would, in the opinion of the Contractor, if carried out would prevent it from fulfilling any of its obligations or guarantees under the Contract, it shall notify the Employer thereof in writing and the Employer shall decide forthwith whether or not the same shall be carried out and if Employer confirms its instruction, the Contractor shall carryout the work as per the instructions.

29.3 The differences in cost, if any, occasioned by such variations, shall be added to or deducted from the specific Contract Price i.e., Supply, Erection and Civil Works, as the case may be.

29.4 In the event of the Employer requiring any variations; reasonable and proper notice shall be given to the Contractor as well, to enable it to make arrangements accordingly, and in cases where goods or materials are already prepared/ procured, or any designs, drawings or patterns made or work done that require to be altered, a reasonable sum in respect thereof shall be allowed by the Employer.

29.5 In every case in which the contractor shall receive instructions from the Employer for carrying out any work, which either then or later, will in the opinion of the Contractor involve a claim for additional payment, the Contractor shall as soon as reasonably possible, not later than 15 days after the receipt of such instructions, inform in writing to the Employer of such claim for additional payment.

29.6 In any case, if the Bidder deviates from the design or specification as defined in the NIT document, the Bidder has to submit the deviation sheet along with the Bid.

30. Negligence

If the Contractor neglects to manufacture or supply or construct the Plant and equipment with due diligence and with expeditiousness or refuses or neglects to comply with any reasonable order given to it in writing by the Employer or contravenes any provisions of the Contract, the Employer may give (7) seven days' notice in writing to the Contractor, to make good the failure, neglect or contravention complained of. If the Contractor fails to comply with the notice within reasonable time depending on the nature of affected work, which is evaluated by the Project Manager from the date of serving thereof, in the event of failure, neglect or contravention capable of being made good

within that time, then in such case, if the Employer thinks fit it may get the work done at the risk and cost of the contractor

If the cost of executing the work as aforesaid shall exceed the balance due to the Contractor and the Contractor fails to make good such deficiency, the Employer shall take action in the manner it may consider deem fit in terms of the Contract.

31. Statutory Responsibility

The Contractor shall comply with all applicable laws or ordinances, codes, approved standards, rules, and regulations and shall procure and maintain their validity along with all necessary Municipal, Panchayat and Government permits & licenses etc. at its own cost.

32. Insolvency

The Employer may at any time, by notice in writing, summarily terminate the Contract without compensation to the Contractor in the following events:

If the Contractor being an individual or a firm or any partner thereof shall at any time, be adjudged insolvent or shall have a receiver appointed from administration against it or shall take any proceeding for compensation under any Insolvency Act for the time being in force or make any conveyance or assignment with its creditors or suspend payment or if the firm be dissolved under Partnership Act, or court or a Receiver, Liquidator or manager on behalf of the Debenture holder is appointed or circumstances have arisen which entitle the Court or debenture holder to appoint a Receiver, Liquidator or Manager.

33. Delay in Execution or Failure to Supply

Any delay in completion of the work, shall attract liquidated damage, for late completion as per Liquidated Damage GCC Clause 34.

If the Contractor fails to deliver the Plant or fails to start the work within specified time frame after signing of Contract Agreement or leave the work Site after partial execution of the work, Employer shall have the right to get the work done through any other agency at the risk and cost of the Contractor. Further to this, Employer may, without prejudice to the right of the Employer to recover damages for breach of trust of the Contract, may impose liquidated damages on the contractor as per GCC Clause 34.

34. Liquidated Damages

34.1 The project is scheduled to be commissioned within the period specified in SCC from the date of issue of LOI/ NTP.

34.2 Incase the Contractor fails to achieve successful commissioning of Plant by the due date indicated in schedule, the Employer shall levy Liquidated Damages on the Contractor at the rate of 0.10% per week of the value of the remaining work for first sixty days(The value of remaining work shall be consider based on difference between the total contract price and Bills Submitted for Payment by the Bidder). For next fifty days of delay in successful commissioning of Plant, Liquidated Damages @ 0.15% per week of the Total Contract value shall be applicable. However, total amount on account of LD shall be maximum of 5% (five percent) of the total contract value.

34.3 The project should be commissioned within the stipulated time period mentioned at SCC. In case of delay for more than the maximum time period allowed (including LD) as mentioned at para 34.2 above, the Employer may get the project completed by other suitable agency at risk and cost of Contractor. For calculation of liquidated damages, the month shall be considered consisting of 30 days and date of LOI/ NTP as reference date.

35. Defect Liability

35.1 The Contractor must warrant that the Facilities shall be free from defects in the engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed.

35.2 If it shall appear to the Project Manager that any supplies have been executed with unsound, imperfect or unskilled workmanship, or with materials of any inferior description, or that any materials or articles provided by the Contractor for the execution of Contractor are unsound or otherwise not in accordance with the Contract, the Contractor shall on demand in writing inform the Project Manager or its authorized representative specifying the item, materials or articles complained of, notwithstanding that the same may have been inadvertently passed, certified and paid for. The Contractor shall forthwith rectify or remove and replace that item so specified and provide other proper and suitable materials or articles at its own charge and cost, and in the event of failure to do so within a period to be specified by the Project Manager in its demand aforesaid, the Project Manager may on expiry of notice period rectify or remove and re-execute the time or remove and replace with others, the materials or articles complained of as the case may be at the risk and expense in all respects of the Contractor. The decisions of the Project Manager in this regard shall be final and binding.

35.3 The Contractor shall also be undertaking the operation and maintenance of the Facility and consequently shall be required to rectify any defects that emerge during the operation of the Facilities for the entire term of this Contract.

35.4 The Defect Liability Period shall be of Sixty(60)months from the date of completion of the Facilities, during which the Contractor must repair any defect identified by the Project Manager / EIC after commissioning of the Plant. All the expenses to repair the defects shall be borne by the contractor and no additional cost charged to the Employer (“Defects Liability Period”).

35.5 If during the Defect Liability Period any defect should be found in the engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the Employer regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Contractor shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.

35.6 Furthermore, without prejudice to the generality of the foregoing, it is clarified that the Contractor shall also be responsible for the repair, replacement or making good of any defect, or of any damage to the Facilities arising out of or resulting from any of the following causes:

- Improper operation or maintenance of the Facilities by the Contractor during operation and maintenance of the Facility; and
- Operation of the Facilities outside specifications of the Facilities.

35.7 The Employer shall give the Contractor a notice stating the nature of any such defect together with all available evidence thereof, promptly following the discovery thereof. The Employer shall afford all reasonable opportunity for the Contractor to inspect any such defect.

35.8 The Employer shall provide the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations under this Clause 35 (Defect Liability). The Contractor may, with the consent of the Employer, remove any Plant and Equipment or any part of the Facilities that are defective from the Site, if the nature of the defect and/or any damage to the Facilities caused by the defect is such that repairs cannot be expeditiously carried out at the Site.

35.9 If the repair, replacement or making good is of such a nature that it may affect the efficiency of the Facilities or any part thereof, the Employer may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, whereupon the Contractor shall carry out such tests.

35.10 If such part fails the tests, the Contractor shall carry out further repair, replacement or making good (as the case may be) until that part of the Facilities passes such tests. The tests, in character, shall in any case be not inferior to what has already been agreed upon by the Employer and the Contractor for the original equipment/part of the Facilities.

35.11 If the Contractor fails to commence the work necessary to remedy such defect or any damage to the Facilities caused by such defect within a reasonable time (which shall in no event be considered to be less than seven (7) days), the Employer may, following a notice to the Contractor, proceed to do such work, and the costs incurred by the Employer in connection therewith shall be paid to the Employer by the Contractor or may be deducted by the Employer from any monies due to the Contractor or claimed under the Performance Guarantee, without prejudice to other rights, which the Employer may have against the Contractor in respect of such defects.

35.12 If the Facilities or any part thereof cannot be used by reason of such defect and/or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the Facilities or such part cannot be used by the Employer because of any of the aforesaid reasons. Upon correction of the defects in the Facilities or any part thereof by repair/ replacement, such repair/replacement shall have the defect liability period of twelve (12) months from such replacement.

35.13 In addition, the Contractor shall also provide an extended warranty for any such component of the Facilities and for the period of time. Such obligation shall be in addition to the defect liability specified under Clause 35.2.

35.14 The Bidder's liability under this contract for any reason, what so ever, shall be limited to the total Contract Price (Including T & D)

36. Termination by default and Breach of Contract

Employer may, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the Contractor, terminate the Contract in whole or in part:

36.1 If the Contractor fails to deliver or execute any or all of the goods within the time period(s) under the Contract or any extension thereof granted by the Employer pursuant to the clause for Delay in Execution or Failure to Supply or, if the Contractor fails to perform any other obligations(s) under the Contract.

36.2 In the event the Employer terminates the contract in whole or in part, pursuant to above, the Employer may procure, upon such terms and in such manner as it deems appropriate, goods similar to those undelivered, the Contractor shall be liable to the Employer for any excess costs for such similar goods. However, the Contractor shall continue the Performance of the Contract to the extent not terminated.

36.3 In case of termination of the Contract due to breach of contract, the Contractor may be debarred from participation in future tenders by Employer, through a communication in writing for a period to be specified therein.

36.4 In case the termination of contract in accordance with GCC Clause 32 thereto.

37. Breach & Cancellation of the Contract

37.1 In case of non-Performance, in any form or change of the covenant and conditions of the Contract by the Contractor, Employer shall have the power to annul, rescind, cancel or terminate the order and upon its notifying in writing to the Contractor that it has so done, this Contract shall absolutely determine. The decision of the Employer in this regard shall be final and binding.

37.2 The following conditions shall contribute to the breach of contract:

- If the Contractor fails to deliver any or all of the Goods within the period(s) specified in the Contract;
  or
- If the Contractor fails to perform any of their obligations(s) under the Contract, and
- If the Contractor, in either of the above circumstances does not rectify his failure within a period of 30 (Thirty) days (or such longer period as the Employer may authorize in writing) after receipt of the default notice from the Employer

38. Force Majeure

38.1 A 'Force Majeure' means any event or circumstance or combination of events those stated below that wholly or partly prevents or unavoidably delays an Affected Party in the performance of its obligations under this Agreement, but only if and to the extent that such events or circumstances are not within the reasonable control, directly or indirectly, of the Affected Party and could not have been avoided if the Affected Party had taken reasonable care or complied with Prudent Utility Practices:

- Act of God, including, but not limited to lightning, fire not caused by contractors' negligence and explosion (to the extent originating from a source external to the site), earthquake (above 7.0 magnitude on Richter Scale), volcanic eruption, landslide, unprecedented flood, cyclone, typhoon or tornado;
- Any act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot, insurrection, terrorist or military action, quarantine;
- Radioactive contamination or ionizing radiation originating from a source in India or resulting from another Force Majeure Event mentioned above.

38.2 **Force Majeure Exclusions**

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

- Unavailability, late delivery,
- Delay in the performance of any contractor, sub-contractor or their agents;
- Non-performance resulting from normal wear and tear typically experienced in power generation materials and equipment;
- Strikes at the facilities of the Contractor / Affected Party;
- Insufficiency of finances or funds or the agreement becoming onerous to perform; and
- Non-performance caused by, or connected with, the Affected Party's:
- Negligent or intentional acts,errors or omissions;
- Failure to comply with an Indian Law;or
- Breach of,or default under this ContractAgreement.
- Normal rainy seasons and monsoon

38.3 In the event of either party being rendered unable by Force Majeure to perform any obligation required to be performed by them under this Contract, relative obligation of the party affected by such Force Majeure shall be treated as suspended during the period which the Force Majeure clause last.

38.4 Upon occurrence of such causes, the party alleging that it has been rendered unable as aforesaid, thereby, shall notify the other party in writing by registered notice within 48 (forty eight) hours of the alleged beginning thereof giving full particulars and satisfactory evidence in support of its claim. Further, within 7 (seven) days, the Contractor will furnish a detailed Contingency Plan to overcome the effects of the incident and bring the project on its schedule after cessation of the effect of Force Majeure.

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

38.6 Time for Performance of the relative obligation suspended by the force majeure shall stand extended by the period for which such Force Majeure clause lasts.

38.7 If works are suspended by Force Majeure conditions lasting for more than two months,the Employer shall have the option of cancelling this Contract in whole or part thereof, at its discretion.

38.8 The Contractor will not be entitled to claim any compensation for Force Majeure conditions and shall take appropriate steps to insure its men and materials utilized by it under the Contract.

39. Insurance

39.1 During the Contract period, i.e., during Construction, all insurance related expenses shall be borne by the Contractor. The goods supplied under the Contract shall be fully insured against the loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in such a manner that Employer shall not incur any financial loss, as long as the plant continues to remain under the custody of the Contractor. During O&M period (after Contract period is over), the insurances shall be arranged by the Owner (at Owner cost).

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

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

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

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

39.6 All other insurance like In – transit insurance (Marine/ Cargo/ others as applicable), Contractor All Risk, Erection All Risk, workmen compensation , third party liability, insurance against theft and acts of GOD and others as required for the Construction and O&M of the Plant and to indemnify the Employer/ equipment/ material and resources shall be borne by the Contractor. Fire insurance is to be arranged by the Contractor up to the years of O&M of the Contract.

39.7 Employer shall be named as co – insured under all insurance policies taken out by the contractor pursuant to GCC Clause 39, except for the workmen compensation, third party liability and Employer's liability insurances. Also, Contractors' sub – contractor shall be named as co – insured under all insurances taken out by the contractor pursuant to GCC Clause 39 except for Cargo insurance, workmen compensation insurance and Employer's liability insurance. All insurers' rights of subrogation against such co – insured for losses or claims arising out of the performance of the contract shall be waived under such policies.

39.8 All the insurance cover taken for the construction and O&M period shall be seamless in nature.

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

40. Statutory Acts, Rules and Standards

The work shall be executed in conformity with the relevant standard of Bureau of Indian Specification (or equivalent International Standard), Indian Electricity Act 2003, Indian Electricity Rules 2005 (as amended up to date), Explosive Act 1948 (As amended), Petroleum Act 1934, National Building Code, Hazardous Waste Management Rules 2009, e – waste (Management & Handling) rules 2011 and relevant Rules/ acts in vogue at the time of execution including operation & maintenance period.

41.Hazardous Material

Any hazardous material used during construction or used as part of the plant has to be taken back by the supplier for recycling or dumping purpose after its operating / working life, so that it may not affect the environment or any living being. Bidder(s) have to comply with Tamilnadu State Pollution Board regulation.

42. Stoppage of Work

Employer shall not be responsible and not liable to pay any compensation due to stoppage of work as a reaction from local public due to any undue action on the part of the Contractor causing annoyance to local people.

43. Hindrance Register

The Contractor may also maintain a Hindrance Register where reasons for delay/ fault may be recorded from time to time and at the time of occurrence of the hindrance and get it duly certified by the Project Manager or his authorized representative.

44. Manuals

The Contractor shall supply all necessary erection and commissioning manuals, O&M manuals etc. as and when required.3 sets of test results, manuals etc. shall be submitted by the Contractor on completion of the work.

45. Delivery of Equipment

45.1 The Contractor shall deliver the equipment of the Plant and machineries in accordance with the terms of the Contract at the time(s) to the place(s) and in the manner specified in the Contract. The Contractor shall comply with instructions that may be given by the Employer from time to time regarding the transit of the Plant and material.

45.2 Notification of delivery or dispatch in regard to each and every consignment shall be made to the Employer immediately after dispatch or delivery from the manufacturing works. The Contractor shall supply to the consignee Invoice in triplicate and packing account of all stores delivered or dispatched by him.

45.3 In case of any occurrence of loss or damage in transit, it shall be the liability of the Contractor to initiate or pursue the claim with insurance company. It should take immediate steps to repair the damaged apparatus or replacement thereto.

46. Liabilities during Transit

All the supplies mentioned/ required under this NIT shall be FOR destination basis. The Contractor shall be responsible for loss, damages or depreciation to goods or of plant, equipment, and machineries up to delivery at Site. The replacement of the affected item shall also to be carried out by the contractor to meet the performance of the contract within the specified time.

47. Deduction from Contract Price

47.1 All costs, claims, damages or expenses, which the Employer may have paid for which the Contractor is liable, will be deducted by the Employer from deposited Performance Bank Guarantee (s).

47.2 Any sum of money due and payable to the Contractor, as per the Contract Agreement, may be appropriated by the Employer and set off against any claim of the Employer, for the payment of a sum of money arising out of or under any other contract made by the Contractor with the Employer. It is an agreed term of the Contract that the sum of money, withheld or obtained under this clause by the Employer, will be kept withheld or retained as such by the Employer or till the claim arising out of in the same Contract is either mutually settled or determined by the arbitrator, or by competent court, as the case may be, and that the Contractor shall have no claim for interest or damages whatsoever on this account or any other account in respect of any sum of money

48. Warranty / Guarantee

48.1 PV modules to be used in grid connected Solar Power Plant must be warranted for peak output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

48.2 The modules shall be warranted for at least 5 years for failures due to material defects and workmanship.

48.3 The mechanical structures, electrical works and overall workmanship of the grid connected Solar Power Plant must be warranted for a minimum of 5 year.

48.4 The Contractor must ensure that the goods supplied under the Contract are new, unused and of most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

48.5 The warranty / guarantee period shall be as follows:

The modules shall be warranted for at least 5 years for failures due to material defects and workmanship.

Power Conditioning Units(PCU)/Inverters: PCUs shall be warranted for the minimum period of 5 years or guarantee period provided by the OEM, whichever is higher.

Transformers, associated switch gear and others: Bidder must furnish in detail its warranties / guarantees for these items.

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

48.7 At the end of guarantee period, the Contractor's liability shall cease. In respect of goods not covered by the GCC Sub Clause 48.5, the Employer shall be entitled to the benefit of such guarantee given to the Contractor by the original Contractor or manufacturer of such goods.

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

49. Final Bill/ Final Due Payment

The final bill relating to the EPC Contract or its parts viz. Supply, Erection and Civil Works contract, shall be prepared only after the Guaranteed Performance of the Plant has been observed. It will include the adjustments of all claims against the Contractor by the Employer and awarded in its favor by the adjudicator or arbitrator, as the case may be, up to the date of preparation of the final bill.

50. Operation and Maintenance

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

50.2 **Preventive / Routine Maintenance:**

This shall be done by the Contractor regularly and shall include activities such as cleaning and checking the health of the Solar PV system, cleaning of module surface, tightening of all electrical connections, and any other activity including the associated civil works, as mentioned in TS Clause 3, wear and tear that may be required for proper functioning of the Solar PV system as a whole. Necessary maintenance activities, Preventive and Routine for Transformers and associated switch gears and transmission line also shall be included.

50.3 **Breakdown / Corrective maintenance:**

Whenever a fault/failure/breakdown/malfunctioning occurs, the Contractor has to attend to rectify the fault & the fault must be rectified within the 48 hours from the time of occurrence of fault, failing which LD will be applicable in line with SCC Clause 25.2 or 25.4 depending upon nature of fault/failure/defect/ breakdown/malfunctioning. The contractor must maintain all the records pertaining to such faults/failure/breakdown/ malfunctioning and necessary measures taken.

The date of Comprehensive Operation & Maintenance Contract period shall begin on the date of Successful demonstration of guaranteed PR i.e., Operational acceptance. However, operation of the Power Plant means operation of system as per bid and workmanship in order to keep the project trouble free covering the guarantee period. The contractor must demonstrate the committed CUF at the end of every year in accordance with commitment made in the Techno-Commercial Enclosures of the Bid.

50.4 Serviceability Level Agreement (SLA)

50.4.1 Contractor shall make efforts to maintain 100% service ability of complete Plant including all other associated infrastructure developed by the Contractor during execution of project as its scope of work.

50.4.2 Contractor shall produce monthly service ability report for individual components of the plant & associated infrastructure to the employer by 5th of next month.

50.4.3 Contractor shall maintain a Complaint log book, which shall include the timing of logging of complaint including unique Complaint number, time of closure of complaint & it's Root Cause Analysis.

50.4.4 Any complaint related to un service ability/improper functioning of any & all component of the plant including but not limited to PV Module, PCU, Transformers, switchgears, SCADA, roads, drainage, water supply lighting system, office infrastructure, CCTV system which is not attended & rectified within 48 hours, shall attract a penalty of Rs. 500 per 24 hours, which shall be over & above GCC Clause 34 & 50.3. If such complaint is not rectified within 480 hours from logging of complaint. Employer may choose to rectify the same through any other agency at the risk of Contractor and Employer shall recover 110% of such cost incurred from subsequent payment to the contractor. Cumulative value of such LD shall be limited to 50% of yearly O&M Cost

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

50.4.6 O&M Routine&Manpower: Contractor shall provide Preventive/Routine Maintenance schedule based on Original Equipment manufacturer and good engineering practices. The team deployed for the O&M must have a minimum manpower structure with following qualification;

Project Manager (B.E./B.Tech Electrical, with minimum 5 years of relevant experience) -1 No. Shift Engineers (BE/B-Tech Electrical, with minimum 3 years of relevant experience) –1 No / Shift Polytechnic/Diploma Electrical (with minimum 3 years of relevant experience) -2 / shift Polytechnic/Diploma Mechanical or Civil (with minimum 3 years of relevant experience) -1/shift Unskilled for cleaning & other unskilled works with respect to Plant – As per requirement. However contractor shall engage additional manpower as and when need arise.

51. Risk Purchase

If the Contractor fails, on receipt of the LOI, to take up the work within a reasonable period or leave the work Site after partial execution of the work, the Employer shall have the liberty to get the work done through other agency at the Contractor's own risk and additional cost if any has to be borne by the Contractor. If the situation, so warrants, to compel the Employer to cancel the LOI placed on the Contractor, the Contractor shall be liable to compensate the loss or damage, which the Employer may sustain due to reasons of failure on Contractor's part to execute the work in time.

52. Unforeseen/ Differing site Conditions

52.1 If, during the execution of the Contract, the Contractor shall encounter on the Site any physical conditions (other than climatic conditions) or artificial obstructions that could not have been reasonably foreseen prior to the date of the Contract Agreement by an experienced contractor on the basis of reasonable examination of the data relating to the Facilities, and on the basis of information that it could have obtained from a visual inspection of the Site (if access thereto was available) or other data readily available to it relating to the Facilities, and if the Contractor determines that it will in consequence of such conditions or obstructions incur additional cost and expense or require additional time to perform its obligations under the Contract that would not have been required if such physical conditions or artificial obstructions had not been encountered, the Contractor shall promptly, and before performing additional work or using additional Plant and Equipment or Contractor's Equipment, notify the Project Manager in writing of

- The physical conditions or artificial obstructions on the Site that could not have been reasonably foreseen
- The additional work and/or Plant and Equipment and/ or Contractor's Equipment required, including the steps which the Contractor will or proposes to take to overcome such conditions or obstructions
- The extent of the anticipated delay
- The additional cost and expense that the Contractor is likely to incur and the breakup of the same.
- On receiving any notice from the Contractor under this GCC Sub- Clause 52.1, the Project Manager shall consult and decide upon the actions to be taken to overcome the physical conditions or artificial obstructions encountered. Following such consultations, the Project Manager shall instruct the Contractor of the actions to be taken.

52.2 Any reasonable additional cost and expense incurred by the Contractor in following the instructions from the Project Manager to overcome such physical conditions or artificial obstructions referred to in GCC Sub-Clause 52.1 shall be paid by the Employer to the Contractor as an addition to the Contract Price, after submission of relevant documents justifying same.

52.3 If the Contractor is delayed or impeded in the Performance of the Contract because of any such physical conditions or artificial obstructions referred to in GCC Sub-Clause 52.1, the Time for Completion shall be extended in accordance with GCC Clause 54.

53. Change in Laws and Regulations

If, after the date seven (7) days prior to the date of Bid submission, in the country where the Site is located, any law, regulation, ordinance, order or by-law having the force of law is enacted, promulgated, abrogated or changed (which shall be deemed to include any change in interpretation or application by the competent authorities) that subsequently affects the costs and expenses of the Contractor and/or the Time for Completion, the Contract Price shall be correspondingly increased or decreased, and/or the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been affected in the Performance of any of its obligations under the Contract. However, these adjustments would be restricted to direct transactions between the Employer and the Contractor/assignee of Foreign Contractor (if applicable). This adjustment shall not be applicable on procurement of raw materials, intermediary components etc. by the Contractor and shall also not be applicable on bought out items dispatched directly from sub- vendor works to site. Notwithstanding the foregoing, such additional or reduced costs shall not be separately paid or credited if the same has already been accounted for in the price adjustment provisions where applicable.

54. Extension of Time for Completion

54.1 The Time(s) for Completion specified in the SCC shall be extended if the Contractor is delayed or impeded in the Performance of any of its obligations under the Contract by reason of any of the following:

54.1.1 Any occurrence of Force Majeure as provided in GCC Clause 38 (Force Majeure), unforeseen/ differed site conditions as provided in GCC Clause 52 (Unforeseen/ differed site Conditions).

54.1.2 Any changes in laws and regulations as provided in GCC Clause 53 (Change in Laws and Regulations) or by such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Contractor.

54.2 Except where otherwise specifically provided in the Contract, the Contractor shall submit to the Project Manager a notice of a claim for an extension of the Time for Completion, together with particulars of the event or circumstance justifying such extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Employer and the Contractor shall agree upon the period of such extension. In the event that the Contractor does not accept the Employer's estimate of a fair and reasonable time extension, then the matter will be settled in accordance with the provisions of GCC Sub-Clause 6.1 (Adjudicator).

54.3 The Contractor shall at all times use its reasonable efforts to minimize any delay in the Performance of its obligations under the Contract.

54.4 The Contractor shall be required to attend all weekly site progress review meetings organized by the 'Project Manager' or his authorized representative. The deliberations in the meetings shall include the weekly program, progress of work (including details of manpower, tools and plants deployed by the Contractor vis-à-vis agreed schedule), inputs to be provided by Employer, delays, if any and recovery program, specific hindrances to work and work instructions by Employer. The minutes of the weekly meetings shall be recorded in triplicate in a numbered register available with the 'Project Manager' or his authorized representative. These recordings shall be jointly signed by the 'Project Manager' or his authorized representative and the Contractor and one copy of the signed records shall be handed over to the Contractor.

55. Care of Facilities

The Contractor shall be responsible for the care and custody of the Facilities or any part thereof until the date of Completion of the Facilities pursuant to GCC Clause 18 or, where the Contract provides for Completion of the Facilities in parts, until the date of Completion of the relevant part, and shall make good at its own cost any loss or damage that may occur to the Facilities or the relevant part thereof from any cause whatsoever during such period. The Contractor shall also be responsible for any loss or damage to the Facilities caused by the Contractor or its Subcontractors in the course of any work carried out, pursuant to GCC Clause 35 (Defect Liability).

56. Contractor Performance & Feedback and Evaluation System

The Employer has in place an established 'Contractor Performance and Feedback System' against which the Contractor's Performance during the execution of Contract shall be evaluated on a continuous basis at regular intervals. In case, the Performance of the Contractor is found unsatisfactory on any of the following four parameters, the Contractor shall be considered ineligible for participating in future tenders for a period as may be decided by the Employer:

- Financial Status
- Project Execution and Project Management Capability
- Engineering & QA Capability
- Claims & Disputes

57. Documents constituting the Contract

The following documents shall constitute the Contract between the Employer and the Contractor, and each shall be read construed as an integral part of the contract:

a) Contract Agreement
b) Letter of Intent / Notice to proceed
c) Special Conditions of Contract
d) General Conditions of Contract
e) Technical Specifications and Drawings
f) The Bid and Price schedules submitted by the contractor

58. Fraud Prevention Policy

The Contractor along with their Associate/ Collaborator/ Sub- contractors/ Sub-vendors/ Consultants/ Service Providers shall observe the highest standard of ethics and shall not indulge or allow anybody else working in their organization to indulge in fraudulent activities during execution of the Contract. The Contractor shall immediately apprise the Employer about any fraud or suspected fraud as soon as it comes to their notice.

TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – IV

SPECIAL CONDITIONS OF CONTRACT

Section – IV – Special Conditions of Contract
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1.0 Project description

Design , Supply , Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur in Tiruchirappalli City Corporation

2.0 Project Site

Project site is located inside Panchappur of Tiruchirappalli city Corporation, Tiruchirappalli city, available area is 10.00 acres. The contractor has to suitably plan the layout of the Plant for optimum utilization of land. The designated substation at Manikandam 110/11KV S/S, Tiruchirappalli is located near the proposed site (for actual distance, Bidders are advised to visit the site), where the Plant is to be connected for power evacuation.

3.0 Appointing Authority

Appointing Authority of Adjudicator and Arbitrator shall be **Managing Director, TSCL.**

4.0 Project Manager/ Engineer in - Charge

Project Manager/ Engineer in - Charge will be appointed by Managing Director, TSCL and will be intimated after award of the contract.

5.0 Scope of Works

The detailed scope of works under this contract shall be referred at Section V: Technical Specifications.

6.0 Training of Employer's Personnel

On successful commissioning of the Plant, the Bidder shall provide training on Plant operations and maintenance to a team of 5 – 10 personnel (Engineers and Technician/ Operators) as nominated by Employer, within first two months of Operation of Plant

7.0 Performance Guarantee

7.1 The Plant performance will be evaluated through Performance Ratio (PR) test as per IEC 61724 and Capacity Utilization Factor (CUF) calculation as per the formulas and procedures mentioned under Section-V (Technical Specification).

7.2 The minimum acceptable PR of the Plant is 0.78 and CUF shall be 18% against installed rated DC capacity at STC.

As the PR of the Plant is dependent on the quality of Plant equipment and optimum design of the Plant, the bidders shall demonstrate the PR of 0.78 as per the procedure mentioned at TS Clause 10 for Operational Acceptance of the Plant.

The initial acceptance of the Plant will be evaluated during commissioning by measuring PR for continuous 7 days. However, contractor must demonstrate the PR for a period of 30 days as per the PR test procedure specified in TS Clause 10.

The performance of Plant will be evaluated based on minimum CUF demonstrated at the end of every year from the date of Operational Acceptance till the culmination of the O&M period. During this period, the contractor shall operate and maintain the Plant with full reliability and up keep.

During O&M contract, the Plant performance will be evaluated based on annual Capacity Utilization Factor. Second year onwards 1% degradation of the module output (i.e., 1% of DC capacity at STC per year) shall be considered for the calculated CUF every year.

During the O&M period, the bidders need to maintain 99% uptime of the Plant to achieve the proposed CUF at the end of each year. Any routine repair, replacement, overhauling, etc. are to be performed during night times so that no generation loss will be there in day time

Bidders are expected to make their own study of solar radiation profile and other related parameters of the area & make sound commercial judgment about the Performance Ratio and CUF. It shall be the responsibility of the Bidder to assess the corresponding solar insulation values and related factors of solar Plant along with expected grid availability. The Bidder should access all related factors about the selected Site for the Project before giving commitments of PR and CUF of the proposed Project.

The bidders are free to install additional DC capacity any time during O&M period, with proper consent by the Employer, to meet the desired performance parameters with no additional cost to the Employer.

The Contractor shall be responsible for achieving PR and CUF.

8.0 Project Time lines:

The time lines for Completion of the EPC Works is 181 days from the handing over of final 8.7 acres of Land.

