SECTION – I

INVITATION FOR BIDS (IFB)

(NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50)

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

Ist floor, Wing A, Religare Building, D – 3, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989224, Fax: 011 – 71989241

DETAILED INVITATION FOR BIDS

Solar Energy Corporation of India Limited
(A Govt. of India Enterprise)

NOTICE INVITING e - TENDER

ON BEHALF OF

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED

FOR

DESIGN, ENGINEERING, PROCUREMENT & SUPPLY, CONSTRUCTION & ERECTION, TESTING, COMMISSIONING, ASSOCIATED TRANSMISSION SYSTEM
&
COMPREHENSIVE OPERATION & MAINTENANCE FOR
10 (TEN) YEARS OF 50 MW (AC) SOLAR PV POWER PLANT
at
Kasaragod Solar Park, Kerala
NIT No.: SECI/C&P/PMC/NIT/2016/THDCIL/50

1 Project Overview:

Solar Energy Corporation of India Limited (SECI) on behalf of THDC India Limited (THDCIL), The Employer, invites online bids from eligible bidders on Single stage – Two envelop bid system in the prescribed forms and formats, for setting up of 50 MW (AC) Solar Photovoltaic Power Plant at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India), on turnkey basis and thereafter comprehensive Operation & Maintenance for 10 years of the Plant, as per the Scope of Work mentioned hereinafter. A qualified bidder needs to set up the total capacity of 50 MW (AC) power plant at the designated location.

2 Brief Scope of work

The Brief Scope of the Work shall include, but not limited to, the following:

2.1 Design, Engineering, Procurement & Supply, Packing & Forwarding, Transportation, Unloading, Storage at site, Site development, Construction, Erection & Installation of equipment, Testing & commissioning along with associated interfacing at 33kV/110kV Voltage system as per technical specifications and comprehensive O&M for 10 (ten) years thereafter of the said 50 MW (AC) Solar PV Power Plants at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala. PV modules used in the solar PV power plant must be made in India. The selected bidder has to demonstrate assured performance of the Plant as specified in the bidding documents.

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

2.2.1. Land development to make the topography of the land generally flat & carrying out Geo-technical study of soil for designing of foundation of Module Mounting & other civil structures.

2.2.2. Solar panels including module mounting structures and fasteners

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

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

2.2.5. All associated electrical works and equipment required for interfacing at 33 kV/110kV voltage system including (i.e. transformer(s) – power and auxiliary, breakers, isolators, lightning arrestor(s), LT/ HT/ other panels, protection system, cabling, metering at 33 kV level, earthing of transformer etc., as per technical specifications.

2.2.6. Design, supply, erection, testing & commissioning, cabling/ interconnection line (as required) as per project requirement and associated switchgear & interfacing equipment, transformer and metering equipment for connecting at 33/110kV level, including right of way (ROW) if any, as per technical specification and state regulations.

2.2.7. Design and implementation of plant string level monitoring scheme with compatible software, hardware and cabling for accessing the live SCADA data remotely at a location in SECI, New Delhi

& THDCIL Office. Use of Y Connectors is allowed for up to two string level monitoring.

2.2.8. Install and setup a communication infrastructure to provide telemetry data to the Kerala state load despatch centre (SLDC) in compliance to CERC/ SERC norms/ specifications.

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

2.3.1. Earthwork for Site grading, cutting, filling, levelling & compacting in requisite project land as required for development of this Solar PV Power Plant.

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

2.3.3. Construction of perimeter fencing of Solar PV (SPV) Project with security gate (s)

2.3.4. Construction of Equipment room, battery room and Office cum Control room including store, pantry, toilet etc.

2.3.5. Arrangement of permanent water supply infrastructure for module washing and daily usage.

2.3.6. Construction of Storm water drainage & sewage network

2.3.7. Construction of approach road to plant from main road and road network within plant for easy access & transportation of equipment up to Plant locations.

2.3.8. Street lighting, perimeter lighting and area lighting within plant

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.tcilindia-electronictender.com .

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

NIT Document No.	SECI/C&P/PMC/NIT/2016/THDCIL/50
Document availability Date & Timing	From 01/07/2016 To 12/08/2016 & 1430 hrs (IST)

Last Date & Time of Bid Receipt	Up to 12/08/2016 & 1430 hrs (IST)
Techno-commercial Bid (Online & Physical)	12/08/2016 at 1530 hrs (IST)
Tender/Bid processing Fees	2,00,000/- (Rupees two Lac only) + 15 % ST = INR 2,30, 000

3.3 All bids must be accompanied by

3.3.1. A **Bid Security of INR 6,00,00,000/- (**Rupees Six Crores only) in the form, as stipulated in the Bidding Documents to be drawn in favour of "Solar Energy Corporation of India Limited" payable at New Delhi.

3.3.2. Bid processing fee of INR 2,30,000/- (Rupees two Lac Thirty Thousand only) inclusive of Service Tax in form of DD drawn in favour of "**Solar Energy Corporation of India Limited**" payable at **New Delhi for each package.**

ANY BID NOT ACCOMPANIED BY A BID SECURITY 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 should be a body incorporated in India under the Companies Act, 1956 or 2013 including any amendment thereto, engaged in the business of Power/Infrastructure. A copy of certificate of incorporation, Memorandum of Association & Article of Association shall be furnished along with the bid in support of above.

4.2 Technical Eligibility Criteria:

The bidder should have designed, supplied, erected/supervised erection and commissioned/ supervised commissioning of Solar Photo Voltaic (SPV) based grid connected power plant(s) of following cumulative installed capacity of **50 MW**. Out of which at least two plants should have been of 10 **MWp** capacity or above. The reference two plants of 10 **MWp** or above capacity must have been in successful operation for at least Six months prior to the scheduled date of techno-commercial bid opening.

4.2.1. 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 since last one year calculated up to date of publication of NIT.

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 following:

INR 110 Crores (Indian Rupees One Hundred & Ten Crores only) or in equivalent foreign currency (Bills Clearing (B.C.) Selling Market Rate of Exchange (MRE) of the foreign currency as established by State Bank of India, prevalent as on 30 days prior to the date set for bid opening).

4.3.2. The net worth for the last year should be positive, "Net Worth" of the Bidder shall be calculated as follows:

Net Worth	=	Paid up share capital
	Add:	Free Reserves and surplus
	Subtract:	Miscellaneous Expenditures to the extent not written off and carry forward losses
	Subtract:	Intangible Assets

Free reserves means reserves created out of profits and securities premium account but does not include reserves created out of revaluation of profits, write back of depreciation and amalgamation or any capital reserve. Securities Premium will be considered to be part of net worth only in those cases where it has been realized/received in the form of cash. However, this may not be applicable in case of listed companies.

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. The Net Worth of the Bidder as on the last day of the preceding financial year shall not be less than total paid-up share capital. However, in case, the bidder is subsidiary of a holding company, the net worth of the bidder as on the last day of the preceding financial year shall not be less than 75% of total paid-up share capital and in such case, bidder has to submit a board resolution/comfort letter from CEO of the holding company indicating that "holding company shall support the bidder financially or otherwise, to execute the project successfully". Also, the Net Worth of the Holding Company of the Bidder, as on the last day of the preceding financial year shall not be less than total paid-up share capital.

4.3.5. 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.

NOTES:

- Paid up share capital will include
  - Paid up equity share capital
  - Fully, compulsorily and mandatorily convertible preferential shares
  - Fully, compulsorily and mandatorily convertible Debentures
- Share premium will form an integral part of the net worth provided it is realized in cash or cash equivalents

4.4 Notwithstanding 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.

4.5 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.

5 Address for communication:

Name:	General Manager (Solar)
Address:	Solar Energy Corporation of India Limited
	Ist floor, A Wing, Religare Building
	D-3, District Centre, Saket, New Delhi – 17
Tel:	011 – 71989236/225
Email:	solarpv@seci.gov.in/ solarpv@seci.co.in

Note: Bidders are requested to keep themselves updated with the website of THDCIL, SECI & TCIL (http://thdc.gov.in/index.aspx, www.seci.gov.in/ www.seci.co.in **and** https://www.tcil-india-electronictender.com) **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.seci.gov.in / www.seci.co.in, **and the details only will be available from** www.tcil-india-electronictender.com.

SECTION – II

INSTRUCTIONS TO BIDDER (ITB)

(NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50)

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

I[st] floor, Wing A, Religare Building, D – 3, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989224, Fax: 011 – 71989241

Contents

1 Introduction

1.1 Company

THDC India Limited: THDC India Limited (THDCIL), is a Public Limited Company (CIN U45203UR1988GOI009822) having its registered office at Bhagirath Bhawan, Top Terrace, Bhagirahti Puram, Tehri Garhwal-249 001, Uttarakhand and engaged in development of power in all its aspects through conventional and non-conventional sources in India and abroad for development of hydropower. The Company was incorporated in July' 88 to develop, operate & maintain the 2400 MW Tehri Hydro Power Complex and other hydro projects. The Company has an authorised share capital of ` 4000 cr. THDCIL is a Mini Ratna Category-I and Schedule 'A' CPSE. The initial mandate of THDCIL was to develop, operate and maintain the 2,400 MW Tehri Hydro Power Complex (comprising of 1000 MW Tehri Dam & HPP, 1000 MW Tehri Pumped Storage Plant & 400 MW Koteshwar HEP) and other Hydro Projects. THDC India Limited presently operates Tehri HPP (1,000 MW) and Koteshwar HPP (400 MW) totaling 1,400 MW. The 1,000 MW Tehri Pumped Storage Plant is presently under construction. Further, 444 MW Vishnugad Pipalkoti HEP located in the State of Uttarakhand and 24 MW Dhukwa Small Hydro Project are also under construction.

THDCIL is also diversifying in Thermal, Wind and Solar power projects. The implementation of 50 MW Wind Farm in Patan Wind Park, Gujarat is under progress. Govt. of Uttar Pradesh has allotted 1,320 MW Super Thermal Power Project to THDCIL for implementation. Land acquisition for the Project is under progress.

Solar Energy Corporation of India Limited (SECI) is a Government of India Enterprise having its registered office at **1st Floor, A-Wing, D-3, District Centre, Saket, New Delhi-110017**, is under the administrative control of the Ministry of New & Renewable Energy (MNRE). SECI is committed to plan and execute an integrated program on development and deployment of solar energy technologies through commercialisation of R&D. One of the main objectives of the Company is to assist the Ministry and function as the implementing and facilitating arm of the Jawaharlal Nehru National Solar Mission (JNNSM) for development, promotion and commercialization of solar energy technologies in the country. SECI is also providing consultancy services to various organizations and has signed MoU's with various PSU's for development of solar projects as Project Management Consultant to provide turnkey solutions for establishing solar projects.

1.2 Project

The Solar PV Power Plant of 50 MW (AC) capacity is to be set up at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India). The Project shall be funded and owned by THDCIL (hereinafter called as "Employer") and SECI shall set up the Project on behalf of THDCIL through EPC contractor selected through this Tender. The Solar Power generated from the Project shall be injected into the state

grid at the 110 kV voltage level.

The Bidder selected based on this NIT (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.

1.2.1 Online 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**
NIT No.	NIT NO. – SECI/SD/NIT/2016/THDCIL/50MW
Brief description of the Project	Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including its O&M contract for 10 (Ten) years and performance demonstration. PV modules shall be made in India.
Date & time of Pre-Bid Meeting and Venue	21/07/2016 at 1100 hrs at SECI's Office (New Delhi)
Last date and time for submission of Bids (Online and Physical)	Up to 12/08/2016 1430 hrs (IST)
Date of opening of Techno-commercial Bid (Online & Physical)	12/08/2016 at 1530 hrs (IST) at SECI Office, New Delhi
Date of opening of Price Bid (Online and Physical)	To be Intimated later
Bid validity	180 days from the date of opening of Techno-Commercial bid
Tender Processing Fees	INR 2, 00,000 + 15% ST i.e., INR 2, 30, 000 in favor of "Solar Energy Corporation of India Limited" payable at New Delhi".
Bid Security (in form of BG only)	INR 6,00,00,000 (Rupees Six Crores Only), in favour of "Solar Energy Corporation of India Limited" payable at New Delhi

Bid Security validity	210 days from the date of opening of Techno – Commercial Bid
Bank guarantee against Mobilization Advance, if required by the contractor	The Contractor shall furnish within 10 days from the date of issue of Letter of Intent (LOI), an unconditional and irrevocable bank guarantee of 110% of mobilization advance to be drawn, which is interest bearing, the Rate of interest being the SBI base rates prevailing on the Date of opening of Techno-commercial Bids plus 2%, as per Format attached. i. The selected contractor will require to submit separate BGs for supply contract, erection contract and civil works contract individually. ii. Valid for 180 days from the date of issue of LOI.
Performance bank 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 10% of the total Contract Value (i.e., total sum of all the supply contract, erection contract and civil works contract) and shall be valid up to 90 days beyond defect liability period. (ii) The Contractor shall furnish within 14 days from the date of issue of Operational Acceptance, an unconditional and irrevocable bank guarantee for due Performance as per Format attached and which shall be for 5% of the total Contract Value (i.e., total sum of all the supply contract, erection contract and civil works contract) and valid for 60 months from the date of Operational Acceptance. (iii) The Contractor shall furnish within 14 days prior to the date of expiry of the bank guarantee mentioned at (ii) above, an unconditional and irrevocable bank guarantee for due Performance as per Format attached and which shall be for 2% of the total Contract Value (i.e., total sum of all the supply contract, erection contract and civil works contract) and valid for 62 months from the date of expiry of bank guarantee mentioned at (ii).

Address for correspondence	General Manager (Solar), Solar Energy Corporation of India Limited (SECI), Ist floor, Wing A, Religare Building, D - 3, District Centre, Saket, New Delhi – 110017 TEL: 011- 71989236/225 Email: solarpv@seci.gov.in / solarpv@seci.co.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 insolation 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 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:

(i) Made a complete and careful examination of the Bidding documents;

(ii) Received all relevant information requested from the Employer;

(iii) 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;

(iv) 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;

(v) 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

(vi) 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 Bid documents or the Bidding 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.

1.3.8 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 Instructions to Bidder

2.1 General Instructions

2.1.1 The current documents with all sections, annexures 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 selection process shall be through e - bidding followed by e - auctioning process as per ITB Clause 3.19 and Procedure of e-reverse Auction as per clause 3.20.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 SECI on behalf of THDCIL, 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 NIT are liable to be rejected without any further opportunity.

2.1.3 **Bidders need to ensure that in the event the Project is awarded to it, and during execution of the Project, it shall not seek to alter any agreed contractual terms, conditions and specifications**.

2.1.4 All Bids must be accompanied by a Bid processing fees and Bid security of value as specified in the ITB Clause no. 1.2.1, in the form and manner as specified in the NIT document and must be delivered along with Bid.

2.1.5 It is mandatory for every bidder to submit their bid online. However, the bidder must also submit all the requisite original bid documents in hard form to the address specified in IFB Clause 5 on or before the date specified at ITB Clause 1.2.1, 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.

2.1.6 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 necessitates the Employer's approval for such design as assumed by the bidder for purpose of bidding

2.1.7 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.

2.1.8 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.

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

2.1.10 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.