S.No	Stage	Reference form D
1	Issue of LOI/NTP/Handing over of land	Zero Date(D)
2	Approval Major Drawings	D + 30 Days
3	Site Development Work	D + 60 days
4	Completion of supply of major equipments like SPV modules, Power conditioning units , mounting structures, Transformers etc.,	D + 120 days
5	Installation of Major Equipments	D + 140 days
6	Interconnection of all major equipments & Completion of installation	D+ 150 days

S.No	Stage	Reference form D
7	Completion, testing and Pre-commissioning of Solar PV Power Plant of 2.4	D + 170 days
8	Commissioning of Plant along with Completion of Facilities in line with Technical/Functional/Performance Requirement stated under this Tender Document.	D + 181 days

PR Demonstration Test as Per Technical Specification Clause-10 for Operational Acceptance shall be done only after commissioning of Plant & Completion of all associated infrastructure as mentioned under Section-V (Technical Specification).

9.0 Mode of Execution

The entire work shall be executed on turnkey basis. Any item(s) not included in the schedule but essentially required for completion of the work shall have to be carried out/ supplied without any extra cost. Such works, not listed in the schedule of works but elaborately described to perform or to facilitate particular operation(s) required for completion of the project shall deemed to have been included in the scope of this work and the **Contractor shall supply, install the same without any extra cost.**

10.0 Programme of Work

The Contractor shall submit the detailed programme of work within 15 days from the date of receipt of Letter of Intent. The programme shall include a Bar/ Gantt chart indicating there in the starting position and completion date of each of the major items of work.

11.0 Starting of Work

The date of issue of LOI/NTP shall be treated as the Zero day for the start of work & there by Contract Timeline. The Contractor shall be required to start the work within 15 (fifteen) days from the date of issue of Letter of Intent (LOI) / NTP and shall thereof, report to the Employer accordingly. During these 15 days following things are to be accomplished;

I. Employer at its own discretion may call a kick-off meeting, where broader guidelines of EPC shall be discussed.

II. Contractor's representative from Procurement, design, Project Execution team shall participate in this meeting & submit their Plan with respect to EPC works.

III. Contractor shall submit the L-2 schedule of Project activities.

IV. Communication Protocol for Project coordination to be frozen by the Employer, within this timeline Contractor must identify & communicate the details of their nodal persons for Procurement, Design & Execution.

12.0 Completion Schedule

The Contractor shall inform the Employer through advance information at least 30 days in advance in written notice, and a final notice 7days in advance to enable the Employer inform the commissioning committee of the date on which it intends to synchronize the Power Project to the Grid System.

The Contractor shall prepare the completion schedule accordingly and in conformity with provisions of technical specifications and carry out the work as per this schedule subject to "Force Majeure" conditions. The Contractor shall mobilize resources keeping in view, the above scheduled completion period.

13.0 Site Inspection & Basis of Bid

The volume and quantity of work indicated in schedule of works may vary. The Contractor should survey the proposed land at Panchappur Tiruchirappalli city corporation's area, Tiruchirappalli city visit the Site before quoting rate for EPC & O&M works. After taking in to consideration all aspects of the site, condition of soil, distance of designated substation etc., the Contractor should quote for EPC works. No extra claim will be entertained at post bidding stage. All the work including foundation design of module structure and the building shall have to be approved by the Employer. In case of any defects arising in such installations during guarantee/O&M period, the Contractor shall have to rectify the same at its own cost.

14.0 Terms of Payment

Payments shall be released against each component of Price Bid in the following manner after submission by the contractor and acceptance of Security cum Performance Bank Guarantee by Employer and signing of Agreement as per provisions of bidding document.

14.1 In accordance with the provisions of GCC Clause 11 (Terms of Payment), the Employer shall pay the Contractor in the following manner and at the following times:For **Supply of Plant & Equipment** including PV Modules, Inverter and BOS up to site

(FOR basis) including transportation and insurance along with mandatory spares

I. 90% of the total price of supplies of Plant and Equipment shall be paid against delivery of supplies on pro-rata basis against receipt of material at site under the Contract.

II. 10 % of the total price of supplies of Plant and Equipment shall be paid on Operational Acceptance of the Facility pursuant to successful Guarantee Tests and demonstration of PR and submission of all as – built documentation. BG for an amount equivalent to 10 % of total supplies shall be submitted in the in the following manner,

1. 2% of total price of supplies for a period of 1 Year
2. 2% of total price of supplies for a period of 2 Year
3. 2% of total price of supplies for a period of 3 Year
4. 2% of total price of supplies for a period of 4 Year
5. 2% of total price of supplies for a period of 5 Year

14.1.2 **For Erection, Testing and Commissioning**

I. 90% of the total price of Erection, Testing and Commissioning shall be paid on pro-rata basis on completion of installation of equipment on certification by the Engineer-In- Charge/ Project Manager for the quantum of work completed after successful clearance of quality check points involved in the quantum of work billed.

II. 10% of the total price of Erection, Testing and Commissioning shall be paid on Operational Acceptance of the Facility pursuant to successful Guarantee Tests and demonstration of PR. BG for an amount equivalent to 10 % of total supplies shall be submitted in the in the following manner,

1. 2% of total price of Erection, Testing and Commissioning for a period of 1 Year
2. 2% of total price of Erection, Testing and Commissioning for a period of 2 Year
3. 2% of total price of Erection, Testing and Commissioning for a period of 3 Year
4. 2% of total price of Erection, Testing and Commissioning for a period of 4 Year
5. 2% of total price of Erection, Testing and Commissioning for a period of 5 Year

14.1.3 On successful Operation and Maintenance of the Solar Power Plant on **quarterly** basis at the end of every quarter for each year till 10 years. The O&M of the Plant starts after Operational Acceptance.

I. Year 1: OM -1
II. Year 2: OM -2
III. Year 3:OM-3
IV. Year 4: OM -4
V. Year 5: OM -5
VI. Year 6: OM -6
VII. Year 7: OM -7
VIII.Year 8: OM -8
IX. Year 9: OM -9
X. Year 10: OM -10

'OM' indicates the O&M Contract Value quoted by the Successful Bidder for each individual year in its Financial Proposal.

14.2 Recovery of interest bearing Mobilization advance: NOT APPLICABLE

14.3.1 All the transactions shall be made directly between the Employer (Tiruchirappalli Smart City Limited) and the contractor. Hence for every consignment, the consignee must be in the name of "The Managing Director,TSCL".

14.3.2 The bidder shall furnish a detailed break-up, including bill of materials, for the Price Component of all the packages which shall be mutually discussed and finalized with the Employer. Progressive payment for Erection and Civil works will be made against monthly bills based on certification by the Project Manager/ Engineer In – Charge for the work completed.

14.3.3 The release of first progressive payment for Civil Works shall also be subject to submission of documentary evidence by the Contractor towards having taken the insurance policy (ies) in terms of relevant provisions of GCC Clause 39 (Insurance) and acceptance of same by the Project Manager/ Engineer-In-Charge.

14.3.4 All the applicable Taxes and Duties which are payable by the Employer under the Contract, pursuant to GCC Sub – Clause 13.5, shall be reimbursed to the Contractor upon the production of satisfactory Tax Invoice (s) by the Contractor subjected to maximum of which has been considered during evaluation.

14.3.5 **Contract Value (CV):**

The firm sum quoted by the Successful Bidder in its Final Financial Proposal is the sum of individual contract values for Design, supply, erection, Installation & Commissioning of the plant as mentioned below:

a. Supply Contract Value: Total value mentioned against the Supply package mentioned at SCC clause 14.1.1 and Bill of Quantities.

b.Erection,Installation & Commissioning Contract Value: Total value mentioned under the Erection,Installation & Commissioning package mentioned at SCC clause 14.1.2 and Bill of Quantities.

d.O&M Contract Value: Total value mentioned under the Operation & Maintenance works mentioned at SCC clause 14.1.4 and Bill of Quantities

Employer shall issue LOI's for different components of the contract i.e.,

a. Supply Contract, Erection, Testing and Commissioning Contract
b. O&M Contract

14.4 Mobilization Advance: **NOT APPLICABLE**

14.5 **NOT USED.**

14.6 The Employer will withhold / deduct /under this Contract, and or to any additions or deductions provided for in this Contract, the statutory deductions as per provisions of the laws in force before making payments. Accordingly the contractor shall submit Bills / Invoices after incorporating and in line with the following:

14.6.1 All payments shall be made in Indian Rupees, unless otherwise specified in the LOI/PO/ NTP/ Contract Agreement. All payment shall be made on the basis of actual measurement for the quantified items as per schedule of works and approved by Project Manager/ EIC within 14 days of submission of duly certified invoice by the Contractor. The Contractor shall submit the bill / invoice for the work executed showing separately VAT, and any other statutory levies in the bill / invoice.

14.6.2 All taxes and deductions shall be applicable as per prevailing income tax and other statutory rules and provisions in force. Bidders are requested to take in account while quoting their bids.

14.6.7 The Contractor, while raising Bills / Invoices shall raise separate Bills / Invoices against individual contracts with reference to the LOI/ Contract number and indicating applicable taxes / duties on the contract. Bills / Invoices for more than one contract package shall not be clubbed together

15.0 Price Escalation

No Price escalation is allowed. The rate(s) quoted against the work shall remain firm during the entire Contract period. Any change in Forex rate less than 5% shall not be considered for price variation.

16.0 Taxes and Duties:

Proper tax invoices, raised against the different work packages viz. Supply, Erection and Civil works must be submitted mentioning the tax component clearly and separately.

Bidder will quote the rates of taxes & duties based on the concessional rate or exemption in the same (as applicable) that can be availed by the bidder on its own.

17.0 Procurement of Materials

The Contractor shall procure all necessary material required for the project work and arrange to store them properly. Test certificate in accordance with the specifications are to be furnished by the Contractor to the Employer for approval in respect of the materials procured by the Contractor.

18.0 Samples

The Contractor shall within 30 days of issue of Letter of Intent/NTP, provide to the Employer detailed Technical literature &/or test certificates of all major materials it proposes to use irrespective of the fact that specific make/material might have been stipulated. The Employer shall check the compliance of the proposed items and give its comments and/or approval to the same.

19.0 Notice of Operation

The Contractor shall not carry out important operation without the consent in writing of the Employer or his representative. For carrying out such important activity, the Contractor shall intimate to the Employer at least 72 hours before starting of the job.

20.0 Rejection of Materials

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

21.0 Construction Power & Water Supply

21.1 The Contractor has to arrange Construction Power and water at the site for construction purpose at its own cost.

21.2 Cost of electricity required during construction shall be payable by the bidder. For construction, temporary connection for construction power from DISCOM/suitable supply source shall be arranged by the bidder as per applicable tariff.

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

22.0 Labour Engagement

The Contractor shall be responsible to provide all wages and allied benefits to its labours engaged for execution of the project work and also to carry out Operation & Maintenance service. The Contractor shall remain liable to the authorities concerned for compliance of the respective existing rules and regulations of the government for this purpose and shall remain liable for any contravention thereof.

The contractor is encouraged to use local manpower as per the local statutory (labour) requirement, if any.

23.0 Handing Over –Taking Over

The work shall be taken over by the Employer upon successful completion of all tasks to be performed at Site(s) on equipment supplied, installed, erected and commissioned by the Contractor in accordance with provision of Tender Document. During handing over complete project work, the Contractor shall submit the following for considering final payment:

23.1 All as- Built Drawings and documents as per the contract coordination procedure set out for the successful completion of the project

23.2 Detailed Engineering Document with detailed specification, schematic drawing, circuit drawing, cable routing plans and test results, manuals for all deliverable items, Operation, Maintenance & Safety Instruction Manual and other information about the project.

23.3 Bill of material.

23.4 Inventory of recommended and mandatory spares at project Site.

23.5 Immediately after taking over of complete facilities (s), the same will be handed over to the Contractor for Operation & Maintenance for a period of as mentioned in the bidding document.

24.0 Liquidated Damages

Liquidated damages for the delay in construction of the Plant shall be as per the GCC Clause 34.

25.0 Miscellaneous

25.1 Based on reviewing the Project, if the progress is below expectation as demanded by the Employer then, the employer reserves right to reduce the Scope of the Contractor in part or full and assign the same to other contractor(s) and get the work done at the risk and cost of the existing Contractor.

25.2 The Contractor shall continue to provide all the monitoring services, licenses, software, access to all information (real-time or stored) that were being used during the O&M to the Employer.

25.3 The Contractor will construct/ provide a separate temporary facility/ arrangement at site (including office furniture, computer, vehicle etc) for the office of Employer's employee/ consultant/TSCL's employees at the time of construction of the Solar Power Plant. All the temporary facilities constructed for the purpose of execution of the contract shall be removed after taking necessary permissions from the Employer immediately after Operational Acceptance

25.4 Provision for installing any additional monitoring equipment to facilitate on- line transfer of data shall be provided by the Contractor.

25.5 In case of discrepancy between GCC Clause and SCC Clause on a particular subject, SCC conditions will prevail.

TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – V

Technical Specification

Section – V – Technical Specification
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DISCLAIMER:

I. Though adequate care has been taken while preparing the Bidding documents, the Bidders/ Applicants shall satisfy themselves that the document is complete in all respects. Intimation of any discrepancy shall be given to this office immediately. If no intimation is received from any Bidder within twenty (20) days from the date of notification of IFB/Issue of the IFB documents, it shall be considered that the IFB documents are complete in all respects has been received by the Bidder.

II. The Managing Director, Tiruchirappalli Smart City Limited, (TSCL), The Employer, reserves the right to modify, amend or supplement this IFB documents including all formats and Annexure.

III. While this bidding documents have been prepared in good faith, neither Employer or its authorised representatives 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 bidding documents, even if any loss or damage is caused by any act or omission on their part.

IV. The specification mentioned for all the equipment which include Solar modules, PCU, combiner boxes, DC cables, module mounting structures, transformer, CT, PT, LT/ HT cables, interfacing panels, switch gears & other associated equipment etc., to complete the power generation to the designated transformer at Panchappur of Tiruchirappalli city Corporation STP area r , Tiruchirappalli city in the present bidding documents is for the **reference** only. It is subject to revise/ alter as per the design/ planning/Good engineering practices etc., to be carried out by the selected bidder, to the satisfaction of the Employer or its authorized representatives. It is advised that the bidders must satisfy himself with the prevailing site conditions before design/ plan. The design must be optimized for the site conditions and directed to achieve the maximum output form the installed capacity at all times. Moreover, the components not separately mentioned, but are required to complete the Plant for operation is also included in the scope of bidder and shall be vetted by the Employer or its authorized representatives.

Place:

Date:

Name and Designation of bidder

Introduction

1.0 Site Description

1.1 The suitable and requisite land for the proposed 2.4Mw (DC), AC Solar PV power Plant is in the TSCL premises, in the state of Tamilnadu.

1.2 This land is owned by Tiruchirappalli City Municipal Corporation and located within the premises, in Tiruchirappalli city District of Tamilnadu.

1.3 Interconnection point for evacuation of Power from the Plant will be designated Substation at Manikandam 110/11KV S/S, Tiruchirappalli city at 33 kV level.

System Design and Philosophy

2.0 Design Philosophy

2.1 The main objective of the design philosophy is to construct the Plant with in-built Quality and appropriate redundancy to achieve high availability and reliability with minimum maintenance efforts. In order to achieve this, the following principles shall be adopted while designing system.

2.2 Technology: Solar PV Mono/ multi-crystalline modules of high efficiency (>15.5% Multi, >17% mono, Fill factor of the module shall not be less than 72 %.) and the cells and modules shall either be manufactured in India or shall be imported.

2.3 Adequate capacity of SPV module, PCUs, Junction boxes etc. to ensure generation of power as per design estimates. This to be done by applying liberal de-rating factors for the array and recognizing the efficiency parameters of PCUs, transformers, conductor loss etc.

2.4 Use of equipment and systems with proven design and performance that have a high availability track record under similar service conditions.

2.5 Selection of the equipment's and adoption of a Plant layout to ensure ease of maintenance.

2.6 Strict compliance with the approved and proven quality assurance systems and procedures during the different stages of the project starting from sizing, selection of make, shipment, storage (at site) , during erection, testing and commissioning.

2.7 Proper monitoring in the synchronizations which ensures the availability of power to the grid/DISCOM.

2.8 The Plant instrumentation and control system should be designed to ensure high availability and reliability of the Plant to assist the operators in the safe and efficient operation of the Plant with minimum effort.

2.9 It should also provide for the analysis of the historical data and help in the Plant maintenance people to take up the Plant and equipment on predictive maintenance.

2.10 Inverter output voltage of 230-415V has to be stepped up to 11 kV to connect it to the grid at the point of interconnection as per the **TS Clause 1.3.**

2.11 The power Plant has to satisfactorily operate in parallel with the grid system which is infinite electrical system. Any faults generated from Solar Plant, if not taken care will result in damage of only SPV power Plant without affecting state Grid/downstream distribution system.Thus suitable protective measure is to be in built so that any disturbance of the grid will not cause any damage of the equipment's of the Solar Power Plant.

2.12 Very fast responsive microprocessor based Directional and Reverse power flow protection should be provided to ensure isolation of the Solar Power Plant from the grid at the time of any fault or/and during maintenance, Contractor may provide any additional suitable protection.

2.13 The basic and detailed engineering of the Plant shall aim at achieving high standards of operational performance especially considering following:

2.13.1 Plant layout to ensure optimum availability for generation during the day time without any shading.

2.13.2 High DC system voltage and low current handling requirements.

2.13.3. Selection of PCUs with proven reliability and minimum downtime. Ready availability of requisite spares.

2.13.4 Based on the SOLAR INSOLATION data from reliable sources, the solar PV system should be so designed that it shall take into account the mean energy output after allowing for various losses, temperature corrections, on an average day for each month of the year.

2.13.5 Careful logging of operational data / historical information from the Data Monitoring Systems, and periodically processing it to determine abnormal or slowly deteriorating conditions.

2.13.6 SPV power Plant should be designed to operate satisfactorily in parallel with the DISCOM/grid within permissible limits of high voltage and frequency fluctuation conditions, so as to export the maximum possible units generated to the grid. It is also extremely important to safeguard the system during major disturbances, like tripping / pulling out of big generating stations and sudden overloading during falling of portion of the grid loads on the power Plant unit in island mode, under fault / feeder tripping conditions.

2.13.7 Generally, flat plate SPV arrays are held fixed at an optimum tilted angle and face towards the equator and the angle of tilt should be approximately equal to the angle of latitude for the site. A steeper angle increases the output in winter; while a shallower angle more output in summer. It should be arranged in such a manner that optimum generation is achieved. Seasonal tilt mechanism is also allowed for meeting CUF & PR Requirement. Seasonal tilt mechanism is also allowed for meeting CUF & PR Requirement.

2.14 The specifications provided with this bid document are a functional ones; any design provided in this document is only meant as an example. The Bidder must submit a proposal based upon their own design. Bidder must optimize their own design for Solar Photovoltaic (SPV) system with proven technology so that it shall best meet to guarantee the performance factors as it is a part of the acceptance criteria given in this bid document. The bidders are advised to visit the site before designing the Plant.

2.15 The minimum array capacity at STC shall be determined to have 2.4Mwp (DC) output at the time of installation. If the bidder anticipates any degradation of the modules more than 1% of the module output during the first year, it shall be taken care of to meet guaranteed generation to avoid liquidated damages/ compensation on account of Generation Performance Guarantees.

2.16 This Bid document specifically cover the rest of the requirements for Grid Connected 2.4 MW (DC) for Solar Power Plant along with their associated equipment. The capacity of the Plant shall be determined to attain minimum of 2.4Mwp (DC) at the point of evacuation.

2.17 Successful Bidder (Contractor) shall prepare the detailed project report & design basis report and submit a copy to Employer for evaluation within 4 weeks from the date of issue of LOI

2.18 Component and equipment reliability: Each component offered by the bidder shall be of established reliability. The minimum target reliability of each equipment shall be established by the bidder considering its failure, mean time between failures and mean time to restore, such that the availability of complete system is assured. The guaranteed annual system availability shall not be less than 99%. Bidder recommendation of the spares shall be on the basis of established reliability.

2.19 The Contractor shall design the equipment and Plant in order to have sustained life of 25 years with minimum maintenance efforts.

2.20 The supply, erection, testing, commissioning and all other allied works for 2.4Mwp (DC) Solar PV Power Plant at Panchappur of Tiruchirappalli city corporation area, Near palar rive, Tiruchirappalli city in the state of Tamilnadu shall be completed within 181 days from the date of order/ LOI/ NTP and shall follow timelines under SCC Clause 8.

Scope of Supply and Work

3.0 Detailed Scope of Work

3.1 The Scope of Work under this package, includes all design & engineering, procurement & supply of equipment and materials, testing at manufacturers works, inspection, packing and forwarding, supply, receipt, unloading and storage at site, associated civil works, services, permits, licenses, installation and incidentals, insurance at all stages, erection, testing and commissioning of 2.4Mw(DC). Ground Mounted Solar PV Power Plant and performance demonstration with associated equipment and materials along with associated transmission system up to 33 kV Transformer located at the site of Panchappur of Tiruchirappalli city corporation's area , Tiruchirappalli city on turnkey basis in the state of Tamilnadu, India and 10 (Ten) years comprehensive operation and maintenance from the date of Operational Acceptance, whichever is later.

3.2 The equipment and materials for 2.4Mwp (DC) Ground Mounted Solar PV Power Plant with associated system (Typical) shall include but not be limited to the receipt, unloading, storage, erection, testing and commissioning of all supplied material for the following:

3.2.1 The bidder/Contractor is required to keep in mind the connectivity of the Plant at 33 kV level at designated substation at Manikandam, Tiruchirappalli city.

3.2.2 Solar PV modules of suitable rating, in array totalling minimum of 1.0 x 2.4Mwp (under STC Condition to meet 1.2 AC output) including mounting frames, structures, fasteners, array foundation and module interconnection.

3.2.3 Array Junction boxes, distribution boxes and Fuse boxes: MCBs, Surge Arrestors with string monitoring capabilities and with proper lugs, glands, ferrules, terminations and mounting structures.

3.2.4 DC and AC cables of appropriate sizes with adequate safety and insulation

3.2.5 Power Conditioning Units (PCU) with SCADA compatibility, common AC power evacuation panel with bus bars and circuit breakers LT & HT Power Interfacing Panels, Plant Monitoring Desk, AC & DC Distribution boards.

3.2.6 Step up transformers (Inverter Duty with suitable intermediate voltage but not less than 33 kV) in relevance with state grid code and inverter manufacturer requirements

3.2.7 Internal 415V interconnection & Indoor feeder panels to cater auxiliary needs of Plant

3.2.8 Metering and protection system along with battery system.

3.2.9 LT Power and Control Cables including end terminations and other required accessories for both AC & DC power

3.2.10 NA

3.2.11 33 kV indoor/ outdoor panels having incoming and outgoing feeders with VCBs, CTs, PTs, Bus bars, cables terminals kits and Main Bus. Each bay shall consist of VCB, CT, Isolators with earth switch, LAs and PT's etc.

3.2.12 ABT meters (Main, Check & standby 0.2 s class accuracy) with all necessary metering rated CT's and PT's at the Plant take off point as per CEA Metering Regulation 2006 as amended time to time and state metering code.

3.2.13 Data acquisition system with remote monitoring facilities. Provision for specific data transfer to the State Load Dispatch Centre (SLDC) shall also be provided.

3.2.14 Lightning arrestors for entire Solar Power Plant area.

3.2.15 PVC pipes, cable conduits, cable trays and accessories/trenches.

3.2.16 Earthing of the entire Solar Power Plant as per relevant standards.

3.2.17 Control room equipment related to solar system etc.

3.2.18 Testing, maintenance and monitoring of equipment.

3.2.19 Spares & consumables, as required or recommended, for 10 years O&M period.

3.22.20 All safety gadgets during Construction and O&M period including but not limited to, anti-static rubber mats of appropriate grade, PPE, rubber gloves and shoes etc.

3.22.21 Design of 2.4Mw (DC) Ground Mounted Solar Power Plant and its associated civil, structural, electrical & mechanical auxiliary systems includes preparation of single line diagrams and installation drawings, manuals, electrical layouts, erection key diagrams, electrical and physical clearance diagrams, design calculations for Earth- mat, Bus Bar & Spacers indoor and outdoor lighting/ illumination etc. design memorandum, GTP and GA drawings for the major equipment & Facilities, design basis & calculation sheets, and other relevant drawings and documents required for engineering of all facilities within the fencing to be provided under this contract, are covered under Contractor's scope of work.

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

3.2.23 Estimation and determination of the Plant generation on daily basis in form of look ahead scheduling of power output.

3.2.24 Any other equipment / material, not mentioned but essentially required to complete the 2.4Mwp (DC) Solar Power Plant in all respect.

3.3 **During the O&M period, the Contractor shall,**

3.3.1 Keep the measured daily generation, radiation, fault log data at regular interval and provide the same to Employer in electronic form compatible in CSV format. The right to use the data shall remain with Employer. Generation data shall be provided in the form of continuous day around generation curve viz a viz radiation data as automatically generated SCADA or Centralized Monitoring System (CMS) Report.

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

3.3.3 Keep the availability of vehicles for O&M staff and for inspection by Employer as per requirement may be ensured, failing which Employer shall have full right for alternate arrangement at the risk & cost of contractor.

3.4 The items of civil design and construction work shall include all works required for solar PV project and should be performed specifically with respect to following but not limited to:

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

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

3.4.3 Construction of Equipment room with necessary illumination system and finishing as required.

3.4.4 A suitable arrangement of water shall be ensured to cater the day-to-day requirement of drinking water and service water supply for module cleaning and other needs of SPV power Plant during entire O&M period. Necessary permanent arrangement for module cleaning shall be made available in SPV array yard, this shall include installing tube well/bore well (including permission for doing bore well) with pump and motor and laying network of GI/HDPE/UPVC pipe in each row/as required for cleaning of SPV panels. (Contractor shall provide single line diagram of water cleaning arrangement). Drainage systems to be designed in such a way that there is no water logging happening from cleaning or any other manmade/natural causes within the Plant.

3.4.5 Galvanized steel/ HDPE conduits and their accessories and Pre-cast concrete pipes with accessories for Road/ Drain and other crossings.

3.4.6 Supply of ferrules, lugs, glands, terminal blocks, galvanized sheet steel junction boxes with powder coating paint for internal fixtures, cable fixing clamps, nuts and bolts etc. of appropriate sizes as required in the Plant.

3.4.7 Power Cables laying underground / over ground with proper cable tray arrangements

3.4.8 Entire GI cable tray with proper support and accessories inside equipment room and control room building and other locations as required.

3.4.9 Obtaining statutory approvals /clearances on behalf of the Employer from various Government Departments, not limited to, the following-

- Pollution control board clearance, if required
- Mining Department, if required
- Forest Department, if required
- All other statutory approvals and permissions, not mentioned specifically but are required to carry out hassle free Construction and O&M of the Plant prevailing at site

3.5 Though any statutory fee required to be paid by the owner of the Solar Power Plant shall be reimbursed by to the Contractor after production of the original receipt.

3.6 The Contractor shall arrange deployment of qualified and suitable manpower and required necessary tools, logistics, spares & consumables during construction, commissioning and O&M.

3.7 Construction Power & construction Water as required for construction and completion of this contract are to be arranged by the Contractor.

3.8 Complete responsibility of total Operation & Maintenance of Solar Photovoltaic Power Plant including all the infrastructure developed as a part of EPC Contract for 10 year from Operational Acceptance of the Plant, including deployment of engineering personnel, technicians and security personnel after the commissioning till final acceptance shall be with the Contractor.

3.9 All approvals, equipment, item and works which are not specifically mentioned in this document but are required for successful completion of work including construction, commissioning, O&M of Solar PV Power Plant in every respect and for safe and efficient construction & erection, operation and guaranteed performance are included in the scope of the Contractor.

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

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

3.11.1 Contour plan including digital record of spot levels, Geotechnical Investigation Report and data representative of complete LAND Area.

3.11.2 GA drawings of the entire project including roads, drains, storm water drainage, sewage networks and treatment facilities, Equipment rooms, Main Control Room (office cum control room),Local control rooms, Security gate, Fire protection system, Rain water harvesting etc.

3.11.3 Design basis criteria along with relevant standards (list of standards and respective clause description only)

3.11.4 Solar insolation data and basis for generation data.

3.11.5 Design calculations and sheets with expected power loss at each stage and backup sheets, if any. Lightening arrestor with area coverage also to be provided.

3.11.6 Detailed technical specifications of all the equipment.

3.11.7 General arrangement and assembly drawings of all major equipment.

3.11.8 Schematic diagram for entire electrical system.

3.11.9 GTP & G.A. drawings for all types of structures/ components, 11 kV switchgears & other interfacing panels..

3.11.10 Relay setting charts.

3.11.11 Quality assurance plans for manufacturing and field activities

3.11.12 Detailed site EHS plan, fire safety & evacuation plan and disaster management plan.

3.11.13 Detailed risk assessment and mitigation plan

3.11.14 Test reports (for type, acceptance, and routine tests).

3.11.15 O&M Instruction's manuals and its drawings.

3.11.16 As-builtdrawings/documentsanddeviationlistfromgoodforconstruction(GFC)

3.11.17 O&M plans, schedules and operational manuals for all equipment etc. Daily/ Weekly site work progress report with catch-up plan(s), as necessary to monitor actual timelines of the project during construction period along with the real time snap shots during the time of construction.

3.11.18 Quarterly O&M reports after commissioning of the project.

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

3.13 The contractor shall forward the following to Employer within a specified timeline as given below;

3.13.1 Schedule for various activities in the form of PERT Chart: within two weeks from the issue of LOI/NTP/PO.

3.13.2 Detailed engineering calculations, Design basis report and complete layout of the Plant: within four weeks from the issue of LOI/NTP/PO

3.13.3 Equipment data sheets, Guaranteed technical particular of equipment and GA drawings of major equipment like, inverter, mounting structure and transformer: within four weeks from the issue of LOI/NTP/PO.

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

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

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

3.17 Adequate and seamless insurance coverage during EPC and O&M period to cater all risks related to construction and O&M of Plant to indemnify the Employer.

3.18 Maintain at the facility accurate and up-to-date operating logs, records and monthly reports regarding the generation, Operation & Maintenance of facility.

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

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

3.21 Handover the system to maintain an inventory of spare parts, tools, equipment, consumables and supplies for the facility's operation & maintenance along-with required details of recommended spares list with all associated information regarding replacement records, supplier details, storage details, specifications on the basis of replacement frequency and mean time between failures and mean time to restore at the culmination of penultimate year under O&M period.

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

3.23 Discharge obligations relating to retirement/ Superannuating benefits to employees or any other benefit accruing to them in the nature of compensation, profit in lieu / in addition to salary, etc. for the period of service with the contractor, irrespective continuance of employees with the project as employees of Contractor, after conclusion of O&M period.

4.0 Operation and Maintenance

4.1 The contractor shall be entrusted to carry out the total O&M activities of the 2.4Mwp (DC) Solar Photovoltaic Power Plant along with transmission & power evacuation system and other infrastructure developed by the Contractor as a part of scope of work for the 10 (Ten) years with immediate effect from the date of operational acceptance.

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

- Deputation of qualified and experienced engineers Supervisors & Technicians.
- Deputation of Security personnel for the complete security of Plant during development of Project as well as O&M.
- Successful running of Solar Power Plant for committed energy generation.
- Co-ordination with STU/DISCOM/SLDC/other statutory organizations as per the requirement on behalf of Employer for Joint Metering Report (JMR), furnishing generations schedules as per requirement, revising schedules as necessary and complying with grid requirements updated time to time.
- Monitoring, controlling, troubleshooting maintaining of logs & records, registers.
- Installation of all spares, consumables etc., as required.
- Installation & use of spares, consumables, tools, logistics and skilled manpower throughout the maintenance period as per recommendations of the equipment manufacturers and requirement of the Plant & other associated infrastructure developed under the scope of EPC works.
- Conducting periodical checking, testing, overhauling, preventive and corrective action.
- Up keeping of all equipment, building, roads, Solar PV modules, inverter etc.
- Arranging & updating any licences/permits required for operation of Plant.
- Submission of periodical reports to Employer on the energy generation & operating conditions of the power Plant.
- Furnishing generation data monthly to Employer by 5^{TH} of every month or finalised by Employer for the previous month to enable Employer raise commercial bills on consumers.
- Periodic cleaning of solar modules as per the recommendations of OEM & existing site conditions.
- Arranging & updating any licences/permits required for operation of Plant.
- Repair & replacement of components of Solar Power Plant including all other associated infrastructure developed as a part of EPC Works which has gone faulty or worn-out components including those which has become inefficient.
- Comprehensive Repair, Operation & maintenance all other facilities like roads, drainages, water supply system, CCTV Network, Streetlight Network, Air Conditioning System, Fire Detection & Protection System and other civil, mechanical, electrical & plumbing system developed during project as a part of Solar PV Power Plant.

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

4.3.1 Preventive and corrective maintenance of the complete Solar Power Plant and associated infrastructure developed as a Part of EPC work, including supply of spares, consumables, repair & replacement of wear and tear, overhauling, replacement of damaged modules, inverters, PCU's and insurance covering all risks (Fire & allied perils, earth quake, terrorists, burglary and others) as required, for a period of 10 (ten) years from the date of start of O&M of the project shall be carried out at fixed annual cost, included in O&M cost quoted by the Contractor.

4.3.2 The period of Operation and Maintenance will be deemed to commence from the date of Operational acceptance and successively the complete Solar Photovoltaic Power Plant including all other infrastructure developed as a part of EPC works has to be handed over to the O&M contractor for operation and maintenance of the same. O&M contract shall further be extended on the mutually agreed terms, conditions & period.

4.3.3 All the equipment required for Testing, Commissioning and O&M for the healthy operation of the Plant must be calibrated, time to time, from the NABL accredited labs and the certificate of calibration must be provided prior to its deployment.

4.4 **Operation and Performance Monitoring**

4.4.1 Operation part consists of deputing necessary manpower required to operate the Solar Photovoltaic Power Plant at the full capacity. Standard Operation procedures (SOPs) such as preparation to starting, running, routine operations with safety precautions, monitoring etc., shall be carried out as per the manufacturer's instructions & best engineering practices to have trouble free & optimum operation of the complete system with maximum possible energy generation.

4.4.2 Daily work of the operation and maintenance in the Solar Photovoltaic Power Plant involves periodic cleaning of Modules, logging the voltage, current, power factor, power and energy output of the Plant at different levels along with fault/breakdown log. The operator shall also note down time/failures, interruption in supply and tripping of different relays, reason for such tripping, duration of such interruption etc. The other task of the operators is to check battery voltage-specific gravity and temperature. The operator shall record monthly energy output, down time, fault logs & their Root Cause Analysis reports etc.

4.5 **Maintenance**

4.5.1 The contractor shall carry out the periodical Plant maintenance as given in the manufacturer's service manual and perform operations to achieve committed generation.

4.5.2 Regular periodic checks of the Modules, PCU's and other switch gears shall be carried out as a part of routine corrective & preventive maintenance. In order to meet the maintenance requirements stock of consumables are to be maintained as well as various spare as recommended by the manufacturer at least for 5 years to be kept for usage.

4.5.3 Maintenance of other major equipment involved in Solar Photovoltaic Power Plant are step up transformers, overhead line equipment/ underground transmission cables, indoor/ outdoor VCB/ SF6 kiosk, associated switchgears, other fixtures & components metering panel Transmission & Evacuation infrastructure, internal roads, water supply network, fire detection & protection system & other infrastructure developed as a part of scope of Work during development of Plant. Particular care shall be taken for outdoor equipment to prevent corrosion. Cleaning of the insulators and applying Vaseline on insulators shall also be carried out at regular intervals. Earth resistivity of Plant as well as individual earth pit is to be measured and recorded every month. If the earth resistance is high, suitable action is to be taken to bring down the same to required level.

4.5.4 According to the recommendations stock of special tools and tackles shall be maintained for Modules, PCU's, switchgears, transformers and other major equipment of the Plant.

4.5.5 A maintenance record is to be submitted to operation/engineer-in-charge to record the regular maintenance work carried out as well as any breakdown maintenance along with the date of maintenance reasons for the breakdowns steps have taken to attend the breakdown duration of the breakdown including action taken to avoid the same in future.

4.5.6 The Schedules will be drawn such that some of the jobs other than breakdown, which may require comparatively long stoppage of the Power Plant, shall be carried out preferably during the non-sunny days/night. An information shall be provided to Engineer-in-charge for such operation prior to start.

4.5.7 The Contractor shall deploy enough manpower with required set of skill sets and knowledge at Plant site to carryout work instructions and preventive/predictive maintenance schedules as specified for complete Plant. The contractor shall keep skilled and experienced supervisor at site on permanent basis to supervise the jobs that are being carried out at site.

4.5.8 The Contractor will attend to any breakdown jobs immediately for repair/replacement / adjustments and complete it at the earliest working round the clock. During breakdowns (not attributable to normal wear and tear) at O&M period, the Contractor shall immediately report the accidents, if any, to the Engineer In-charge showing the circumstances under which it happened and the extent of damage and or injury caused.

4.5.9 The Contractor shall comply with the provision of all relevant acts of Central or State Governments including but not limited to Payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Mines Act 1952, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970, Electricity Act 2003, Grid Code, Metering Code, MNRE guidelines or any modification thereof or any other law relating whereto and rules made there under or amended from time to time.

4.5.10 The contractor shall at his own expense provide all amenities to his workmen as per applicable laws and rules.

4.5.11 The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his or his sub-contractor or Employer's Workmen.

4.5.12 If negligence / mal-operation of the contractor's operator results in failure of equipment such equipment should be repaired replaced by contractor at free of cost.

4.6 **Quality Spares & Consumables**

In order to ensure longevity and safety of the core equipment and optimum performance of the system the contractor should use only genuine spares of high quality standards.

4.7 **Testing Equipment, Tools and Tackles**

The Contractor shall arrange for all the necessary testing equipment, tools and tackles for carrying out all the construction, operation and maintenance work covered under this contract. All the instruments are required to be calibrated from NABL accredited lab before put in use. The certificate of the same shall be submitted to Employer for verification.

4.8 **Security Services**

The contractor has to arrange proper security system including deputation of security personnel at his own cost for the check vigil for the Solar Power Plant. The security staff may be organized to work on suitable shift system; proper checking & recording of all incoming & outgoing materials vehicles shall be maintained. Any occurrence of unlawful activities shall be informed to Employer immediately. A monthly report shall be sent to Employer on the security aspects.

Technical Requirement of Solar Power Plant

5.0 Bill of Material:

The equipment and material for 2.4Mwp (DC) Ground Mounted Solar Photovoltaic Power Plant with associate system (typical) shall include, but not limited to the following:

S.No	Item Details (Along with make & Specification)	Unit
1	Solar PV Modules	Nos
2	Module Mounting Structures including fasteners & clamps	Set
3	Main Junction Boxes with monitoring capabilities	Lot
4	Solar Module to array junction box interconnection cable (Cu)	RM
5	Junction box to inverter connection cable (Cu/Al)	RM
6	Connection Accessories, lugs, ferrules, glands, terminations etc.,	Lot
7	Ac Cable (LT/HT) of appropriate sizes	RM
8	Power Conditioning Units/Inverters	Nos.
9	Metrological station with sensors and logger	Lot

S.No	Item Details (Along with make & Specifiaction)	Unit
10	String level monitoring system (SCADA) & ancillaries	Set
11	Transformers (Power, Inverter & Auxiliary)	Set
12	Circuit Breakers, CT & PT set	Set
13	11KV indoor /outdoor interfacing panels with CT, VCB, PT, Relays etc.,	Set
14	AC & DC distribution panels/boards, PDB, LDB etc.,	Set
15	Control & Relay Panel	Lot
16	Lighting Arrestor of suitable ratings	Lot
17	Earth Mat for switch yard, DC field array & Equipment	Nos
18	Control & Power Cables	Lot
19	SPD's & Fuses	Lot
20	Earth cables, Flats & earthing pits	Lot
21	Rubber mats for specific KV ratings and safety gadgets, PPE	Lot
22	Fire Extinguisher	Lot
23	Sand Buckets	Lot
24	Discharge Rods	Lot
25	Cable for power evacuation with suitable support system	Lot
26	Metering Equipments	Set
27	Protection Equipment	Set
28	Solar Observatory with remote monitoring assistance	Set
29	Module Cleaning system	Lot
30	Danger Sign Plates, anti-climbing, bird protection etc.,	Lot

All the information shown here is indicative only and may vary as per design and planning by the Contractor. The Contractor must provide the BOM of the Plant as per the design during the time of bidding.

The technical features of major equipment are described hereunder.

6.0 Photovoltaic Modules

Total capacity of PV Modules to be supplied for the proposed 2.4Mw (DC) project is minimum of 1.2 which is the cumulative rated capacity of all solar PV module under supply as per relevant IEC standards under Standard Temperature Condition (STC). The Project shall consist of Mono/poly-crystalline silicon photovoltaic modules as per the specifications given below:

6.1 The solar photovoltaic modules with efficiency more than 15.5 % for multi-crystalline, 17% for mono-crystalline silicon based modules with positive tolerance only. Fill factor of the module **shall not be less than 72%.** Minimum module rating shall be 250 Wp @ STC. The cells used for module making shall be free from all defects like edge chipping, breakages, printing defects, discoloration of top surface etc

6.2 The glass used to make the crystalline silicon modules shall be toughened low iron glass with minimum thickness of 4.0 mm for 72 cell module and 3.2 mm for 60 cell module. The glass used shall have transmittance of above 90%.

6.3 The back sheet used in the crystalline silicon based modules shall be of 3 layered structure. Outer layer of fluoropolymer, middle layer of Polyester (PET) based and Inner layer of fluoropolymer or UV resistant polymer. Back sheet with additional layer of Aluminium also will be considered. The thickness of back sheet should be of minimum 300 microns with water vapour transmission rate less than 3g/m2/day. The Back sheet shall have voltage tolerance of more than 1000 V.

6.4 The EVA used for the modules should be of UV resistant in nature. No yellowing of the back sheet with prolonged exposure shall occur.

6.5 The sealant used for edge sealing of PV modules shall have excellent moisture ingress protection with good electrical insulation (Break down voltage >15 kV/mm) and with good adhesion strength.

6.6 The junction box used in the modules shall have protective bypass diodes to prevent hot spots in case of cell mismatch or shading. The material used for junction box shall be made with UV resistant material to avoid degradation during module life and the Junction sealing shall comply IP65 degree of protection. EVA used for fabrication of modules shall be fresh & used within the specified shelf life.

6.7 The crystalline silicon based modules supplied should be of Potential Induced Degradation (PID) resistant modules and the test certificate from third party lab complying with the same shall be provided.

6.8 The rated output of the modules shall have positive tolerance of +/-3W.

6.9 Modules should have rugged design to withstand tough environmental conditions and high wind speeds suitable for site condition.

6.10 Modules shall perform satisfactorily in relative humidity up to 95% and temperature between -10^{o}C and 85^{o}C (module temperature).

6.11 PV modules must be warranted for their output peak watt capacity, which should not be less than 90% of the initial value at the end of 10 years and 81% of the initial value at the end of 25 years.

6.12 The modules shall be warranted for minimum of 5 years against all material/ manufacturing defects and workmanship, starting from date of Operational Acceptance. If the manufacturer provides it from the date of manufacturing this shall be Contractor's responsibility to get the extended warranty from the manufacturer at its own cost and effort.

6.13 All modules shall be certified

- IEC 61215 2nd Edition (Design qualification and type approval for Crystalline Si modules).
- IEC61730 (PV module safety qualification testing @ 1000 V DC or higher)
- IEC 61701: Salt Spray test for highly corrosive environment, (Severity-6)
- IEC 62716: Ammonia Resistant certified, if applicable
- Test certificate from NABL approved or /ILAC member body approved labs shall be provided at the time of submission of bids.

The Bidders shall provide BIS certification for modules , if the modules are supplied after BIS certification for modules are enforced by MNRE

6.14 **Not used.**

6.15 The developer shall arrange for the details of the materials along with specifications sheets of from the manufacturers of the various components used in solar modules along with those used in the modules sent for certification. The Bill of materials (BOM) used for modules shall not differ in any case from the ones submitted for certification of modules.

6.16 The I-V characteristics of all modules as per specifications to be used in the systems are required to be submitted at the time of supply.

6.17 The Contractor would be required to maintain accessibility to the list of module IDs along with the parametric data for each module.

6.18 The temperature co-efficient of power for the modules shall not be more than 0.45% / °C.

6.19 The current mismatch of the modules connected to an inverter should be less than 2%

6.20 SPV module shall have module safety class-II and should be highly reliable, light weight and must have a service life of more than 25 years.

6.21 The module frame shall be made of anodized Aluminium or corrosion resistant material, which shall be electrically & chemically compatible with the structural material used for mounting the modules. In case of metal frames for modules, it is required to have provision for earthing to connect it to the earthing grid. Module frame thickness/Height should be minimum 40 mm, the anodization thickness shall not be less than 15 micron. Junction box of IP 67 rated with min 3 no. of bypass diode and MC4 connectors with 1 meter of TUV 2pfg 1169/09.07 certified Cu cable of 4 mm sq.

6.22 All materials used for manufacturing solar PV module shall have a proven history of reliability and stable operation in external applications. Module shall perform satisfactorily in relative humidity up to 95% with ambient temperature between -10°C to +50°C. The material shall withstand adverse climatic conditions, such as high speed wind, blow with dust, sand particles, and saline climatic / soil conditions.

6.23 Modules only with the same rating and of same manufacturer shall be connected to any single inverter.

6.24 Bidder shall provide data sheet for Solar PV Module (Under STC) along with their offer as per Guarantee Technical Particular Data Sheet- 1. Also, the bidder must provide the commercial data sheet indicating the exact power of the module, if the data sheet consists of a range of modules with varying output power.

6.25 The Employer or its authorized representative reserves the right to inspect the modules at the manufacturer's site prior to dispatch or during manufacturing.

6.26 The Bidder is advised to check and ensure the availability of complete capacity of modules prior to submitting the NIT document.

6.27 Entire drawings, detailed test & flash reports and compliance certificates of the offered modules should be submitted for approval of Employer within 15 days from the date of issue of LOI and supply should start thereafter.

6.28 • Proof of procurement of components like cell, back sheet, lamination material, frames, Glass, sealant etc), mentioning manufacturer name, manufacturing date and relevant test certificate shall be submitted at the time of pre-dispatch inspection and acceptance.

- Solar PV Module should have TSCL logo on it.
- Each PV module must use a Bar Code which shall be embedded inside the Module Lamination & must be able to withstand harsh environmental conditions, which must contain the following information. The barcode scanner along with database shall be provided. The database shall have the following information traceable by bar code.
- Name of the manufacturer of PV Module
- Name of the Manufacturer of Solar cells Type of cell : Mono / Multi
- Month and year of the manufacture (separately for solar cells and module) Country of origin (separately for solar cells and module)
- I-V curve for the module
- Peak Wattage, Im, Vm and FF for the module
- Unique Serial No and Model No of the module.
- Date and year of obtaining IEC PV module qualification certificate.
- Name of the test lab issuing IEC certificate
- Other relevant information on traceability of solar cells and modules as per ISO 9000 series.

6.29 No different quality/makes of back sheets shall be used in the single lot of supply of modules.

6.30 The modules shall be uniformly laminated without any lamination defects.

6.31 The modules used in the Plant are to be freshly manufactured (not having manufactured before the last date of bid submission)

7.0 PV Array Configurations

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

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

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

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

7.4 **String Monitoring Unit:**

7.4.1 All SMUs should be equipped with appropriate functionality, safety (including fuses, grounding, contacts etc.) and protection.

7.4.2 The terminals will be connected to copper bus-bar arrangement of proper sizes to be provided. The junction boxes will have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus-bars for easy identification and weather resistant cable ferrules will be fitted at the cable termination points for identification.

7.4.3 The Junction Boxes shall have suitable arrangement for the followings:

7.4.4 Provide arrangement for disconnection for each of the groups/incomers.

- Provide a test point for each sub-group for quick fault location and to provide group array isolation.
- SCADA Communication device with all necessary equipment for communicating with main SCADA Server.
- Suitable space for workability and natural cooling.

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

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

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

7.8 At outgoing side DC Disconnector switches Switch of suitable capacity shall be provided.

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

8.0 Power Conditioning Unit (PCU) & PV Array Field

8.1 Power Conditioning Unit (PCU)/ Inverter shall consist of an electronic inverter along with associated control, protection and data logging devices.

8.2 Central inverter of min 500 kVA or above to be used.

8.3 The rated power/name plate capacity of the inverters shall be the AC output of the inverter at 50^{o}C.

8.4 The inverter supplied shall have minimum of 10% additional DC input Capacity. (E.g. Inverter is supplied with rated capacity of 500 kVA (AC) shall accept at least 550 kW of DC power.)

8.5 All PCUs should consist of associated control, protection and data logging devices and remote monitoring hardware and compatible with software used for string level monitoring.

8.6 Dimension, weight, cooling arrangement etc. of the PCU shall be indicated by the Bidder in the offer. Type (in- door & out-door) of installation also to be indicated.

8.7 Only those PCUs/ Inverters which are commissioned for more than 50 MW capacity solar PV projects till date in India shall be considered for this project. Contractor has to provide sufficient information to the satisfaction of the Employer before placing the final order for PCUs/Inverters. Service centre of the PCU manufacturer must be in India

8.8 The minimum European efficiency of the inverter shall be 98% load as per IEC 61683 standard for measuring efficiency. The Bidder/ Contractor shall specify the conversion efficiency of different loads i.e. 25%, 50%, 75% and 100% in its offer. The Bidder/ Contractor should specify the overload capacity in the bid.

8.9 The PCU shall be tropicalized and design shall be compatible with conditions prevailing at site. Provision of exhaust fan with proper ducting for cooling of PCU's should be incorporated in the PCU's, keeping in mind the extreme climatic condition of the site as per the recommendations of OEM to achieve desired performance and life expectancy.

8.10 The inverters shall have minimum protection to IP 65(Outdoor)/IP 21(indoor) and Protection Class II.

8.11 Nuts & bolts and the PCU enclosure shall have to be adequately protected taking into consideration the atmosphere and weather prevailing in the area.

8.12 Grid Connectivity: Relevant CERC regulations and grid code as amended and revised from time to time shall be complied. The system shall incorporate a unidirectional inverter and should be designed to supply the AC power to the grid at load end. The power conditioning unit shall adjust the voltage & frequency levels to suit the Grid.

8.13 All three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency.

8.14 The inverter output shall always follow the grid in terms of voltage and frequency. This shall be achieved by sensing the grid voltage and phase and feeding this information to the feedback loop of the inverter. Thus control variable then controls the output voltage and frequency of the inverter, so that inverter is always synchronized with the grid. The inverter shall be self-commutated with Pulse width modulation (PWM) technology.

8.15 Operational Requirements for Inverter/ PCU

8.15.1 The PCU must have the feature to work in tandem with other similar PCU's and be able to be successively switched "ON" and "OFF" automatically based on solar radiation variations during the day. Inverters must operate in synergy and intelligently to optimize the generation at all times with minimum losses.

8.15.2 The PCU shall be capable of controlling power factor dynamically.

8.15.3 Maximum power point tracker (MTSCL) shall be integrated in the power conditioner unit to maximize energy drawn from the Solar PV array. The MTSCL should be microprocessor based to minimize power losses. The details of working mechanism of MTSCL shall be mentioned by the Bidder in its offer. The MTSCL unit shall confirm to IEC 62093 for design qualification.

8.15.4 The system shall automatically “wake up” in the morning and begin to export power provided there is sufficient solar energy and the grid voltage and frequency is in range.

8.15.5 Sleep Mode: Automatic sleep mode shall be provided so that unnecessary losses are minimized at night. The power conditioner must also automatically re-enter standby mode when threshold of standby mode reached.

8.15.6 Stand – By Mode: The control system shall continuously monitor the output of the solar power Plant until pre-set value is exceeded & that value to be indicated.

8.15.7 Basic System Operation (Full Auto Mode): The control system shall continuously monitor the output of the solar power Plant until pre-set value is exceeded & that value to be indicated.

8.15.8 PCU shall have provisions/features to allow interfacing with monitoring software and hardware devices.

8.16 **Protection against faults for PCU**

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

Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices. In addition, it shall have following minimum protection against various possible faults.

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

8.16.2 Over Voltage & Current: In addition, over voltage protection shall be provided between positive and negative conductor and earth ground such as Surge Protection Devices (SPD).

8.16.3 Galvanic Isolation: The PCU inverter shall have provision for galvanic isolation with external transformer, if required.

8.16.4 Anti-islanding (Protection against Islanding of grid): The PCU shall have anti islanding protection. (IEEE 1547/UL 1741/ equivalent BIS standard)

8.16.5 Unequal Phases: The system shall tend to balance unequal phase voltage (with 3-phase systems).

8.16.6 Reactive Power: The output power factor of the PCU should be of suitable range to supply or sink reactive power. The PCU shall have internal protection arrangement against any sustained fault in the feeder line and against lightning in the feeder line.

8.16.7 Isolation: The PCU shall have provision for input & output isolation. Each solid- state electronic device shall have to be protected to ensure long life as well as smooth functioning of the PCU.

8.16.8 PCU shall have arrangement for adjusting DC input current and should trip against sustainable fault downstream and shall not start till the fault is rectified.

8.16.9 Each solid state electronic device shall have to be protected to ensure long life of the inverter as well as smooth functioning of the inverter.

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

8.17 **Standards & Compliances (PCU)**

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

- Efficiency measurement: IEC 61683
- Environmental Testing: IEC 60068-2 or IEC 62093
- EMC, harmonics, etc.: IEC 61000 series, 6-2, 6-4 and other relevant Standards.
- Electrical safety: IEC 62109 (1&2), EN 50178 or equivalent
- Recommended practice for PV – Utility interconnections: IEEE standard 929 – 2000 or equivalent
- Protection against islanding of grid: IEEE1547/ UL1741/ IEC 62116 ore equivalent
- Grid Connectivity: Relevant CEA/ CERC regulation and grid code (amended up to date)
- Reliability test standard: IEC 62093 or equivalent

8.17.2 The Bidder/Contractor should select the inverter (Central) as per its own system design so as to optimize the power output, however selected inverter must comply with the Technical/functional requirement of Plant as per this Tender Document.

8.17.3 **Desired Technical Specifications of PCU.**

- Sinusoidal current modulation with excellent dynamic response.
- Compact and weather proof housing (indoor/ outdoor)
- Comprehensive network management functions (including the LVRT and capability to inject reactive power to the grid)
- Total Harmonic Distortion (THD) <3%
- No load loss < 1% of rated power and maximum loss in sleep mode shall be less than 0.05%
- Optional VAR control
- Power factor Control range: 0.9 (lead – lag)
- Humidity: 95% Non – Condensing
- Operating Temperature Range should be -20*C TO + 60*C
- Unit wise & integrated Data logging Dedicated Prefabs / Ethernet for networking

8.17.3 **Inverter/ Power Condition unit must provide protection against:**

- Over current
- Sync loss
- Over temperature
- DC bus over voltage
- Cooling Fan failure (If provided)
- Short circuit
- Lightning
- Earth fault
- Surge voltage induced at output due to external source
- Power regulation in the event of thermal overloading
- Set point pre-selection for VAR control
- Bus communication via -interface for integration
- Remote control via telephone modem or mini web server
- Integrated protection in the DC and three phase system
- Insulation monitoring of the PV array with sequential fault location

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

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

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

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

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

- DC power input
- DC input voltage
- DC Current
- AC power output
- AC voltage (all the 3 phases and line)
- AC current (all the 3 phases and line)
- Power Factor

Documentary Requirements & Inspection

- The bill of materials associated with PCU's should be clearly indicated while delivering the equipment.
- The Contractor shall provide to the Employer, data sheet containing detailed technical specifications of all the inverters and PCUs, Type test reports and Operation & Maintenance manual before dispatch of PCUs.
- The Employer or its authorized representative reserves the right to inspect the PCUs/ Inverters at the manufacturer's site prior to dispatch.

8.18 **DC Cable and Wires**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The boxes/ panels shall be dust, vermin, and waterproof and made of

thermoplastic/ metallic in compliance with IEC 62208, which should be sunlight/ UV resistive as well as fire retardant & must have minimum protection to IP 65(Outdoor)/ IP 20(indoor) and Protection Class II.

All panels/ boxes shall be provided with adequately rated bus-bar, incoming control, outgoing control etc. as a separate compartment inside the panel to meet the requirements of the Chief Electrical Inspector General (CEIG)/CEA. All live terminals and bus bars shall be shrouded. The outgoing terminals shall be suitable to receive suitable runs and size of cables required for the Inverter/Transformer rating.

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

All the Panels to be manufactured with sufficient space for working and must have temperature suitability up to 85^{o} C with separate cable and bus bar alley.

8.20 **Lightning Protection for PV Array**

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

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

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

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

The lightning conductor must ensure three zone protection level

8.21 **Solar Photovoltaic Power Plant Electrical System**

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

IS/ IEC Reference	Specification
IEC-298	A.C. Metal – enclosed and control gear for rated voltages above 1KV and including 72.5KV
IS-3427	A.C. Metal – enclosed and control gear for rated voltages above 1KV and including 52KV.
IS-8623	Specification for Low Voltage Switchgear and Control gear assemblies.
IS-13118/ IEC-56	Specification for High Voltage AC Circuit Breakers.
IEC-529	Degrees of Protection.
IS-5578 & 11353	Making and arrangement for switchgear bus bar main connections and auxiliary wiring.
IS-325	Specification for 3 Phase Induction motors.
IS-2629	Recommended practice for hot dip galvanizing of iron and steel.
IEC-137	Bushing for AC Voltages.
IS-3347	Porcelain Transformer Bushings.
IS-5561	Terminal Connectors
IS-3156	Voltage Transformers
IS-2705	Current Transformers
IS-3231	Electric relays for power protection.
IS-13010	Watt hour meters
IS-13779	Static Energy Meters
IS-8686	Static Protection Relays
IS-1248	Electrical measuring instruments
IS-2099	High Voltage Porcelain Bushings.
IS-10118	Minimum clearances for Outdoor Switchgear.
IEC-694	Common Clauses for High Voltage Switchgear and Control gear
IEC-60255 & IEC- 61330	Numerical Relays

9.0 Power Transmission System (33KV OHT), Metering, Protection, Monitoring & Control System

9.1 General

This Specification covers construction of 33kV overhead lines shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer.

- The design, testing, supply, and erection of all types 33kV single circuit distribution line support structures, including cross-arms, bolts, nuts and washers, D-shackles, support stays and all type of accessories such as phase plate, circuit or support structure identification plate, danger plate, anti-climbing and earthing devices;
- The supply of conductors, insulators, insulator hardware, earth-wire, joints, connectors and all other conductor and earth-wire clamps and accessories;
- Design, selection and installation of foundations for all, poles and other structures required for the lines;
- Preliminary route survey, finalization of route alignment, detailed survey, structure (tower / pole) spotting, optimization of structure location, geo-technical investigation;

The Facilities shall be designed to facilitate inspection, cleaning and repairs, and for operation where continuity of supply is the first consideration. All equipment shall also be designed to ensure satisfactory operation under the atmospheric conditions prevailing at the Site and under such sudden variations of load and voltage as may be met with under working conditions on the system.

9.1.1 STANDARDS

Except where modified by this specification, the distribution lines and associated equipment shall be designed, manufactured, tested and erected in accordance with the latest editions of the following standards and associated specifications.

IEC / ISO	Indian Standard	Subject
IEC: 826	IS: 812 Part 1/1 (1995) or IS: 812 Part 1/1 (1977) IS: 812 Part 1/2 (1992) IS: 812 Parts 2 and 3 (1978) (1985)	Use of Structural Steel in Overhead Transmission Line Towers — Code of Practice
IEC: 652	IS: 5613 Parts 1 and 2	Code of Practice for Design Installation and Maintenance of Overhead Power Lines
IEC: 1284	IS: 5613 Part 3 (1989) IS: 4091 (1979) IS: 2486	Code of Practice for Design and Construction of Foundations for Transmission Line Towers and Poles Insulator fittings for Overhead Power Lines.
IEC: 120		

IEC: 1089	IS: 398	Round wire concentric lay overhead electrical stranded conductor
	IS: 1498	Classification and Identification of Soil for General Engineering Purposes.
	IS: 1888	Method of load tests in soil
	IS: 1892	Code of practice for subsurface investigations for foundations
IEC: 1089	IS: 2141	Galvanised steel wire
	IS: 9708	Stock Bridge Vibration Damper
ISO: 1460	IS: 2629	Hot dip galvanising of steel and iron
BS: 729		
	IS: 2121	Conductor and earthwire accessories
ISO: 9000		Quality Management Systems
ISO: 8501-1		Shotblasting
	IS: 6005	Phosphating of iron and steel
	IS: 2633	Tests on galvanised steel
	IS: 3043	Code of practice - earthing

The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. The Project Head shall adjudge whether to accept or reject any alternative standard. The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In the case of conflict the order of precedence shall be 1) IEC or ISO Standards, 2) Indian Standards, 3) other alternative standards.

9.1.2 SYSTEM CONDITIONS

The equipment shall be suitable for installation in supply systems of the following characteristics:

• Frequency		50 Hz
• Nominal system voltages		33kV
• Maximum system voltages:	33kV System	36 kV
• Nominal short circuit levels:	33kV System	25 kA
• Insulation Levels:		
1.2/50 ms impulse withstand		
(positive and negative polarity):	33kV System	170 kV
• Power frequency one minute withstand (wet and dry)	33kV System	70 kV
• Neutral earthing arrangements:	33kV System	Solidly earthed

9.1.3 SUPPORT STRUCTURES FOR 33KV LINES

9.1.4 General

The support structures shall be designed to carry the line conductors with the necessary insulators and all other fittings and equipment under the conditions specified.
Poles may be manufactured from concrete (pre-stressed or spun).

For conductor sizes of 100/232 mm^2 intermediate pole structures shall be of the single pole or double pole type with pin or post insulators. The average span length for 100 Sq.mm shall be 81 to 100 Mtrs & for 232 Sq.mm shall be 45 to 55 Mtrs.
Pole cross arms are normally constructed of steel and shall be bolted to the pole.

9.1.5 Stays, Guys and Struts

Except where the structure is designed to perform without stays, stays or guys shall be erected on poles at all positions at which strain occurs, that is, at angles, branches, end and section poles. The angle of stay spread shall normally be between 30º and 45º, which is measured between the perpendicular of the pole and the stay wire.
The number of stays required for each structure, angle of stays and tension in stay wires should be detailed in the design calculations. The basic design shall assume a 45 degree stay angle, and the maximum tension on the structure. For lesser tension the number of stays shall be reduced. Alternatively the Project Head may reduce the stay angle subject to approval.
In the design of the individual lines the number of stays required on any structure shall be kept to the minimum necessary, except by agreement with the Project Head. The Contractor shall provide a schedule of staying requirements for each type of line structure indicating the optimum number of stays for various angles of deviation.
The stay or stays shall be applied along or about the centre line of the direction of the resultant tensions of the conductors. Stay tension shall be adjustable using the stay turnbuckle. WESCO normally mount the turnbuckle above the stay insulator.
Stays shall be attached to the pole by stay brackets bolted through the poles, and held in the ground by a stay block. The stay block shall be installed perpendicular to the line of the stay. The stay block shall be buried to a depth of at least 1.5m, in good ground, with as little disturbance of the surrounding ground as possible. The hole shall be undercut to allow the stay block to bear against undisturbed ground. A slot shall be formed in the ground, to accommodate the stay rod, so that it can be aligned with the angle and direction of the stay.
Stays set in solid rock shall be held by a patented anchoring arrangement of approved type and design. Details of the system to be used shall be submitted with the bid, together with the relevant design calculations, for the Project Head's approval.
A stay insulator shall be inserted in the stay, 1.8m from the stay bracket. The stay wire shall be made off in a secure, approved manner.
The maximum permissible tension in any one stay wire shall not exceed 40 percent of the ultimate tensile strength of the wire. The complete stay assembly shall be designed to match the strength of the stay wire.
In situations, where stays or guys would be required, but cannot be installed, it shall be permissible to use a strut pole. The Project Head shall approve the use of strut poles.