2.1.11 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 Financial Proposal for submission of documents which are missing with Bid.

2.1.12 In case 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 "**Solar Energy Corporation of India Limited**" payable at **New Delhi**.

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. 1.2.1.

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.seci.gov.in / www.seci.co.in and www.tcil-india-electronictender.com.

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 NIT 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. Power of attorney (PoA)/ Board Resolution (BR), as applicable, in the prescribed Format shall be submitted along with the bid. In case of board resolution, there is no prescribed format. However, the Board resolution should clearly indicate the authorization of the person. .

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 PoA and Board Resolution in proper format only.

2.9 Financial Proposal and Currencies

2.9.1 The Bidders shall quote the prices **along with** 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 break 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 of GCC Clause 8.5 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 **"Solar Energy Corporation of India Limited" payable** at **New Delhi** from any bank specified in the "Schedule 1: List of Banks" enclosed at SCC of this Bidding documents. The Employer shall not be liable to pay any interest on the Bid security.

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 Bid security shall not be considered and shall be summarily rejected.

2.10.4 The validity of Bid security shall be as per ITB Clause 1.2.1.

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 Employer shall, however, arrange to release the Bid Security in respect of unsuccessful Bidders **(except L-2 bidder**) within 15 days of Reverse Auction, without any interest, Bid Security of **L-2 bidder** shall only be released after issue of LOI to the successful bidder and their acknowledgement of the same.

2.10.7 The Bid Security in respect of the Successful Bidder shall be released on bidders' 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.

2.10.8 The Bidder shall also undertake that, in the event of the Bidder becoming the Successful Bidder,

the validity of the Bank guarantee for Bid security shall be extended suitably until it furnishes to the Employer & Performance Guarantee for the specified value.

2.10.9 The Employer shall have an unqualified discretion not to release the Bid security 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.
- To sign the Contract Agreement within 21 days from release of LOI and/or
- To furnish the Performance Bank Guarantee.

(iv) Not Used"

(v) Performance Bank Guarantee for O&M: The Successful Bidder has to carry out comprehensive O&M for 10 (Five) 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 authorised representatives, reserve the right to inspect the project components, as per project schedule to ensure compliance of the quality of Components/ material as per the specification and data sheet, before dispatch to site. 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 despatch of the project equipment. All

administrative expenses for Employer or its authorised 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. In case contractor fails to show the compliance for the component under inspection as per Technical Specification & approved drawing /design & same is not approved for mass production or dispatch, in such cases Contractor shall bear the expenses towards visit of Employer's/SECI's team for subsequent visit/s for inspection of same component.

2.12 Applicability of Labour Laws

2.12.1 The Successful Bidder i.e., Contractor shall furnish valid Employee Provident Fund (EPF) code number together with supporting relevant document duly notarized by notary public to this effect within 14 days after issue of LOI.

2.12.2 The Contractor shall obtain license under Contract Labour (Regulation & Abolition) Act 1970 and amendments till date, read with rules framed there under and furnish the same to the Employer before mobilization, failing which the detailed order of contract may be cancelled/ terminated without any further notice and its Bid Bond and/ or Performance bank guarantee will be forfeited.

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

2.12.4 Notwithstanding anything contained in this NIT, 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.

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

2.12.6 Such misrepresentation/ improper response shall lead to the disqualification of the Bidder. If such disqualification / rejection occur 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.

2.12.7 In case, it is found during the evaluation or at any time before signing of the Contract or after its execution and during the period of subsistence thereof, that one or more of the pre-qualification

conditions 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 Bid Security / Performance Bank Guarantee (PBG), without prejudice to any other right or remedy that may be available to the Employer.

2.12.8 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: IFB clause 4" of this NIT.

3 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 Notwithstanding anything to the contrary contained in this NIT, 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 NIT 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 initialled 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 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.

3.3 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 Single Stage-Two Envelope Bidding procedure shall be followed through e-tendering for the subject package as under:

Cover – I / Envelope - I: Techno-Commercial Bid

Cover – II / Envelope - II: Price Bid

3.4.2 The Cover –I / Envelope - I:"Techno-Commercial Bid" shall be evaluated for completeness and

in regard to fulfilment of the qualification requirements and eligibility conditions before opening of the Price bid. The Envelope to contain the following formats for acceptance/ Statements/ Certificates / information as per requirements of Formats -

(i) Original Bid Bond [as per format 12(a)] & DD towards tender processing fees

(ii) Duly signed, sealed, valid and operative Pass – phrase to decrypt Techno – Commercial Bid (Separate sealed envelope within Envelope – I, and shall not be uploaded online).

(iii) Appendix 1: Format for Bid Letter

(iv) Appendix 2: Format for Details of Bidder: (To be submitted on line only)

(v) Appendix 3: BID Evaluation Criteria (BEC): (To be submitted on line-only)

(vi) Appendix 4: Details of Power Plant Performance Guaranteed parameters: (To be submitted on-line only)

(vii) Appendix 6: Details of qualified technical staff for EPC and O&M separately: (To be submitted on line only)

(viii) Appendix 7: Format for Declaration of Compliance: (To be submitted on line only)

(ix) Appendix 8: Format for No Deviation Certificate: (To be submitted on line only)

(x) Appendix 9: Format for Declaration on Bidder's relation to Directors: (To be submitted on line only)

(xi) Appendix 10: Format for Execution Timeline: (To be submitted on line only)

(xii) Appendix 11: Not Applicable

(xiii) Appendix 12(a): Bank Guarantee for Bid Security (To be submitted in original)

(xiv) Appendix 12(b): Format of Bank Guarantee for Performance Security during EPC (To be submitted on line only).

(xv) Appendix 12(c): Format of Bank Guarantee for Performance during O&M (To be submitted on line only).

(xvi) Appendix12 (d): Checklist for Bank Guarantee Verification: (To be submitted on line only)

(xvii) Appendix 13: Not Used

(xviii) Appendix 14: Format for Contract Agreement (To be submitted online only)

(xix) Appendix 15: Format for Power of Attorney for signing of Bid (To be submitted in original)

(xx) Appendix 16: Format of Board Resolution (To be submitted in original)

(xxi) Appendix 17: Format for Indemnity Bond to be executed by The Contractor for the Removal / Disposal of Scrap/Disposal of Surplus Material (To be submitted online only)

(xxii) Appendix 18: Format for Indemnity Bond to be executed by the contractor for the plant handed over to Employer for Performance of its O&M Contract (Entire Solar PV Plant). (To be submitted online only

(xxiii) Appendix 19 (a): Format for 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) (To be submitted online only)

(xxiv) Appendix 19(b): Format for indemnity bond to be executed by the contractor for the equipment handed over in instalments by the employer for performance of its contract (To be submitted online only)

(xxv) Appendix 20: Format of Bank Guarantee for Mobilization Advance.
(xxvi) Appendix 21: DETAILS OF PROJECT (To be submitted online only).
(xxvii) Not Used.
(xxviii) Not Used.

(xxix) Documents relevant to Eligibility of the bidder (including list of projects commissioned, commissioning certificates, Satisfactory Operation (in the format given in Appendix-24), financial eligibility documents etc.) (To be submitted online only)

(xxx) Technical document with all relevant enclosures (Sheet-1, 2, 3 & 4) as mentioned in the Section V – Technical Specifications (TS): (To be submitted on line only)

(xxxi) NIT Documents along with clarifications, amendments & addendums if any. (To be submitted online only)

3.4.3 Envelope – II: Price Bid

The pass – phrase for the decryption of the Financial bid shall be provided in original under sealed envelope along with the Cover – I. **The pass – phrase shall not be uploaded online.** The bid value/price shall have to be filled online in the Electronic Form provided at the TCIL portal only.

3.4.4 All the requisite originals must be supplied in hard form along with their online submission of the scanned copy of the documents except pass – phrases. In case of any discrepancy among the online and hard copy submitted by the bidder, the document uploaded online shall prevail.

3.4.5 Envelop markings

Each envelop shall clearly mark the name of the bidder. The Bid Security, DD towards the tender processing fees and pass - phrases for techno – commercial and financial bid must be supplied in original along with the bid,

(i) The outer/ common envelope shall clearly bear the following identification:

"Bid Documents for setting up of 50 MW (AC) for Grid connected Solar PV Power Plant at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India) on Turnkey basis"

(ii) Cover-I / Envelope -I shall bear the following identification:

"**Cover-I / Envelope-I: Techno – Commercial Bid for setting up of 50 MW (AC) for Grid connected Solar PV Power Plant at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India) on Turnkey basis "**

(iii) Cover –II / Envelope -II shall bear the following identification:

"Cover-II / Envelope-II: Price Bid for setting up of 50 MW (AC) for Grid connected Solar PV Power Plant at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India) on Turnkey basis "

3.4.6 All the envelopes must be marked properly. The signed bid document, techno – commercial enclosures and the price bid must be submitted online with every page bearing sign and stamp by the authorized representative of the bidder. In case of any discrepancy between online and hard copy submitted, scan copy submitted online shall prevail.

3.4.7 Each of the envelopes shall be addressed to:

Kind Attn.	General Manager (C&P)
Address:	Solar Energy Corporation of India Limited 1st Floor, A Wing, Religare building, D-3, District Centre, Saket, New Delhi - 110017 TELE: 011- 71989236/225
E-mail address:	solarpv@seci.gov.in / solarpv@seci.co.in

3.4.8 If the envelopes are not sealed and marked as instructed above, the Employer assumes no responsibility for the misplacement or premature opening of the contents of the Bid submitted. If bids are found in open condition or not in sealed condition, the bids may be rejected and returned in the same condition to the bidder.

3.4.9 Bids submitted by fax, telex, telegram or e-mail shall not be entertained and shall be rejected.

3.4.10 Detailed process for submission of e – tender/ e - bid is detailed under ITB clause 3.10.

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 NIT.

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 NIT 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 Bid Security/ Bid Bond, 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 5 (Five) 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 CST, VAT, service tax*** 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 SECI whose required

documents are received at SECI office 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. Of this, top 50% of the bidders starting from L1 subject to a minimum of 3 bids shall be eligible for third stage i.e. electronic Reverse Auctioning (e-RA). The e-RA procedure as per clause no-3.20 of ITB.

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:

(i) Bid is received by the bid due date and time including any extension thereof;

(ii) Bid is signed, stamped, sealed and marked as stipulated in ITB Clause 3.4;

(iii) Bid is accompanied by the DD for Tender processing fees and Bid Security as specified in ITB Clause 1.2.1.

(iv) 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;

(v) It contains all the information (complete in all respects) as requested in this NIT (in formats same as those specified);

(vi) 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 thereafter

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 Bid Bond.

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

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 non-willingness to sign the contract will result in forfeiture of their Bid Security.

3.17 Performance Bank Guarantee

3.17.1 The Successful Bidder shall submit the Bank Guarantees as per ITB Clause 1.2.1 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 "Schedule 1: Specified list of banks" only.

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.

3.18.1 Any effort by a Bidder to influence the Employer on the Bid evaluation, 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

3.19.1 Submission of Online Bids is mandatory for this Tender.

3.19.2 E-Tendering is a new methodology for conducting Public Procurement in a transparent and secured manner. Now, the Government of India has made e-tendering mandatory. Suppliers/ Vendors will be the biggest beneficiaries of this new system of procurement. For conducting electronic tendering, SECI has decided to use the portal https://www.tcil-india-electrionictender.com through TCIL, a Government of India Undertaking. This portal is based on the world's most 'secure' and 'user friendly' software from Electronic Tender®. A portal built using Electronic Tender's software is also referred to as Electronic Tender System® (ETS).

3.19.3 Benefits to Suppliers are outlined on the Home-page of the portal.

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

3.19.5 Broad Outline of Activities from Bidder's Perspective:

(i) Procure a Digital Signing Certificate (DSC)-Class II and above.

(ii) Register on Electronic Tendering System® (ETS)

(iii) Create Marketing Authorities (MAs), Users and assign roles on ETS

(iv) View Notice Inviting Tender (NIT) on ETS

(v) For this tender -- Assign Tender Search Code (TSC) to a MA

(vi) Download Official Copy of Tender Documents from ETS

(vii) Clarification to Tender Documents on ETS

a. Query to SECI (Optional)

b. View response to queries posted by SECI

(viii) Bid-Submission on ETS

(ix) Respond to SECI Post-Tender Opening Event (TOE) queries

3.19.6 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.

3.19.7 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 II or above, issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer http://www.cca.gov.in].

3.19.8 Registration

To use the ElectronicTender® portal https://www.tcil-india-electrionictender.com, 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. In ETS terminology, this person will be referred to as the Super User (SU) of that organization. For further details, please visit the website/portal, and click on the 'Supplier Organization' link under 'Registration' (on the Home Page), and follow further instructions as given on the site. Pay Annual Registration Fee as applicable. After successful submission of Registration details and payment of Annual Registration Fee, please contact TCIL/ ETS Helpdesk (as given below), to get your registration accepted/ activated.

3.19.9 Important Note:

(i) Interested bidders have to download official copy of the NIT & other documents after login into the ETS Portal of TCIL (https://www.tcil-india-electronictender.com. If the official copy of the documents is not downloaded from ETS Portal of TCIL within the specified period of downloading of NIT and other documents, bidder will not be able to participate in the tender.

(ii) 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.

(iii) 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.

3.19.10 Some Bidding related Information for this Tender (Sealed Bid)

(i) The entire bid-submission would be online on ETS (unless specified for Offline Submissions). Broad outline of submissions are as follows:

(ii) Submission of Bid Parts:

a. Envelope – I: Technical Bid

b. Envelope – II: Financial Bid

(iii) Submission of digitally signed documents (i.e., NIT document, Appendices, Technical Documents, Addendum, Corrigendum, amendments etc.)

(iv) For Offline Submission:

a. Pass – Phrase for each stage i.e., Techno – commercial bid opening and financial bid opening, duly signed, stamped and properly sealed. It is to be enclosed as a part of Envelope –I.

3.19.11 Special Note on Security and Transparency of Bids

(i) Security related functionality has been rigorously implemented in ETS in a multidimensional manner. Starting with 'Acceptance of Registration by the Service Provider', provision for security has been made at various stages in ElectronicTender's software. Specifically for Bid Submission, some security related aspects are outlined below:

(ii) As part of the ElectronicEncrypter™ functionality, the contents of both the 'ElectronicForms' and the 'Main-Bid' are securely encrypted using a Pass-Phrase created by the Bidder himself. Unlike a 'password', a Pass-Phrase can be a multi-word sentence with spaces between words (e.g. I love this World). A Pass-Phrase is easier to remember, and more difficult to break. It is recommended that a separate Pass-Phrase be created for each Bid-Part. This method of bid-encryption does not have the security and data-integrity related vulnerabilities which are inherent in e-tendering systems which use Public-Key of the specified officer of a Buyer organization for bid-encryption. Bid-encryption in ETS is such that the Bids cannot be decrypted before the Public Online Tender Opening Event (TOE), even if there is connivance between the concerned tender-opening officers of the Buyer organization and the personnel of e-tendering service provider.