9.1.6 DESIGN CONDITIONS FOR 33KV LINES

9.1.7 Minimum Clearances

The minimum clearance between the line conductors and ground or other objects shall be as specified in the section referenced 33kV Line Clearances in this specification. These clearances shall be obtained under conditions corresponding to the 75□ C still air sag of the AAAC line conductors and with an angle of swing of the conductors from the vertical between 0□ and 35□ , assuming the aforementioned sag is always applicable.

9.1.8 Conductor Phase Spacing

Phase to phase spacing at cross-arms shall be determined by reference to sag on the maximum span at maximum conductor temperature (75□ C), insulator string deflection and voltage. The calculations to substantiate choice and sizing of the cross-arm to attain design phase to phase clearance will be submitted as per the Submittals clause of this specification. For pin insulator lines the minimum recommended horizontal spacing is 1.5 metres.

9.1.9 33kV Line Clearances

Situation	Min. Clearances (Metres)
33kV Lines	
Over Open Country	5.20
Over a Road	6.10
Along A Road	5.81
Over Telecomm Lines	2.44
Over Rivers	6.10*
Over Railways	14.10
Over 11kV or LV Lines	2.44
Under HV Lines	2.44
Near Buildings: Vertical	3.70
Horizontal	2.00

9.1.10 Adjacent or Over Buildings

Where bare 33kV overhead lines passes above or adjacent to any building or part of a building it shall have on the basis of maximum sag a vertical clearance above the highest part of the building as specified in the section referenced 33kV Line Clearances in this specification.

The 33 kV overhead lines crossing over buildings or close enough in the horizontal plane to buildings such that the nearest conductor is within falling distance then 'H' or other approved structures shall be used with reinforced insulator strings. The crossing span shall be, where possible, limited to 64% of maximum span length and no mid-span joints shall be allowed in it.

In every case worst design condition shall be obtained from every point in the building including television aerials. Worst design conditions are considered to be 75□ C conductor temperature in still air for vertical sag and 75□ C conductor temperature with maximum zone wind pressure for horizontal swing out.

9.1.11 Road Crossings

At all road crossings the conductor to ground clearances, at maximum conductor temperature, stipulated in the section referenced 33kV Line Clearances must be achieved. The crossing angle shall be as near as possible to 90□ but in any case, shall not be less than 60□ . At all major road crossings double pin or double string suspension or tension insulator sets shall be used at both sides of the road to support the conductor. On national highways double tension strings shall be mandatory. In all instances the method of crossing national highways shall be agreed between WESCO and the Roads Authority. Where the use of double insulator sets is not mandatory and the use of a guard or cradle is an option then the method to be adopted shall be at the discretion of the Project Head.

9.1.12 Railway Crossings

Where an overhead line must be constructed across a railway line then the method of crossing shall be agreed between WESCO and the Railways Authority. In general, all crossings up to and including 11kV shall be by underground cables (IS 5613 part 1, sect, 3). Where the crossing is by overhead line then the clearances stipulated in the section referenced 33kV Line Clearances in this specification must be observed. The crossing angle shall be as near as possible to 90□ .

At the time of detailed survey the details of the crossings of railways shall be finalised to comply with Regulations of the Railway Authorities. These include the requirements that tension towers shall be used on either side of the crossing and that twin string tension sets shall be used at each end of the crossing span, which is to be at right angles to the rail track. The minimum distance of the towers at either side of the crossing from the centre line of the railway track nearest to the tower shall not be less than the height of the tower plus six metres. Details of the crossing shall be prepared by the Contractor including profile, plan, tower and foundation designs and drawings. Six copies of the details shall be provided by the Contractor to the Project Head in order that approval of the crossing proposals can be obtained by the Employer from the Railway Authority.

The span shall be kept to a minimum and the use of 'H' Poles or other approved tension structure shall be used. In general the crossing span shall be restricted to 64% of maximum span length and midspan joints shall not be permitted in it.

9.1.13 Telecommunication Line Crossings

Where it is necessary for a line to cross over an overhead telecommunications line the construction shall be such that a failure of a line conductor (s) does not create a danger to the telecommunications system. The following minimum precautions shall be taken:

- Minimum clearance as specified in the section referenced 33kV Line Clearances in this

specification must be observed

- Span length shall be, where possible, no longer than 64% of normal span
- Crossing angle shall be as near to 90º as possible but in any case not less than 60º
- Separate guard should be erected over the telecommunications line as detailed in IS: 5613

On request from the Contractor, the Employer may obtain the permission of the telecommunication authority. Also, in the crossing span, power line support will be as near the telecommunication line as possible, to obtain increased vertical clearance between the wires.

9.1.14 River Crossings

For crossings over major navigable rivers the clearance to be provided shall be that required by the Navigation Authority. For non-navigable rivers the clearances shall be measured over highest flood level as stipulated in the section referenced 33kV Line Clearances in this specification. The crossing angle shall be as near as possible to 90° but in any case, shall not be less than 60°. The Bidder shall include in the standard designs a structure for long spans up to 250 metres. These shall be used on river crossing up to that length. For longer spans special crossing structures shall be required. The Contractor shall propose an appropriate solution for each situation as it arises.
No mid-span joints shall be permitted in the crossing span.

9.1.15 Power Line Crossings

Where the line crosses over other power lines the span shall be kept to a minimum and the use of 'H' Poles or other approved tension structure shall be used. In general, the crossing span shall be restricted to 64% of maximum span length and mid-span joints shall not be permitted in it. Provisions to prevent the possibility of one line coming in contact with the other overhead line shall be made in accordance with the Indian Electricity Rules, 1956 or the latest revisions/amendments thereof.

When crossing under another power line similar precautions shall be required. The Contractor shall refer his proposals for such crossings to the Project Head for reference to the appropriate authority. In general, such crossings should be made as close as possible to the higher voltage line structure to maximize clearance.

9.1.16 Working in Proximity to Services

The Contractor shall at all times comply with the restrictions and conditions stipulated by the responsible authorities. Before any work is undertaken, the Contractor shall give due notice to all utilities where services may be in conflict with the proposed route, for example, telecommunications, roads, railways, rivers and other electricity authorities.
Special safety procedures and precautions apply to pole erection and stringing activities in the vicinity of live existing electricity networks especially where conductor is being strung under or over networks, which are alive or are capable of being made alive. In such circumstances the Contractor shall be responsible for strict adherence to, and compliance with any safety procedures, practices and requirements, which shall be laid down by the Project Head.
The Contractor shall provide and erect approved work signs; bollards, lighting, safety barriers and such like where necessary or required to ensure the safety of the public and workers.
All care shall be taken to minimise damage to property in the execution of these works, by means of route design, planning and prior consultation with owners, occupiers and responsible authorities. It shall be the Contractors responsibility to make good any damage which is caused to lands, crops, trees, walls, fences, gates, drains, pipelines buildings, roads, or any other property, caused directly or indirectly by the execution of the works.

9.1.17 Cradles and Guards:

Where approved by the Project Head, guards or cradles shall be erected where overhead lines cross over roads, railways, telecommunications lines and other overhead power lines. Approved devices, as defined in the Indian Electricity Rules, shall be used.

9.1.18 RIGHT OF WAY FOR 33KV LINES

The proposed Line will be constructed along the existing 33 KV line. If any kind of right of way problem arises out of re orientation of line or any deviation of route of the existing line, this should be brought to the notice of the Purchaser

9.1.19 CONFLICTS FOR 33KV LINES

Lines shall be located so as to minimise conflicts along the route. Support structures located in or at sites accessible to large trucks and mobile mechanical equipment shall be strategically situated so as to avoid vehicular contact and ensure adequate conductor to ground safety clearances. There are special precautions necessary for lines crossing roads, telecommunication circuits, rivers, roads, railways or near to buildings. Such lines shall be built to the specially stipulated security standards covered in this specification.

9.1.20 SUPPORT STRUCTURE DESIGN AND FABRICATION FOR 33KV LINES

The support structures shall comply with the Technical Specification for Line Support Structures and Cross-arms.

For 33kV lines the wind pressures to be applied to the conductors, insulators and support structures are specified in IS: 5613(Part 1/Sect. 1): (1985) and as stipulated in the Service Conditions in this specification. The Bidder shall take account of the wind loading regimes necessary for the projects for which he is bidding and shall propose the design of structures, which will prove most effective for the project and for the system.

The working load on the structures should correspond to those that are likely to come onto the structure during their service life.

9.1.21 Factors of Safety

The factor of Safety of these support structures varies depending on the type of structure and are as follows:

- For metal supports 2.0
- For mechanically processed concrete supports 2.5
- The minimum factors of safety shall be based on such a load as would cause failure of the support to perform its function (assuming that the foundation and other components of the structure are intact)
- This load shall be -
- Equivalent to the yield point stress or the modulus of rupture, as the case may be, for supports subject to bending and vertical loads;
- The crippling load for supports used as struts

The Ultimate Moment capacity in the longitudinal direction should be at least one quarter of that in the transverse direction.

Provided that in the case of latticed steel or other compound structures, factors of safety shall not be less than 1.5 under broken wire conditions.

The minimum factor of safety for stay wires, guard wires or bearer wires shall be 2.5 based on the

ultimate tensile strength of the wire.
The minimum factor of safety for conductors shall be 2.0 based on their ultimate tensile strength. For the purpose of calculating the factors of safety the following guidelines shall be adopted:

- The maximum wind pressure shall be as specified for the location in IS: 5613 (1985) or the latest revision thereof.
- For compound structures, such as 'H' frame the wind pressure on the lee - side members shall be taken as one - half of the wind pressure on the wind - ward side members and the factors of safety shall be calculated on the crippling load of the struts and upon the elastic limit of the tension members.
- Maximum conductor tension under full wind load and minimum temperature.
- The maximum and minimum temperatures shall be as stated in the Service Conditions of this specification.

9.1.22 EARTHING PRACTICE AND CONDUCTORS FOR 33KV LINES

9.1.23 Earthing of Poles.

All steel and concrete support poles inclusive of metal fittings shall be permanently and efficiently earthed. The earth shall be of the pipe or coil type and shall be constructed and installed in accordance with IS: 3043: 1966. The cross-sectional area of the galvanised steel earth conductor connecting the pole structure to the earthing device shall not be less than 25 mm² and in accordance with IS: 5613.

9.1.24 INSULATORS FOR 33KV LINES

Suspension and tension insulator sets of the cap and pin, pin or post type insulators, shackle insulators and stay insulators shall comply in all respects with the requirements of the Technical Specification for Insulators referenced.
All insulators and insulator fittings shall be handled carefully during transportation, assembly and installation on the support structures to avoid chipping or damage and shall be cleaned when installed. Proper precautions shall also be taken to ensure that they are not strained or damaged during erection or during the pulling in of the conductors. Any damaged insulator shall not be installed on the Employer's system.

9.1.25 Binding - In

On 33kV pin insulators or post type, the conductor shall be bound in on the top groove, using two suitable stirrups in each case. The bind shall be formed of a single layer of closely wound wire, extending at least 25 mm beyond the stirrups. The bind shall be wound in opposite directions, on each side of the insulator.
With all aluminium alloy conductor the bind shall be formed of two stirrups, with 3.53 mm diameter aluminium binding wire. In addition, aluminium armour tape shall be used, wrapped in a direction opposite to that of the conductor lay. The armour tape shall cover the portion of the conductor, which is in contact with the insulator, and extend at least 40 mm beyond the bind, on each side.
At 33kV angle, section and end pole positions where disc type strain insulators are used, the conductor shall be terminated using compression joints of a material suitable for the conductor. Wrapped joints or terminations shall not be permitted. All connections to suspension disc type insulators shall be via an approved conductor clamp and armour rods.

9.1.26 FOUNDATIONS FOR 33KV LINES

9.1.27 Ground Types

Foundations for structures shall be designed to cater for the following types of ground:

- Normal dry soil

Cohesive or non-cohesive soils which are present without encountering sub-soil water table within the first 1.50 metres of depth of the foundation.

- Wet soil (Ground Type 'A')

Wet earth due to sub-soil water table met at less than 1.50 metres below the ground level and in locations where surface water is prevalent for long periods of time, for instance, paddy fields.

- Black cotton soil (Ground Type 'B')

soil of a clayey type, not necessarily black in colour, which shrinks when dry and swells when wet, resulting in differential movement. For designing the foundation at such locations, the soils are to be considered as wet soil.

- Fissured rock (Ground Type 'C')

Decomposed or fissured rock, hard gravel, kankar, lime stone, laterite or any other soil of a similar nature.

- Hard rock (Ground Type "D')

Rock, which requires chiselling, drilling or blasting for excavation. Rock anchoring techniques are required to prevent uplift forces.

9.1.28 Pole structure foundations

The foundation design criteria shall be determined from the classification of the ground into which the structure is to be erected and in accordance with IS: 2720 and the Ground Types definitions in this specification.

The allowable bearing pressure of the soil where the poles are to be erected shall be based on adequate subsoil exploration and tests carried out in accordance with IS 1888 and IS 1892.

The pole foundation holes in normal soil shall not be so large as to affect adversely the bearing strength of the ground in the immediate vicinity. The butt end of the pole structure shall be supported with the installation of a 100 mm thick concrete pad, six mm thick galvanised steel plate or cast-iron plate, set in the bottom of the foundation hole. The structure shall be mounted on this pad.

Where the bearing area of the support structure is insufficient to resist the overturning moment acting on the foundation, then the bearing area shall be increased by casting a concrete collar around the structure. The Contractor shall demonstrate by calculation which option is required.

The collar of concrete cover to be provided shall be of not less than 100 mm thick and shall be cast around the pole from the base pad to a point approximately 250 mm below ground level. A further collar of concrete of the same thickness shall be applied from this point to 300 mm above ground level. Each section of the concrete being allowed to dry prior to the application/installation of the next section. The concrete shall be to a minimum nominal mix of 1:3:6 with the size of aggregates for the pad and top collar being 18 mm and for the intermediate section 13 mm.

Where a foundation hole has been excavated directly into the ground and the pole erected without any concrete support then the soil shall be thoroughly tamped, as the foundation hole is backfilled, at intervals of not more than 300 mm. When backfilling, the subsoil shall be filled first, and so on

progressively until the topsoil is replaced in its proper position in order to achieve maximum strength for the pole foundations and to restore the site to its original condition.
In poor ground precautions shall be taken to increase the bearing area in order to ensure the bearing strength of the foundation is adequate to sustain the overturning moment due to the wind loads on the conductors and structures. Where necessary, side stays or baulks shall be used in addition to assist stability. Baulks, if used shall be buried at least 450 mm below surface level, they shall be securely fastened to the structure with galvanised bolts and hardware. Baulks shall be constructed from reinforced concrete or galvanised steel, and shall be of adequate cross section to withstand the worst design loads to be applied during their life. Baulks shall be designed with the factors of safety specified in the Section on Factor of Safety in this specification
In general the planting depth of the pole shall not be less than one sixth of the total length of the pole above ground level, and shall not be less than 1.5 metres.
Where soil is of a composite nature, classification of the foundation shall be according to the type of soil predominant in the excavation and payment shall be accordingly.
The type of foundation to be used at each position shall be to the approval of the Project Head and shall normally be decided on the most economic solution.
Guidelines for the design and construction of foundations are detailed in IS 4091 - 1979.

9.1.29 SURVEY OF 33KV LINES

9.1.30 Preliminary Survey.

Based on the initial route alignment drawings to be provided by the Purchase, the Contractor shall carryout the survey to finalise the route alignment.
The route alignment shall be plotted on Survey of India topographical maps to the scale of 1 cm = 0.25 Km. (1:25,000) where these are available, or 1 cm = 0.5 km (1:50,000). All topographical details including all Railway lines, rivers, canals, roads upto 2 km on either side of the route of lines shall be drawn to the scale. The name of railway stations shall be written in capital letters only. Alignment shall be plotted on the map with North being clearly indicated on each drawing. Latitude and longitude shall also be properly marked. In large urban areas maps shall be to the scale of 1:10,000.
For convenience in handling, each drawing shall be restricted to the standard 'Survey Of India' Toposheet size with 30 mm. overlaps between the sheets. The match line shall be clearly shown on each sheet.
The Bidder should note that Purchase will not furnish the topographical maps prepared by Survey of India but will make available any assistance that may be required in obtaining the topographical maps.
Some portions of the line may require clearance from various authorities. The Contractor shall indicate the portion of the line so affected, the nature of clearance required and the name of concerned organisation such as local bodies, municipalities, DoT (name of circle), Inland Navigation, Irrigation Department and Zonal Railways, Divisional Forest Authorities etc.
Three copies of the route alignment drawings and all other the information shall be furnished in a report form, to the Project Head for approval. After approval, the Contractor shall submit three more sets of the approved survey report along with one set of reproducible of final route alignment drawings to the Project Head.
The preliminary shall include details of all obligatory points on the route. These obligatory points shall include all the rivers crossing, railway crossings, power line crossings, telecommunication line crossings, forest areas or any other important crossings encountered in the line route.

9.1.31 Final Survey

Immediately after the Employer has approved the line routes as determined by the preliminary survey, the Contractor will arrange for clearing to commence to allow the ground profile survey to proceed with the minimum of delay.

At the starting point of the commencement of route survey, an angle iron spike of 65x65x6mm section and 1000 mm long shall be driven firmly into the ground to project only 150 mm above the ground level. A punch mark on the top section of the angle iron shall be made to indicate location of the survey instrument. Teak wood peg 50 x 50 x650 mm size shall be driven at prominent position at intervals of not more than 750 metre along the line to be surveyed upto the next angle point. Nails of 100 mm wire should be fixed on the top of these pegs to show the location of instrument. The pegs shall be driven firmly into the ground to project 100 mm only above ground level. At angle position stone/concrete pillar with WESCO marked on them shall be put firmly on the ground for easy identification.

The ground profiles (longitudinal sections) with strip route plans are to be prepared by the Contractor for the complete route length, generally in accordance with the requirements of IS: 5613 and this Specification. The scale shall be 1:2000 horizontal and 1:200 vertical. In addition to showing the line route ground line and tower (centre point) location, the following features, where applicable, shall be shown:

- Continuous longitudinal chain-age
- Ground line
- Indication of side slopes where these affect clearances (account being taken of conductor under wind loaded conditions)
- All the numbered pegs identifying the survey points and the towers locations. For each peg the plan will show partial and progressive distances and elevation
- Buildings, rivers, roads, power and telecommunication lines, railways and other obstacles to be crossed, including where necessary details to confirm the required electrical clearances are obtained
- Sections unsuitable for structure locations
- Vegetation and nature of ground
- Distances from centre line of route to forest land/groves/orchards
- Land scheduling for forest stretches
- Structure locations, type of structure with height (standard, standard plus 1 m etc.) if necessary and structure number
- Angles of deviation, spans, ruling spans.
- Line of lowest conductor at maximum still air sag (75°C)
- Clearance curve

The Contractor shall be responsible for ensuring that at crossings of public services he has complied with all relevant Regulations and Rules.

All topographical details, permanent features, such as trees, building etc. within 7.5 m of the lines on either side of the alignment shall be detailed on the profile plan.

Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended upto date.

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9.1.32 Line schedule.

As soon as the final tower locations are agreed and approved by the Purchase, the Contractor shall submit a line schedule. The line schedule shall include all the price schedule items to be included inthe construction of the line. The line schedule shall indicate route designation, voltage, conductor type number and size, structure numbers, structure types, structure heights, angles of deviation, insulator types, insulators string types, spans, equivalent spans, section lengths, accumulated chain-age, and a "remarks" column in which details of crossings, etc. can be entered.

After the completion of various parts of the works further data, for instance the foundation types for each structure, locations of conductor mid-span joints and repair sleeves, shall be added to the line schedule.

For rehabilitation work, completed detailed inspection sheets showing work to be done on a structure by structure / span-by-span basis. In addition, maps, to a 1: 25000* scale in rural areas and a minimum of 1:10000 in urban areas, showing the location of individual poles / tower, shall be required where inter- poling takes place.

A comprehensive detailed plan, on a circuit-by-circuit basis, showing proposed isolation and commissioning detail, to effectively manage the shutdowns to achieve minimum disruption to consumers shall be included with each line schedule.

9.1.33 INSTALLATION OF 33KV LINES

Installation of 33kV overhead lines shall be done in compliance with the requirements of this and other associated WESCO specifications and of IS: 5613.

9.1.34 Conductor Installation

The new or up-rated line conductors shall consist of All Aluminium Alloy Conductor, (hereinafter referred to as AAAC) of the specified cross section and complying in all respects with the requirements.

9.1.35 Phase Rotation

As far as is possible lines shall comply with the conventional phase rotation used in the Employer’s overhead network. The three phases are designated R, Y and B, which stand respectively for red, yellow and blue.

On "V" and horizontal cross-arms, the convention is that, with one’s back to the sending station, the phases are arranged R, Y and B from left to right. This same arrangement is maintained from top to bottom on any pole in which a vertical construction is used.

All connections to transformers, and to cable end boxes, must be arranged so that LV networks may be paralleled.

9.1.36 Conductor Stringing

Running out blocks or stringing pulleys shall be used to run out the conductors and care shall be taken to ensure that the conductors are run out from the top of the drums and do not touch or rub on the ground or against any object that may cause damage or scratching of the conductors. Pulling of conductors over and against cross-arms is prohibited. All damage to conductors shall be reported to the Project Head and at his discretion the use of an approved repair sleeve may be permitted. The fullest possible use shall be made of the maximum lengths of line conductor to reduce to a minimum the number of mid-span joints. All mid-span joints used shall be of the compression type and to the approval of the Project Head.

The Contractor shall include in his submittal a method statement for stringing.
Tensioning and Sagging of Conductors
For each type and size of conductor, suitable sag and tension charts shall be provided by the Contractor, for both design and erection conditions. The Contractor shall also state in his proposal the method to be employed for the erection, sagging and tensioning of the conductors.
Tensioning to achieve the design sag shall preferably be completed using a dynamometer, but where this is not available then other methods such as "sighting" will be considered for approval by the Project Head.
Sags shall be checked before handing over of the completed network in the presence of the Project Head.
The minimum factor of safety for conductors shall be 2 based on the Ultimate Tensile Strength (UTS).
The conductor tension at 32□ C without external loading, shall not exceed the following percentages of the UTS of the conductor:

- .....Initial unloaded tension 35%
- ..... Final unloaded tension. 22%

Conductor creep shall be compensated for by slight over tensioning at the time of sagging. To achieve the correct over tensioning value the conductor is sagged to a temperature on the sag - tension charts which is 15□ C below the actual stringing temperature.
In calculating the sags and tensions allowance shall be made for the elasticity and co-efficient of expansion of the conductor materials. The "ruling span" method shall be used, in which the tension in any section length is that which would apply to a single span equal to the square root of the figure arrived at by dividing the sum of the cubes of the individual span lengths, in the section considered, by their sum. Unless otherwise approved, the sag of any one conductor should not differ from the correct sag by more than +/- 4 percent as specified in IS: 5613 (part 2 sect 2) Appendix B, and, in any one span, the maximum permissible difference in sag between conductors of different phases shall not exceed 150 mm.
The Contractor shall take into account a sag tolerance of + 150 mm when determining structure height.

9.1.37 Joints and Jumpers

The fullest possible use shall be made of maximum conductor lengths and therefore tension joints shall be minimised but where they are unavoidable they shall preferably be of the compression type and in accordance with the requirements of IEC - 1284, IS - 2121 and IS - 2486. Other tension joints, such as "preformed" and "self locking", may be proposed, but final approval for use shall be at the Project Head's discretion.
The electrical conductivity and current carrying capacity of each joint shall be such that the resistance of the joint is not greater than 75% of the resistance of an equivalent length of the line conductor. At the Project Heads request the Contractor shall measure the electrical resistance of joints after completion and before erection. The resistance of the joint shall be in accordance with the requirements of the Specification and shall in no case be greater than 75 percent of the resistance of the equivalent length of conductor. Any faulty joint shall be cut out and replaced at the Contractor’s expense. This operation may be required on all joints or as a random exercise. Contractor shall supply not less than one suitable resistance measuring machine complete with calibration test certificate.
Tension joints shall not permit slipping of, or cause damage to, or failure of, the complete line conductor or any part thereof at a load less than 95% of the ultimate tensile strength of the line conductor.

Mid-span joints shall not be less than 15m from the nearest conductor tension / suspension clamp

or bind connection, and there shall not be more than one joint per conductor in any one span. Mid-spanjoints shall not be used in railway crossings, where lines cross other lines of different voltages, cross over communications lines or pass over or in close proximity to buildings. Two mid-span joints shall not be made less than four spans apart in any one conductor.
Jumpers shall be formed in smooth curves, without sharp bends. They shall be as short as possible, and where necessary, shall be supported on pilot insulators to which they shall be clamped or bound.

9.1.38 Temporary Stays
Where it is necessary to install conductors on one side of a structure or otherwise apply loads in excess of the structure design loads the Contractor shall install temporary stays, anchors or other approved restraints to ensure that the structure is not over stressed. All temporary stays or anchors shall be installed into the ground and proof loading tests carried out prior to use.

9.1.39 Pole Numbering System
Each feeder support structure shall be uniquely identified along the route. The Employer shall, through the Project Head, inform the Contractor of the particular numbering system used. The details shall be painted onto the concrete and steel pole structures using stencils or via approved circuit identification plates in the case of steel latticed towers.
The painted numbers shall be applied at a height of 1.6 metres from ground level directly onto the pole in a position approved by the Project Head. The numerals shall be of approved dimensions and painted in black on a yellow background. The paint shall be of a permanent outdoor type and free from UV degradation and fading.

9.1.40 Steelwork
All steelworks stored at site shall be kept clear of the ground. Contact with brackish water or other substances likely to attack galvanising shall be avoided and all tower members shall be kept in a clean and tidy condition. Steelwork being erected on site should be kept off the ground by using timber blocks.
If any shop errors in the steel are discovered, the Contractor shall notify the Project Head who will decide whether the error shall be corrected on site or the members shall be replaced.
After erection all steelworks within 150 mm of the upper surface of the concrete together with the upper surface of the concrete within 150 mm of the projecting steel shall be painted with two coats of bituminous or other approved paint. In swamp areas the painting shall extend 500 mm above the concrete. Steelwork and concrete to be thoroughly cleaned prior to application.
The Contractor shall at his own expense make suitable arrangements for temporary guying of towers, where necessary. The additional loads imposed on specific towers during erection by the use of temporary guys shall be calculated and approved. Attachment of the guys to the tower shall be accomplished so as not to damage the steelworks or its galvanised coating. This can be achieved by Hessian bagging of the steelwork, timbering or with the use of hosing placed around the slings.

9.1.41 GENERAL PARTICULARS AND GUARANTEES

9.1.42 COMPLIANCE WITH SPECIFICATION

The overhead lines shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of tendering in the Non Compliance Schedule of this document.

The mass and dimensions of any item of equipment shall not exceed the figures stated in the Schedules.

9.1.43 COMPLIANCE WITH REGULATIONS

All the equipment and work carried out shall comply in all respects with the Indian Statutory Regulations and Acts in force.

The equipment and connections shall be designed and arranged to minimise the risk of fire and any damage, which might be caused in the event of fire.

9.1.44 Inspection and Testing

The Project Head shall have free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concern the manufacture, testing, processing, installation or erection of the equipment ordered. The manufacturer shall afford the Project Head without charge, all reasonable facilities to assure that the equipment being furnished is in accordance with this specification.

The equipment shall successfully pass all the type tests and routine tests referred to in relevant equipment technical specification and those listed in the most recent edition of the standards given in Clause 2 of this specification.

The Project Head reserves the right to reject an item of equipment if the test results do not comply with the values specified or with the data given in the technical data schedule.

Type tests shall be carried out at an independent testing laboratory or be witnessed by a representative of such laboratory or some other representative acceptable to the Project Head. The Contractor at no extra charge at the manufacturer’s works shall carry out routine tests.

Type Test certificates shall be submitted with the bid for evaluation. The Project Head will decide the requirement for additional type tests.

The Project Head may witness routine and type tests. In order to facilitate this, the Contractor shall give the Project Head a minimum of four weeks notice that the material is ready for testing. If the Project Head does not indicate his intention to participate in the testing, the manufacturer may proceed with the tests and shall furnish the results thereof to the Project Head.

Full details of the proposed methods of testing, including connection diagrams, shall be submitted to the Project Head by the Contractor for approval, at least one month before testing.

All costs in connection with the testing, including any necessary retesting, shall be borne by the Contractor who shall provide the Project Head with all the test facilities which the latter may require, free of charge. The Project Head shall have the right to select the samples for test and shall also have the right to assure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the Contractor at an approved laboratory and shall be approved by the Project Head.

The Contractor shall be responsible for the proper testing of the work completed and plant and materials supplied by sub-suppliers to the same extent as if the work, plant or materials were completed or supplied by the Contractor.

Any cost incurred by the Project Head in connection with inspection and re-testing as a result of failure of the equipment under test or damage during transport or offloading shall be to the account of the Contractor.

The Contractor shall submit to the Project Head five signed copies of the test certificates, giving the results of the tests as required. No materials shall be dispatched until the Project Head has received the test certificates and the Contractor has been informed that they are acceptable.
The test certificates must show the actual values obtained from the tests, in the units used in the relevant specification, and not merely confirm that the requirements have been met.
In the case of components for which specific type tests or routine tests are not given in the Tests section of the relevant specification, or in the quoted standards in Clause 2, of this specification, the Contractor shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.
No inspection or lack of inspection or passing by the Project Head's Representative of work, equipment and materials whether carried out or supplied by the Contractor or sub-contractor, shall relieve the Contractor from his liability to complete the contract works in accordance with the contract or exonerate him from any of his guarantees.