(iii) **CAUTION:** All bidders must fill ElectronicForms™ for each bid-part sincerely and carefully, and avoid any discrepancy between information given in the ElectronicForms™ and the corresponding Main-Bid. If it is found during the Online Public TOE that a bidder has not filled in the complete information in the ElectronicForms™, the TOE officer may make available for downloading the corresponding Main-Bid of that bidder at the risk of the bidder. **If variation is noted between the information contained in the**

ElectronicForms™ and the 'Main-Bid', the contents of the ElectronicForms™ shall prevail.

(iv) In case of any discrepancy between the values mentioned in figures and in words, the value mentioned in words will prevail.

(v) Additionally, the bidder shall make sure that the Pass-Phrase to decrypt the relevant Bid-Part is submitted to SECI in a sealed envelope before the start date and time of the Tender Opening Event (TOE).

(vi) There is an additional protection with SSL Encryption during transit from the client-end computer of a Supplier organization to the e-tendering server/ portal.

3.19.12 Other Instructions

(i) For further instructions, the vendor should visit the home-page of the portal https://www.tcil-india-electrionictender.com, and go to the User-Guidance Centre

(ii) The help information provided through 'ETS User-Guidance Centre' is available in three categories – Users intending to Register / First-Time Users, Logged-in users of Buyer organizations, and Logged-in users of Supplier organizations. Various links (including links for User Manuals) are provided under each of the three categories.

(iii) Important Note: It is strongly recommended that all authorized users of Supplier organizations should thoroughly peruse the information provided under the relevant links, and take appropriate action. This will prevent hiccups, and minimize teething problems during the use of ETS.

3.19.13 SIX CRITICAL DO'S AND DON'TS FOR BIDDERS

Specifically for Supplier (Bidding) organizations, the following 'SIX KEY INSTRUCTIONS for BIDDERS' must be assiduously adhered to:

(i) Obtain individual Digital Signing Certificate (DSC or DC) of Class II or above well in advance of your tender submission deadline on ETS.

(ii) Register your organization on ETS well in advance of the important deadlines for your first tender on ETS viz 'Date and Time of Closure of Procurement of Tender Documents' and 'Last Date and Time of Receipt of Bids'. 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.

(iii) Get your organization's concerned executives trained on ETS well in advance of your first tender submission deadline on ETS

(iv) Submit your bids well in advance of tender submission deadline on ETS (There could be last minute problems due to internet timeout, breakdown, et al)

(v) It is the responsibility of each bidder to remember and securely store the Pass-Phrase for each Bid-Part submitted by that bidder. **The bidders may note that as per ITB Clause 3.10.1,** the bid shall be considered as non-responsive due to non-submission of correct, valid and operative Pass-Phrase to

decrypt either Technical Bid Part or Financial Bid Part in a separate sealed envelope before due date and time of submission of bid.

(vi) ETS will make your bid available for opening during the Online Public Tender Opening Event (TOE) 'ONLY IF' your 'Status pertaining Overall Bid-Submission' is 'Complete'.

NOTE:

(i) While the first three instructions mentioned above are especially relevant to first-time users of ETS, the fourth, fifth and sixth instructions are relevant at all times.

(ii) Minimum Requirements at Bidder's End

a. Computer System with good configuration (1 GB RAM, Windows 7 and above)

b. Broadband connectivity

c. Microsoft Internet Explorer 7.0 or above

d. Digital Certificate(s)

(iii) Any Further support and assistance:

TCIL/ ETS Helpdesk	
Telephone/ Mobile	Customer Support: +91-11- 26202699 (Multiple Telephone lines) Emergency Mobile Numbers: +91-9868393775, 9868393717, 9868393792
Email-ID	ets_support@tcil-india.com

3.20 Procedure for electronic Reverse Auctioning (e-RA):

1. The e-auctioning shall be conducted on www.tcil-india-electronictender.com. E-Auctioning shall be carried out on the day as intimated by SECI to the eligible bidders.

2. After financial bid evaluation, the bidders shall be shortlisted in the ascending order of price bid quoted. Of this top 50% of the bidders starting from the LI Bid subject to minimum of 3 bids shall only be eligible for e-RA. If the price bid quoted is same for two or more bidders, then all the bidders with same price bid shall be considered of equal rank/ standing in the order. The e-RA shall be conducted as follows:

At least one week prior to e-RA, an advance intimation regarding the date and time of the e-RA will be sent to by email to all bidders whose technical bids have been opened and found to be qualified. However from this advance intimation it shall not be construed by the bidders that they have been shortlisted for e-RA. Further at least two hours before the schedule start time

of e-Auctioning, a system generated email for invitation for e-Auctioning will be sent to all those bidders only who have been shortlisted based on the criteria mentioned in IFB.

a. Shortlisted bidders for e-Auctioning will be able to login into the TCIL website of eauctioninging15 minutes before the start time of e-auctioning.

b. At the start of e-auctioning process, the bid along with the list of short listed bidders shall be displayed as their first round bid along with the NPV value of O&M quotation per year submitted and calculated as per Appendix -3 of Section VI. The auctioning shall be on the EPC price quoted by the bidder. The NPV value of O&M price Bid shall remain fixed.

c. The minimum decrement step for e-Auctioning is Rs. 2,00,000/- in 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), i.e. each decrement shall be in multiples of Rs. 2,00,000/- only. The multiples of bid decrement are 1, 2, 3…10, 15, 20, 25…50,100 (as per TCIL ETS). Further to the above, the prospective bidders may also note that whatever the discount offered by the lowest bidder during the e – RA process on the price quoted by them during financial bid, the same shall be applied proportionately to the prices of items quoted by them initially in the financial bid, for making payments.

d. Bidders can only quote **any value** lower than their **minimum EPC price** quoted by any bidder at that point of time during E-Auctioning. However, at no stage, increase in EPC price will be permissible.

e. During E- Auctioning, no revision in total price for which a bidder is considered qualified after evaluation of Technical Bid is allowed.

f. The initial auctioning period will be of one (01) hour with a provision of auto extension by eight minutes from the scheduled/ extended closing time if any fresh bid is received in last eight minutes of auctioning period or extended auctioning period. If no valid bid is received during last eight minutes of auctioning period or extended auctioning period, then the e-auctioning process will get closed.

3. Following information will be displayed in the bidder's bidding window:

a. First round EPC and O&M price as their start price initially and thereafter last quoted EPC price. The price (mentioned with NPV) shall remain fixed throughout the process.

b. The list of last quoted EPC price (i.e. last Bid Value) along with NPV of O&M price (fixed) of all bidders with their Pseudo Identities and their time of quote.

4. Selection of Successful Bidders

The bidders shall be selected in the ascending order with lowest quoted Total Price (EPC + NPV of O&M price) (being L1).

a. The final price arrived by adding the EPC price (as a result of e-auctioning process) and the NPV of O&M price (fixed during e-auctioning).

b. The bidder with lowest sum quoted at the end of E-Auctioning will be considered L1.

c. In case of tie in Total Price (i.e. the sum of their last quoted discounted EPC price and the NPV of O&M price), among two or more bidders being the same at the end of e-Reverse Auction, they will be considered in the chronological order of their last bid with preference to the bidder who has quoted his last bid earlier than others.

d. In the above case, if the time of quote also become exactly same among the bidders at a tie, then the ranking among these bidders shall be done as follow:

- The bidder who has quoted lowest Total Price in their Price BID before commencement of E-Auction shall be considered as L-1.
- If there is also a tie among any of these bidders, then L-1 will be the bidder who has the highest average annual turnover as per the documents submitted as a part of their bid.

(ii) At the end of selection process, a letter of Intent (LOI)/Notice to Proceed (NTP)/Purchase Order (PO) will be issued to the successful bidder (L1).

(iii) In all cases, SECI's decision regarding selection of bidder through E-Auctioning or otherwise based on First Round quotation or annulment of tender process shall be final and binding on all participating bidders.

3.20.1. Other Instructions

(iv) For further instructions, the vendor should visit the home-page of the portal https://www.tcil-india-electronictender.com, and go to the User-Guidance Centre.

(v) The help information provided through 'ETS User-Guidance Centre' is available in three categories – Users intending to Register / First-Time Users, Logged-in users of Buyer organizations, and Logged-in users of Supplier organizations. Various links (including links for User Manuals) are provided under each of the three categories.

(vi) Important Note: It is strongly recommended that all authorized users of Supplier organizations should thoroughly peruse the information provided under the relevant links, and take appropriate action. This will prevent hiccups, and minimize teething problems during the use of ETS.

3.20.2. SIX CRITICAL DO'S AND DON'TS FOR BIDDERS

Specifically for Supplier organizations, the following 'SIX KEY INSTRUCTIONS for BIDDERS' must be assiduously adhered to:

(vii) Obtain individual Digital Signing Certificate (DSC or DC) of Class II or above well in advance of your tender submission deadline on ETS.

(viii) Register your organization on ETS well in advance of the important deadlines for your first tender on ETS viz 'Date and Time of Closure of Procurement of Tender Documents' and 'Last Date and Time of Receipt of Bids'. 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.

(ix) Get your organization's concerned executives trained on ETS well in advance of your first tender submission deadline on ETS

(x) Submit your bids well in advance of tender submission deadline on ETS (There could be last minute problems due to internet timeout, breakdown, et al)

(xi) It is the responsibility of each bidder to remember and securely store the Pass-Phrase for each Bid-Part submitted by that bidder. **The bidders may note that as per ITB Clause 3.10.1,** the bid shall be considered as non-responsive due to non-submission of correct, valid and operative Pass-Phrase to decrypt either Technical Bid Part or Financial Bid Part in a separate sealed envelope before due date and time of submission of bid.

(xii) ETS will make your bid available for opening during the Online Public Tender Opening Event (TOE) 'ONLY IF' your 'Status pertaining Overall Bid-Submission' is 'Complete'.

NOTE:

(iv) While the first three instructions mentioned above are especially relevant to first-time users of ETS, the fourth, fifth and sixth instructions are relevant at all times.

(v) Minimum Requirements at Bidder's End

e. Computer System with good configuration (1 GB RAM, Windows 7 and above)

f. Broadband connectivity

g. Microsoft Internet Explorer 7.0 or above

h. Digital Certificate(s)

(vi) Any Further support and assistance:

TCIL/ ETS Helpdesk	
Telephone/ Mobile	Customer Support: +91-11- 26202699 (Multiple Telephone lines) Emergency Mobile Numbers: +91-9868393775, 9868393717, 9868393792
Email-ID	ets_support@tcil-india.com

Section – III

General Conditions of Contract

(NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50)

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

I[st] floor, Wing A, Religare Building, D – 3, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989224, Fax: 011 – 71989241

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 Company 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 including 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 has 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 Commissioning has been attained 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 therefrom, 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.

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

"Defect Liability Period" means the period of twelve (12) 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" means THDC India Limited (THDCIL), having its registered office at Bhagirath Bhawan, Top Terrace, Bhagirahti Puram, Tehri Garhwal-249 001, Uttarakhand and includes the legal successors or permitted assigns of the THDCIL and also its authorized representative i.e. Solar Energy

Corporation of India Limited (SECI), New Delhi.

"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**" means acceptance of Facilities by the Employer at the end of O&M period, as stated in this NIT, from the date of Commissioning 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.

"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. O&M 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.

"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 Specifications

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

3.7.1 The Contract does not create any agency, partnership, joint venture or other joint relationship

between the parties hereto.

3.7.2 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.

3.7.3 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

3.10.1 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.

3.10.2 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 Hyderabad 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

6.1.1 Adjudicator

6.1.2 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.

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

6.1.4 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.

6.1.5 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.

6.1.6 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.

In case the Contractor is a Public Sector Enterprise or a Government Department:

6.2.3 In case the Contractor is a Public Sector Enterprise or a Government Department, the dispute shall be referred for resolution in Permanent Machinery for Arbitration (PMA) of the Department of Public Enterprise, Government of India. Such dispute or difference shall be referred by either party for Arbitration to the sole Arbitrator in the Department of Public Enterprise to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary / Additional Secretary, when so authorized by the Law Secretary, whose decision, shall bind the Parties finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

In case the contractor is not a Public Sector Enterprise or a Government Department:

6.2.4 Any dispute submitted by a party to arbitration shall be heard by an arbitration panel composed of three arbitrators, in accordance with the provisions set forth below.

6.2.4.1 The Employer and the Contractor shall each appoint one arbitrator, and these two arbitrators shall jointly appoint a third arbitrator, who shall chair the arbitration panel. If the two arbitrators do not succeed in appointing a third arbitrator within twenty-eight (28) days after the latter of the two arbitrators has been appointed, the third arbitrator shall, at the request of either party, be appointed by the Appointing Authority for arbitrator designated in the SCC.

6.2.4.2 If one party fails to appoint its arbitrator within forty-two (42) days after the other party has named its arbitrator, the party which has named an arbitrator may request the Appointing Authority to appoint the second arbitrator.

6.2.4.3 If for any reason an arbitrator is unable to perform its function, the mandate of the Arbitrator shall terminate in accordance with the provisions of applicable laws as mentioned in GCC Clause 5 (Governing Law) and a substitute shall be appointed in the same manner as the original arbitrator.

6.2.4.4 Arbitration proceedings shall be conducted in accordance with the Arbitration and Conciliation Act, 1996 (as amended). The venue of arbitration shall be New Delhi.

6.2.4.5 The decision of a majority of the arbitrators (or of the third arbitrator chairing the arbitration, if there is no such majority) shall be final and binding and shall be enforceable in any court of competent jurisdiction as decree of the court. The parties thereby waive any objections to or claims of immunity from such enforcement.

6.2.4.6 The arbitrator(s) shall give reasoned award.

6.3 **Reference to arbitration**

Notwithstanding any reference to the arbitration herein,

6.3.1 The parties shall continue to perform their respective obligations under the Contract unless they otherwise agree.

6.3.2 The Employer shall pay the Contractor any payment due to the Contractor.

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 50 MW (AC) Solar PV power plant with modules manufactured in India, at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India), 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 associated interfacing at 33kV/110kV Voltage system and including O&M of the complete facilities for ten (10) 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 Bidder is requested 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, with its previous experience, 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 grade/level the land identified for development of 50 MW Solar power plant (modules manufactured in India) at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India), 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 associated interfacing at 33kV/110kV Voltage system including Right of Way (if any) and the O&M of the complete facilities

for ten years. It is contractor's responsibility to coordinate with state/central agencies in order to get any permission whatsoever, required for successful development & operation of Plant till its desired life.

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 with the State Grid, Employer shall fill up the application & hand it over to the contractor however all other activities beyond it such as coordination for Bay allocation, technical/regulatory compliance for interconnection including payment of Fee or any other charges to the state agencies/STU as the case may be shall be taken care by the Contractor. Bidders are advised to include these cost in their final offer/Price BID.

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, the right of way for the access to site and for erection of transmission lines as applicable, viz. 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 . The Employer shall be responsible for acquiring and providing legal and physical possession of the Site thereto required for the proper execution of the Contract. The Employer shall give full possession or phased possession of site and accord all rights of access thereto on or before the date(s) of LOI/ NTP or as agreed in contract agreement. The Employer shall pay fees for 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 for the plant establishment, which such authorities or undertakings require the Employer to obtain them in the Employer's name, are necessary for the execution of the Contract (they include those required for the Performance by both the Contractor and the Employer of their respective obligations under the Contract), including those specified in "Scope of Works and Supply by the Employer" at the Contract Agreement on providing the proper demand note letter. However, such demand notes must be provided to the Employer at least 7 days prior to the submission

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 27. 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 shall be firm and shall not be subject to price variation.

10.2 Subject to GCC Sub-Clauses 8.2 and 9.1 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.

12. Bank Guarantees

12.1 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.

12.2 Mobilization Advance Bank Guarantee:

12.2.1 The Contractor shall, if required, within 10 (ten) days from the date of Issue of LOI, provide a Bank Guarantee in an amount equal to the advance mobilization payment calculated in accordance with ITB Clause 1.2.3 of this NIT, and in the currency mentioned in ITB Clause 2.9.2, with an initial validity of up to 180 days from the date of issue of LOI for the Facilities in accordance with GCC Clause 26. However, in case of delay in completion of facilities under the

the package, the validity of the security shall be extended by the period of such delay.

12.2.2 The security shall be in the form of an unconditional and irrevocable bank guarantee as per the Format provided in "Appendix 12 (a): Format of Bank Guarantee for Mobilization Advance". The Mobilization Advance shall be interest bearing. The rate of interest being the SBI base rates prevailing on the 7th day prior to the Date of opening of Techno-commercial Bids. The Mobilization Advance against Bank Guarantee shall be reduced pro-rata from every Running Account Bill/ Stage Payment under the Contract based on the value of equipment/ facilities received. The total amount of mobilization advance, including the interest levied, shall deemed to be adjusted from the running bills on pro – rata basis till the commissioning of the Project as specified in SCC Clause 14. It should be clearly understood that adjustment in the value of Bank Guarantee for Mobilization Advance shall not in any way dilute the Contractor's responsibility and liabilities under the Contract including in respect of the Facilities for which the adjustment in the value of Bank Guarantee is allowed.

12.2.3 The Bank Guarantee submitted against the Mobilization advance shall be essentially from any of the Banks listed at "Schedule – 1: List of Banks" supplemented at SCC of the Bidding Documents.

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 shall be extended by the period of such delay plus ninety days.

12.3.2 The Performance Bank Guarantee shall be denominated in the currency as mentioned in the ITB 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 Banks listed at "Schedule – 1: List of Banks" supplemented at SCC of the Bidding Documents.

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

12.4.1 The contractor shall, at the time of Operational Acceptance and at the end of fifth year of O&M, 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 Banks listed at "Schedule – 1: List of Banks" supplemented at SCC of the Bidding Documents.

13. 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 and pay/ reimburse to the Contractor Excise Duty, Custom Duty, Sales Tax (but not the surcharge in lieu of Sales Tax), Local Tax including Entry Tax/ Octroi and other levies in respect of direct transactions between the Employer and the Contractor, if imposed on the Plant and Equipment including Mandatory Spares to be incorporated in the Facilities, by the laws of India on submission of proper documentary evidence/ tax invoice.

13.3 If specified as such in SCC, Employer will issue the requisite sales tax declaration form(s) in order to get the benefit of any concession in the rate of sales tax. Further, in case of all components, equipment and materials identified by the Contractor and Employer to be dispatched directly from the sub- vendor's work to Employer site in a state different from the state wherein sub-vendor's works are located, the Contractor will effect sale in transit. For effecting the sale in transit, the contractor shall ensure that his sub vendor raises invoices and obtains GR/LR/RR/BL/AWB in the name of Contractor (and not in the name of Employer). The Contractor shall further ensure that he endorses the GR/LR/RR/BL/AWB in the name of Employer during transit of the equipment before the delivery of equipment is taken by Employer.

13.4 All taxes, duties and levies on Works Contract or civil works, if any, shall be to the contractor's account and no separate claim in this regard will be entertained by the Employer.

13.5 Service Tax, if any, shall be to the contractor's account and no separate claim in this regard will be entertained by the Employer for EPC portion of Contract. However, for O&M Contract, any statutory variation on account of service Tax shall be paid/reimbursed based on Documentary Evidence.

13.6 The taxes, duties, levies and charges, as mentioned by bidder (hereinafter called "TAX" in GCC Clause 13) are to be considered for evaluation. Bidders are required to ascertain correctness of amount mentioned in the bid as on date of techno – commercial bid opening.

13.7 Any new tax introduced or revision in respective applicable tax rates 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. However, any variation in Service Tax and Work Contract Tax shall not be payable for EPC portion of the Contract.

13.8 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 excise duty and sales tax. No variation in ED and CST on bought out items shall be admissible. All other taxes such as Service tax, duties & levies including sale tax 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 service tax in the invoice and shall certify that the tax has been deposited with the appropriate authority

D. Project Implementation:

14. Copyright & Patent

14.1 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.

14.2 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. 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.

15.5 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. 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 The Contractor shall execute the basic and detailed design and engineering work in compliance 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.

22.3 If the Contractor offers equipment manufactured in accordance with other international well recognized standards (mentioned above), he shall, in that case, supply a copy in English of the Standard Specification adopted and shall clearly mention in what respect such standard specification differs from Indian Standard Specifications. The Plant, equipment, and materials offered by the Contractor should comply with one consistent set of Standards only to make the system compatible and work in harmony as far as possible, except if mentioned otherwise.

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 Labuor:

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 onto 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 otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment which is not covered under the Scope of Work of the Contractor and has been brought by the Contractor onto the Site.

23.4 Site Regulations and Safety

The Contractor shall have to provide necessary and adequate safety measures including personal protective equipment 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 and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, 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.

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

24.8 Neither the waiving of inspection nor acceptance after inspection by the Employer shall, in anyway, absolve the Contractor of the responsibility of supplying the plant and equipment strictly in accordance with specification and drawings etc.

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 by one of the NABL Accredited Test Centers in India. 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, the Facilities and all parts thereof shall attain the Functional Guarantees specified under Technical Specifications, subject to and

upon the conditions therein specified.

27.1.2 If, for reasons attributable to the Contractor, the guaranteed level of the Functional 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 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; or
- 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

27.4.1 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's notice, the Project 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 on 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

30.1 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

30.2 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

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

33.2 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 In case 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 day 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 @ 0.10% per day 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 design, 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 twelve (12) 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 design, 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, or changes in cost of the plant, machinery, equipment, materials, spare parts or consumables for the Power Project;
- 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 Contract Agreement.
- 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 Telangana 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. Six 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) or from any money due or which become due to him under this Contract or any contract are being executed elsewhere with the Employer.

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 withheld or retained under this clause and duly notified as such to the Contractor.

48. Warranty / Guarantee

48.1 PV modules used in grid connected solar power plants 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 10 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 10 years.

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:

48.5.1 Solar PV Modules: Modules shall be warranted for a minimum period of 25 years in the Bidder's detailed Warranty / Guarantee certificate.

48.5.2 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.

48.5.3 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 occurs, the Contractor has to attend to rectify the fault & the fault must be rectified within the 24 hours from the time of occurrence of fault, failing which the Contractor will be liable for additional liquidated damages as per reference to the generation parameters accumulated in similar/ associated equipment of the plant (for example if a block consists of 4 inverters and one inverter is down for more than 24 hours, then the generation for faulty inverter shall be calculated as the average of accumulated generation for the other 3 inverters over the 24 hours duration of fault as the deemed generation) and the LD shall be levied on the deemed generation as per the tariff of Rs. 5.50 per unit. The contractor must maintain all the records pertaining to all such faults 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 % serviceability of all the plant equipment & other

associated infrastructure developed by him during execution of project as its scope of work.

50.4.2 Contractor shall produce monthly serviceability 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 unserviceability/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. 1000 per 24 hours, which shall be over & above GCC Clause 34 & 50.1.2. 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.

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-minimum 3/shift.
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.

Section – IV

Special Conditions of Contract

(NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50)

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

Ist floor, Wing A, Religare Building, D – 3, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989224, Fax: 011 – 71989241

Contents

1 Project description

Design, Engineering, Procurement & Supply, Packing & Forwarding, Transportation, Unloading, Storage at site, Site development, Construction, Erection & Installation of equipment, Testing & commissioning along with associated interfacing at 33 kV/110kV voltage system including Right of Way (ROW) (if any) and comprehensive O&M for 10 (ten) years thereafter, of the said 50 MW Solar PV Power Plant at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India).

2 Project Site

The Project site is located at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India). The available area for the Project is 101.0636 Hectares. The contractor has to suitably plan the layout of the plant for optimum utilization of land ensuring installation, interconnection and commissioning of entire Project Capacity. Bidders are advised to visit the Site and get themselves acquainted with the Project Site. Details of the Project Site is mentioned under Section V: Technical Specifications

3 Appointing Authority

Appointing Authority of Adjudicator and Arbitrator shall be **CMD, THDCIL.**

4 Project Manager/ Engineer in - Charge

Project Manager/ Engineer in - Charge will be appointed by SECI and will be intimated after award of the contract.

5 Scope of Works

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

6 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 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 TS Clause 7.

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

7.3. 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 7 for Operational Acceptance of the plant.

7.4. 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 7.

7.5. The performance of plant will be evaluated based on minimum CUF demonstrated at the end of every year from the date of commissioning 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.

7.6. During O&M contract, the plant performance will be evaluated based on annual Capacity Utilization Factor. Second year onwards linear degradation of the module output (i.e., 0.75% of DC capacity at STC per year) shall be considered for the calculated CUF every year.

7.7. 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.

7.8. 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 insolation 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.

7.9. 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.

7.10. The Contractor shall be responsible for achieving PR and CUF. For any shortfall in achieving PR and CUF, compensation shall be recovered from the Contractor as per SCC Clause 25.

8 Project Time lines:

The time lines for execution of the contract is 360 days from the date of issue of LOI/ NTP and as per the indicative milestones mentioned below.

Timelines for Scope of work in Days

S. No.	Stage	Timelines
I.	Issue of LOI / NTP	Zero Date (D)
II.	Survey and soil Investigation	D+30 days
III.	Site Development Work	D+ 120 days
IV.	Approval of Major drawings	D+120 days

S. No.	Stage	Timelines
V.	Completion of supply of major equipment like SPV Modules (including structure for the above), Power Conditioning Units, transformers etc.	D+210 days
VI.	Installation of all major equipment	D+ 270 days
VII.	Interconnection of all major equipment and completion of installation	D+300 days
VIII.	Completion, testing and commissioning of Solar PV power plant of 50 MW (AC)	D+ 330 days
IX.	Operational Acceptance entire capacity (PR test demonstration)	D+360 days

9 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 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 Starting of Work

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.

12 Completion Schedule

12.1. 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.

12.2. 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 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 Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India), visit the Site before quoting rate for EPC works. After taking in to consideration all aspects of the site, condition of soil, requirement of interfacing and grid interconnection, the Contractor should quote for EPC works. No extra claim will be entertained at post bidding stage. The foundation design of module structure and the building shall have to be approved by the Employer. In case of any defects arising in the building during guarantee/O&M period, the Contractor shall have to rectify the same at its own cost.

14 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:

14.1.1 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) 10% of the total price of supplies of Plant and Equipment as advance payment against equal amount of Bank Guarantee (with validity as per relevant ITB clause) which shall be furnished by contractor in addition to Performance Bank Guarantee.

(ii) 60% 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.

(iii) 25% 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.

(iv) 5% of the total price of supplies of Plant and Equipment shall be paid on demonstration of CUF for the successful first year of operation. However, this Payment may also be released on the submission of Bank Guarantee of equivalent amount. The BG is valid up to demonstration of CUF for the successful first year of Operation. However, in case of delay, the BG shall be extended suitably.

14.1.2 For **Erection, Testing and Commissioning**

(i) 10% of the total price of Erection, Testing and commissioning as advance payment against equal amount of Bank Guarantee (with validity as per ITB Clause 1.2.3) which shall be furnished by contractor in addition to Performance Bank Guarantee.

(ii) 70% 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.

(iii) 15% 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.

(iv) 5% of the total price of Erection, Testing and Commissioning shall be paid on demonstration of CUF for the successful first year of operation. However, this Payment may also be released on the submission of Bank Guarantee of equivalent amount. The BG is valid upto demonstration of CUF for the successful first year of Operation. However, in case of delay, the BG shall be extended suitably.

14.1.3 For **Civil and Allied Works**

(i) 10% of the total price of Civil Works as 10 % advance payment against equal amount of Bank Guarantee (with validity as per ITB Clause 1.2.3) which shall be furnished by contractor in addition to Performance Bank Guarantee.

(ii) 70% of the total price of Civil Works shall be paid progressively on certification by the Project Manager/ Engineer In - Charge for the quantum of work completed/ Milestones achieved after successful clearance of quality check points involved in the quantum of work / Milestones billed.

(iii) 15% of the total price of Civil Works shall be paid on completion of all the civil works including finishing and debris removal.

(iv) 5% of the total price of Civil Works shall be paid on demonstration of CUF for the successful first year of operation. However, this Payment may also be released on the submission of Bank Guarantee of equivalent amount. The BG is valid up to demonstration of CUF for the successful first year of Operation. However, in case of delay, the BG shall be extended suitably.

14.1.4 On successful Operation and Maintenance of the Solar Power Plant on **quarterly** basis at the end of every quarter for each year till 10 (ten) 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

14.2. **Recovery of interest bearing Mobilization advance**:

Recovery of the mobilization advance and interest component on the advance amount shall be made from the progressive payments released to the Contractor as per terms above. The amount of interest to be recovered from a particular bill shall be calculated at SBI base rate (per annum) prevailing on the 7th day prior to the date of opening of techno – commercial bid on the value of advance corresponding to the percentage of total progressive payment being released. The period for which the interest is to be calculated shall be reckoned from the date of release of the advance payment to the actual date of release of the said progressive payment. The interest on the advance payment shall stand fully recovered on release of all the progressive payments. If the amount payable under any interim bill is not sufficient to cover all deductions to be made for interest on the advance payment and other sums deductible therefrom, the balance outstanding shall be recovered from the next payments immediately falling due. If the bidder is not taking any mobilization advance from the Employer, then the mobilization advance mentioned as percentage of the total cost will be distributed to the other heads proportionately.

14.3. **Notes:**

(i) All the transactions shall be made directly between the Employer (THDCIL) and the contractor. Hence for every consignment, the consignee must be in the name of "THDC India Limited".

(ii) 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.

(iii) 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.

(iv) All the applicable Taxes and Duties which are payable by the Employer under the Contract, pursuant to GCC Clause 13, 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.

(v) Contract Value (CV):

The firm sum quoted by the Successful Bidder in its Financial Proposal is the sum of individual contract values for supply, erection and civil works under different work order packages 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 Contract Value: Total value mentioned under the Erection Testing and commissioning works package mentioned at SCC clause 14.1.2 and Bill of Quantities.
c. Civil Contract Value: Total value mentioned under the Civil and allied works package mentioned at SCC Clause 14.1.3 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

(vi) Employer shall issue separate or consolidated LOI's for the following components of the contract i.e.,

a. Supply Contract.
b. Erection, Testing and Commissioning Contract
c. Civil and allied works Contract
d. O&M Contract

14.4. Mobilisation Advance: Mobilisation Advance, if requested, shall be payable against submission of unconditional and irrevocable Mobilization advance payment bank guarantee of equivalent amount as per format mentioned in "Section VI: Forms and Formats" and issued by a bank enlisted at Schedule-1. This bank guarantee shall have validity as per the relevant clause of ITB. The recovery of the mobilization advance shall be made in accordance with the SCC Clause 14.2.