9.1.45 Supervision, Checking and Operational Acceptance of the Facilities

The completion of all work, at the sites included in the scope of work of this specification, shall be supervised throughout by the Contractor or by a sufficient number of his representatives who have had thorough experience of the erection, repair and commissioning of similar Facilities.
If at any time it appears to the Project Head that the Contractor will be unable to complete any part of the Facilities in the time stipulated in the programme, then the Contractor shall, if required by the Project Head, carry on such work outside normal working hours and shall not make any claims for any extra expense thereby incurred unless, in the opinion of the Project Head, the delay is due to causes for which the Contractor would be entitled to an extension of time under the conditions of the contract.
The Contractor shall be responsible for any remedial work that may emanate from defects on the Facilities during the "Defects Liability Period" and as such shall make available locally to the equipment skilled personnel who can respond without delay to the Employer's needs.
Each section or subsection of Facilities completed and ready for service shall be "Handed Over" to the Employer. The certificate of Hand Over shall state which section or subsection of the Facilities is clear of all personnel, tools, temporary earths and equipment and is ready for service and can be energised. Handing over does not constitute taking over.
Until each part of the Facilities has been given Operational Acceptance or deemed to have been given Operational Acceptance under the Conditions of the Contract, and an Operational Acceptance Certificate issued, the Contractor shall be entirely responsible for each such section of the Facilities, whether under construction, during tests or returned to the Employer's service.
Any work to be completed by the Contractor in compliance with his Contract shall be done with the minimum of disturbance to the consumer and within the shortest time span possible. To this end the Contractor shall propose methodologies as how he will approach the projects to achieve these goals and include these proposals with his Bid documents. If he is successful with his bid, then he shall, in agreement with the Employer, submit a comprehensively detailed document before he commences work

9.1.46 Guarantee

The Contractor shall guarantee the following:

- Quality and strength of materials used.
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- Satisfactory operation during the guarantee period of twelve (12) months from the date of Operational Acceptance, or 18 months from the Date of Completion of the Facilities or any part thereof, whichever is the earlier.
- Performance figures as supplied by the Bidder in the schedule of guaranteed particulars.

9.1.47 Submittals

The following must be prepared by bidders and accompany each bid:

- Completed technical data schedules;
- Descriptive literature giving technical details of equipment offered;
- General arrangement of each type of intermediate support and heavy angle support and cross-arms;
- Type test certificates, where available, and sample routine test reports;
- Detailed reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating;
- Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted;

9.2 Step Up Transformer

9.2.1 The transformer shall be copper wound, 3 phase, natural cooled, core type construction, and oil immersed and shall be suitable for outdoor applications.

9.2.2 The Contractor shall provide the complete turnkey design, supply, erection, testing and commissioning of transformers and transformer substation to step- up the output of the inverter to 33 kV voltage level at the location of the inverter. The power from inverter room/s shall be collected at a common location from where it shall be transmitted to the designated substation at Manikandam S/S through Over Head Transmission Lines at 33 kV voltage level. However, the detailed scheme of design lies with the Contractor and must submit the same to Employer for approval prior to construction.

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

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

9.2.5 General requirement for the transformers shall be as per below:

Standards	Relevance
IS: 2026 (Part 1 to 4)	Specifications for Power Transformer
IS: 2099	Bushings for alternating voltage above 1000 V
IS: 3639	Fittings and accessories for power transformer
IEC: 60076 (Part 1 to 5)	Specifications for Power Transformer

IS: 9921 Part 1 to 5	Alternating currents dis connectors (isolators) and earthing switches rating, design, construction, tests etc.
IS: 2705 Part 1 to 4 & IEC: 185	Current transformer
IS: 3156 Part 1 to 4	Voltage Transformer
IS: 3070 part 1 to 3	Lightning arrestors

9.3 General Standards

9.3.1 The equipment and accessories covered by this specification shall be designed, manufactured and tested in accordance with the latest relevant standards and codes of practice published by the relevant Indian Standards (IS) as applicable.

9.3.2 All electrical equipment and installation shall confirm to the latest Indian Electricity Rules as regards safety, earthing and other essential provisions specified for installation and operation of electrical plants. Relevant national and international standards in this connection can be followed in order to improve the efficiency and safe operations.

9.3.3 All working parts, insofar as possible, are to be arranged for convenience of operation, inspection, lubrication and ease of replacement with minimum downtime. All parts of equipment or of spare equipment offered shall be interchangeable.

9.3.4 The quality of materials of construction and the workmanship of the finished products / components shall be in accordance with the highest standard and practices adopted for the equipment covered by the specification.

9.3.5 All items of equipment and materials shall be thoroughly cleaned and painted in accordance with relevant Indian Standards. The finish paint shall be done with two coats of epoxy based final paint of colour Shade RAL 7032 of IS: 5 for indoor equipment.

9.3.6 Any fitting or accessories which may not have been specifically mentioned in the specification but which are usual or necessary in the equipment of similar plant or for efficient working of the Plant shall be deemed to be included in the contract and shall be provided by the Contractor without extra charges. All plant and apparatus shall be complete in all details whether such details are mentioned in the specifications or not.

9.3.7 Not Applicable

9.3.8 **Efficiency:**

The percentage loading for the maximum efficiency shall be clearly stated at unity power factor as well at 0.8 and 0.9 power factor (lead and lag).

9.3.9 **Insulation:**

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

9.3.10 **Factory Assembly and Tests:**

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

9.3.11 **Routine Tests:**

Each completed transformer shall be subjected to following routine tests as per IS: 2026 Part. I & III (latest amendment). No extra charges for any of the tests shall be paid. No deviation shall be acceptable. If the supplier desires, he may not fix radiators on transformers (other than the one which is to be type tested) during routine testing. However in that case, radiator manufacturer's test certificate shall be furnished for reference of inspecting officer with undertaking that supplier shall be responsible for proper alignment/fixing of radiator on transformer at site.

- Measurement of resistance of each winding.
- Measurement of turn's ratio between HV-LV windings at each tap.

  Checking of polarity and phase relation-ships for each winding.

  Measurement of no load loss and no load current.
- Positive phase sequence impedance/short circuit impedance between HV-LV windings on minimum, maximum and normal taps.
- Separate source voltage withstand test.
- BDV test on transformer oil.
- Induced over voltage withstand test.
- Measurement of neutral unbalance current.
- Regulation at rated load at unity, 0.90 and 0.81 lagging power factor.
- Load losses measured at rated frequency by applying voltage sufficient to produce the rated relevant current in one winding with the other winding short circuited.
- Measurement of insulation resistance.
- The total losses shall comprise of the No Load Losses, load losses at rated output duly converted at 75^{o}C average winding temperature and shall also be indicated in the test report. Load losses shall be that corresponding to rated load on HV & LV winding.
- Routine dielectric tests as per IS: 2026(Part. I & III), 1981 and any amendments thereto.
- complete transformer against approved outline drawing, provision for all fittings, finish oil level etc.

9.3.12 **Tests at Site**

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

a) Insulation resistance test.

b) Ratio and polarity test.

c) Dielectric test on oil.

d) Physical check

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

The Employer reserves the right of having other reasonable tests carried out at his own expenses either before dispatch or during performance guarantee period from Govt. approved/ Govt. recognized lab to ensure that the transformer complies with the requirements of this specification after due intimation to the supplier. In case the equipment is not found meeting the requirement of Technical Specification of Tender Document, all expenses incurred for such testing will be on supplier’s account and the material shall be replaced by the supplier at site free of cost

9.3.13 **Frequency and System Voltage:**

The transformer shall be suitable for continuous operation with a frequency variation of ± 2.5% from normal of 50Hz without exceeding the specified temperature rise. The highest system rated voltage shall be 36.3 kV on HV side & at least 1.1 times Rated voltage on LV side. However the flux density requirements shall be as per this specification.

9.3.14 **Installation & Commissioning:**

Mainly following activities are required to be carried out before commissioning of Power Transformers:-

- Assembling of Power Transformer accessories as per GA drawing.
- Testing activities in presence of Employer such as
- Ratio Test
- Megger Value
- Magnetic balance.
- Oil BDV
- Earth Resistance
- Buchhloz Relay checking.
- WTI/OTI/MOLG (oil level) checking.
- Checking of points of leakage of oil from Transformer body/ Radiator/Valve o Setting of Relays in Panel

9.4 **Auxiliary transformer**

Auxiliary transformer shall be provided by the Contractor

9.5 **Instrument Transformer**

9.5.1 The instrument transformers i.e. current and voltage transformers shall be single phase transformer units and shall be supplied with a common marshalling box for a set of three single phase units. The tank as well as top metallic shall be hot dip galvanized or painted Grey colour as per RAL 9002.

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

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

9.5.4 Current Transformer, Voltage Transformer, Circuit Breaker and Relays should match state DISCOM requirements.

9.6 **Current Transformer (CT)**

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

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

9.6.3 Type and Rating

9.6.3.1 The current transformer should be of indoor/ outdoor type, single phase, oil immersed, self-cooled and suitable for operation in 3 phase solidly grounded system.

9.6.3.2 Type test certificate for the proposed CT shall be provided to the Contractor before dispatch.

9.6.3.3 Each current transformers should have the following particulars under the site conditions for the system under design

9.6.3.4 **General Parameters: CT**

Particulars	Details
Highest system Voltage (Vm)	As per system design
Rated frequency	50 Hz
System Neutral Earthing	Effective earthed
Installation	Indoor (IP 20)/ Outdoor (IP 65)
Rated dynamic current	As per system design
Rated min power frequency withstand voltage (RMS value)	As per system design
Rated lightning impulse withstand voltage (peak value)	As per system design
Partial discharge level	10 Pico coulomb max.
Temperature rise	As per IEC 60044
Type of insulation	Class A
Number of cores	Two (2) with One (1) protection core and one (1)metering core of accuracy 0.5 class
CT secondary current	Protection cores – 1 Amp. Metering Core – 1 Amp
Number of terminals in marshalling box	All terminals of control circuits wired up to marshalling box plus 20% spare terminals
CT ratio & Rated VA Burden, short time thermal rating ,class of accuracy	Minimum burden required (as per design): 1. Metering core – 40 VA 2. Protection core – 10 VA

9.7 **Voltage Transformer (VT/ PT)**

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

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

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

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

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

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

9.7.7 Each voltage transformers should have the following particulars under the site conditions for the system under design

9.7.8 General Parameters: VT

Particulars	**Details**
Highest system voltage (Um)	As per system design
System neutral earthing	effective earthed
Installation	Indoor (IP 20)/ Outdoor (IP 65)
System fault level	Appropriate
Rated min power frequency withstand voltage	As per system design
(rms value)	
Rated lightning impulse withstand voltage	As per system design
Standard reference range of frequencies for	96% to 102% for protection and 99% to 101% for
which the accuracy are valid	measurement
Rated voltage factor Class of Accuracy	1.2 continuous & 1.5 for 30 sec
Class of Accuracy	0.5 / 3P
Stray capacitance and stray conductance of	
LV terminal over entire carrier frequency range	As per IEC:358
One Minute Power frequency withstand	2kVrms
voltage for secondary winding	
Temp rise over an ambient temp. of 50	As per IEC 60044
	All terminals of control circuits wired up
Number of terminals in control Cabinet	to marshalling box plus 10 terminals spare
Rated total thermal burden	350 VA (or as per design)

Particulars	Details
Partial discharge level	10 pico Coulombs max.
Number of cores	2 (two) – 1 for protection and 1 for metering with 0.5 class accuracy.
Rated Output, insulation level, transformation ratio, rated voltage factor	Should be provided by Bidder

9.8 **Metering Bay**

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

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

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

9.8.4 **Applicable Standards:**

Unless otherwise modified in this specification, CT-PT Metering Sets shall comply with the following Indian Standard Specification (latest version):
IS: 2705-1992 -Specification for current transformers.
IS: 3156-1992 -Specification for voltage transformers.
IS: 5621-1981 -Specification for Hollow insulators and accessories
IS: 2099-1986 -Specification for insulators/ bushing
IS: 3347-1986 -Specification for the dimension of Porcelain transformer
IS: 335-1983 -Specification for new insulating oil

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

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

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

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

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

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

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

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

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

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

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

General Parameters: CT (Owners Bay and Metering Bay)

Particulars	**Details**
Normal system voltage (kV rms)	11 KV
Highest system voltage (kV rms)	As per system design
Frequency	50 Hz
Impulse withstand voltage (kVp) (on assembled CT/ PT set)	As per system design
One minute power frequency dry withstand voltage (on assembled CT-PT set)	As per system design
Primary (r.m.s.)	
Secondary (r.m.s.)	
Transformation ratio (CT Ratio)	400/1 A or as per requirement
Rated output (VA burden)	10 VA
Class of accuracy	0.2S
Rated continuous thermal current	1.2 times of rated primary current.
Short time thermal current rating for 1sec.	25kA for 400/1 A Current density corresponding to Short Time Thermal Current should not exceed 160A /mm sq.
Rated dynamic current	2.5 times of short time thermal current rating.

Particulars	Details
Number of cores	One
Instrument security factor	Not exceeding 5
Max. ratio error	As per IS:2/05/1992

9.8.17 General Parameters: VT (Owner's Bay & Metering Bay)

Particulars	Details
Nominal system voltage (kV rms)	11 KV
Highest system voltage (kV rms)	As per system design
Nos. of phases	Three
Impulse withstand voltage (kVP) (on assembled CT-PT set)	As per system design
One minute power frequency dry withstand voltage (on assembled CT-PT set) Primary	As per system design
Dry secondary	
Frequency	50 Hz
Transformation ratio (PT Ratio)	As per system design
Rated output (VA burden)	As per system design
Class of accuracy	0.2 (As per IS:3156/1992)
Winding connection	Star/ Star
Rated voltage factor and time	1.2 Continuous & 1.9 for 30 seconds.
Temp. Rise over max. Ambient temp.	Within limits of IS:3156/1992
Phase angle error max.	-do-
Max. Phase angle error	-do-
Ratio error (Max.)	-do-

Note : Meeting all the Technical requirement & guidelines of DISCOM for metering and connectivity at designated substation at Manikandam Substation, Tiruchirappalli city shall be the responsibility of the Contractor, irrespective of whether those specifications/ guidelines are mentioned under this Tender document or not.

9.9 **Circuit Breakers**

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

9.9.2 Applicable Standards: The materials shall conform in all respects to the relevant Indian Standard Specifications/ IEC Standards, with latest amendments indicated (reference only) below:

IS-13118/1991	**General requirements for Circuit breakers for voltage above 1000 V IEC 62271-100-1/2001**
IS-2705/1992	Current Transformers
IS-2099/1986	Bushings for alternating voltages above 1000 V
ISS-2633/1964	Methods of testing uniformity of coating of zinc coated articles
IS-3231/1986	Electrical relays for power system protection
IS-1248/1983	Specification for Ammeters & Voltmeters
IS-335/1983	New insulating oils Electrical IEC 71 (For oils in CTs) Clearances
IS-2147/1962	Degree of protection provided by enclosures for low voltage switchgear & control gear

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

9.9.4 Appropriate & adequate Capacity 415V AC indoor air Circuit Breaker as per the IEC 60898 / IEC 62271 – 100 or equivalent Indian Standards along with control circuit and protection relay circuit, fuses, annunciations and remote operating and controlling facility from the Main Control Room.

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

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

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

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

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

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

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

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

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

9.10 **Operating Mechanism of Circuit Breakers**

9.10.1 Circuit shall be vacuum type with electrically spring charged mechanism.

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

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

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

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

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

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

9.10.8 General parameters: Vacuum type Circuit Breaker:

Particulars	Details
Type of circuit breaker	Vacuum type
Highest System Voltage	As per system design
Rated operating voltage	As per system design
Rated frequency	50 Hz (+3% to -5%)
Number of poles	Three (3)
Rated/ minimum power, frequency, Withstand voltage	As per system design
Rated lightning impulse Withstand voltage	As per system design
Rated operating duty cycle	0 - 0.3 sec. - CO – 3 min. – CO
Rated line charging breaking	As per IEC
Reclosing	Single and three phase high speed auto reclosing
Maximum fault level	As per system design
Auxiliary contacts	As required plus 6NO and 6NC contacts per pole as spare.
Noise level	Maximum 140dB at 50m distance from base of circuit breaker
Seismic acceleration	0.4 g horizontal

9.10.9 Co-ordination of rated voltages, short circuit breaking current and rated normal current for guidance as per IS 13118 for rated voltage 11 kV and above

9.10.10 Circuit Breaker Protection against

- Over Current
- Earth fault
- Under voltage & over voltage protection
- Under frequency & over frequency
- SF6 gas pressure low (where applicable)
- DC supply failure

9.11 **Isolators**

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

9.11.2 Each isolating switch should have the following particulars under the site conditions for the system under design (typical values for 11 kV system are given).

9.11.3 General Parameters: Isolators

Particulars	Details
Operating mechanism of Isolator and Earth Switch	Motor operated
Nominal system voltage	As per system design
Highest system voltage	As per system design
Type	Outdoor (IP 65)
Rated short time current of isolator and earth switch	As per system design
Rated dynamic short time with stand current of isolator and earth switch	As per system design
Impulse withstand voltage with 1.2/50 micro sec. wave	As per system design
One minute power frequency withstand Voltage	As per system design
Temperature rise	As per Table-IV of IS: 9921
Rated mechanical terminal load	As per 62271-102

9.12 **Indicating and Integrating Meters/Instruments:**

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

9.12.1 **A.C. Static HT Tri Vector Meter:**

A.C. Static HT Tri Vector Meter shall be installed as per STATE DISCOM's/STU's norms and shall be intimated while placement of order. The meters shall be located at eye level to facilitate observations of readings correctly.

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

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

9.13 Surge Arrestors

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

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

9.13.3 Arrestors shall be complete with insulating base for mounting on structure. Suitably enclosed for outdoor use and requiring no auxiliary or battery supply for operation shall be provided for each single pole unit with necessary connection.

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

9.13.5 Each lightning arrestors should have the following particulars under the site (Tamilnadu). conditions for the system under design.

(i) Codes and Standard

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

NF C 17-102: Lightning Protection with Early Streamer Air Termination Rod

(ii) Complete Solar Array with associated structure shall be protected from Direct Lightning Stroke. Lightning Protection for solar array shall be achieved with any or both of the following two systems as per specification provided in the following section; (1) Single Rod Air Terminal (Faraday Rods), (2) Early Streamer Emission (ESE) Air Terminal.
Suitable earthling and equipotential bonding shall be ensured for the air termination rods as per applicable standard/Equipment manufacturer guidelines. Current carrying parts and accessories such as clamps, fasteners, down conductor, Test links and earth termination etc. shall be preferably procured from OEM of Air Terminals if it is supplied by them as part of lighting protection system.

(iii) Lightning Protection System for solar array with single rod air terminal

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

(iv) Lightning Protection System for solar array with E.S.E air terminal

Solar array shall be protected from direct lightning stroke with Early Streamer Emission air terminal in accordance to NF C 17-102 (Latest revision). Number and location of ESE air terminal shall be decided during detail engineering. For this purpose, design calculation and AutoCAD drawing of the layout of ESE terminal shall be submitted to Employer for approval. ESE air terminal shall be type tested in any national/ international approved lab for advance triggering time (T) and lighting Impulse current test and type test report shall be submitted to Employer for approval.
(a) Each ESE air terminal shall be provided with separate earthling termination
and test link for equipotential bonding of Lighting Protection System as per OEM guidelines/NFC 17 -102. Each ESE air terminal shall be equipped with(b)
lightning stroke counter to be fixed at suitable height in serial on the down conductor. ESE air terminal shall be erected on isolated foundation to be approved by Employer. If required,
Suitable guy wire shall be used to support the mast of ESE terminal against the wind.

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

(vi) Lightning Protection System for Inverter Room (LCR) and MCR

Contractor needs to provide the Lightning Protection for each inverter, Switchyard building and Main Control Room building in accordance to IS:2309.

9.14 **Protective Relays**

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

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

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

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

9.14.5 Detailed Design calculations shall be provided on fault power computations and the philosophy of protective relaying with respect to short circuit kA calculations. Design, drawing and model of protection relay shall be approved by Employer/ state DISCOM.

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

9.15 **Earthling for PV Array**

9.15.1 The photovoltaic modules, BOS and other components of power Plant requires adequate earthing for protecting against any serious faults as guided by IEC 60364.

9.15.2 The earthing system shall be designed with consideration of the earth resistivity of the project area. The earth resistivity values shall be measured prior to designing the earthing system. Unless otherwise specified, earthing system shall be in accordance with IS: 3043 and IEEE 81, Indian Electricity Rules, Codes of practice and regulations existing in the location where the system is being installed.

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

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

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

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

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

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

The array structures are to be connected to earth pits as per IS standards. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance.

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

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

The Contractor should submit the earthing system design calculations along with the system layout for Owner approval. Prior to the installation of the system.Unless otherwise specified, the earthing system primary and secondary grid conductors, equipment connections shall be constructed with galvanized iron flat. However the earthing of transformer neutrals, plc and inverter terminals and electronic earthing shall be provided using copper earthing conductor only.

9.16 Isolator and Isolator-cum-Earthing Switches

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

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

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

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

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

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

Contacts:

The moving & fixed contacts shall be made of hard drawn electrolytic grade copper strips and shall be heavy duty self- aligning & high pressure type preferably which applies pressure to the contact surfaces after the blades are fully closed and release the pressure before they start to open. High pressure type contacts shall wipe the contact surfaces, while opening and closing. The contacts shall be so designed that wiping, action shall not cause securing or abrasion on the contact surfaces. The wiping action shall be sufficient to remove oxide film, formed during the operation of the switches. The pressure shall be developed by rotation of the entire blade.

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

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

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

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

9.18 **Earthing Blades**

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

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

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

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

9.19 **Insulators**

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

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

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

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

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

9.20 **Bus Bar**

The outdoor bus-bars and equipment connections shall be with ACSR conductor (suitable size as per design).

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

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

Bus bar Material – The materials in common use for bus bars and connections of the strain type are ACSR conductor.

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

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

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

9.21 Control & Relay Panel

General Requirement:

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

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

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

I. Metering, Indications & Controls
II. Ammeter
III. Ammeter selector switch
IV. Voltmeter
V. Voltmeter selector switch
VI. Load manager to display the following parameters: MW, MVA, MVArh, MVAr Cos Ø, Hz,
VII. Indication lamps for R, Y, B phases, Breaker 'ON' (R), Breaker 'OFF' (G), Breaker 'TRIP' (A), Spring charged (W), Trip Circuit Healthy (B)
VIII. TNC switch, spring return to neutral position shall be provided for circuit breaker operation.
IX. Local / Remote selection switch for circuit breaker operation
X. Semaphore indicators (LED type) for CB and Isolator 'Open' & 'Close' positions
XI. Mimic diagram for the systems with aluminium strips and 'ON' 'OFF' indications for isolators

9.22 Low/ High Voltage Switchgear Panels

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

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

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

Power Control Centres (Construction)

I. Single front / compartmentalized, modular design, degree of protection IP52 with provision of extension on both sides.
II. Incomer feeders: mains incomer - Electrically operated draw out type Air Circuit Breakers (ACBs)/ Vacuum Circuit breakers (VCBs), as applicable.
III. Outgoing feeders: Moulded Case Circuit Breakers (MCCBs)/ electrically operated draw out type Air Circuit Breakers (ACBs) / Vacuum Circuit Breakers (VCBs), as applicable.

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

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

VI. The gland plates shall be 3 mm thick

9.23 **Control Circuit**

I. Control supply for breaker closing / tripping - 110V DC

II. Air Circuit Breaker spring charge motor – 240 V AC, 1 phase III.

Moulded Case Circuit Breakers – 240 V AC, 1 phase

IV. Indications, annunciation – 110V DC

V. Space heater, sockets, etc. – 240 V AC, 1 phase 9.24

Bus Bar & Cable Cavity

The material for main bus bars and tap off bus bars shall be electrolytic grade aluminium with properly colour coded HR PVC sleeved insulation.

Bus bars shall be suitable for short circuit rating and current suitable for all connected load.

Cable entry for incoming and outgoing cables shall be from Bottom.

A suitable gland plate shall be supplied for termination of power, control and instrumentation cables.

Whenever feeders are housed in multi-tier configuration, these tiers shall be segregated by sheet metal barriers.

Earthing: Earthing bus bar shall be terminated at both ends of the switchgear to suit the connections to outside earthing conductor. All components inside the module are required to be earthed individually and are to be looped and connected to the horizontal earth bus. All the non-current carrying parts of the panels, e.g., enclosure, must be connected to earth as per the regulations.

9.25 **Terminals:**

CT circuit - Isolating link type terminals with shorting facility

PT circuit – clip on type terminals

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

9.26 **Specific Requirement**

All ACBs/ VCBs, as applicable, shall be 4 pole, electrically operated, draw-out type, with closing coil, spring charge motor, trip coil, TNC switch for close and trip, manual closing and tripping push buttons, door I/L, test and service position micro switches, emergency P.B., safety shutters, etc. The circuit breaker shall be provided with anti-pumping feature.

ACB's/ VCBs, as applicable, shall be complete with microprocessor release and shall be provided with over current, short circuit and earth fault protections.

Minimum10% spare feeders of each rating shall be provided in the switchgear.

All current transformers shall have 5/1A secondary and all meters shall be suitable for 5/1A operation

All indicating lamps shall be of LED cluster type. ACB feeders shall be provided with

ON, OFF, AUTOTRIP, SPRING CHARGED, TEST, SERVICE, TRIP CIRCUIT HEALTHY indications

All indicating instruments, including MFM, shall be flush mounting, Digital type and of standard size.

Window annunciator with hooter and accept, test, reset button shall be provided.

Necessary auxiliary relays for contact multiplication shall be provided in the panel.

The maximum temperature of the bus bars, droppers and contacts at continuous current rating under site reference ambient temperature of 50o C shall not exceed 105o C.

- Instrumentation: Switchgear instrumentation shall be provided as follows:
- Mains Incomer – Voltmeter with selector switch
- Ammeter with selector switch
- Power Factor meter
- Frequency meter
- TVM + MD meter
- Potential indicating lamps
- Outgoing Feeders
- Ammeter with selector switch on all feeders

9.27 **General Technical Specifications (LT/ HT Switch gear Panel)**

The panel shall be self-supporting, free standing, floor mounted, modular type with construction having degree of protection of IP 54 as per IS 2147.

The panel shall be fabricated from 14 SWG CRCA sheet steel for frame & load bearing surfaces. Partitions may be fabricated from 16 SWG CRCA if no components are mounted on them.

The panel shall be painted with 2 coats of primer after pre-treatment and 2 coats of Polyurethane / epoxy paint with shade as decided by the Owner

Stiffeners shall be provided at corners & between modules to make panel rugged. The stiffeners will necessarily be required for relay compartments or doors where heavy components are mounted.

The openable covers will be provided with lift off type hinges, quarter turn door locks and flexible copper wire for earth connection.

The panel shall be dust and vermin proof. Synthetic or neoprene gaskets shall be provided at all openings.

The panel shall be of dead front construction suitable for front operated and back maintained functioning.

Panel shall be provided with fluorescent lamp of 20W capacity operated by door operated limit switch. Panel shall also have space heaters and thermostat arrangement.

Panel shall be provided with 3 pin switch socket combined unit of 5 Amp capacity.

Lifting hooks shall be provided at the top of the panel.

The hardware components used in the panel shall be hot dipped galvanized.

The control components shall be fixed on mounting plate by drilling & tapping.

Aluminium anodized legend plates shall be provided for all the components.For components mounted on front face, legend plate from inside shall also be provided.

Pre-treatment by 7 tank process shall be done before painting/powdercoating the panel.

Panel shall have provision of drawing pocket.

The panel shall be designed to ensure maximum safety during operation inspection, connection of cables and maintenance. Inside panel, checking and removal of components shall be possible without disturbing other units.

Cable entries will be from bottom. The opening of cable entry shall be covered by 3 mm thick gland plates.

The panel shall be provided with all necessary components / devices and instruments as per the recommended schematic diagram and functional requirements.

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

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

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

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

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

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

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

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

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

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

Busbars shall be provided with colour coded heat shrink able insulating sleeves.

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

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

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

The panel shall be inspected at manufactures works before dispatch to site at the discretion of Employer

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

I. Verification of components ratings and operation.
II. High voltage measurement test.
III. Insulation Resistance measurement.
IV. Control testing

Approval on following drawings shall be obtained before manufacturing the panels

General arrangement drawing

- Wiring Diagram.
  Detail bill of material
- 33 KV Over Head Transmission Line
- Contractor shall provide 33 KV Over Head Transmission Lines and metering on Turnkey basis as per State DISCOM's requirement.

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

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

9.29 **Metering System**

9.29.1 Metering scheme, to measure the delivered quantum of energy to the grid for sale. The responsibility of arranging for the meter, its inspection/calibration/testing charges etc. rests with the Contractor. All charges incurred on Meter testing, shall be borne by the Contractor. ABT energy metering system is to be approved by state DISCOM.

9.29.2 Meter must be provided with the necessary data cables.

9.29.3 Separate metering system has to be provided for L.T. (incoming) and H.T. (outgoing) supply.

9.29.4 The Contractor shall provide ABT compliant meters at the interface point

9.29.5 Interface metering shall conform to the Central Electricity Authority (Installation and Operation Meters) Regulation 2006 and amendment thereof Commercial settlement of solar Photovoltaic Ground Mounted based power project.

9.29.6 Meter shall be suitable for interfacing for synchronizing the built-in clock of the meter by GPS time synchronization equipment existing at the station either through a synchronization pulse received from the time synchronization equipment or through a remote PC synchronized to GPS clock shall also be in the scope of Contractor.

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

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

9.29.9 Meters shall be microprocessor-based conforming to IEC 60687 / IEC 6205211/ IEC 62053-22 / IS 14697 unbalanced 3 phase load.

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

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

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

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

9.29.14 At least the following data shall be stored before being over-written for the following parameters.

9.29.15 At least the following data shall be stored before being over-written for the following parameters.

S. No.	Parameters	Details	Min No of days
1	Net MWh	15 min. block	90 days in meter
2	Average Frequency	15 min. block	90 days in meter
3	Net MVARh for >103%	15 min. block	90 days in meter
4	Cumulative net MWh	At every mid night	30 days in meter/90 days in PC
5	Cumulative net MVARh for >103%	At every mid night	30 days in meter/90 days in PC
6	Date & time blocks for VT failure on any phase		

9.29.16 Shall have a built-in clock and calendar with an accuracy of less than15 seconds per month drift without assistance of external time synchronizing pulse.

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

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

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

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

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

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

9.29.22 The Employer/ Owner shall have the right to carry out surprise inspections of the Metering Systems from time to time to check their accuracy.

9.30 **SCADA and Remote Monitoring System**

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

9.30.2 An integrated SCADA shall be supplied which should be capable of communicating with all inverters and provide information of the entire Solar PV Ground Mounted power Plant.

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

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

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

9.30.6 The Bill of Materials associated with the equipment must clearly indicate especially the details about the PC and Printers, etc.

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

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

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

- Energy export to grid at 33 KV
- Main combiner box parameters
- Inverter level parameters
- Parameters at LV terminal
- Power characteristics of HT side
- Ambient temperature near array field
- Module surface temperature
- Wind Speed and direction
- Solar irradiation/isolation
- Any other parameter considered necessary by supplier based on current prudent practice

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

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

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

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

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

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

9.30.16 The PC/ workstation shall be of Industrial type, rugged & robust in nature to operate in a hostile environment. The PC will have minimum Intel processor (4th generation) having 2 X 1TB HDD with 4 GB RAM. The PC shall also have 17" TFT Colour monitor, DVD Drive with Writer, USB drive, Scroll Mouse and UPS for 4 hours Power back up. The Contractor can suggest the workstation best used for the purpose.

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

9.31 **DC Battery & Charger**

9.31 **DC Battery & Charger**

9.31.1 Adequate capacity DC battery Bank should be provided for control supply of inverters, control / protection system & emergency lighting at buildings. A appropriate capacity battery charger (float cum boost charger – FCBC) with relevant IS/IEC standards & protection and automatic change over system should be provided to charge the battery bank along with relay circuit, fuses, annunciations and remote operating and controlling facility from the Main Control Room.

9.31.2 A DC power supply Distribution panel/board should be supplied along with the Charger (FCBC) as per relevant IS standards. Control room DC Battery Bank & DC supply system theoretical design, calculations and detailed explanations along with drawing shall be provided and approved by the Employer.

9.31.3 The battery shall be provided with epoxy paint coated exhaust fan for removal of gasses released from the battery cells.

9.31.4 The design of the battery bank and loads considered along with the data sheet for the battery and battery charger shall be submitted for approval.