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

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 compliance of 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 30 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, Works Contract Tax and other statutory rules and provisions in force. THDCIL will issue C – Form etc. in order to get sales tax concession. Bidders are requested to take in account while quoting their bids.

14.7. 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 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 shall not be considered for price variation.

16 Taxes and Duties:

16.1. 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.

16.2. 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 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. Contractor shall furnish all the documents related including GR/LR/RR along with the supplier invoices as a proof of the purchase along with the bill / invoice raised by the contractor.

18 Samples

Apart from adhering to special provision made in the specification regarding submission of samples, the Contractor shall within 10 days of its receipt of Letter of Intent, provide to the Employer samples along with detailed literature of all materials it proposes to use irrespective of the fact that specific make/material might have been stipulated. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at Site, detailed literature / test certificate of the same shall be provided instead. The Employer shall check the samples and give his comments and/or approval to the same.

19 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 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 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 Contractor. For construction, temporary connection for construction power from DISCOM shall be arranged by the Contractor 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 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 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 this 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 Liquidated Damages

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

25 Liquidated Damages (LD) for PR and CUF deviations

25.1. During the Operational Acceptance any shortfall in the Performance Ratio (PR) as determined through the PR Test Procedure specified in Clause 7 of Section V: Technical Specification, will attract imposition of liquidated damages. For every 0.01 shortfall in PR below 0.78 by the bidder, a LD of 0.5% of the total Contract Value shall be levied. In case the Plant PR result is 0.05 below 0.78, i.e., 0.73 or lower, the total performance bank guarantee submitted by the bidder will be encashed. In case the Performance guarantee has already been encashed on account of delays, the due amount will be recovered from the Final Instalment of the EPC payable at the end of the first year (as per the Terms of Payment specified in Clause 14 of SCC)

25.2. In case of any defect in the system after commissioning, the Contractor shall repair it within 48 hours. Otherwise LD shall be charged for shortfall in generated units beyond 24 hours as per Tariff of Rs. 5.5 /unit, with the cumulative maximum of 5% of the total contract value, and the same shall be deducted from their payments due / Bank guarantee available with the Employer. The LD will be calculated with reference to applicable GCC Clause.

25.3. Liquidated Damages for during O&M period shall be charged at a rate of:
Difference in units derived from committed and achieved CUF x Rs. 5.5 per unit; for period after commissioning till the O&M contract closure. LD applicable shall be on annual basis. The CUF shall be evaluated as per the formula mentioned at Clause 11 of Technical Specification of this tender document. During the O&M period, at any point of time, the Contractor has to ensure the availability of BG of requisite value with Employer.

25.4. Liquidated Damage during O&M period against breakdown of other Infrastructure of Solar Power plant, which doesn't affect the generation of power, directly such as Road inside the plant, water supply system, SCADA, CCTV & other Infrastructure developed by the Contractor as a scope of work for the Project, shall be charged as Rs. 1000/day, per incidents of break down reported beyond 48 hours of such reporting. Cumulative

value of such LD shall be limited to 50% of yearly O&M Cost.

25.5. The Liquidated Damages specified on account of delays, as specified in GCC Clause 34 and LD specified on account of deviations in Functional / Performance Guarantees as specified in SCC Clause 25 above shall be assessed independent of each other.

26 Miscellaneous

26.1. 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.

26.2. 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.

26.3. 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/SECI'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.

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

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

Schedule 1: List of Banks

1. SCHEDULED COMMERCIAL BANKS	2. OTHER PUBLIC SECTOR BANKS
SBI AND ASSOCIATES	1. IDBI Bank Ltd.
1. State Bank of India	3. FOREIGN BANKS
2. State Bank of Bikaner & Jaipur	1. Bank of America NA
3. State Bank of Hyderabad	2. Bank of Tokyo Mitsubishi UFJ Ltd.
4. State Bank of Indore	3. BNP Paribas
5. State Bank of Mysore	4. Calyon Bank
6. State Bank of Patiala	5. Citi Bank N.A.
7. State Bank of Travancore	6. Deutsche Bank A.G
NATIONALISED BANKS	7. The HongKong and Shanghai Banking Corpn. Ltd.
1. Allahabad Bank	8. Standard Chartered Bank
2. Andhra Bank	9. Societe Generale
3. Bank of India	10. Barclays Bank
4. Bank of Maharashtra	11. ABN Amro Bank N.V.
5. Canara Bank	12. Bank of Nova Scotia
6. Central Bank of India	13. Development Bank of Singapore (DBS, Bank Ltd.)
7. Corporation Bank	4. SCHEDULED PRIVATE BANKS
8. Dena Bank	1. Federal Bank Ltd.
9. Indian Bank	2. ING Vysya Bank Ltd.
10. Indian Overseas Bank	3. Axis Bank Ltd.
11. Oriental Bank of Commerce	4. ICICI Bank Ltd.
12. Punjab National Bank	5. HDFC Bank Ltd.
13. Punjab & Sind Bank	6. Yes Bank Ltd.
14. Syndicate Bank	7. Ratnakar Bank Limited
15. Union Bank of India	
16. United Bank of India	
17. UCO Bank	
18. Vijaya Bank	
19. Bank of Baroda	

SECTION – V

TECHNICAL SPECIFICATIONS

(NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50)

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

I[st] floor, Wing A, Religare Building, D – 3, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989224, Fax: 011 – 71989241

Contents

DISCLAIMER:

1. 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.
2. Solar Energy Corporation of India Limited (SECI) on behalf of THDC India Limited (THDCIL), The Employer, reserves the right to modify, amend or supplement this IFB documents including all formats and Annexures.
3. While this bidding documents have been prepared in good faith, neither Employer or its authorized 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.
4. 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 and evacuation at 33 kV till the designated substation at Manjeswar, Kasargod Solar Park in the state of Kerala (India), 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 authorised representatives.

Place:

(Signature)

Date: Name and Designation of bidder

Introduction

1 Site Description

1.1 The suitable and requisite land for the proposed 50 MW, AC Solar PV power Plant is located at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India)

1.2 The survey report of the land for the Project Site given at Annexure-i.

1.3 Interconnection point for evacuation of Power from the Project shall be at 33 kV level, through designated Substation.

System Design and Philosophy

2 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 (>16 Multi, >18% mono) of high efficiency and the cells/ modules. Fill factor of the module shall not be less than 72 %.). PV modules must be made in India and complying with the other DCR requirements for the PV Modules.

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.

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 33 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/DISCOM infinite 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 grid within permissible limits of high voltage and frequency fluctuation conditions, so as to export the maximum possible units generated to the grid as per the applicable regulations and grid codes. 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 55 MWp output at the time of installation. If the bidder anticipates any degradation of the modules more than 0.7% 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 50 MW (AC) for Solar Power Plant along with their associated equipment. The capacity of the Plant shall be determined to attain minimum of 50 MW (AC) 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 50 MW (AC) Solar PV Power Plant at Manjeswar, Kasargod Solar Park in the state of Kerala (India) shall be completed within 360 days from the date of order/ LOI/ NTP and shall follow timelines under SCC Clause 8.

Scope of Supply and Work

3 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, licences, installation and incidentals, insurance at all stages, erection, testing and commissioning of 50 MW (AC). Grid Interactive Solar PV Power Plant and performance demonstration with associated equipment and materials along with associated transmission system along with interconnection & interfacing at 33 kV level including Right of Way (if any), on turnkey basis at Manjeswar, Kasaragod Solar Park in the state of Kerala (India) and 10 (ten) years comprehensive operation and maintenance from the date of commissioning or Operational Acceptance, whichever is later.

3.2 The equipment and materials for 50 MW (AC) Grid Interactive 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 levelling, grading & development of land , Construction of control room, requisite testing facilities at site, safety and security requirements and provision for other things that may require for successful operation and maintenance of Plant and equipment. For the purpose of calculation 5 (five) acers per MW land requirement is envisaged. The bidder/Contractor is required to keep in mind the connectivity of the Plant along with interconnection & interfacing at 33 kV at the designated substation including Right of Way (if any).

3.2.2 Solar PV modules of suitable rating, in array totalling minimum of 1.1 x 50 MWp (under STC Condition to meet 50 MW 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 33kV / 415V auxiliary transformer (s).

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

3.2.11 33 kV indoor/ outdoor panels having incoming and outgoing feeders with VCBs, CTs, PTs, Bus bars, cables terminals kits and Bus coupler having Main and transfer Bus. Each bay shall consist of VCB, CT, Isolators with earth switch, LAs and PT's etc. All tolls & tackles, equipment and materials for the termination at the designated substation point.

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 well as at the substation 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 Plant area.

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

3.2.16 Earthing of the entire 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.

3.2.20 CCTV cameras at Main Entrance and at Control Rooms, Plant Area & Plant

perimeter to cover entire area in order to capture any trespassing, theft & pilferage in the Plant area.

3.2.21 Fire detection & protection system in buildings, Plant and adequate number & types of fire extinguishers.

3.2.22 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.

3.2.23 One Solar Radiation Measurement Station including testing facilities. The Solar Observatory with associated systems shall include but not be limited to the following:

- Four number of Pyranometers in two sets of Pyranometers at distant apart in the Plant premises.
- Pyranometers to be installed in such a way that they should be under CCTV coverage all the time.
- Each set shall have one pyranometre on module plane and another on horizontal surface to earth.
- The pyranometere on module plane to be fixed to the module mounting structure only, to follow the seasonal tilt if employed.
- Ultrasonic Anemometer (wind speed and direction)
- Temperature Sensor – Ambient and module surface
- Power source to the all sensors
- Data Logger
- Data of all (4) the pyranometers must be collected throughout year in not more than 1 min interval.

3.2.24 Construction of suitable structures for termination of 33 kV line for taking off and receipt of lines through 33 kV transmission lines from Plant end and DISCOM'S Substation respectively.

3.2.25 Design & construction of requisite 33 kV Transmission line/ cable from Plant take off point to the Substation of Solar Park at 33 kV along with interconnection & with the substation including Right of Way (if any) as per the requirement stated under the clause 3.2.24 of Technical Specification, shall be the responsibility of Contractor.

3.2.26 Design of 50 MW (AC) Grid Interactive Solar Power Plant and its associated civil,

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

3.2.27 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.

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

3.2.29 Any other equipment / material, not mentioned but essentially required to complete the 50 MW (AC) 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 Contractor shall design suitable power evacuation system including design and construction of a suitable transmission line/ cabling infrastructure from power Plant to inject power from Solar Photovoltaic Power Plant to the designated Substation at 33 kV

Voltage level.

3.5 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:

3.5.1 Conducting Topographical survey of the total area identified for 50 MW (AC) Solar Photovoltaic capacity & complete soil investigation with bore hole details and Pullout tests. Number of Bore holes to be chosen in such a way that it is representative of the whole plot area.

3.5.2 Earthwork for site grading, cutting, filling, levelling & compaction of land.

3.5.3 Construction and erection of perimeter fence/ boundary wall and main/ security gate(s).

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

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

3.5.6 Construction of peripheral road, 2.5m wide with 0,5m well compacted WBM shoulder on either side or internal roads, 3.75m wide with 0.5m wide well compacted WBM shoulders on either side to carry safe and easy transportation of equipment and material at the project site during and after construction. The Approach road and road from Main gate up to Main Control Room (MCR) Building shall be of WBM with bitumen topping. All other roads shall be of WBM. All roads shall be minimum 150 mm above grade level and shall have road side drains for effective drainage of surface run-off.

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

3.5.8 Construction of Office cum stores cum control room building with Supervisor room, pantry, wash room, conference room etc along with requisite furniture, workstations, air conditioning, Fire detection & protection system, internal and external illumination, other equipment as per the specifications. The minimum floor area of the control room building shall be 5000 sqft.

3.5.9 Security cabin (s) at strategic locations inside the boundary of the Plant.

3.5.10 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.

3.5.11 Suitable Communication System for SCADA with remote monitoring capabilities.

3.5.12 Construction of independent networks for Storm water drainage & sewage disposal system. Rain water harvesting system to promote water conservation.

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

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

3.5.15 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.

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

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

3.5.18 Laying of transmission line, fabrication and erection of structure to support transmission line conductors from take-off point at Plant to the delivery point at DISCOM's substation.

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

3.6.1 Pollution control board clearance, if required

3.6.2 Mining Department, if required

3.6.3 Forest Department, if required

3.6.4 All other approval, as necessary for setting up of a Solar Power Plant including CEIG/CEA, Consent to Establish & Consent to Operate (if applicable), connectivity, power evacuation, railways, PTCC etc. as per the applicable regulations and guidelines

3.6.5 All other statutory approvals, permits, permissions and clearances, not mentioned

specifically but are required to carry out hassle free Construction and O&M of the Plant prevailing at Site.

3.6.6 Though any statutory fee required to be paid by the owner of the Solar Power Plant shall be reimbursed by THDCIL to the Contractor after production of the original receipt, however all efforts in terms of forwarding the application, follow-up etc. to ensure the clearance of those Statutory requirement shall be in Contractor's scope.

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

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

3.9 Complete responsibility of total Operation & Maintenance of Solar Photovoltaic Power Plant including all the infrastructure developed as a part of EPC Contract for 10 (ten) 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.

3.10 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.

3.11 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, 33 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-built drawings / documents and deviation list from good for construction (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 Weekly/ Monthly 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 Ninety days 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 Ninety days 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 Operation and Maintenance

4.1 The contractor shall be required to carry out the total O&M activities of the 50 MW (AC) 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 after commissioning w.e.f. from the date of operational acceptance.

4.2 The 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.
- Supply of all spares, consumables and fixing / application as required.
- Supply & use of spares, consumables, tools, logistics and skilled manpower throughout the maintenance period as per recommendations of the equipment manufacturers and requirement of the Plant & other associated infrastructure developed under the scope of EPC works.
- Conducting periodical checking, testing, overhauling, preventive and corrective action.
- General 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 5TH of every month or finalized 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 /renewal (if any) of 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 and other civil, mechanical, electrical & plumbing system developed during project as a part of Solar PV Power Plant.

4.3 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, invertors, 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 completion of performance demonstration/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 may be further extended on the mutually agreed terms and conditions.

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 switchgears 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, 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.

4.5.13 If any jobs covered in O&M Scope as per O&M Plan are not carried out by the contractor during the O&M period, the Engineer-In-Charge can issue a notice to the Contractor. Repetition of such instances for more than 2 times a year may

lead to the Termination of the O&M Contract by the Employer & forfeiture of Bank Guarantee against same.

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 Bill of Material:

The equipment and material for 50 MW (AC) Grid Interactive Solar Photovoltaic Power Plant with associate system (typical) shall include, but not limited to the following:

Item Details (along with make & specifications)	**Unit**
PV Modules	Nos.
Module Mounting Structures including fasteners and clamps	Set
Main Junction Boxes with monitoring capabilities	Lot
Solar module array to Junction box Interconnection cable (Cu)	RM
Junction box to Inverter Interconnection Cable (Cu/ Al)	RM
Connection accessories – lugs, ferrules, glands, terminations etc.	Lot
AC Cable (LT/ HT) of appropriate sizes	RM
Power Conditioning Units/ Inverters	Nos.
Meteorological station with sensors and data logger	Lot
String level monitoring system (SCADA) and ancillaries	Set

Transformers (Power, Inverter and Auxiliary)	Set
Circuit breakers, CT and PT set (at all voltage levels used)	Set
33 kV Indoor/ outdoor interfacing panels with CT, VCB, PT, Relays etc.	Set
33 kV XLPE Outgoing feeder cable and supports	Set
AC & DC distribution panels/ boards, PDB, LDB etc.	Lot
Control and Relay Panel	Lot
Lightning Arresters of suitable ratings	Nos.
Earth mat for switch yard, DC field array and equipment	Lot
Control and power cables	Lot
Surge Protection devices and Fuses	Set
Earth cables, flats and earthing pits	Lot
Equipment and Control cum office Building with associated equipment	Lot
Rubber Mats for specific kV ratings and safety gadgets, PPE	Lot
Fire extinguisher - Foam type, CO2 type, ABC type etc., as applicable	Lot
Sand Buckets	Lot
Discharge Rods	Lot
Cable for power evacuation with suitable H – poles, towers etc.	Lot
Power efficient peripheral lighting arrangement for the Plant safety	Nos.
Outgoing grid interconnecting 33kV feeders along with all control, protection & metering instruments	
Fire – Alarm system and signboards in buildings	Lot
Metering Equipment (Meters, and associated CT and PT's)	Set
Protection Equipment	Set
Solar Observatory with remote monitoring assistance	Set
Module cleaning system	Lot
CCTV cameras including monitoring system	Set
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 shall be responsible for providing the BOM for the Plant as per the planning, design and good engineering practices..

The technical features of major equipment are described hereunder.

6 Photovoltaic Modules

Total capacity of PV Modules to be supplied for the proposed 50 MW (AC) project is minimum of 55 MWp 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 16 % for multi-crystalline, 18% 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. PV modules must be made in India and complying with the other DVCR requirements for the PV modules.

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 $3g/m^2$/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 +5W and no negative tolerance is allowed.

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°C and 85°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 80% of the initial value at the end of 25 years.

6.12 The modules shall be warranted for minimum of 10 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, if applicable
- IEC 62716: Ammonia Resistant certified, if applicable
- Test certificate from NABL approved or /ILAC member body approved labs shall be provided.

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.

i) Module should have manufacturer's logo on it.

ii) 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.

a) Name of the manufacturer of PV Module

b) Name of the Manufacturer of Solar cells

c) Type of cell : Mono / Multi

d) Month and year of the manufacture (separately for solar cells and module)

e) Country of origin (separately for solar cells and module)

f) I-V curve for the module

g) Peak Wattage, Im, Vm and FF for the module

h) Unique Serial No and Model No of the module.

i) Date and year of obtaining IEC PV module qualification certificate.

j) Name of the test lab issuing IEC certificate

k) 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 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.

7.4.5 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.

7.4.6 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.

7.4.7 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.

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

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

8 Power Conditioning Unit (PCU)

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 1000 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 50ºC.**

8.4 The inverter supplied shall have minimum of 10% additional DC input Capacity. (e.g. Inverter is supplied with rated capacity of 1000 kVA (AC) shall accept at least 1100 kWp

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 (MPPT) shall be integrated in the power conditioner unit to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor based to minimize power losses. The details of working mechanism of MPPT shall be mentioned by the Bidder in its offer. The MPPT 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.

8.16.10 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

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.

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

8.17.4 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

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

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

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

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

8.17.9 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

8.17.10 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 Cable and Wires

8.18.1 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)

8.18.2 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.

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

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

8.19 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. Contractor shall provide the type test report for each type of cable used before dispatch of the cable.

8.20 Wires with sufficient amp city 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.

8.20.1 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 compliant with IEC 60228, Class 5 of reputed make shall be used.

8.20.2 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.

8.20.3 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.

8.20.4 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.

8.20.5 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.

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

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

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

8.21.3 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.

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

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

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

8.21.6 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.

8.21.7 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.

8.21.8 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.

8.21.9 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.

8.22 Lightning Protection for PV Array

8.22.1 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.

8.22.2 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.

8.22.3 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.

8.22.4 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.

8.22.5 The lightning conductor must ensure three zone protection level

8.23 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 Power Transmission System, Metering, Protection, Monitoring & Control System

9.1 Transmission Tower: In case the Contractor erects Transmission Towers, the Contractor shall be required to comply with the following:

9.1.1 SCOPE: This part of the specification provides for designing, manufacturing, supply, installation & testing of power Transmission Tower.

9.1.2 STANDARDS: It shall conform to the latest revision with amendments thereof of the following Bureau of Indian Standards and other International Standards.

Sl. No	Bureau of Indian Standards (BIS)	Title
1.	IS:209	Specification for Zinc
2	IS:2062	Structural steel (standard quality)
3	IS:432	Mild steel and medium tensile bars and hard Drawn steel wire for concrete reinforcement
4	IS:802	Code of practice for use of structural steel in Overhead transmission line Part I : Loads and permissible Stresses Part II : Fabrication, Galvanizing, Inspection & Packing
5	IS:1367	Supply conditions for threaded fasteners (First Revised)
6	IS:2016	Plain washers
7	IS:2551	Danger Notice Plates
8	IS:2629	Recommended practice for hot dip galvanizing of Iron and Steel
9	IS:2633	Method of testing uniformity of casting of zinc coated articles
10	IS:3063	Single coil rectangular section spring washers for bolt nuts, screws
11	IS:5358	Hot dip Galvanized coatings on fasteners
12	IS:6610	Specification for heavy washers for steel structures
13	IS:12427	Hexagonal bolts for steel structures
14	IS:6745	Methods of determination of weight of zinc coating of zinc coated iron and steel articles
15	IS:5613	Code of practice for Design Part I & II Installation & Maintenance of Section of Overhead Power Line
16	IS:8500	Structural Steel Micro Alloyed (MEDIUM AND HIGH STRENGTH QUALITY)
17		Indian Electricity Rules 1956
18	IS: 4759	Hot dip zinc coating on structural steel and other allied products, plain and heavy washers, spring washers Electro galvanization.

9.1.3 GENERAL TECHNICAL REQUIREMENTS

(a) The Contractor has to inspect various type of towers suitable for this purpose at site and prepare detailed and shop drawing and proceed for fabrication.

(b) The towers shall be of self-supporting type, built up of lattice steel sections or members.

(c) The towers shall be fully Galvanized structures built up of structural mild steel sections. All members shall be connected with bolts, nuts and spring washers.

(d) Stubs and Superstructures and extensions:

(i) The stubs shall mean a set of four stub angles galvanized from top to 300mm below ground level and rest black and shall include cleats, the black portion of the stub being cast in foundation footings.

(ii) Superstructure shall mean the Galvanized tower assembly above the stubs which includes structural members like angle sections, cross arms, Earth wire peak, gusset plates and pack washers. The Contractor shall arrange steel and zinc required for manufacturing these items.

(iii) Extensions shall mean the galvanized tower assembly above the stubs, which includes structural members for maintaining adequate ground clearance.

(iv) Hangers for attaching suspension strings, 'U' bolts for attaching ground wire suspension assemblies are included in the scope of supply since these are required for completing the towers in all respects.

9.1.4 Tower Extensions: The towers are suitable for adding 3 M, 6 M, 9 M and 12 M extensions for maintaining adequate ground clearances without reducing the specified factor of safety in any manner

9.1.5 Proto Inspection: Proto assembly of each type of tower, extension, and stub setting template shall be done by the Contractor and offered for inspection to the Employer before taking up mass fabrication of the structures required. Waiving the Proto Assemblies inspection, for various reasons including urgency is purely at the discretion of Employer.

9.1.6 Galvanization of the members of the tower shall withstand tests as per latest edition of IS:2633

9.1.7 INSPECTION:

(i) The successful Bidder/Contractor shall keep the Employer informed well in advance of the commencement of manufacture, progress of manufacture thereof and fabrication of various tower parts at various stages, so that arrangements could be made for inspection by the Employer. Towers shall be offered for inspection in such a way that they are in full shape.

(ii) The acceptance of any batch of items shall in no way relieve the Contractor of any of his responsibilities for meeting all the requirements and intent of this specification and shall not prevent subsequent rejection of any item of that batch later found defective.

(iii) The Employer or his authorized representatives shall have free access at all reasonable times to inspect those parts of the Contractor's or its Supplier's works connected with the fabrication of the materials covered under the contract for satisfying themselves provisions of this specification.

(iv) Unless specified otherwise, inspection shall be made at the place of manufacture prior to dispatch and shall be conducted so as not to interfere unnecessarily with the operation of the work.

(v) Should any member of the structure be found not to comply with the approved drawing, it shall be liable for rejection. No member once rejected shall be resubmitted for inspection, except in cases where the Employer or his authorized representative considers that the defects can be rectified.

(vi) All gauges and templates necessary to satisfy the Employer for conducting tests shall be made available at the test site by the Contractor.

(vii) The correct grade and quality of steel shall be used by the Contractor. To ascertain the quality of steel, the Employer may at his discretion get the material tested at an approved Laboratory.

(viii) The Contractor shall give 15 days advance intimation to enable the Employer to depute his representative for witnessing acceptance and routine tests. The Contractor shall offer the materials for inspection in such a way that the towers reach the site in full shape with all extensions, accessories and stubs & cleats, stub setting templates.

9.2 Transmission line/Conductor

9.2.1 Standards for design, manufacture, stage testing, inspection and testing before dispatch, packing and delivery of Steel Cored Aluminium Conductors specified hereunder for their satisfactory operation. The power conductors shall conform to the following Indian Standards, which shall mean latest revisions, amendments/changes adopted and published, unless otherwise specified hereinbefore;

Sr.No.	Indian Standards or any Equivalent International Standard	Title
1	IS:209 -1990	Specification for Zinc
2	IS:398 Part I to Part V (as relevant)	Specification for Aluminium Conductors for overhead Transmission purpose
3	IS:1778	Reels and drums for Bare wires
4	IS:1521	Method of Tensile Testing of Steel wire
5	IS:2629 -1990	Recommended practice for Hot Dip Galvanising Iron and Steel
6	IS:2633 -1990	Method of Testing Uniformity of Zinc coating of Zinc coated Articles.
7	IS:4826	Galvanised coating on Round Steel wire
8	IS:6745 -1990	Method of Determination of weight of Zinc coating of zinc coated Iron and Steel Articles
9	IS:8263	Method of Radio Interference Tests
10	IS:1841	EC Grade Aluminium Rod produced by rolling

11	IS:5484	EC grade Aluminium Rod produced by continuous casting and rolling
12	IS: 2141 -1990	Method of Elongation test of steel wire

9.2.2 General Technical requirements for Conductor:

(i) The conductors shall be manufactured from EC grade aluminium rods suitably hard-drawn on wire drawing machines. The aluminium rods used shall comply with IS: 1841 and IS: 5484 or any equivalent International Standard. The mechanical and electrical properties of aluminium wire shall comply with the requirements given in relevant standard.

(ii) No joints shall be permitted in the aluminium wires in the outermost layer of the ACSR Conductor. Joints in the inner layers are permitted, in addition to those made in the base rod or wire before final drawing, but no two such joints shall be less than 15 mtr. apart in the complete stranded conductor. Such joints shall be made only by cold pressure butt-welding. It may please be noted that Joints are not permitted in the outermost layer of the conductor in order to ensure a smooth conductor finish and reduce radio interference levels and corona losses on extra high voltage lines.

(iii) There shall be no joints except those made in the base rods or wires before final drawing, in steel wires forming the core of the steel-reinforced aluminium conductor. Joints are not permitted in the steel wires after final drawing also in order to avoid reduction in the breaking strength of the conductor that may occur as a result of failure of the joints.

(iv) All the wires of Iron & steel strand shall be galvanized in accordance with IS-2629-1990. 'Recommended practice for hot dip galvanizing of Iron and Steel' or some other authoritative equivalent standard.

9.3 Step-Up Transformer

9.3.1 The transformer shall be copper wound, 3 phase, natural cooled, core type construction, and oil immersed and shall be suitable for outdoor applications.

9.3.2 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 through overhead transmission line /cables 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.

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

9.3.4 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%.

9.3.5 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
IS: 2544	Porcelain insulators for system above 1000 V
IS: 5350	Part III – post insulator units for systems greater than 1000V
IS: 5621	Hollow Insulators for use in electrical equipment
IS: 5556	Serrated lock washers – specification

Ratings and specifications (Transformer)

The typical rating and electrical characteristics of the ONAN Outdoor type Grid Tie & Auxiliary transformer shall be as under however, the ratings may vary subjected to design by the Contractor and relevant to the respective IS codes, however HV voltage rating for the Transformers must be 33 kV.

Table-2			
Sl. No.	**Parameters**	**Specification for Grid tied Transformer**	**Specification for Auxiliary Transformer**
1	MVA Rating	As per System Requirement/ As per approved SLD	
2	Voltage Ratio (KV)	33 kV/ as per system design (as approved in SLD)	
3	Duty, Service & Application	Continuous Solar Inverter application and converter duty (Outdoor)	Continuous application (Outdoor)
4	Winding	As per System Requirement	Two
5	Frequency	50 Hz	50 Hz
6	Nos. of Phase	3 phase	3 phase
7	Vector Group & Neutral earthing	As per system Requirement	As per system Requirement
8	Cooling	ONAN	ONAN
9	Tap Changer	As per system Requirement/ As per approved SLD	
10	Impedance at75 ◦ C		
11	a) Principal Tap	As per system Requirement/ As per approved SLD	
12	b) Other Taps	As per system Requirement/ As per approved SLD	
13	Permissible Temperature rise over an ambient of 50 deg C (irrespective of tap)		
14	Top Oil	50°C	50°C
15	Winding	55°C	55°C
16	SC withstand time (thermal)	2 Sec	2 Sec
17	Fault Level & Bushing CT	As per system Requirement/ As per approved SLD	
18	Termination	As per system Requirement/ As per approved SLD	
19	Bushing rating, Insulation class (Winding & bushing)	As per relevant IS/IEC (However Inverter Transformer LV side winding & bushing insulation class shall be of at least 3.6 kV)	

20	Noise level	AS PER NEMA TR-1	
21	Loading Capability	Continuous operation at rated MVA on any tap with voltage variation of +15 % & -10%, also transformer shall be capable of being loaded in accordance with IS:6600/IEC60076-7.	
22	Flux density	Not to exceed 1.9 Wb/sq.m. at any tap position with +15 & -10% voltage variation from voltage corresponding to the tap. Transformer shall also withstand following over-fluxing conditions due to combined voltage and frequency fluctuations: a) 110% for continuous rating. b) 125% for at least one minute. c) 140% for at least five seconds. Contractor shall furnish over-fluxing characteristic up to 150%	
23	Air Clearance	As per CBIP	
24	Only Type –Tested transformers shall be used		

9.4 General Standards

9.4.1 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.