9.32 **Power and Control Cables specifications on AC side**

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

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

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

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

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

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

9.32.7 Cables inside the equipment room, control room and in the switchyard shall be laid in Galvanized Cable Trays mounted on mild steel supports duly painted, in constructed trenches with RCC raft and sidewalls or bricks sidewalls and provided with removable RCC covers.

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

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

9.33.2 **DESIGN AND CONSTRUCTIONAL FEATURE**

9.33.2.1 **Inter Plant Cabling**

Interplant cabling for main routes shall be laid in Cable trenches/cable trays/buried/ duct banks. In case of Duct banks, pull-pits shall be filled with sand and provided with a PCC covering. All buried cables shall be armoured.

9.33.2.2 **Trenches**

PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.

9.33.3. **EQUIPMENT DESCRIPTION**

9.33.3.1 Support System for Cable Trays

Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types:

- C1: - having provision of supporting cable trays on one side
- C2: -having provision of supporting cable trays on both sides. Support system shall be able to withstand
- weight of the cable trays
- weight of the cables (75 Kg/Metre run of each cable tray)
- Concentrated load of 75 Kg between every support span.
- Factor of safety of minimum 1.5 shall be considered.

9.33.4. **PIPES, FITTINGS & ACCESSORIES**

9.33.4.1 Pipes offered shall be complete with fittings and accessories (like tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples etc.) The size of the pipe shall be selected on the basis of maximum 40% fill criteria.

9.33.4.2 GI Pipes shall be of medium duty as per IS:1239.

9.33.4.3 Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.

9.33.4.4 Hume pipes shall be NP3 type as per IS 458.

9.33.5 **Terminations & Straight through Joints**

9.33.5.1 Termination and jointing kits for 132kV, 33kV, 11kV, 6.6 kV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be pre-moulded type, taped type or heat shrinkable type. 132kV, 33kV, 11kV and 6.6 kV grade joints and terminations shall be type tested as per IS: 13573. 3.3kV grade joints and terminations shall be type tested as per VDE0278. Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the Aluminum solderless crimping type cable lugs & ferrule as per DIN standard.

9.33.5.2 Straight through joint and termination shall be capable of withstanding then fault level for the system.

9.33.5.3 KV grade Straight through Joint shall be of proven design.

9.33.6 **Cable glands**

9.33.6.1 Cable shall be terminated using double compression type cable glands. Cable glands shall conform to BS: 6121 and be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.

9.33.7 **Cable lugs/ferrules**

9.33.7.1 Cable lugs/ferrules for power cables shall be tinned copper solder less crimping type suitable for aluminum compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments. Cable lugs and ferrule shall conform to relevant standard.

9.33.8 **Trefoil clamps**

9.33.8.1 Trefoil clamps for single core cables shall be pressure die cast aluminum or fibre glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength to withstand the forces generated by the peak value of maximum system short circuit current.

9.33.9 **Cable Clamps & Straps**

The cable clamps required to clamp multicore cables on vertical run shall be made up of Aluminum strip of 25x3 mm size. For clamping the multicore cables, self-locking, de-interlocking type nylon clamps/straps shall be used. The clamps/straps shall have sufficient strength and shall not get affected by direct exposure to sun rays and outdoor environment.

9.33.10 Installation

9.33.10.1 **Cable tray and Support System Installation**

- Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.
- Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/clamps on both top and bottom side rails at an interval of 2000 mm in general.For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted. Cable tray installation shall generally be carried out as per the approved guidelines/ drawings.

- The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated.

- All cable way sections shall have identification, designations as per cable way layout drawings and painted/stenciled at each end of cable way and where there is a branch connection to another cable way. Minimum height of letter shall be not less than 75 mm. For long lengths of trays, the identification shall be painted at every 10 meter. Risers shall additionally be painted/stenciled with identification numbers at every floor.

- In certain cases it may be necessary to site fabricate portions of trays, supports and other non-standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint.

9.33.10.2 **Conduits/Pipes/Ducts Installation**

- The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/roof/wall /cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.

- GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc.

- Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material.

- Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average spacing between the supports as given below, unless specified otherwise.

9.33.10.3 **Cable Installation**

Cable installation shall be carried out as per IS: 1255 and other applicable standards. For Cable unloading, pulling etc following guidelines shall be followed in

General:

- 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.

- 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 Project Manager.

- Bending radii for cables shall be as per manufacturer's recommendations and IS: 1255.
- Where cables cross roads/rail tracks, the cables shall be laid in Hume pipe/HDPE pipe.
- 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.
- 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.

9.33.10.4 Separation

At least 300mm clearance shall be provided between:

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

9.33.10.5 **Directly Buried Cables**

- Cable trenches shall be constructed for directly buried cables. Construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of route markers and joint markers. Laying of cables and providing protective covering shall be as per IS: 1255.
- RCC cable route and RCC joint markers shall be provided wherever required. The voltage grade of the higher voltage cables in route shall be engraved on the marker. Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable Joint". The marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road crossings and drain crossings. Top of cable marker/joint marker shall be sloped to avoid accumulation of water/dust on marker.

9.33.10.6 **Cable Terminations & Connections**

- 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.

- 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.

- 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.

- 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.

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

Note: Contractor must comply with the relevant grid regulations, DISCOM'S, State Transco's & CEA's guidelines with respect to all the works corresponding to power evacuation, transmission, termination along with metering at designated substation at MGR Nagar at Edamalapatti Pudhur , Tiruchirappalli city.

9.34 **Danger Plates**

Size of each Danger Notice plates shall be 200 mm x 150 mm made of mild steel sheet and at least 2 mm thick, and vitreous enamelled white on both sides and with inscription in signal red colours on front side as required. The inscriptions shall be in Hindi, Tamil and English.

9.35 **Fire alarm System**

- Buildings shall have fire detection and alarm system installed as per relevant standards and regulations. The installation shall meet all applicable statutory requirements, safety regulations in terms of fire protection.
- Liquefied CO2/ Foam/ ABC type fire extinguisher shall be upright type of capacity 5/10 kg having IS: 2171. 7 IS: 10658 marked. The fire extinguisher shall be suitable for fighting fire of Oils, Solvents, Gases, Paints, Varnishes, Electrical Wiring, Live Machinery Fires, and all Flammable Liquid & Gas. Contractor shall provide portable fire extinguisher as per the recommendation by relevant fire safety authority.
- The minimum 2 no. of fire extinguishers (CO2 and Foam type each) shall be provided at every buildings/enclose, however Contractor must comply with existing building code for fire Protection by NFPA, IS & State Fire Protection Department.
- Sand bucket should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546 at strategic locations.
- The plan for fire extinguishing must be provided by the Contractor to Employer for the approval.

9.36 Not applicable

9.37 Testing Instruments for Electrical & Electronic

Contractor shall also provide required set of onsite testing instruments/equipment viz

- Earth resistance tester:
- Array Tester:
- Insulation tester:
- Multi-metres:
- Clamp meters:
- Transformer oil BDV kit:
- Infra-red thermal imaging hand held Camera:

Note:

I. All testing equipment shall possess valid calibration certificate issued from approved NABL labs.

II. Instruments of superior rating is allowed after seeking consent of the Employer

III. Maintenance, calibration, up keeping, repair & replacement of these tools will be in the scope of Contractor during 10 years of O&M.

IV. It is Contractor's responsibility to arrange for tools, tackles, logistics, test kits,

V. manpower, experts etc. required for trouble free operation of Plant

9.38 Specification of Weather Monitoring System

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

9.38.1 Pyranometer

- Contractor shall provide minimum 4 (four) number of pyranometers for measuring the incidental solar radiation at horizontal and inclined plane of array.
- Specification of the pyranometer shall be as follows:
- Each instrument shall be supplied with necessary cables. Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. The signal cable length shall not exceed 20m. Contractor shall provide Instrument manual in hard and soft form.

9.37.2 Thermometer

Contractor shall provide minimum two thermometers (one for ambient temperature measurement with shielding case and other for module temperature measurement). The thermometers shall be RTD/ semiconductor type measuring instrument. Instrument shall have arrange of 0^{o}C to 81^{o}C.The instrument shall have valid calibration certificate.

9.37.3 Anemometer

Contractor shall provide minimum one no. anemometer with wind vane of rotating cup type

9.38 General Guidelines

9.38.1 Any civil, electrical, mechanical & plumbing work which is not mentioned or included in this tender document but necessary for the Plant shall be borne by the Contractor.

9.38.2 Successful Bidder/ Contractor shall prepare all designs / drawings have based on the specifications given in the tender and in light of relevant BIS/IS/equivalent standard.

9.38.3 The Contractor shall provide type test reports and datasheet/ GTP for all equipment used for the project.

9.38.4 The Employer reserves right to modify the design at any stage, to meet local site conditions / project requirements.

9.38.5 All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed there under and as amended from time to time.

Performance Measurement procedure

10.0 Performance Ratio Test Procedure

10.1 **PR - Provisional Acceptance Test Verification Procedure**

10.1.1 The Performance ratio test aims at the comparison of the actual PV Plant energy production with the guaranteed value for a limited operation time of the PV Plant of 30 consecutive days.

10.1.2 After Commissioning of the Plant and after receiving all the satisfactory results regarding the correct operation of the Plant, there will be continuous monitoring of the performance for 30 days. This monitoring will be performed on the site under the supervision of the Employer / Employer's engineer.

10.1.3 The final tests to prove the guaranteed performance parameters shall be conducted at site by the Contractor in presence of the Employer. The Contractor's commissioning / start-up Engineer shall make the Plant ready to conduct such tests. The Performance Guarantee Tests (PG tests) shall be commenced, within a period of one (1) month after successful Commissioning. Any extension of time beyond the above one (1) month shall be mutually agreed upon. These tests shall be binding on both the parties to the contract to determine compliance of the equipment with the guaranteed performance parameters.

10.1.4 The test will consist of guaranteeing the correct operation of Plant over 30 days, by the way of the efficiency rate (performance ratio) based on the reading of the energy produced and delivered to the grid and the average incident solar radiation.

10.1.5 The Efficiency or performance ratio (PR) of the PV Plant is calculated as follows (according to IEC 61724)

Performance Ratio (PR) = {YA / YR} * [1 – α * (TCell avg. – TCell)]

Where;

YA = Final PV system yield (representing the number of hours that the system would need to operate at its rated output power PNom to contribute the same energy to the grid as was monitored)

Or YA = Eac / Pinst

YR = Reference yield (representing the number of hours during which the solar radiation would need to be at STC irradiance levels in order to contribute the same incident energy as was monitored)

Eac= AC energy injected into the grid during a clearly specified amount of time (kWh) = Installed nominal peak power of modules (Flash test rating at STC) (kWp) Irradiation on the module plane of array during a clearly specified amount of time

Pinst =Installed nominal peak power of modules (Flash test rating at STC) (kWp)

IR Site = Irradiance at STC (kW/ sq. m) Average cell/ module temperature (^{o}C) STC cell/ module temperature (^{o}C) (measured with a pyranometer installed on the array plane) (kWh/sq. m)

IR STC

Tcellavg = Average cell/ module temperature (^{o}C)

Tcell=STC cell/ module temperature (^{o}C)

α = temperature coefficient of power (negative in sign) corresponds to the installed Module (%/^{o}C)

10.2 **Monitoring System for PR Verification**

10.2.1 The following instrumentation will be used to determine the Solar Plant Performance:

- Power Meter at the delivery point.
- Power Meter for each inverter/ LT panel incomer for reference only.
- Two sets of Radiation measuring stations, each with one nos. calibrated pyranometer to determine irradiance on the plane of array (with a target measurement uncertainty of ± 2) & one nos. calibrated pyranometer to determine irradiance on horizontal plane (with a target measurement uncertainty of ± 2)
- Two nos. thermocouples to measure module temperature with a measurement uncertainty of ±1 °C.
- Shielded ventilated thermocouple with a measurement accuracy of ±1°C.
- An anemometer mounted on a 10m mast to measure wind speed (without additional shadowing on modules).

Data measurement shall be witnessed in the format mutually agreed before the start of PR test by the Employer and the Contractor jointly for the said period.

10.2.2 The Contractor shall show the specified PR for Operational Acceptance and committed CUF for Final Acceptance (i.e. after one year from the date of Operational Acceptance till last day of O&M Period on annual basis).

11.0 **Capacity Utilization Factor (CUF)**

11.1 Capacity Utilization Factor shall be calculated as per the following formula:

CUF =EN/8760∗ ∗

Where,

EN is number of units recorded at the ABT metre at 11 kV local bus bar in Plant Facilities after excluding auxiliary consumption
Pnom- 1,000 kW, i.e. minimum proposed DC Capacity. CF -
CUF Correction Factor
The correction factor for CUF shall be calculated at the end of each year, by factoring module degradation and any shortfall in radiation as per the formula given below.
CF= (1-Module Degradation Factor X No. of Years of operation after Operational acceptance of the Plant).

11.2 Total hours in a year considered in the CUF calculation formula (TS Clause 11.1) i.e. 8760 is for normal years, however for leap years this shall be considered as 8784.

Civil & Mechanical Works

This section of Technical Specifications describes detailed technical and functional requirements of all civil, Mechanical & Plumbing works included in the scope. All the Civil, Mechanical & Plumbing works must be done considering coastal environmental/climatic condition existing at site.

All design and construction of civil works shall conform to relevant Indian standards such as BIS, IRC, MORST, NBC etc. Design of steel structures shall conform to IS: 810, 812 or 812 as applicable with working stress method (WSD) of design. Design of concrete structure shall conform to IS: 456. For design of liquid retaining structure IS: 3374 shall be followed. Only in case of non-availability of Indian standard, equivalent American or British standard may be used for design with prior approval of the Employer and the contractor shall submit proper justification along with his request to the Employer for his review. All the design/ drawings shall be prepared/ approved by the chartered structural engineer. The design calculations for MMS, RCC structure, steel structure, foundation system, road work, drainage work, etc. shall be submitted for prior approval of Employer before commencement of construction.

The design calculations shall be supplemented with a neat sketch showing the structure geometry, node and member nos., Lengths of various typical members, support points and type of supports, types of materials with design properties considered, type of sections used in analysis & design. The report shall also include back-up calculations for various loads adopted in design, brief write-up on primary load cases and load combinations considered and conclusions on design results with supporting sketches for easy reference and clarity. Where a computer program (other than STAAD Pro) is used for analysis and design, the contractor shall also include a write-up on the computer program used along with validation check. Input and output file shall also be given in the design report to facilitate its review and approval by the Employer.

The construction methodology for MMS and its foundations, road works, drains and pile load test procedure shall also be submitted for prior approval of Employer before start of works. The construction shall be done only as per approved drawings

12.0 Topographical Survey, Area Grading and Land Development

12.1 The contractor shall be responsible for detailed Topographical Survey of the proposed project site. The work shall be carried out through an agency with relevant experience and shall have qualified survey team. The Topographical survey shall be conducted at 20m x 20m grid, or as directed by the Engineer, with the help of digital surveying instruments like Total Station. The Contractor shall carry the Bench Mark from nearest GTS Bench Mark, or any other establish source like Railway station etc. as approved by the Employer, by fly-levelling and establish two permanent bench marks (PBM) at site. All subsequent transfer of levels shall be carried out with respect to these PBMs. The work shall also include constructing permanent reference pillars at suitable locations as approved by the Employer. These reference pillars shall be labelled permanently with their respective coordinates and reduced levels for future use. The Permanent Bench Marks and reference pillars shall be shown on the survey drawings.

12.2 While carrying bench mark to the project site, levels shall be established on the permanent objects like culverts etc. at least on one object in every one km. if available along with route with adequate description about the objects. These levels shall be maintained at site & also mentioned in the survey report to facilitate locating these objects later on.

12.3 The work survey work shall be carried out in UTM grids system. The contractor shall also establish the latitudes and longitudes of the corners of the project site. At least 50m width of the adjoining plots and surrounding areas shall also be covered in the survey for correlation with adjoining plots and facilities. The grids for the survey work shall be established in N-S & E-W direction (corresponding to magnetic North) or the Plant North as directed by the Employer. Positions, both in plan and elevation, of all natural and artificial features in the area like waterways, railway tracks, trees, cultivation, houses, fences, pucca and kutcha roads including culverts and crossings, foot tracks, other permanent objects like telephone posts etc. are to be established and subsequently shown on survey maps by means of conventional symbols (preferably, symbols of survey of India Maps). All hills and valleys within the area/areas are to be surveyed and plotted on maps by contours. Any unusual condition or formations on the ground, locations of rock outcrops (if visible on the surface) and spring/falls, sand heap/dune, possible aggregate deposits etc. shall also be noted and plotted on contour maps.

12.4 The record of measurement of all Reduced Levels (RL) shall be submitted in digital format, (in x, y z coordinate system) along with preliminary contour plan of the site, for Employer's review before submission of final contour Map. The contour interval shall be as required for proper representation of the topography however it shall not be more than 0.5m. The Contractor shall submit survey maps of the site in 1:10,000 scale indicating grid lines and contour lines, demarcating all permanent features like roads, railways, waterways, buildings, power lines, natural streams, trees, sand dunes etc. Present use of the site i.e. mining, quarrying, agriculture etc, existing drainage pattern of the site, possibility of water logging and high flood level of the area shall also be captured in the document. The project plot boundary with coordinates of all corner points along with coordinate grid of 50x50M interval shall be marked on the contour map. The Finished Grade Level (FGL) of the proposed Plant shall be fixed with reference to the highest flood level and surrounding ground profile at proposed site. The data regarding highest flood level at proposed site shall be obtained from the metrological department by the contractor. In case of absence of this data, the contractor shall assess the required information through local site reconnaissance. The minimum plinth level of all buildings shall be 450mm above FGL. Module mounting structure foundation or any other pedestal shall be min. 250mm above FGL. A detailed drawing for site levelling and grading (if necessary) shall be submitted by the contractor before commencement of grading and area development works. The estimated volume of cutting and filling shall also be marked on the Grading drawings for reference. The final grade levels thus adopted for different blocks shall be clearly marked on the Plant Layout drawing. The contractor is responsible for making the site ready and easily approachable by clearing bushes, felling of trees (Mandatory permissions/ licenses/ statutory clearances from competent authorities if required for cutting of trees, blasting or mining operations, disposal of waste material etc. shall be obtained by the contractor), cutting, filling with selected excavated earth or borrowed earth including identifying borrow areas. Except in exceptional cases (with approval of the Employer), filling shall normally be made up of cohesive non-swelling material. The filling for levelling/ reclaiming the ground/ area shall be done in layers not more than 150mm of compacted thickness in case of cohesive (clayey) soils and 250mm compacted thickness in case of granular (sandy) soils with compacting up to 95% of modified proctor density in case of cohesive (clayey) soils and 81% of relative density in case of granular (sandy) soils. The slope at edge of graded areas shall not be flatter than 1:1.5 (1 Vertical: 1.5 Horizontal) in cutting and 1:2 (1 Vertical: 2 Horizontal) in filling. In case of filling is done with rock material the edges shall be provided in line with provisions of relevant BIS standard. It shall be ensured that the land is graded or levelled properly for free flow of surface runoff and the grade levels shall be fixed w.r.t. high flood level at site, drainage pattern and system requirements. It shall be ensured that the land is used optimally to have maximum Solar power generation considering full utilization of the plot areas It is advisable to follow the natural flow of water at the ground. In case the filled up earth is brought from outside the Plant / borrow areas, the contractor shall carry out all required soil investigations to ascertain the suitability of the soil for land development and filling purposes. Contractor's scope shall also include getting all necessary statutory approvals for mining, payment of necessary challans etc. Excess earth if any shall be disposed of properly at location as directed by the Engineer- incharge

13.0 Geotechnical Investigations

13.1 The contractor shall be responsible for detailed soil investigations at the proposed project site for the purpose of foundation design for various buildings, structures, HT lines, MMS etc. and other design/ planning requirements. The investigation work shall be carried out through any Govt. approved/ NABL accredited/IIT's/NIT's Labs, which are authorized to carry out such tests. The contractor shall submit the credentials of the proposed agency along with relevant certificates in support thereof for verification/ approval by the Employer.

13.2 The scope of work includes execution of complete soil exploration including boring and drilling, standard penetration test (SPT), collecting disturbed(DS) and undisturbed samples (UDS), collecting ground water samples, electrical resistivity tests (ERT) and conducting laboratory tests on collected samples of soil, ground water analysis, preparation and submission of report.

13.3 The field investigations shall mainly include drilling of min. 5 m deep boreholes (50% of total No. of boreholes shall be 10m deep), conducting SPT and collecting Disturbed (DS) and Undisturbed samples (UDS); conducting in-situ CBR test for internal roads & peripheral road; ERT and Trial pits. Number and location of bore holes, CBR tests and trial pits shall be decided as per the project layout, site topography and soil conditions in consultation with the Employer. However, there shall be minimum 1 No. of borehole per 10 acres of the area & No. of samples for laboratory investigations shall not be less than 25.

13.4 The proposed Geotechnical investigation plan indicating proposed locations of Trial pits, Bore holes and CBR tests shall be submitted to the Employer for review and approval before start of work.

13.5 Laboratory tests shall be conducted on DS & UDS samples and water samples in sufficient no. and shall include, Soil classification, Grain size analysis including Hydrometer analysis, determination of Bulk and dry density, Specific gravity, Natural moisture content, Atterberg limits, Tri-axial shear tests (UU), Consolidation tests, Unconfined compression tests, Free swell index of soil and water samples to determine the carbonates, sulphates, chlorides, nitrates, pH, Organic matter and any other chemicals harmful to concrete and reinforcement/ steel. Laboratory tests on rock samples shall be carried out for Hardness, Specific Gravity, Unit Weight, Uniaxial Compressive Strength (in-situ & saturated), Slake Durability etc.

13.6 After completion of field and laboratory work, the contractor shall submit a Geotechnical Investigation Report for Employer's approval. All bore log details and lab test results shall be presented in the report as per provisions of relevant BIS standards. The report shall include a Map showing the locations of various field tests including coordinates, calculations and recommendations for foundation type and safe bearing capacity (SBC) for buildings, switch yard structures, Sub-Station, Transformer foundation, HT lines, MMS foundation etc. corresponding to settlement of 25mm

13.7 In case the contractor wishes to adopt pile foundation for MMS supports the report shall also include the calculations for pile capacity for direct compression, lateral and pull out capacity and recommended depth and dia. The contractor shall carry out field trials for initial load test on pile to verify the pile design & finalize the safe load carrying capacity under direction compression, lateral load and pull out. The no. of piles to be tested under each category shall be finalized corresponding to geotechnical characteristics at site, plot area etc. However, minimum 5 no. of piles shall be tested under each category of load. The locations of test piles shall be finalized in consultation with Employer. The adequacy of provided pile reinforcement in job (working) pile corresponding to the set of test loads shall be reviewed by the contractor for any additional requirement of reinforcement steel and the shall provide the same, the revised drawings for pile details, if any, shall be submitted to Employer for his approval before casting. The load test on pile shall be conducted after min. of 28 days from the date of casting. In case the contractor desires to conduct the test earlier than 28 days, he may use suitable higher grade of concrete or if substantial evidence from earlier cube test results on design grade concrete to demonstrate the early gain of required compressive strength prior to application of the test load. However, no pile test shall be conducted before 7 days of casting the pile. All the dial gauges and hydraulic jack assembly shall be properly calibrated as per the requirements of relevant IS codes and valid calibration certificate to this effect shall be submitted to the Employer before the equipment is used for the test. The contractor shall submit detailed methodology for conducting the tests in line with IS: 2911 – Part 4 for Employer's approval before commencement of any test. After completion of these tests the contractor shall compile the test results and submit the report in a proper format as specified in the IS code with recommendations/ conclusions for Employer's approval. The pile work shall start only after approval of the final pile design duly verified/ confirmed with initial load test results.

13.8 All building, switchyard and sub-station area shall have levelled ground. No foundation for buildings, switch yard equipment & structures, sub-stations, underground transmission cables shall rest on filled up ground. Minor structures like cable trench, pipe pedestal etc. with max. safe bearing capacity of soil not more than 3 T/ Sq.

13.9 The report shall also include ground water analysis to ascertain its suitability for construction purposes, recommendations for type of cement, grade of concrete &minimum cement content as per prevalent soil characteristics with respect to presence of aggressive chemicals, environment exposure conditions as per relevant BIS specifications. However, minimum grade of concrete shall be M25 for all RCC works except liquid retaining structures like underground water tank etc. where minimum grade of concrete shall be M30.

14.0 Other Investigations

14.1 The contractor shall also obtain and study other input data at proposed project site for design of the project. This shall include data related to earthquake and wind, rainfall, maximum & minimum ambient temperature, humidity, high food level (HFL) etc.

14.2 The contractor shall carry out Shadow Analysis at proposed site and accordingly design strings and array layout with optimum use of space, material and man power. In case of large and steep variations in topography the study shall also include the effect of topographical variations on array layout. The contractor shall submit all the details/ design to the Employer for review/ approval.

14.3 The contractor shall also identify potential quarry areas for coarse and fine aggregates to be used for concrete and shall carry out the concrete mix design for different grades of concrete to be used in the work. The concrete mix shall be designed for each source of cement and quarry as per provisions of relevant Indian Standard. The concrete mix design shall be carried out through NABL accredited Laboratory or any Gov. Engineering college as approved by the Employer.

15.0 Plant Layout

15.1 The contractor shall submit drawing showing proposed Project Plant Layout.

15.2 The Plant layout shall be a comprehensive drawing showing various requirements of the project like, Reference coordinate grid, Geographical and Plant North, Boundary fence including coordinates of all corner points, Main Entrance Gate and any other access gates as per project needs, Block wise FGL, Internal and peripheral roads, Security Room/ cabin (s), All buildings with coordinates, temporary storage yard/ facility to be used by the contractor during construction, proposed Array layout, Lightening Arrester etc.

15.3 The Plant Layout drawing shall be in suitable scale to have proper representation of the information.

15.4 The Plant layout drawing shall be submitted by the contractor for review/ approval by the Employer .

16.0 Foundations

16.1 Contractor shall design all foundations for buildings, equipment, Switch yard structures, Transformer, MMS & other structures as per relevant BIS standards and recommendations of Geotechnical investigation report.

16.2 All design drawings shall be submitted to the Employer for approval before execution.

16.3 In case the contractor proposes to provide pile foundation for support of module mounting structure (MMS); the type, dia. and length of pile shall be as per recommendations of Geotechnical Investigation Report corresponding to prevalent soil characteristics at site, however the min. dia. and depth of the pile shall be 300 and 1000mm respectively except when very hard strata/ rock (N>100) is encountered at a higher level, the pile shall be extended in to the hard strata minimum 1 times the diameter of the pile or shall have total min. length of 1000 mm.

16.4 The pile shall project minimum 150mm above grade level to avoid any damage to the MMS column/sub support due to direct contact of rain water/ surface run-off.

16.5 In case collapse of foundation strata during drilling of the pile bore, removal steel liner shall be used to maintain design depth and diameter of the pile for proper concreting.

16.6 The design pile capacity under direct compression, lateral load and pull out shall be verified through field trials by conducting initial load tests on test piles to be specially cast for this purpose. The tests shall conform to IS 2911 – Part 4. The no. and location of such tests shall be as discussed and finalized with Engineer-in-charge. However, min. 3 no. of Tests shall be conducted under each category.

16.7 Contractor shall also carry out routine tests on 0.5 % of the total no. of working piles as per provisions of IS: 2911 – Part 4.

17.0 Module Mounting Structure (MMS)

17.1 The ground mounting structure design must follow the existing land profile.

17.2 The structure shall be designed to allow easy replacement of any module and shall be in line with the site requirements.

17.3 The MMS stub/ column, rafter, purlin, ties and bracing members shall conform to Indian standards as mentioned in the list of codes and standards: IS: 2062 – Hot rolled Medium and High tensile structural steel IS: 811 – Cold formed light gauge structural steel sections IS: 1161 – Steel tubes for structural purposes IS: 4923 – Hollow steel sections for structural use.

17.4 Minimum thickness (BMT) of various elements of MMS structure shall be as following: Stub/ column –2 mm, Rafter – 1.6 mm & Bracing/Purlin & other members – 1.6 mm. Final thickness of the members shall be arrived by structural analysis considering combination of all possible loads.

minimum thickness (BMT) of various elements of MMS structure for ZNAL shall be as following: Stub/ column – 1.2mm, Rafter – 2.5mm & Bracing/Purlin & other members – 1.0mm. Final thickness of the members shall be arrived by structural analysis considering combination of all possible loads.

17.5 The contractor can also propose new light gauge structural steel or structural Zinc-aluminium sections other than specified above subject to approval of the Employer. In this case the contractor shall submit his proposal stating the technical advantages of the proposed sections for Employers review along with supporting literature.

17.6 MMS column post shall be supported with base plate secured to foundation using anchor bolts for easy maintenance/ repair/ replacement.

17.7 The primary loads and load combinations for design of MMS structure shall be as specified under “Design Load” above.

17.8 The support structure design shall be as per relevant Indian standard(s) and shall be with working stress method considering appropriate factor of safety. No increase in permissible stress under wind/ Seismic load combination shall be permitted.

17.9 The maximum permissible deflection/ side sway limits for various elements of MMS under serviceability conditions shall be as following: Lateral deflection for Column/ stub – Span/ 240 & Vertical deflection for Rafter and Purlin – Span/ 181

17.10 In case of fundamental time period of MSS table structure more than 1 Sec, the structure design shall be checked against dynamic effects of wind as per provisions of IS – 875 (Part-3).

17.11 MMS shall support SPV modules at a given orientation & tilt, absorb and transfer the mechanical loads to the ground properly.

17.12 The MMS structure shall be hot dip galvanized with minimum thickness of coating not less than 81 microns on each side. Galvanization shall conform to IS-2629, 4759 & 4736 as applicable, considering coastal environmental condition. It is to ensure that before application of this coating, the steel surface shall be thoroughly cleaned of any paint, grease, rust, scale, acid or alkali or such foreign material as are likely to interfere with the coating process. The Contractor should ensure that inner side should also be coated. The galvanization shall be done after fabrication of members to ensure galvanization of all cut surfaces. In case the proposed section is made up of Aluminium, anodized coating shall be Gr AC25 and shall conform to IS: 1868. 10.13 The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels at the same time.

17.13 Two numbers of anti-theft fasteners of stainless steel on two diagonally opposite corners for each module shall be provided. All the fasteners and washers (packing & spring) for Module Mounting Structure and Module shall be adequately protected from atmosphere and weather prevailing in the area. Fasteners and washers to be used for erection of mounting structures and those for fixing Module over MMS shall be of stainless steel grade SS 316 equivalent and must sustain the adverse climatic conditions to ensure the life of the structure for atleast 25 years.

17.14 Modules shall be clamped & bolted with the structure properly. The material of clamps shall be Anodized Al / Stainless Steel. Clamp/bolt and must be designed in such a way so as not to cast any shadow on the active part of a module. In case bolts are used, Spring Washers shall be used bolt head end and EPDM rubber shall be used in between Module & purlin.

17.15 The MMS foundation shall be designed as per the loads specified under clause “Design Loads” above.

17.16 The array structure shall be grounded properly using maintenance free earthing kit.

17.17 The Contractor shall specify installation details of the PV modules and the support structures with appropriate diagram and drawings.

17.18 The Contractor should design the structure height considering highest flood level at the site and the finished grade level. The minimum clearance between the lower edge of the module and the finished grade shall be the higher of (i) Highest flood level + 100mm and (ii) 500 mm.

17.19 For multiple module mounting structures located in a single row, the alignment of all modules shall be within an error limit of maximum 10mm.