9.4.2 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.

9.4.3 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.

9.4.4 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.

9.4.5 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.

9.4.6 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.

9.4.7 All equipment shall be designed for operation in tropical humid climate at the required capacity. The reference parameters for which the transformers are to be designed are as under:-

Particulars	Condition
Maximum ambient temperature	50^{o}C
Maximum daily average ambient temp	40^{o}C
Maximum yearly weighted average ambient temp	35^{o}C
Minimum ambient air temperature (Cooling)	-5^{o}C
Max. Relative Humidity	95%

Particulars	Condition
Yearly Avg. number of thunder storms	30-50
Average Number of rainy days	60 days
Fog	In winter
Number of months during which topical monsoon prevail	5 months
Dust storms	May occur
Average Annual rain fall	100 cms.
Maximum wind speed	150 kmph

9.4.8 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).

9.4.9 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.

9.4.10 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.

9.4.11 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 0.80 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.
- Check complete transformer against approved outline drawing, provision for all fittings, finish oil level etc.

9.4.12 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

9.4.13 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.

9.4.14 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
  - Setting of Relays in Panel

9.5 Auxiliary transformer

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

9.6 Instrument Transformer

9.6.1 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.

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

9.6.3 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.

9.6.4 Current Transformer, Voltage Transformer, Circuit Breaker and Relays should match state DISCOM requirements.

9.7 **Current Transformer** (CT)

9.7.1 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.

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

9.7.3 Type and Rating

9.7.3.1 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.

9.7.3.2 Type test certificate for the proposed CT shall be provided to the Contractor before dispatch.

9.7.3.3 Each current transformers should have the following particulars under the site conditions for the system under design

9.7.4 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

9.8 **Voltage Transformer (VT/ PT)**

9.8.1 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.

9.8.2 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.

9.8.3 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.

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

9.8.5 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.

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

9.8.7 Each voltage transformers should have the following particulars under the site conditions for the system under design

9.8.8 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 (rms value)	As per system design
Rated lightning impulse withstand voltage	As per system design
Standard reference range of frequencies for which the accuracy are valid	96% to 102% for protection and 99% to 101% for measurement
Rated voltage factor	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 voltage for secondary winding	2 kV rms
Temp rise over an ambient temp. of 50°C	As per IEC 60044
Number of terminals in control Cabinet	All terminals of control circuits wired up to marshalling box plus 10 terminals spare
Rated total thermal burden	350 VA (or as per design)
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

9.9 METERING BAY (STATE DISCOM)

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

9.9.2 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.

9.9.3 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

9.9.4 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: 5621-1980	Specification for Hollow insulators and accessories
IS: 2099-1986	Specification for insulators/ bushing
IS: 3347-1986	Specification for the dimension of Porcelain transformer
IS: 335-1983	Specification for new insulating oil

9.9.5 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.

9.9.6 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.

9.9.7 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.

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

9.9.9 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.

9.9.10 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.

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

9.9.12 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.

9.9.13 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.

9.9.14 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.

9.9.15 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

9.9.16 General Parameters: CT (Owners Bay and Metering Bay)

Particulars	**Details**
Normal system voltage (kV rms)	33 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) Primary (r.m.s.) Secondary (r.m.s.)	As per system design
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.
Number of cores	One
Instrument security factor	Not exceeding 5
Max. ratio error	As per IS:2/05/1992

9.9.17 General Parameters: VT (Owner's Bay & Metering Bay)

Particulars	**Details**
Nominal system voltage (kV rms)	33 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 Dry secondary	As per system design
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 STU/DISCOM for metering and connectivity at designated Substation shall be the responsibility of the Contractor, irrespective of whether those specifications/ guidelines are mentioned under this Tender document or not.

9.10 Circuit Breakers

9.10.1 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

9.10.2 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

9.10.3 The arc quenching chambers shall have devices to ensure almost uniform

distribution of voltage across the interrupters.

9.10.4 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.

9.10.5 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.

9.10.6 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.

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

9.10.8 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.

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

9.10.10 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.

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

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

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

9.11 Operating Mechanism of Circuit Breakers

9.11.1 Circuit shall be vacuum type with electrically spring charged mechanism.

9.11.2 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.

9.11.3 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.

9.11.4 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.

9.11.5 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.

9.11.6 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.

9.11.7 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.

9.11.8 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

9.11.9 Co-ordination of rated voltages, short circuit breaking current and rated normal current for guidance as per IS 13118 for rated voltage 33 kV and above.

9.11.10 Not Used

9.11.11 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

9.12 Isolators

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

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

9.12.3 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

9.13 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.

9.13.1 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.

9.13.2 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.

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

9.14 Surge Arrestors

9.14.1 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.

9.14.2 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.

9.14.3 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.

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

9.14.5 Each lightning arrestors should have the following particulars under the site 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 (ΔT) 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 lightning stroke counter to be fixed at suitable height in serial on the down conductor.

(b) ESE air terminal shall be erected on isolated foundation to be approved by 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.

9.15 Protective Relays

9.15.1 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.

9.15.2 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.

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

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

9.15.5 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.

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

9.16 Earthing for PV Array

9.16.1 The photovoltaic modules, BOS and other components of power Plant requires adequate earthing for protecting against any serious faults as guided by IEC 60364.

9.16.2 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 80, Indian Electricity Rules, Codes of practice and regulations existing in the location where the system is being installed.

9.16.3 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.

9.16.4 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

9.16.5 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.

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

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

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

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

9.16.10 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.

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

9.16.12 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.

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

9.16.14 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.

9.17 Isolator and Isolator-cum-Earthing Switches

9.17.1 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).

9.17.2 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.

9.17.3 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.

9.17.4 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.

9.17.5 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.

9.17.6 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.

9.18 Contacts:

9.18.1 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.

9.18.2 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.

9.18.3 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.

9.18.4 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.

9.18.5 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.

9.19 Earthing Blades

9.19.1 The Isolators controlling the transmission line shall be equipped with earthing blades. The Earthing blades shall be counter balanced to ensure easy operation.

9.19.2 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.

9.19.3 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.

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

9.20 Insulators

9.20.1 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.

9.20.2 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.

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

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

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

9.21 Bus Bar

9.21.1 The outdoor bus-bars and equipment connections shall be with ACSR conductor (suitable size as per design).

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

9.21.3 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.

9.21.4 Bus bar Material – The materials in common use for bus bars and connections of the strain type are ACSR conductor.

9.21.5 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.

9.21.6 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.

9.22 Control & Relay Panel

9.22.1 General Requirement:

9.22.1.1 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.

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

9.22.1.3 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

9.23 Low/ High Voltage Switchgear Panels

9.23.1 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.

9.23.2 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.

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

9.23.4 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

9.24 Control Circuit

9.24.1 Control supply for breaker closing / tripping - 110V DC

9.24.2 Air Circuit Breaker spring charge motor – 240 V AC, 1 phase

9.24.3 Moulded Case Circuit Breakers – 240 V AC, 1 phase

9.24.4 Indications, annunciation – 110V DC

9.24.5 Space heater, sockets, etc. – 240 V AC, 1 phase

9.25 Bus Bar & Cable Cavity

9.25.1 The material for main bus bars and tap off bus bars shall be electrolytic grade aluminium with properly colour coded HR PVC sleeved insulation.

9.25.2 Bus bars shall be suitable for short circuit rating and current suitable for all connected load.

9.25.3 Cable entry for incoming and outgoing cables shall be from Bottom.

9.25.4 A suitable gland plate shall be supplied for termination of power, control and instrumentation cables.

9.25.5 Whenever feeders are housed in multi-tier configuration, these tiers shall be segregated by sheet metal barriers.

9.25.6 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.

9.26 Terminals:

9.26.1 CT circuit - Isolating link type terminals with shorting facility

9.26.2 PT circuit – clip on type terminals

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

9.27 Specific Requirement

9.27.1 All ACBs/ VCBs, as applicable, shall be 4 pole, electrically operated, draw-out type, with closing coil, spring charge motor, trip coil, TNC switch for close and trip, manual closing and tripping push buttons, door I/L, test and service position micro switches, emergency P.B., safety shutters, etc. The circuit breaker shall be provided with anti-pumping feature.

9.27.2 ACBs/ VCBs, as applicable, shall be complete with microprocessor release and shall be provided with over current, short circuit and earth fault protections.

9.27.3 Minimum10% spare feeders of each rating shall be provided in the switchgear.

9.27.4 All current transformers shall have 5/1A secondary and all meters shall be suitable for 5/1A operation.

9.27.5 All indicating lamps shall be of LED cluster type. ACB feeders shall be provided with ON, OFF, AUTOTRIP, SPRING CHARGED, TEST, SERVICE, TRIP CIRCUIT HEALTHY indications

9.27.6 All indicating instruments, including MFM, shall be flush mounting, Digital type and of standard size.

9.27.7 Window annunciator with hooter and accept, test, reset button shall be provided. Necessary auxiliary relays for contact multiplication shall be provided in the panel.

9.27.8 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.

9.27.9 Instrumentation: Switchgear instrumentation shall be provided as follows:

(i) Mains Incomer – Voltmeter with selector switch

(ii) Ammeter with selector switch

(iii) Power Factor meter

(iv) Frequency meter

(v) TVM + MD meter

(vi) Potential indicating lamps

(vii) Outgoing Feeders

(viii) Ammeter with selector switch on all feeders

9.28 General Technical Specifications (LT/ HT Switch gear Panel)

9.28.1 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.

9.28.2 The panel shall be fabricated from 14 SWG CRCA sheet steel for frame & load bearing surfaces. Partitions may be fabricated from 16 SWG CRCA if no components are mounted on them.

9.28.3 The panel shall be painted with 2 coats of primer after pre-treatment and 2 coats of Polyurethane / epoxy paint with shade as decided by the Owner

9.28.4 Stiffeners shall be provided at corners & between modules to make panel rugged. The stiffeners will necessarily be required for relay compartments or

doors where heavy components are mounted.

9.28.5 The openable covers will be provided with lift off type hinges, quarter turn door locks and flexible copper wire for earth connection.

9.28.6 The panel shall be dust and vermin proof. Synthetic or neoprene gaskets shall be provided at all openings.

9.28.7 The panel shall be of dead front construction suitable for front operated and back maintained functioning.

9.28.8 Panel shall be provided with fluorescent lamp of 20W capacity operated by door operated limit switch. Panel shall also have space heaters and thermostat arrangement.

9.28.9 Panel shall be provided with 3 pin switch socket combined unit of 5 Amp capacity.

9.28.10 Lifting hooks shall be provided at the top of the panel.

9.28.11 The hardware components used in the panel shall be hot dipped galvanized.

9.28.12 The control components shall be fixed on mounting plate by drilling & tapping.

9.28.13 Aluminium anodized legend plates shall be provided for all the components. For components mounted on front face, legend plate from inside shall also be provided.

9.28.14 Pre-treatment by 7 tank process shall be done before painting / powder coating the panel.

9.28.15 Panel shall have provision of drawing pocket.

9.28.16 The panel shall be designed to ensure maximum safety during operation inspection, connection of cables and maintenance. Inside panel, checking and removal of components shall be possible without disturbing other units.

9.28.17 Cable entries will be from bottom. The opening of cable entry shall be covered by 3 mm thick gland plates.

9.28.18 The panel shall be provided with all necessary components / devices and instruments as per the recommended schematic diagram and functional requirements.

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

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

sq.mm wire will be used.

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

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

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

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

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

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

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

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

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

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

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

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

9.28.33 The panel shall be inspected at manufactures works before dispatch to site at the discretion of Employer.

9.28.34 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

9.28.35 Approval on following drawings shall be obtained before manufacturing the panels

(v) General arrangement drawing

(vi) Wiring Diagram.

(vii) Detail bill of material

(viii) 33 kV Transmission Line

(ix) Contractor shall provide 33 kV transmission with bay 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.

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

9.30 Metering System

9.30.1 ABT energy meter shall be complying with the applicable State Metering Regulations and as approved metering scheme by competent authority, 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 competent state authority.

9.30.2 Meter must be provided with the necessary data cables.

9.30.3 Separate metering system has to be provided for L.T. (incoming) and H.T. (outgoing) supply.

9.30.4 The Contractor shall provide ABT compliant meters at the interface points.

9.30.5 Interface metering shall conform to the Central Electricity Authority (Installation and Operation Meters) Regulation 2006 and amendment thereof Commercial settlement of solar Photovoltaic Grid Interactive based power project.

9.30.6 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.

9.30.7 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.

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

9.30.9 Meters shall be microprocessor-based conforming to IEC 60687 / IEC 6205211/ IEC 62053-22 / IS 14697

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

9.30.11 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.

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

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

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

/minus sign for export/import.

9.30.15 At least the following data shall be stored before being over-written for the following parameters.

Sl.No.	Parameters	Details	Min No of days
1	Net MWh	15 min. block	90 days in meter
2	Average Frequency	15 min. block	90 days in meter
3	Net MVARh for > 103%	15 min. block	90 days in meter
4	Cumulative net MWh	At every mid night	30 days in meter/ 90 days in PC
5	Cumulative net MVARh for >103%	At every mid night	30 days in meter/ 90 days in PC
6	Date & time blocks for VT failure on any phase		

9.30.16 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.

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

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

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

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

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

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

9.30.23 The Employer/ Owner shall have the right to carry out surprise inspections of the Metering Systems from time to time to check their accuracy.

Note: Contractor must comply with the relevant grid regulations, DISCOM'S, State Transco's & CEA's guidelines (as applicable) with respect to all the works

corresponding to grid inter-connection, power evacuation, transmission, termination along with metering at designated substation.

9.31 SCADA and Remote Monitoring System

9.31.1 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.

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

9.31.3 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.

9.31.4 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.

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

9.31.6 The Bill of Materials associated with the equipment must clearly indicate especially the details about the PC and Printers, etc.

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

9.31.8 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.

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

(i) Energy export to grid at 33 kV

(ii) Main combiner box parameters

(iii) Inverter level parameters

(iv) Parameters at LV terminal

(v) Power characteristics of HT side

(vi) Ambient temperature near array field

(vii) Module surface temperature

(viii) Wind Speed and direction

(ix) Solar irradiation/isolation

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

9.31.10 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.

9.31.11 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.

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

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

9.31.14 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.

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

9.31.16 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.

9.31.17 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.

9.32 DC Battery & Charger

9.32.1 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.

9.32.2 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.

9.32.3 DC Batteries the batteries will have the following specifications:

(i) Type : VRLA/ MF Stationary, sealed type, storage battery.

(ii) Rating : 110 V D.C., Minimum 80 Ah at 8 Hour rate of discharge (or as per design)

(iii) Standard : IS 1651 – 1979; performance as per IS 8702

(iv) Container : Plastic Resin, ABS or PP

(v) Terminal Posts : Designed suitably to accommodate external bolted connections

9.32.4 The battery shall be provided with epoxy paint coated exhaust fan for removal of gasses released from the battery cells.

9.32.5 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.

9.33 Power and Control Cables specifications on AC side

9.33.1 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.

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

9.33.3 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.

9.33.4 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.

9.33.5 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.

9.33.6 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.

9.33.7 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.

9.33.8 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.

9.33.9 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.