17.20 The Successful Bidder/ Contractor shall submit the detailed foundation & structural design basis and the list of reference standards, in this Bid, duly certified by a Chartered Structural Engineer having adequate successful experience in similar works.

17.21 The contractor shall submit the detailed design calculations and drawings for MMS structure, bill of materials and their specifications/ standards to the Employer for approval within 30 days from issue of LOI/ NTP before start for fabrication work.

17.22 Contractor must submit the complete quality documents i.e. test certificates for all tests conducted starting from raw material stage, in process, final testing w.r.t structure.

18.0 Concrete Works

18.1 All RCC works shall be with design mix as per IS 456 and the materials used viz. Cement, coarse & fine aggregate, Reinforcement steel etc. shall conform to relevant BIS standards

18.2 The minimum grade of RCC shall be M25 except for underground (UG) water tank where the grade of concrete shall be min. M30. PCC shall be of min. grade M10 (equivalent nominal Mix – 1:3:6) unless otherwise specified.

18.3 Reinforcement steel shall be of high strength TMT bars of grade Fe500 D conforming to IS: 1786. Ductile detailing in accordance with IS: 13920 shall be adopted for superstructure and sub-structure of all RCC buildings and structures.

18.4 For grouting works anti shrink ready mix grout of approved make or cement mortar (CM) grout with non-shrink additive shall be used. The grout shall be high strength grout having min. characteristic strength of 30 N/ mm^2 at 28 days.

19.0 Miscellaneous Steel Works

19.1 Unless otherwise specified all structural steel work shall be designed as per provisions of IS: 810 with working stress method of design (WSD).

19.2 Structural steel hot rolled sections, flats and plates shall conform IS: 2062.

19.3 Structural Pipes shall be medium (M)/high (H) grade conforming to IS: 1161.

19.4 Chequered plate shall conform to IS: 3502 and Hollow steel sections for structural purposes shall conform to IS: 4923.

20.0 Pipe and Cable Trenches

20.1 All cable trenches shall be of RCC. The min. wall and base slab thickness shall be 100mm for depth ≤ 750mm and 150mm for depths > 750mm. The trench shall be designed for lateral load due to external soil fill, ground water table at FGL and 50 KN/ Sqm surcharge. External trenches shall be kept min. 100mm above FGL to avoid entry of rain water.

20.2 Internal cable trench shall be provided with chequered plate (min. 8mm thick) covers, The trench cover shall be provided with suitable lifting hooks. Both top edges of the cable trench shall be provided with min. 50x50x6 mm edge protection angle.

21.0 NA

Inspection & Testing

22.0 Inspection:

22.1 Employer shall have free access to **Contractor's manufacturer's works** to inspect, expedite and witness **shop floor** tests. Any materials or work found to be defective or which does not meet the requirements of the specification will be rejected and shall be replaced at Contractor's cost. Employer reserves the right to carry out stage wise inspection of fabrication and components. The Contractor shall furnish a detailed quality assurance plan (QAP) for review by the Employer.

22.2 The test & inspection shall be carried out at manufacturer's work and at the site with the Contractor's obligation. The test and Inspection shall be done in accordance with the relevant standards and the Manufacturer's standard before the delivery to site as well as after the erection and commission at site. The Contractor shall give the list of tests that they will carry out at site to show the performance of Plant.

22.3 A detailed 'QAP' for Manufacturing and Inspection shall be submitted by the Contractor for Employer's approval. The data of each test and inspection shall be recorded and submitted as soon as the test/ trials are conducted and will also be a part of final documentation.

22.4 The shop test shall be carried out to prove the performance parameters of the offered model. The testing shall be done in the presence of the representatives of the department.

22.5 Manufacturer has to submit procedure for Test carried out at their Factory:

- Start Up Trials
- Load Test
- Records & Measurements
- Safety Device List
- Setting values for all sensors for Pressure and Temperature
- Dimensional Check-up, Overall Inspection, Completeness of Scope of Supply
- Shop Test/Load Test for Solar Power Plant

23.0 Load Trials & Reliability test at Site

23.1 Performance Guarantee Test at Site for Grid Connect Solar Power Plant, HT Panel etc. These tests will be conducted at site as per site conditions at available load and after performing all pre-commissioning check and trials and after readiness of the entire Solar Power Plant system which are required to carry out the load trials

23.2 All the tests which are mentioned in the load test of Solar Power Plant will be carried out in presence of Employers' Representative at Site under site conditions and the parameters checked in accordance with the data sheet and guaranteed parameters given by the Contractor.

23.3 All the equipment supplied by the vendor will be tested as per relevant standard/ Quality assurance plan at site conditions and the performance monitored.

24.0 Quality Considerations

24.1 Contractor will submit and get finalized detailed comprehensive Standard Field Quality Plan (SFQP) within 30 days from date of issue of the LOI/NTP/PO for bought out items and items manufactured by them. The Standard Field Quality Plan shall relate to the specific and objective erection practices right from storage of equipment till final inspection and testing to be followed for bought out items and items manufactured by Contractor. Accordingly, the Manufacturing Quality Plan shall be submitted broadly under following sub-heads:-

- Raw material/Bought Out items and Components.
- In process inspection and test/checks to establish successful completion/ accomplishment of the process.
- Final tests/checks in accordance with relevant national/ international standards/ specification.

24.2 The quantum of check for each and every inspection/test items shall be based on an established sampling method and the quantum of check indicated in the SFQP should be designed adequate quality protection.

24.3 In case reference documents/acceptance norms are indicated as per Plant standards then the same shall be duly substantiated/properly explained by well-established and proven engineering practices. All submissions will be in English language only.

24.4 Contractor will to allow Employer to carry out Quality/Audit/Quality surveillance on Contractor's and our sub-vendor's work with reference to contractual obligations to ensure that the quality management practices/norms as detailed out in the Quality Manual are adhered to. To facilitate this activity, you shall keep Employer informed all progress of work in this contract on monthly basis.

24.5 Contractor will associate/fully witness in each inspection being carried out at their/their sub-vendor's works by our authorized inspection engineer(s).

24.6 Employer shall also carry out quality audit and quality surveillance of your systems, procedures and quality control activities. However, this shall not relive you of any of your contractual responsibilities under the contract.

25. 0 Performance and Functional Warranty / Guarantees

25.1 PV modules used in grid connected solar power Plant s must be warranted for peak output wattage, which should not be less than 90% at the end of 10 years and 81% at the end of 25 years.

25.2 Modules shall be warranted for at least 5 years for failures due to material defects and workmanship.

25.3 The mechanical structures, electrical works and overall workmanship of the grid connected solar power Plant must be warranted for a minimum of 5 years.

25.4 The Contractor must ensure that the goods supplied under the Contract are new, unused and of most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

25.5 The warranty / guarantee period shall be as follows:

- Solar PV Modules: Modules shall be warranted for a minimum period of 5 years in the Contractor's detailed Warranty / Guarantee certificate.
- Power Conditioning Units (PCU): PCUs shall be warranted for a period of minimum 5 years from the date of Operational Acceptance or guarantee period provided by the OEM, whichever is higher.
- Transformers, associated switch gear and others: Contractor must furnish in detail its warranties / guarantees for these items.
- All other associated equipment, not mentioned, but otherwise included in the scope of the contract must be warranted for minimum 5 years against its performance and workmanship from the date of Operational Acceptance of the Plant.
- The time period of all these warranties shall be calculated from the day of Operational Acceptance of the Project. If the manufacturer provides it from the date of manufacturing, it is Contractor's responsibility to get the extended warranty from the manufacturer at its own cost and effort.

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

25.7 At the end of guarantee period, the Contractor's liability shall cease. In respect of goods not covered by the first paragraph of this clause, the Employer shall be entitled to the benefit of such guarantee given to the Contractor by the original Contractor or manufacturer of such goods.

25.8 The performance of the Plant will be determined by the performance ratio (PR). The same shall be measured and recorded for a period of one month for operational acceptance of the Plant.

25.9 During the first year of assured performance demonstration and Operation & Maintenance thereafter, the Contractor shall be responsible for any defects in the work due to faulty workmanship or due to use of sub-standard materials in the work. Any defects in the work during the guarantee period shall therefore, be rectified by the Contractor without any extra cost to the Employer within a reasonable time as may be considered from the date of receipt of such intimation from the Employer failing which the Employer shall take up rectification work at the risk and cost of the Contractor.

Guaranteed Technical Particular data Sheet for Solar PV Module -SHEET-1

(To be furnished by the bidder)

S.No.	Particulars	Unit	Type/ value
1	P V M o d u l e M a n u f a c t u r e		
2	P V M o d u l e t y p e (Crystalline - Mono / Multi)		
3	Product Code (commercial)		
4	No of PV cells per module	Cells	
5	Mounting arrangement for Module Solar		
6	Solar Module frame material (if framed)		
7	Module dimensions	mm	
8	Output Cables (viz., Polarized Weather		
9	Proof DC rated multi - contact connector)	mm	
10	Front Glass Description & Thickness	mm	
11	Back Sheet Details		
12	Encapsulating Details		
13	Cell Efficiency	%	
14	Module efficiency	%	

Guaranteed Technical Particular data Sheet for Solar Power Conditioning Unit -SHEET-2

(To be furnished by the bidder)

S.No	Particulars	Unit	Value
1	Make		
2	Country		
3	Origin		
4	**Ac Side**		
4.1	Nominal Power @ 25 C	KW	
4.2	Nominal Power @ 50 C	KW	
4.3	Output AC Voltage	Vac	
4.4	Output AC Current	A ac	
4.5	Frequency (and Variation)	Hz	
4.6	Total Harmonic Distortion (<3%)	%	
4.7	Ac Over/Under voltage , Over/Under		
	Frequency Protection		
4.8	Phase Shift (Cos Phi)		
5	**DC Side**		
5.1	Maximum Input DC Power	KW	
5.2	Maximum DC Voltage	V dc	
5.3	MTSCL Voltage Range	V dc	
5.4	Maximum Dc Current	A dc	
5.5	Dc Voltage Protection		
5.6	Dc Voltage ripple	%	
6	**Others**		
6.1	Maximum Efficiency	%	
6.2	Euro Efficiency	%	
6.3	Ambient Temperature range	C	
6.4	Humidity (Non-Condensing)	RH	
6.5	Quiescent Power	KW	
6.6	Degree of Protection		
6.7	Dimensions Approx (H x W x D)	mm	
6.8	Weight	Kg	
6.9	Compliances (Reference Standards)		

Guaranteed Technical Particular data Sheet for Step-Up-Transformer -SHEET-3

(To be furnished by the bidder)

S.No	Particulars		Guaranteed particulars to be filled in by the manufacturer
1	Service		
2	Type		
3	Rating (kVA)		
4	Rated frequency (Hz)		
5	Number of phase		
	HV side		
	LV side		
	Neutral (separate outside)		
6	Rated Voltage		
	a) HV winding (kV)		
	b) LV winding (kV)		
7	Vector group		
8	Type of cooling (ONAN/ONAF)		
9	Insulation level		
	a)	Power frequency withstand -kV rms. (HV/LV)	
	b)	Impulse withstand voltage -kV (HV/LV)	
10	Method of Earthing		
11	Method of Earthing		
12	Duty		
13	Short circuit level		
14	Off circuit tap changer:		
	a) Range %		
	b)	In steps of	
	c)	Tapping provided on HV side	
15	Tap changer type		
16	Impedance voltage at 75^{o}C		
	a) At principal tapping %		
17	Temperature rise above 50^{o}C ambient		
	a) Top of oil by thermometer ^{o}C		
	b) Winding by resistance ^{o}C		

S.No	Particulars	Guaranteed particulars to be filled in by the manufacturer
18	Terminal details a) HV side b) LV side	
19	Losses (at 75^{o}C and principal tapping) No load loss at rated voltage kW and frequency Load loss at rated current kW (ONAN) Total loss at maximum rated power kW	
20	Efficiency at 75^{o}C and 0.9 PF a) At full load (ONAN) % b) At 75% load (ONAN) % c) At 50% load (ONAN) %	
21	Hot spot temperature in winding limit to ^{o}C	
22	Shipping dimensions a) Height m b) Breadth m c) Length m	
23	Painting	
24	Reference Standards	

TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – VI

Forms and Formats

Section – VI – Forms and Formats

Appendix 1: Performa for Bid Letter (on Bidders' letter head)

To

The Managing Director

Tiruchirappalli Smart City Limited
58, Bharathidasan Salai
Cantonment
Tiruchirappalli city 620 001

Date: --/--/----

Subject: Submission of the bid _____ for the work of Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at STP Panchappur near Madurai By-Pass road in Tiruchirappalli City Corporation., Tiruchirappalli city, Tamilnadu , India

Dear Sir,

We, the undersigned, have considered and complied with the "Instructions to Bidders" and have accepted the terms stipulated in the NIT documents. The scope of work shall include but not be limited to Design , Supply , Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur near in Tiruchirappalli City Corporation. , Tiruchirappalli city, Tamilnadu, India including Operation and Maintenance for 10 (Ten) years from the date of operational acceptance after commissioning & Operational Acceptance of 2.4Mwp (DC) Solar Photovoltaic Grid Connected Solar Power Plant on turnkey basis at Panchappur of Tiruchirappalli city Corporation area , Tiruchirappalli city , Tamilnadu , India

All the above shall be done as per _____

Also, we have familiarized ourselves with the land surface and subsurface, metrological, climatological and environmental conditions which may exist in the installations area. In full cognizance and compliance with these aforesaid conditions and the regulations of local government authorities, we the undersigned do hereby offer for the subject project using PV technology on a turnkey basis at Panchappur of Tiruchirappalli city Corporation STP area, Tiruchirappalli city, Tamil Nadu, India, for which we have Bid. The work covered under the Bid shall be completed to the entire satisfaction of yourselves or your representative in conformity with the NIT documents at the prices accompanying this Bid.

I. It is a term of our Bid that the Project shall be handed over installed, interconnected, tested, commissioned and modified and shall achieve Commissioning not later than **(181) One Eighty days** from the date of issue of LOI/NTP/PO as per the completion schedule mentioned under SCC Clause 8. This shall be the essence of the Contract between us.
II. We further agree and stipulate as follows:
III. Until the final Contract Documents are prepared and executed, the NIT documents, with any modifications, additions, deletions agreed with the Employer and your written acceptance

submitted in the form signed and stamped NIT documents along with its amendments (if any) by Authorized signatory of the contractor at the time of bidding, shall constitute a binding Contract between us, upon terms contained in aforesaid documents and the Financial Proposal accompanying the Bid.

IV. That the Employer will not supply any men, material & logistics. In all respects we shall be fully self-sufficient in the Performance of the work.

V. I/ We understand that Employer is not bound to accept the lowest of the Bid you may receive.

VI. I/ We shall make available to the Employer any additional information it may find necessary or require to supplement or authenticate the qualification statement.

VII. I/ We acknowledge the right of the Employer to reject our Bid without assigning any reason or otherwise and hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

VIII.I/ We understand that you may cancel the bidding process at any time and that you are neither bound to accept any Application that you may receive nor to invite the Applicants to Bid for the Project, without incurring any liability to the Applicants.

IX. I/ We further certify that in regard to matters relating to security and integrity of the country, we or any of our Associates have not been charge-sheeted by any agency of the Government or convicted by a Court of Law.

X. I/ We further certify that no investigation by a regulatory authority is pending either against us or against our Associates or against our CEO or any of our directors/ managers/ employees.

XI. I/ We undertake that in case due to any change in facts or circumstances during the bidding process, we are attracted by the provisions of disqualification in terms of the provisions of this NIT; we shall intimate the Employer of the same immediately.

XII. We understand that the selected Bidder shall be an existing Company incorporated under the Indian Companies Act, 1956 or 2013/ Proprietorship/Partnership/LLB firm.

XIII.I/ We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by the Employer in connection with the selection of Applicants, selection of the Bidder, or in connection with the selection/ bidding process itself, in respect of the above mentioned Project and the terms and implementation thereof.

XIV.I/ We agree and undertake to abide by all the terms and conditions of the NIT document.

XV. I/We agree to keep the bidding valid for acceptance for a period of 90 days from the date of floating the Bid (hereinafter referred to as validity period) and the Bid shall not be withdrawn on

or after the opening of bidding till the expiration of the validity period or any extension thereof.

XVI.I/We also undertake not to vary/ modify the Bid during the validity period or any extension thereof.

XVII.I/We represent that we have fully satisfied ourselves as to the nature and location of the Project having in mind the general and local conditions and other factors incidental to the Performance of the works and the costs there of.

XVIII.I/We further represent that from our own investigation of the Site of the Project we have fully satisfied ourselves as to the character, quality other soil conditions to be encountered in the Performance of the works and we understand and represent that any failure to acquaint ourselves in respect of these matters and the other factors and conditions as set forth shall not relieve us from any responsibility for estimating properly the difficulty and cost of successfully performing the works.

XIX.I/We also acknowledge and accept that you shall not pay for any discontinuance or low Performance rate resulting from malfunction of / or inadequacy of our equipment, instruments or personnel.

XX.I/We agree to return to you all reports and technical data provided for our use in preparing this Bid and in the subsequent conduct of the works. We undertake that we will not use the same for any other work/purpose.

XXI.I/We further represent that we have familiarized ourselves with all the terms and provisions of the various parts of the bidding documents and that in making our Bid, we do not rely upon any representation made by any agent or employee of yourselves in respect of the terms of the bidding documents or the nature of the Performance of the works.

XXII.I/We submit this Bid with the full understanding that our Bid fully complies with all the terms and conditions of the NIT documents including Bid evaluation criteria and that no deviation/ exception to the NIT documents have been taken by us. We also agree that in case we have taken any exceptions/ deviations to the NIT documents, the Employer will be free to reject our offer on account of such exceptions/deviations.

XXIII.I/We agree to guarantee following minimum Plant Performance parameters: Performance Ratio (PR) not less than 0.78 at the time of Operational Acceptance and Plant Capacity Utilization Factor (CUF) not less than 18% at the end of first year from the date of Operational Acceptance till remaining O&M period.

Dated this _____ day of _____ 2018 Signature: _____

In the capacity of: Duly authorized to sign Tenders for and on behalf of (Name & Address)

Appendix 2: Details of Bidder (on Bidders' Letter head)

1. General

a. Name of Company:

b. Country of incorporation:

c. Address of the corporate headquarters and its branch office(s), if any, in India:

d. Date of incorporation and/ or commencement of business:

Brief description of the Company including details of its main lines of business and proposed role and responsibilities in this Project:

Details of individual(s) who will serve as the point of contact/ communication for the Company:

a. Name:

b. Designation

c. Company:

d. Address:

e. Telephone Number:

f. E-Mail Address:

g. Fax Number:

Particulars of the Authorized Signatory of the Bidder:

a. Name:

b. Designation:

c. Address:

d. Phone Number:

e. Fax Number:

Detail of the Bank from where the EMD is issued and submitted along with bid.

A. Name of Contact Person:
B. Name of Bank:
C. Address:
D. Phone No.:
E. Fax No.:
F. E-mail:

Appendix 3: Bid Evaluation Criteria (BEC)

Following factors shall be required for evaluation of Bid:
The Evaluated Bid Value (EBV) shall be calculated using the following method:

1. Contract Value i.e., Total sum of the price mentioned under different work package heads viz. Design, Supply of materials required for Erection ,Installation & Commissioning of 2.4Mw solar power plant & Erection, Installation & Commissioning of 2.4Mw solar power plant works package including all taxes and duties as provided in the Table 5A and 5B of the financial proposal.

2. Net Present Value (NPV) of O&M Contract Price excluding taxes for Ten years

Note

Bidder with lowest EBV shall be L-1 and the Bidder higher than that shall be the L-2 and so on. Present Value Factor for the mentioned Discount Rate will be considered up to 3 decimal places only.

The evaluated price for EPC Works shall be inclusive of all taxes and duties as price quoted by the bidder & evaluated Price for O&M works shall be excluding taxes. Bidder is required to ascertain correctness of applicable Taxes and Duties at the time of bid submission, as for the purpose of evaluation, the Taxes and Duties mentioned by bidder shall be considered.

In case, any of the item/ component from the entire supplies is imported by the bidder than the price break up of those items shall be mentioned separately along with the applicable taxes and duties (bidder is required to ascertain correctness of taxes & duties as for the purpose of evaluation the Taxes and Duties mentioned by bidder shall be considered). Further in case, any concession/ exemption is desired to be availed by the bidder in accordance with provisions of GCC Clause 8.5, and as applicable by the permissible law/ rule/ regulations then the same shall be mentioned by the bidder.

Appendix 4: Power Plant Performance Guarantee Test

- Performance Ratio as determined through the PR Test Procedure specified here should not be less than 0.78 for Operational Acceptance.
- The Contractor shall demonstrate Plant Capacity Utilization Factor (CUF) not less than 18% at the end of first year from the date of Operational Acceptance.

Table 4A: Solar Plant Performance Parameters

Particulars	**Proposal**
Solar PV module Technology proposed	Poly Crystalline
DC installed Capacity Proposed (in kW)	2400
Mounting structures proposed	Fixed tilt
PR at the time of Operational Acceptance	0.78
Guaranteed CUF	18%

Note:

- CUF shall be demonstrated against the minimum DC Capacity (i.e. 2.4Mwp) to be installed at STC
- PR shall be demonstrated against the installed DC Capacity.
- Subsequent to the Commissioning of the Plant, the Contractor shall notify the Employer a date for Commencement of PR Test Procedure within the specified timeline of contract. Contractor is also advised to conduct PR test well within time line, so that in case any correction, modification or remedy required in the system can be carried within time line.
- CUF will be calculated annually from the date of Operational Acceptance of the Facilities.

Appendix 5: Performa for Financial Proposal (on Bidders' Letter head)

To

The Managing Director

Tiruchirappalli Smart City Limited
58, Bharathidasan salai
Cantonment
Tiruchirappalli city 620001

Date: --/--/----

Sub: Submission of the Financial Proposal _____ for the work of Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at STP Panchappur in Tiruchirappalli City Corporation. , Tiruchirappalli city on turnkey basis for 10 (ten) years, Tiruchirappalli city , Tamilnadu, India

Sir,

I,_____, against Roc No. _____ for the work of Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur in Tiruchirappalli City Corporation. , Tiruchirappalli city on turnkey basis for 10 (ten) years in the city of Tiruchirappalli city, Tamilnadu, India dated __/__/__, confirming that:

I agree to all the terms and conditions set forth in this NIT document. If awarded the Project, the implementation of the Project shall also conform to the terms and conditions, as well as specifications indicated in the NIT documents and as finally indicated by the Evaluation Committee.

Rates quoted in this Bid is FOR destination prices inclusive of all taxes (unless stated otherwise), levies, duties, packing, forwarding, freight, insurance, loading, unloading, supply, installation, commissioning, and any/all charges for successful Engineering, Procurement, Construction, Installation, Testing, interconnection to designated transformer at Panchappur of Tiruchirappalli city Corporation area, Tiruchirappalli city , Commissioning of 2.4Mw (DC) Solar Photovoltaic Grid Connected Power Plant on turnkey basis and O&M for 10 (ten) years , Tiruchirappalli city , Tamilnadu , India

Construction, Operation and Maintenance "Project" . The break-up of taxes considered are also furnished in price bid.

Under any circumstances, escalation in the prices quoted against various items of this NIT Document shall not be entertained. The details quoted herein stands valid for at least six months from the date of opening of Bid.

Appendix 6: Details of qualified technical staff for EPC and O&M separately (On bidders' Letter head)

S. No.	Name	Relevant Qualification	Additional Certifications	Total Years of relevant Experience
1				
2				
3				
4				

Note: Kindly submit copies of resumes and appropriate certifications with this sheet. Additional sheets may be used to provide accurate information.

Signature :

Name :

Address :

Email :

Designation :

Organization :

Phone :

Seal of the Company

Appendix 7: Declaration of Compliance (On bidders' Letter head)

To
The Managing Director
Tiruchirappalli Smart City Limited
58, Bharathidasan Salai,
Cantonment
Tiruchirappalli city 620001

Date: --/--/----

Subject: Declaration of Compliance _____ for the work of Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur in Tiruchirappalli City Corporation on turnkey basis for 10 (ten) years, Tiruchirappalli city, Tamilnadu , India

Dear Sir,

This is to certify that I, _____, am the duly authorized signatory appointed on behalf of my organization to submit this Bid. The Power of Attorney along with Board Resolution is attached herewith.

I agree to all the terms and conditions set forth in this NIT Document.

If awarded the job, the job work shall also conform to the terms and conditions, as well as specifications indicated in the NIT documents and as finally indicated by the Evaluation Committee.

I further certify that all the information provided in this document is accurate to the best of my knowledge.

Signature **:**

Name **:**

Address **:**

Email **:**

Designation **:**

Organization **:**

Phone **:**

Seal of the Company

Appendix 8: No Deviation Certificate (On bidders' Letter head)

To

The Managing Director
Tiruchirappalli Smart City Limited
58, Bharathidasan Salai,
Cantonment
Tiruchirappalli city 620001

Date: --/--/----

Subject: No Deviation Certificate (_____) for the work of Design , Supply , Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur in Tiruchirappalli City Corporation on turnkey basis for 10 (ten) years , Tiruchirappalli city, Tamilnadu , India

Dear Sir,

We, _____(Bidder's name), confirm our acceptance to all terms and conditions mentioned in the NIT Document, and all subsequent clarifications, in totality and withdraw all deviations raised by us, if any.

Signature **:**

Name **:**

Address **:**

Email **:**

Designation **:**

Organization **:**

Phone **:**

Seal of the Company

Appendix 9: Declaration on Bidder's relation to Directors (On bidders' Letter head)

This has reference to our proposed bid/ Contract (Roc No.: _____) for the work of Design, Supply, Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur near in Tiruchirappalli City Corporation, Tiruchirappalli city on turnkey basis for 10 (ten) years , Tiruchirappalli city, Tamilnadu , India

We certify that to the best of my/our knowledge;

- I am not a relative of any Director of TSCL/CCMC.
- We are not a firm in which a Director of TSCL/CCMC or its relative is a partner;
- I am not a partner in a firm in which a Director of TSCL/CCMC, or its relative is a partner;
- We are not a private company in which a Director of TSCL and TSCL is a member or director;
- We are not a company in which Directors of TSCL/CCMC hold more than 2% of the paid-up share capital of our company or vice-versa.

Signature :

Name :

Address :

Email :

Designation :

Organization :

Phone :

Seal of the Company

Appendix 10: Execution Timeline (on Bidders' letter head)

DETAILED PROJECT SCHEDULE

Bidder shall enclose Gantt chart / PERT chart for the schedule of activities

1. Supply of all the items.
2. Complete installation plan (in detail)
3. Testing of the complete Plant
4. Pre-Commissioning of Complete Plant.
5. Commissioning of the Plant.
6. Performance Guarantee Testing of the Plant.

NOTE: The Bidder shall ensure that the Commissioning of Plant along with Completion of EPC Works with respect to all the associated infrastructure, as mentioned under Section-V (Technical Specification) is completed within (181) One Hundred Eighty days of issue of LOI/NTP/PO or 120 days from the handing over of last patch of 10.00 Acres of land, whichever is later.

Signature **:**

Name **:**

Address **:**

Email **:**

Designation **:**

Organization **:**

Phone **:**

Seal of the Company

Appendix 11(a): Format of Bank Guarantee for Bid Bond

(BANK GUARANTEE ON NON-JUDICIAL STAMP PAPER OF Rs.100)
(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.)

Ref._____ Bank Guarantee No. _____Date:_____ EMD,

BANK GUARANTEE FORMAT FOR TENDER /Roc No._____

In consideration of the ----------[Insert name of the Bidder] (hereinafter referred to as 'Bidder') submitting the response to NIT inter alia for (Roc No._____) Design , Supply , Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur near in Tiruchirappalli City Corporation. , Tiruchirappalli city on turnkey basis and O&M for 10 (Ten) years Panchappur of Tiruchirappalli city Corporation (_____) dated _____ issued by Tiruchirappalli city Smart City Limited (TSCL) considering such response to the NIT of ..... [insert the name of the Bidder] as per the terms of the NIT, the _____ [insert name & address of bank] hereby agrees unequivocally, irrevocably and unconditionally to pay to Tiruchirappalli city Smart City Limited (TSCL) at [I Tiruchirappalli city Smart City Limited (TSCL), Tiruchirappalli city Corporation, 58, Bharathidasan salai, Cantonment, Tiruchirappalli city] forthwith on demand in writing from TSCL or any Officer authorized by it in this behalf, any amount up to and not exceeding Rupees ----------*[Insert amount as per Clause 1.2.1 of Section II: ITB*] only, on behalf of M/s. _____[*Insert name of the Bidder*] .

This guarantee shall be valid and binding on this Bank up to and including _____[insert date of validity in accordance with *Clause 1.2.1 of Section II: ITB* of this NIT] and shall not be terminable by notice or any change in the constitution of the Bank or the term of contract or by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between parties to the respective agreement.

Our liability under this Guarantee is restricted to Rs._____ (Rs. _____ only). Our Guarantee shall remain in force until _____ [insert date of validity in accordance with Clause 1.2.1 of Section II: ITB of this NIT].
TSCL shall be entitled to invoke this Guarantee till _____ [Insert date which is 30 days after the date in the preceding sentence].

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

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

The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection by ---------- [Insert name of the selected Contractor] and/or any other person. The Guarantor Bank shall not require TSCL to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against TSCL in respect of any payment made hereunder

This BANK GUARANTEE shall be interpreted in accordance with the laws of India and the courts at Tiruchirappalli city shall have exclusive jurisdiction.
The Guarantor Bank represents that this BANK GUARANTEE has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein.

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

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

The Guarantor Bank acknowledges that this BANK GUARANTEE is not personal to TSCL and may be assigned, in whole or in part, (whether absolutely or by way of security) by TSCL to any entity to whom TSCL is entitled to assign its rights and obligations.
Notwithstanding anything contained here in above, our liability under this Guarantee is restricted to Rs. _____ (Rs. _____ only) and it shall remain in force until ..... We are liable to pay the guaranteed amount or any part thereof under this Bank
Guarantee only if TSCL serves upon us a written claim or demand.

Signature _____ Name_____
Power of Attorney No._____

For
_____[Insert Name of the Bank]__ Banker's Stamp and Full Address. Dated this ____ day of ____, 20__ Witness:

1. ..... Signature
   Name and Address
   2. ..... Signature
   Name and Address

The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per stamp duty applicable at the place where the tender has emanated. The non-judicial stamp paper should be in name of the issuing bank.

The Bank Guarantee by Bidder will be given from scheduled commercial bank

This bank guarantee/ all further communication relating to the bank guarantee should be forwarded to TSCL.

The full address along with the Telex/Fax No. and email address of the issuing bank to be mentioned.

! The Bank Guarantee Checklist provided in Appendix 12(d): Bank Guarantee Verification, duly filled in, should be enclosed with The Bank Guarantee.

Note:

1. Non-submission of EMD shall result into rejection of bid and no request from bidder, shall be entertained in this regard.
2. In case the bid is submitted by a Joint Venture, the EMD shall be in the name of the Joint Venture and not in the name of the Lead Partner or any other Partner(s) of the Joint Venture. Non-compliance of the same shall result into rejection of bid and no request from bidder, shall be entertained in this regard. [NOT APPLICABLE AS JV IS NOT ALLOWED]

Appendix 11(b): Format for Performance Bank Guarantee

(**Note**: Performance Guarantee is to be submitted in Bank Guarantee as per the ITB Clause 1.2.1 at respective times)

[To be on non-judicial stamp paper of Rupees One Hundred Only (INR 100/-) or appropriate value as per Stamp Act relevant to place of execution, duly signed on each page. Foreign entities submitting Bid are required to follow the applicable law in their country]

Reference No. ..... Bank Guarantee No. ..... Dated: ..... (On stamp paper of Rs.100/-)

In consideration of the ----- [Insert name of the Bidder] (hereinafter referred to as 'Contractor') submitting the response to Roc No._____ for Design , Supply , Installation & Commissioning of 2.4 Mwp solar power plant at Panchappur in Tiruchirappalli City Corporation. , Tiruchirappalli city on turnkey basis and O&M for 10 (Ten) years in response to the NIT dated..... issued by Tiruchirappalli city Smart City Limited (TSCL) considering such response to the NIT of .....[insert the name of the Contractor] (which expression shall unless repugnant to the context or meaning thereof include its executers, administrators, successors and assignees) and selecting the Contractor and issuing Letter of Intent No ------- to (*Insert Name of Contractor*) as per terms of NIT and the same having been accepted by the Contractor. As per the terms of the NIT, the _____ [*insert name & address of bank*] hereby agrees unequivocally, irrevocably and unconditionally to pay to Tiruchirappalli city Smart City Limited (TSCL) at [*Insert Name of the Place from the address of TSCL]* forthwith on demand in writing from TSCL or any Officer authorised by it in this behalf, any amount up to and not exceeding Rupees----------*[Insert amount as per Clause 1.2.1 of Section II: ITB*] only, on behalf of M/s _____ *[Insert name of the Contractor*] This guarantee shall be valid and binding on this Bank up to and including_____[*insert date of validity in accordance with Clause 1.2.1 of Section II: ITB of this NIT*] and shall not be terminable by notice or any change in the constitution of the Bank or the term of contract or by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between parties to the respective agreement.

Our liability under this Guarantee is restricted to Rs. _____ (Rs. _____only).

Our Guarantee shall remain in force until ..... [insert date of validity in accordance with Clause 1.2.1 of Section II: ITB]. TSCL shall be entitled to invoke this Guarantee till ..... until [Insert date which is 30 days after the date in the preceding sentence].

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

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

The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection by ---------- [*Insert name of the Contractor*] and/or any other person. The Guarantor Bank shall not require TSCL to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against TSCL in respect of any payment made hereunder

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

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

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

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

The Guarantor Bank acknowledges that this BANK GUARANTEE is not personal to TSCL and may be assigned, in whole or in part, (whether absolutely or by way of security) by TSCL to any entity to whom TSCL is entitled to assign its rights and obligations.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to Rs. _____ (Rs. _____ only) and it shall remain in force until ..... We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if TSCL serves upon us a written claim or demand.

Signature _____ Name_____

Power of Attorney No._____

For

_____ [Insert Name of the Bank]__ Banker's Stamp and Full Address. Dated this ____ day of ____, 20__ Witness:

1. ..... Signature
   Name and Address

2. ..... Signature

2. Name and Address

INSTRUCTIONS FOR FURNISHING PERFORMANCE BANK GUARANTEE

The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per stamp duty applicable at the place where the tender has emanated. The non-judicial stamp paper should be in name of the issuing bank.

The Bank Guarantee by Bidder will be given from Scheduled commercial bank

This bank guarantee/ all further communication relating to the bank guarantee should be forwarded to TSCL.

The full address along with the Telex/Fax No. and email address of the issuing bank to be mentioned.

The Bank Guarantee Checklist provided in Appendix 12(d): Bank Guarantee Verification, duly filled in, should be enclosed with The Bank Guarantee.

Appendix11(c): Format of Bank Guarantee for Performance of O&M

[To be on non-judicial stamp paper of Rupees One Hundred Only (INR 100/-) or appropriate value as per Stamp Act relevant to place of execution, duly signed on each page. Foreign entities submitting Bid are required to follow the applicable law in their country]

Reference No. ..... Bank Guarantee No. ..... Dated: ..... To:

WHEREAS ..... *[Insert name of the Contractor]* with address ..... *[Insert address of the Contractor]* having its registered office at ..... *[Insert address of the Contractor]* (Hereinafter, the "Bidder") wishes to participate in NIT document _____ issued by Tiruchirappalli city Smart City Limited (TSCL) ON BEHALF OF Tiruchirappalli city Smart City Limited ("TSCL") (hereinafter, the "Beneficiary") for Operation and Maintenance of Performance of 2.4Mwp (DC) Solar PV Power Plant at designated substation at Manikandam S/S, Tiruchirappalli city , Tamilnadu , India (33kV).

And WHEREAS a Bank Guarantee for Rupees *[.....]* valid till ..... *[Insert date 5 years from the date of Operational Acceptance]* is required to be submitted by the Contractor as per the terms and conditions of the NIT.

We, ...[Insert name of the Bank and address of the Branch giving the Bank Guarantee] having our registered office at ..... [Insert address of the registered office of the Bank] hereby give this Bank Guarantee No. ..... [Insert Bank Guarantee number] dated ..... [Insert the date of the Bank Guarantee], and hereby agree unequivocally and unconditionally to pay immediately on demand in writing from the Beneficiary any officer authorized by it in this behalf any amount not exceeding Rupees [.....] to the said Beneficiary on behalf of the Bidder.

We ..... *[Insert name of the Bank]* also agree that withdrawal of the Bid or part thereof by the Bidder within its validity or non-submission of further O&M Performance Bank Guarantee by the Bidder within the stipulated time of the Letter of Intent to the Bidder or any violation to the relevant terms stipulated in the NIT would constitute a default on the part of the Bidder and that this Bank Guarantee is liable to be invoked and encashed within its validity by the Beneficiary in case of any occurrence of a default on the part of the Bidder and that the encashed amount is liable to be forfeited by the Beneficiary.

NIT for Design,Supply, Installation,Commissioning & Maintenance of Solar Power Plant at Panchappur of Tiruchirappalli city Corporation area , Tiruchirappalli city on turnkey basis and O&M for 10 (Ten) years Panchappur of Tiruchirappalli city Corporation area , Tiruchirappalli city , tamil nadu , India

This agreement shall be valid and binding on this Bank up to and inclusive of ..... *[Insert the date of validity of the Bank]* and shall not be terminable by notice or by Guarantor change in the

constitution of the Bank or the firm of the Bidder Or by any reason whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, conceded with or without our knowledge or consent by or between the Bidder and the Beneficiary.

NOTWITHSTANDING anything contained hereinbefore, our liability under this guarantee is restricted to Rupees ..... (*Insert the Amount*). Our Guarantee shall remain in force till ..... *[Insert date]*. Unless demands or claims under this Bank Guarantee are made to us in writing on or before ..... *[Insert date]*, all rights of the Beneficiary under this Bank Guarantee shall be forfeited and we shall be released and discharged from all liabilities there under.

[Insert the address of the Bank with complete postal branch code, telephone and fax numbers, and official round seal of the Bank] [Insert signature of the Bank's Authorized Signatory]

Attested:
..... [Signature] (Notary Public)

Place: ..... Date: .....

Signature _____ Name_____

Power of Attorney No._____

For

_____[Insert Name of the Bank]__ Banker's Stamp and Full Address. Dated this ____ day of ____, 20__ Witness:

1. ..... Signature
   Name and Address

2. ..... Signature
   Name and Address

INSTRUCTIONS FOR FURNISHING BANK GUARANTEE

The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per stamp duty applicable at the place where the tender has emanated. The non-judicial stamp paper should be in name of the issuing bank.

The Bank Guarantee by Bidder will be given from bank (shall include Nationalized & scheduled banks India).

This bank guarantee/ all further communication relating to the bank guarantee should be forwarded to Tiruchirappalli city Smart City Limited.

The full address along with the Telex/Fax No. and email address of the issuing bank to be mentioned.

The Bank Guarantee Checklist provided in Appendix 12(d): Bank Guarantee Verification, duly filled in, should be enclosed with The Bank Guarantee.

Appendix11 (d): Check List for Bank Guarantee Verification

S.No	Check List	Yes	No
1	Does the bank guarantee Compare verbatim with the format provided for it in this NIT Has the executing Officer Of BG indicated his name		
2	Designation & power of Attorney No./signing power Number etc. on BG.		
3	Is each page of BG duly signed/initialed by the executant, and last page is signed will full particulars and under the seal of the Bank.		
4	Does the last page of the BG carry the signatures of two witnesses alongside the signatures of the executing Bank Manager?		
5	Is the BG on non-judicial stamp Paper of appropriate value.		
6	Is the date of sale of non- judicial stamp paper shown on the BG and the stamp paper is issued not more than six months prior to the date of execution of BG.		
7	Are the factual details such As Bid Specification No., LOI No., contract price, Etc. correct.		
8	Whether overwriting/cutting of any on the BG authenticated under signature & seal of Executants.		
9	Is the amount and validity of BG in line with terms of the NIT?		
10	Is the Bank Guarantee Issued from a Bank's Branch located outside India		
11	If the response to 10 Above is yes, has the Bank Guarantee been routed through the correspondent branch in India for due verification of the signature(s) of the executants(s)?		
12	Whether the BG has been issued by a Bank as per relevant provisions of the bidding documents.		

Note: Bidder / Contractor / Associate / Collaborator is required to fill up this from and enclose along with the Bank Guarantee.

Appendix 12: Terms of Payment

Payments shall be released against each component of Price Bid in the following manner after submission by the contractor and acceptance of Security cum Performance Bank Guarantee by Employer and signing of Agreement as per provisions of bidding document

In accordance with the provisions of GCC Clause 11 (Terms of Payment), the Employer shall pay the Contractor in the following manner and at the following times:

For Supply of Plant & Equipment including PV Modules, Inverter and BOS up to site (FOR basis) including transportation and insurance along with mandatory spares

90% of the total price of supplies of Plant and Equipment shall be paid against delivery of supplies on pro-rata basis against receipt of material at site under the Contract.

10 % of the total price of supplies of Plant and Equipment shall be paid on Operational Acceptance of the Facility pursuant to successful Guarantee Tests and demonstration of PR and submission of all as – built documentation. BG for an amount equivalent to 10 % of total supplies shall be submitted in the in the following manner,

2% of total price of supplies for a period of 1 Year
2% of total price of supplies for a period of 2 Year
2% of total price of supplies for a period of 3 Year
2% of total price of supplies for a period of 4 Year
2% of total price of supplies for a period of 5 Year

For Erection, Testing and Commissioning

90% of the total price of Erection, Testing and Commissioning shall be paid on pro-rata basis on completion of installation of equipment on certification by the Engineer-In-Charge/ Project Manager for the quantum of work completed after successful clearance of quality check points involved in the quantum of work billed.

10% of the total price of Erection, Testing and Commissioning shall be paid on Operational Acceptance of the Facility pursuant to successful Guarantee Tests and demonstration of PR. BG for an amount equivalent to 10 % of total supplies shall be submitted in the in the following manner,

2% of total price of Erection, Testing and Commissioning for a period of 1 Year
2% of total price of Erection, Testing and Commissioning for a period of 2 Year
2% of total price of Erection, Testing and Commissioning for a period of 3 Year
2% of total price of Erection, Testing and Commissioning for a period of 4 Year
2% of total price of Erection, Testing and Commissioning for a period of 5 Year

Appendix 13: Contract Agreement

This agreement is made at Tiruchirappalli city, the ----------day of ----------in the year Two thousand

-------- between ---------- (herein after referred to as "The Contractor" which expression shall unless excluded by or repugnant to the contract include its successors or permitted assigns) of the one part and the Tiruchirappalli city Smart City Limited (TSCL) having their Head Office at _____(insert office address of TSCL)

(Hereinafter called "TSCL" which expression shall unless excluded by or repugnant to the context include its successors or assigns) of the other part.

WHEREAS the aforesaid TSCL has accepted the tender of the aforesaid Contractor for ---------- ---------- as per TSCL's LOI No.---------- ----------hereinafter called "**the Works**" and more particularly described enumerated or referred to in the specification, terms and conditions prescribed in the LOI which for the purpose of identification have been signed by ---------- on behalf of the Contractor and by --------- ----------on behalf of TSCL a list whereof is made out in the Schedule hereunder written and all of which said documents are deemed to form part of this contract and included in the expression " **the Works"** wherever herein used, upon the terms and subject to the conditions hereinafter mentioned.

AND WHERE AS TSCL has accepted the tender of the Contractor for the said works for the sum of Rs. ---------- (Rupees :----------) upon the terms and subject to the conditions herein mentioned.

NOW THIS AGREEMENT WITNESSES AND IT IS HEREBY AGREED AND DECLARED THAT:–

(a) The Contractor shall do and perform all works and things in this contract mentioned and described or which are implied therein or there from respectively or are reasonably necessary for the completion of the works as mentioned and at the times, in the manner and subject to the terms, conditions and stipulations contained in this contract, and in consideration of the due provision, executions, construction and completion of the works agreed to by the contractor as aforesaid, TSCL doth hereby covenant with the Contractor to pay all the sums of money as and when they become due and payable to the Contractor under the provisions of the contract. Such payments to be made at such times and in such manner as is provided by the contract.

(b) The contract value, extent of supply delivery dates, specifications, and other relevant matters may be altered by mutual agreement and if so altered shall not be deemed or construed to mean or apply to affect or alter other terms and conditions of the contract and the general conditions and the contract so altered or revised shall be and shall always be deemed to have been subject to and without prejudice to said stipulation.

SCHEDULE

List of documents forming part of the contract:

1.
2.
3

In witness whereof the parties hereto have set their hands and seals t h i s day and month year first above written.

1. Signed, Sealed and delivered by:
   (Signature with Name, Designation & official seal)
   for and on behalf of M/s. ! _____[*Inset Name of Contractor*] In the presence of name, Full Address & Signatures. :
   i) ----------
   ii) ----------

2. Signed, Sealed and Delivered by:

   (Signature with Name, Designation & official seal) For
   and on behalf of TSCL,
   In the presence of Name, Full Address & Signature:
   i) ----------
   ii) ----------

Appendix 14: Power of Attorney for signing of Bid

POWER OF ATTORNEY

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

Know all men by these presents, We, ... (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorise Mr. / Ms (Name), son/daughter/wife of ..... and presently residing at ....., who is presently employed with us and holding the position of ....., as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Bid for the Design,Supply, Installation,Commissioning & Maintenance of Solar Power Plant at Panchappur of Tiruchirappalli city Corporation area , Tiruchirappalli city on turnkey basis and O&M for 10 (Ten) years using Photovoltaic at ---------- ----------, pursuant to the NIT document no. _____ issued by Tiruchirappalli city Smart City Limited (TSCL),including but not limited to signing and submission of all applications, Bids and other documents and writings, participate in Bidders' and other conferences and providing information / responses to the Company, representing us in all matters before the Company, signing and execution of all contracts including the Contract Agreement and undertakings consequent to acceptance of our Bid, and generally dealing with the Company in all matters in connection with or relating to or arising out of our Bid for the said Project and/or upon award thereof to us and/or till the entering into of the Contract Agreement with TSCL.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ..., THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ..... DAY OF ....., 20.....

For.....

(Signature, name, designation and address)

Witnesses: 1.

2.

Accepted Notarized

(Signature, name, designation and address of the Attorney)

Notes:

1. The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.
2. Wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf o f the Bidder.
3. For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.

Appendix 15: Format for Board resolutions

The Board, after discussion, at the duly convened Meeting on ……..... (Insert date), with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956 or Companies Act 2013, passed the following Resolution:

1. RESOLVED THAT Mr./Ms....., be and is hereby authorized to do on our behalf, all such acts, deeds and things necessary in connection with or incidental to our response to tender NIT _____, for Design, Supply, Installation,Commissioning & Maintenance of Solar Power Plant at Panchappur of Tiruchirappalli city Corporation STP area , Tiruchirappalli city on turnkey basis and O&M for 10 (Ten) years including signing and submission of all documents and providing information / response to Tiruchirappalli city Smart City Limited (TSCL), representing us in all matters before TSCL, and generally dealing with TSCL in all matters in connection with our bid for the said Project.

Certified true copy

(Signature, Name and stamp of Company Secretary / Director)

Notes:

1. This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary / Director.
2. The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.
3. This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act 1956 may be suitably modified to refer to the law applicable to the entity submitting the resolution.

Appendix 16: Indemnity Bond to be executed by The Contractor for The Removal / Disposal of Scrap/Disposal of Surplus Material

(TO BE EXECUTED ON STAMP PAPER OF APPROPRIATE VALUE)

INDEMNITY BOND

This INDEMNITY BOND executed this ..... day of ..... 20..... by .....(Name of Company) ……..,having its registered office(s) at .....(Office Address)....., hereinafter called the Indemnifier(s)/ Contractor(s) (which expression shall, unless excluded by or repugnant to the context, be deemed to mean and include its successors, administrators, executors and permitted assigns).

IN FAVOUR OF Tiruchirappalli Smart City Limited having its registered office at "_____" {insert registered office address of Tiruchirappalli Smart City Limited} (hereinafter referred to as "TSCL").

1. TSCL has awarded the Contractor(s), contract for execution of work ("Scope of Work") as mentioned in the NIT/contract agreement/LOI no ..... dated ....., entered into between TSCL and Contractor(s), relating to ..... (Name & Address of Project/ Station) ..... (hereinafter called 'the Project').

2. The Indemnifier(s) for the purpose of execution of its Scope of Work had from time to time procured and stored .....(Details of Material)..... at the Project Site.

3. After completion of the Scope of Work by Indemnifier(s), it has been identified that scrap ..... (Details of Scrap Material & its Quantity).....and/or surplus ..... (Details of Surplus Material & its Quantity)..... belonging to Indemnifier(s) is lying at the said Project Site.

4. Now, the scrap ..... (Details of Scrap Material & its Quantity).....and/or surplus ..... (Details of Surplus Material & its Quantity)..... belonging to the Indemnifier(s), requires to be removed by Indemnifier(s) from the Project Site.

NOW THEREFORE THIS INDEMNITY BOND WITNESSETH AS UNDER:

1. That Indemnifier(s) by way of this indemnity requests TSCL to issue approval in favour of Indemnifier(s) for removal of scrap .....(Details of Scrap Material & its Quantity).....and/or surplus .....(Details of Surplus Material & its Quantity)..... belonging to Indemnifier(s), from the project.

2. That the Indemnifier(s) shall ensure clearing of its scrap ..... (Details of Scrap Material & its Quantity).....and/or surplus ..... (Details of Surplus Material & its Quantity)..... by itself, as aforesaid.

3. That Indemnifier(s) in consideration of the premises above, for itself and its respective, executors, administrators and assigns, jointly and severally agree and undertake from time to time and at all times hereafter to indemnify TSCL and keep TSCL indemnified from and against all

claims, demands, actions, liabilities and expenses which may be made or taken against or incurred by TSCL by reason of the issue of necessary approval by TSCL and permitting Indemnifier(s) to remove scrap .....(Details of Scrap Material & its Quantity).....and/or surplus .....(Details of Surplus Material & its Quantity)..... belonging to Indemnifier(s), from the project.

4. That Indemnifier(s) undertakes to indemnify and keep TSCL harmless from any act of omission or negligence on the part of the Contractor in following the statutory requirements with regard to removal/disposal of scrap and surplus belonging to Indemnifier(s), from the Project Site aforesaid, by the Indemnifier(s). Further, in case the laws require TSCL to take prior permission of the relevant Authorities before handing over the scrap and/or surplus to the Indemnifier, the same shall be obtained by the Indemnifier on behalf of TSCL.

IN WITNESS WHEREOF, the Indemnifier(s), through its authorized representative, has executed these presents on the Day, Month and Year first mentioned above at

.....(Name of the Place).....

Witness:

1. .....
2. .....

(Authorised Signatory)
Indemnifier

Appendix 17: Indemnity Bond to be executed by the contractor for the Plant handed over by TSCL for Performance of its O&M Contract (Entire Solar Photo Voltaic Plant including power evacuation & transmission system up to designation substation at Near By Substation – Manikandam Substation 110KV/11 kV.

(On non-judical stamp paper of appropriate value) INDEMNITY BOND

THIS INDEMNITY BOND IS made this .....day .. of .....20 ..... by ..... having its Registered Office at.....(hereinafter called as "Contractor" or "Obligor" which expression shall include its successors and permitted assigns) in favour of Tiruchirappalli Smart City Limited (TSCL), having its Registered Office at "_____" {Insert registered office address}, India and its Project at TSCL, District: Tiruchirappalli city in the state of Tamilnadu (hereinafter called "TSCL" which expression shall include its successors and assigns):

WHEREAS TSCL has awarded to the Contractor a Contract for.....vide its Letter of Intent/Award Letter/Contract No ..... dated.... and... its...Amendment No.....(Applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which TSCL is required to hand over various Equipment and facilities provided under Design,Supply Contract, Erection Contract, herein after called "Solar Photo Voltaic Plant" to the Contractor for execution of the Contract.

AND WHEREAS by virtue of Clause No. 27.3 of Section III:GCC of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of TSCL for the Solar Photo Voltaic Plant handed over to it by TSCL for the purpose of Performance of the Contract/O&M portion of the Contract.

NOW, THEREFORE, this Indemnify Bond witnesseth as follows:

1. That in consideration of Solar Photo Voltaic Plant as mentioned in the Contract, Valued at Rs.....#..... (Rupees.....) handed over to the Contractor for the purpose of Performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep TSCL indemnified, for the full value of the Solar Photo Voltaic Plant. The Contractor hereby acknowledges actual receipt of the Solar Photo Voltaic Plant as detailed in the Schedule appended hereto. The Contractor shall hold such Solar Photo Voltaic Plant in trust as a "Trustee" for and on behalf of TSCL.
2. That the Contractor is obliged and shall remain absolutely responsible for the safe O&M/ protection and custody of the Project against all risks whatsoever till completion of O&M Contract in accordance with the terms of the Contract and is taken over by TSCL . The Contractor undertakes to keep TSCL harmless against any loss or damage that may be caused to the Solar Photo Voltaic Plant.
3. The Contractor undertakes that the Solar Photo Voltaic Plant shall be used exclusively for the Performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the Solar Photo Voltaic Plant including its power evacuation & transmission system up to designated substation at Manikandam at 33 kV level shall be utilised for any other work or purpose whatsoever. It is clearly understood by the Contractor that no-observance of the obligations under

this Indemnify Bond by the Contractor shall inter- alia constitute a criminal breach of trust on the part of the Contractor for all intents and purposes including legal/penal consequences.

4. That TSCL is and shall remain the exclusive owner of the Solar Photo Voltaic Plant free from all encumbrances, charges or liens of any kind, whatsoever. The Solar Photo Voltaic Plant shall at all times be open to inspection and checking by Engineer-in-Charge /Engineer o r other e m p l o y e e s /agents authorised by him in this regard. Further, TSCL shall always be free at all times to take possession of the Solar Photo Voltaic Plant in whatever form the Solar Photo Voltaic Plant may be, if in its opinion, the Solar Photo Voltaic Plant are likely to be endangered, mis-utilised or converted to uses other than those specified in the Contract, by any acts of omission of commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds itself and undertakes to comply with the directions of demand of TSCL to return the Solar Photo Voltaic Plant without any demur or reservation.

5. That this Indemnify Bond is irrevocable. If at any time any loss or damage occurs to the Solar Photo Voltaic Plant or the same or any part thereof is mis- utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Engineer-in- Charge/Engineer of TSCL as to assessment of loss or damage to the Solar Photo Voltaic Plant shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Solar Photo Voltaic Plant at its own cost and / or shall pay the amount of loss to TSCL without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to TSCL against the Contractor under the Contract and under this Indemnify Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms of and conditions of this Bond to the satisfaction of TSCL , THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned

SCHEDULE of equipment & facilities

Particulars of the Equipment / Facilities handed-over	**Quantity**	**Value**	**Other details, (if any)**	**Signature of Attorney in token of receipt**

WITNESS

For and on behalf of
M/s. .....

1.Signature ----------

Name ----------

2.Signature ----------

Name ----------

Address ----------

Designation ---------- Authorised representative*

1. Signature ----------

2. Name ---------- Common Seal

(In case of Company)

3. Address ----------

* Indemnity Bond are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the Power of Attorney issued under common seal of the company with authority to execute Indemnity Bond, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

APPENDIX 18a : Form of indemnity bond to be executed by the contractor for the equipment handed over by the employer for performance of its contract (Entire Equipment Consignment in one lot)

(On non-Judicial stamp paper of appropriate value)

INDEMNITY BOND

THIS INDEMNITY BOND is made this ..... day of..... by..... 20..... ..... (Contractor's Name) having its Registered Office at..... (hereinafter called as 'Contractor' or "Obligor" which expression shall include its successors and permitted assigns) in favour of ..... (Name of Employer), having its Registered Office at..... ..... and its project at ..... (hereinafter called "..... "..{Abbreviated name of the Employer}" which expression shall include its successors and assigns):

WHEREAS ..... @..... has awarded to the Contractor a Contract for ....vide its Notification of Award/Contract No..... dated ..... and its Amendment No. ..... and Amendment No..... , (applicable when amendments have been issued) (hereinafter called the Contract") in terms of which ..... @..... is required to hand over various Equipments to the Contractor for execution of the Contract.

And WHEREAS by virtue of Clause No..... of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of..... @..... for the Equipments handed over to it by ..... @..... for the purpose of performance of the Contract/Erection portion of the contract (hereinafter called the "Equipments")

AND THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (Currency and amount in Figures)..... (Currency and amount in words)..... handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep .....@..... indemnified, for the full value of the Equipments. The Contractor hereby acknowledges actual receipt of the Equipment etc. as per dispatch title documents handed over to the Contractor as detailed in the Schedule appended hereto. The Contractor shall hold such Equipment etc. in trust as a "Trustee" for and on behalf of .....@.....

@ Fill in abbreviated name of Employer

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/ protection and custody of the Equipment at .....@..... project site against all risks whatsoever till the Equipments are duly used/erected in accordance with the terms of the Contract and the Plant / package duly erected and commissioned in accordance with the terms of the Contract is taken over by .....@..... . The Contractor undertakes to keep .....@..... harmless against any loss or damage that may be caused to the Equipments.

3. The Contractor undertakes that the Equipments shall be used exclusively for the performance/ execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilised for any other work of purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.

4. That .....@..... is and shall remain the exclusive owner of the equipments free from all encumbrances, charges or liens of any kind, whatsoever. The Equipments shall at all times be open to inspection and checking by the Project Manager or other employees/agents authorised by him in this regard. Further, ...@..... shall always be free at all times to take possession of the Equipments in whatever form the Equipments may be, if in its opinion, the equipments are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of .....@..... to return the Equipments without any demur or reservation.

5. That this Indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipments or the same or any part thereof is mis-utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Project Manager of .....@..... as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipments at its own cost and/or shall pay the amount of loss to .....@..... without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to .....@..... against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of .....@....., THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

@ Fill in abbreviated name of Employer

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE Particulars of Despatch title Documents Particulars of the Equipments handed over

Quantity

RR/GR/ Bill of lading No & Date

Carrier

Value of the Equipment

Signature of Attorney in token of receipt

WITNESSES :

For and on behalf of .....(Contractor's Name)

1. Signature..... Signature.....

2. Name..... Name.....

3. Address..... Designation of..... Authorised representative *

4. Common Seal (In case of Company)

* Indemnity Bond are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the Power of Attorney issued under common seal of the company with authority to execute Indemnity Bond, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

APPENDIX 18b : Form of indemnity bond to be executed by the contractor for the equipment handed over in installments by the employer for performance of its contract (On non-Judicial stamp paper of appropriate value)

INDEMNITY BOND

THIS INDEMNITY BOND is made this ..... day of..... 20..... by..... (Contractor's Name) e at ..... (hereinafter called as 'Contractor' or "Obligor" which expression shall include its successors and permitted assigns) in favour of ..... (Name of Employer), having its Registered Office at ..... and its project at ..... (hereinafter called "..... "{Abbreviated name of the Employer}" which expression shall include its successors and assigns) :

WHEREAS ..... @ ..... has awarded to the Contractor a Contract for ..... vide its Notification of Award/Contract No..... dated..... and its Amendment No. ..... and Amendment No..... , (applicable when amendments have been issued) (hereinafter called the Contract") in terms of which ..... @..... is required to hand over various Equipments to the Contractor for execution of the Contract.

And WHEREAS by virtue of Clause No..... of the said Contract, the Contractor is required to execute an Indemnity Bond in favour in ..... @..... for the Equipments handed over to it by ..... @..... for the purpose of performance of the Contract/Erection portion of the contract (hereinafter called the "Equipments")

NOW THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (Currency and amount in figures)..... (Currency and amount in words) ..... to be handed over to the Contractor in installments from time to time for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep .....@..... indemnified, for the full value of the Equipments. The Contractor hereby acknowledges actual receipt of the initial installment of the Equipment etc. as per details in the Schedule appended hereto. Further, the Contractor agrees to acknowledge actual receipt of the subsequent installments of the Equipments etc. as required by .....@..... in the form of Schedules consecutively numbered which shall be attached to this Indemnity Bond so as to form integral parts of this Bond. The Contractor shall hold such Equipments etc. in trust as a "Trustee" for and on behalf of .....@.....

@ Fill in abbreviated name of Employer.

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/ protection and custody of the Equipment at .....@..... project site against all risks whatsoever till the Equipments are duly used/erected in accordance with the terms of the Contract and the Plant /package duly erected and commissioned in accordance with the terms of the Contract, is taken over by .....@..... . The Contractor undertakes to keep .....@..... harmless against any loss or damage that may be caused to the Equipments.

3. The Contractor undertakes that the equipments shall be used exclusively for the performance/ execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilized for any other work of purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.

4. That .....@..... is and shall remain the exclusive owner of the Equipments free from all Encumbrances, charges or liens of any kind, whatsoever. The Equipments shall at all times be open to inspection and checking by the Project Manager or other employees/agents authorized by him in this regard. Further, ...@..... shall always be free at all times to take possession of the Equipments in whatever form the Equipments may be, if in its opinion, the equipments are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of .....@..... to return the Equipments without any demur or Reservation.

5. That this Indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipments or the same or any part thereof is mis-utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Project Manager of .....@..... as to Assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipments at its own Cost and/or shall pay the amount of loss to .....@..... without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to .....@..... against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of .....@....., THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

@ Fill in abbreviated name of Employer

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE No.1 Particulars of Dispatch title Documents Particulars of the Equipment handed over
Quantity
RR/GR/ Bill of lading No & Date
Carrier
Value of the Equipment

Signature of Attorney in token of receipt (Please number subsequent schedules) WITNESSES:

For and on behalf of ..... (Contractor's Name)

1. Signature..... Signature.....

2. Name..... Name..... 3. Address.....

Designation of..... Authorized representative *

2.

1.

2.

Signature..... Name..... (Common Seal) (In case of Company)

3. Address..... ----------

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* Indemnity Bond are to be executed by the authorized person and (i) in case of contracting Company under common seal of the Company or (ii) having the Power of Attorney issued under common seal of the company with authority to execute Indemnity Bond, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

Appendix-19

Format for Satisfactory operation (on Plant Owners' letter head):

TO WHOMSOEVER IT MAY CONCERN

Date:

This is to certify that the (Plant detail and location) was commissioned on (Date of commissioning)by (Bidder Details)against the LOI/ WO No. (Details of LOI/ WO with complete scope).

The project is under operation since the date of commissioning and has been working satisfactorily as per the estimated output. The cumulative generation (Net) of the Plant recorded for the previous year is (*Number of units generated)* and the PR is *(mentioned the PR value).*

Regards,

TIRUCHIRAPPALLI SMART CITY LIMITED

SECTION – VII

BILL OF QUANTITIES