9.34 Power Evacuation and Hardware

9.34.1 The power from the plant to be evacuated to designated substation through 33 kV transmission line of appropriate size as per prevailing conditions at site. The power evacuation system must reliable, redundant and have low maintenance.

9.34.2 The design and arrangement for the laying of transmission line shall be in Contractor's scope. Contractor has to take necessary precautions for easy maintenance.

9.34.3 The transmission line must be appropriately laid in order to have easy maintenance and marked with route markers for easy identification. The scope of obtaining Right Of Way (ROW) if required, lies with the Contractor.

9.34.4 Metal fittings of specified material for string hardware meant for power conductor and earth wire shall have excellent mechanical properties such as strength, toughness and high corrosion resistance. The suspension and tension clamps shall be made from aluminium alloy having high mechanical strength. Suspension and tension clamps offered shall be suitable for cable/ conductor as per design.

9.34.5 All hooks, eyes, pins, bolts, suspension clamps and other fittings for attaching insulators to the tower or to the power conductor shall be so designed as to reduce (to a minimum) the damage to the conductor, insulator or the fitting arising from conductor vibration.

9.34.6 All drop-forged parts shall be free-from flaws, cracks, or other defects and shall be smooth, close-grained and of true forms and dimensions. All machined surfaces shall be true, smooth and well-finished.

9.34.7 All ferrous parts of hardware shall be galvanized in accordance with IS 2629.

9.34.8 The galvanization shall withstand four dips of 1-minute duration each in copper-sulphate solution as per the test procedure laid down in the relevant IS Standards.

9.34.9 The threads in nuts and tapped holes shall be cut after galvanizing, and shall be well-lubricated/greased. All other threads shall be cut before galvanizing.

9.34.10 Both the suspension and the tension hardware shall be of ball and socket type, and shall be with `R' and `W' type security clip of stainless steel or phosphor Bronze conforming to IS 2486. The tension clamps of both compression type and bolted type as shown in the relevant drawings shall be offered. Arcing horns shall be provided on the line side for both the suspension type and compression type hardware.

9.35 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, Telegu and English.

9.36 Fire alarm System

9.36.1 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.

9.36.2 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.

9.36.3 The minimum 2 no. of fire extinguishers (CO2 and Foam type each) shall be provided at every buildings/encloser.

9.36.4 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.

9.36.5 The plan for fire extinguishing must be provided by the Contractor to Employer for the approval.

9.37 CCTV cameras

9.37.1 CCTV Cameras along with monitoring stations (sufficient numbers) and all other accessories required for its proper operation must be installed to have complete coverage of following areas (i) Main entry: Covering all the entry/exit 24 hrs, (ii) Along the Plant Perimeter: Covering complete perimeter of Plant Area to capture all possible intrusion, (iii) Control Rooms: Covering Entry/Exit and activities within Control Rooms. Contractor has to propose the locations and number of cameras required for the Plant during bidding, however Employer's decision on number of cameras shall be final.

9.37.2 Monitoring stations of the CCTV Network shall be installed in Main Control Room.

9.37.3 The CCTV system shall be designed as a standalone IP based network architecture. System shall use video signals from different cameras at defined locations, process the video signals for viewing on monitors at control room and simultaneously record all video streams using latest compression techniques.

9.37.4 Camera shall be colour, suitable for day and night surveillance (even under complete darkness) and network compatible.

9.37.5 It shall be possible to control all cameras i.e., PTZ auto/ manual focus, selection of pre-sets, video tour selection etc. The software shall support flexible 1/2/4 windows split screen display mode or scroll mode on the display monitor for live video.

9.37.6 The system shall support video analytics in respect of the following:

(i) Video motion detection

(ii) Object tracking

(iii) Object classification

9.37.7 Camera server shall be provided with sufficient storage space to storage recordings of all cameras at HD mode for a period of 15 days. All recordings shall have camera ID, location, date and time of recording.

9.38 Testing Instruments for Electrical & Electronic

Contractor shall also provide required set of onsite testing instruments/equipment viz

(i) Earth resistance tester:

Sl. No	Parameters	Specification
1	Display	LCD Digital Display with backlight
2	Range	Earth Resistance: up to 2000 Ω Earth Voltage : 200 V
3	Safety Ratings	IP 56
4	Programmable Limits setting	Enabled
Accessories		
1	Earth Ground Stakes (4 Nos)	
2	Three cable reels with cable length up to 20 m	
3	Carry Case-1 (capable of handling tester along with accessories)	
4	1 set of spare battery	

(ii) Array Tester:

Sl. No	Parameters	Specification
1	Display	LCD Digital Display with backlight

2	Functionality	All electrical tests required by IEC 62446-1:2016
3	Memory	Up to 200 records & USB downloadable to Computer
Accessories		
1	A set of two, 4mm fused leads for extra protection during installation tests.	
2	Leads which enable the Solar PV100 to connect directly to PV arrays which use MC3 connectors	
3	1 set of spare battery	

(iii) Insulation tester:

Sl. No	Parameters	Specification
1	Display	LCD Digital Display with backlight
2	Insulation Test Range	0.1 MΩ to 10 GΩ
3	Test Voltage	50 V, 100 V, 250 V, 500 V, 1000 V
4	Test Voltage accuracy	+20% on positive side only no negative variation is allowed
5	Insulation Test Current	1 mA nominal
6	Auto Discharge	Discharge time< 0.5 Second for C=1
7	Open Circuit test Voltage	>4 V, <8 V
8	AC/DC Voltage measurement	600 V (0.1 V Resolution)
8	Short Circuit Current	> 200 mA
Accessories		
1	Heavy duty Test Lead Set – 4 Nos.	
2	Carry Case with sufficient space for accommodating accessories.	

(iv) Multi-metres:

Sl. No	Parameters	Specification
1	Display	LCD Digital Display with backlight
2	AC/DC Current	500 µ A to 10 A (Accuracy 0.15 %)

	AC/DC Voltage	50 mV to 1000 V (Accuracy 0.025 %)
3	Resistance	50 Ω to 5000 Ω (Accuracy 0.05 %)
4	Capacitance	1 nF to 100 mF (Accuracy 1.0 %)
5	Frequency	99.999 Hz, 999.99 Hz, 9.9999 Hz, 99.999 kHz, 999.99 kHz (Accuracy 0.005 %)
Accessories		
1	Temperature Probe	
2	Silicon Test Lead	
3	Alligator Clip	
4	Carry Case with sufficient space for accommodating accessories.	

(v) Clamp meters:

Sl. No	Parameters	Specification
1	Display	LCD Digital Display with backlight
2	Jaw Opening	30 mm
3	Maximum Wire Size	600 MCM
3	Current Range	0 to 400 A
4	Accuracy Current	2.0 %
5	Voltage range	0 to 600 V
6	Voltage Accuracy	1.5 %
7	Resistance Range	0 to 4000 Ω
Accessories		
1	Test leads	
2	Electrical test leads	
3	Probe light & extender	
4	Carry Case with sufficient space for accommodating accessories.	

(vi) Transformer oil BDV kit:

Sl. No	Parameters	Specification
1	Display	LCD Digital Display with backlight
2	Input:	230 Volts, 50 Hz, Accuracy /- 10%

3	Output	0 - 100 KV
3	Capacity	1 kVA
4	Duty Cycle	Continuous
5	Compliance	IS-6792

(vii) Infra-red thermal imaging hand held Camera:

Sl. No	Parameters	Specification
1	Temperature measurement Range	Up to 650 °C, Accuracy ± 2 °C
2	On-screen emissivity Correction	Possible
3	On-screen reflective background temperature Correction	Enabled
3	On screen transmission Correction	Enabled
4	Detector Type	Focal Plane Array, uncooled micro-bolometer, 320 x 240 pixels or better
5	Total Pixels	> 75000
6	Infrared spectral Band	7.5 µm to 14µm (long wave)
7	Field of view	46° x 34°
8	Spatial Resolution (IFOV)	2.62 mRad
9	Wi-Fi Connectivity	Enabled
10	Data Storage	USB & memory card enabled

Note:

a) All testing equipment shall possess valid calibration certificate issued from approved NABL labs.

b) Instruments of superior rating is allowed after seeking consent of the Employer

c) Maintenance, calibration, up keeping, repair & replacement of these tools will be in the scope of Contractor during 5 years of O&M.

d) It is Contractor's responsibility to arrange for tools, tackles, logistics, test kits,

manpower, experts etc. required for trouble free operation of Plant

9.39 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.

9.39.1 Pyranometer

(i) Contractor shall provide minimum 4 (four) number of pyranometers for measuring the incidental solar radiation at horizontal and inclined plane of array.

(ii) Specification of the pyranometer shall be as follows:

Details	Values
Spectral Response.	0.31to2.8micron
Sensitivity	Min7micro-volt/w/m2
Time response (95%):	Max15s
Nonlinearity:	±0.5%
Temperature Response:	±2%
Tilt error:	<±0.5%.
Zero offset thermal radiation:	±7w/m2
Zero offset temperature change	±2w/m2
Operating temperature range:	0 deg to+80 deg.
Uncertainty(95%confidence Level):	Hourly- Max-3%, Daily- Max-2%
Non stability:	Max±0.8%
Resolution:	Min+/- 1W/m2
Input Power for Instrument & Peripherals:	230V a.c.(If required)

(iii) 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.

9.39.2 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 80^{o}C.The instrument shall have valid calibration certificate.

9.39.3 Anemometer

Contractor shall provide minimum one no. anemometer with wind vane of rotating cup type

Details	Values
Velocity range with accuracy limit	± 0.11m/s upto10.1 m/s ±1.1% of true when more than10.1 m/s
Wind direction range with accuracy limit	0 to 360^{o} with accuracy ± 4^{o}

9.40 Specification of Lighting in Solar Power Plant

9.40.1 Scope

This specification covers design of Array yard and sub-station, street light using suitable LED luminaires (to meet the required lux levels), tubular poles (from main gate up to the control room/switchyard gate and periphery wall of the Plant) distribution pillar boxes, PVC cables, conduit steel trays etc. which shall be supplied by the contractor for installation of luminaires, their control gear and wiring on them. The street light shall work on the auxiliary supply and same shall be incorporated in auxiliary loads. The Contractor will also design, supply and install lighting fixtures and accessories based on LED for equipment room and control room building and entry points/ gates. The Contractor shall furnish Guaranteed Technical Particulars**.**

All LED luminaires shall be supplied with proper diffuser to avoid direct visibility of LED with proposer thermal management for longer life. Renowned brands available in the market need to be used.

9.40.2 General Technical Requirements:

The lighting system for outdoor and indoor areas of Solar Power Plant shall be designed in such a way that uniform illumination is achieved.

In outdoor yard equipment /bus bar areas and the peripheral wall are to be illuminated and luminaires shall be aimed for clear view.

9.40.3 Lighting Levels

- The average LUX level of 10 lm is to be maintained in switchyard. However, a lux level of 20 lm (10+10) additional switchable on requirement only) is to be maintained in switchyard on transformer.
- Lighting in other areas such as control room, office rooms and battery room & other areas (i.e. street light) shall be such that the average LUX level to be maintained shall be as under:

S. No	Area	LUX
1.	Control Room and equipment rooms	500

2.	Office	300
3.	Battery & other rooms	150
4.	Other areas including periphery wall	10
5.	Transformer yard	20
6.	H – pole and metering point	10

9.40.4 Emergency Light Points:

- Light points using LED lamps of 15-20 W (at 240 V) shall also be provided as given below:
  - Control room and equipment room 4 Nos.
  - Battery room 1 Nos.
  - Office 1 Nos.
  - Corridor 1 Nos.
- These lights shall operate on AC/DC changeover supply from the DC distribution Board. Separate wiring and distribution board shall be provided from these lights.
- The lighting level shall take into account appropriate light output ratio of luminaires, coefficient of utilization maintenance factor (of 0.7 or less) to take into account deterioration with time and dust deposition.
- LED luminaires shall meet the following parameters

PARAMETER	**SPECIFIED VALUE**
Input voltage	170-260 V
Input Frequency	50 HZ +/-1 HZ
Power Factor	0.95 (Minimum)
Power Efficiency	>96%
LED efficacy	>130 lumens per watt
Dispersion Angle	Minimum 120°
Usage hours	Dusk to dawn
Total Harmonic Distortion	< 15 %
Working Temperature	-5° to +50° C
Working Humidity	10% - 90% RH (Preferably Hermetically sealed unit)
Index of Protection Level	Minimum IP 65
Lamp Casing	Powder coated metal / Aluminium.
Life	> 50000 Hrs.
LED Type	Power LEDS from reputed makes.
Colour Temperature	2800° K/3000° K
Colour Rendering	>75

Junction Temperature	< 60° C
Electrical Connector	Lead wire with 2 meter long –or as required by the customer at site.
Expected Life of components	Passive electronic components life greater than >100,000 hours
Moisture protection in case of casing damage	IP 65 (preferably Totally encapsulated)

- Luminaire Compliances:

  - Luminaire Specification:

    Control gear specification:

    EN 61347-2-13: Particular requirements for D.C. or A.C. supplied electronic control gear for LED modules

    EN 62384: D.C. or A.C. supplied electronic control gear for LED modules.

  - Luminaire EMC specification:

    EN 61000-3-2: Electromagnetic compatibility (EMC). Limits for harmonic current emissions (Equipment input current < 16 A per phase)

    EN 61000-3-3: Limitation of voltage fluctuation and flicker in low voltage supply systems for equipment with rated current < = 16 A

- Additional information:

  - The LED luminaire housing, heat sink, pole mounting bracket, individual LED reflectors and front heat resistant tempered glass should be provided.
  - The LED luminaire housing should be made of non-corrosive high pressure die cast aluminium and the housing should be power coated grey, so as to ensure good wetherability.
  - Each individual LED source should be provided with a asymmetrical distribution high reflectance aluminized reflector, which should ensure that the light distribution of the luminaire is suitable for road lighting applications (wide beam distribution) and should ensure high pole to pole spacing.
  - The luminaire should be provided with in built power unit and electronic driver. The luminaire should be should be so constructed to ensure that the gear and LED modules are replaceable, if required.
  - The luminaire should be suitable for both standard street light poles with a typical pole diameter of 50 mm – 60 mm and should be suitable for both side entry and bottom entry (post top).

9.41 General Guidelines

9.41.1 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.

9.41.2 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.

9.41.3 The Contractor shall provide type test reports and datasheet/ GTP for all equipment used for the project.

9.41.4 The Employer reserves right to modify the design at any stage, to meet local site conditions / project requirements.

9.41.5 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 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)

$$\textbf{Performance Ratio (PR)} = \{Y_A / Y_R\} * [1 - \alpha * (T_{Cell\ avg.} - T_{Cell})]$$

Where;

Y_A = Final PV system yield (representing the number of hours that the system would need to operate at its rated output power P_{Nom} to contribute the same energy to the grid as was monitored)

Or $Y_A = E_{ac} / P_{inst}$

Y_R = 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)

Or $Y_R = I_{R\ Site} / I_{R\ STC}$

E_{ac} = AC energy injected into the grid during a clearly specified amount of time (kWh)

P_{inst} = Installed nominal peak power of modules (Flash test rating at STC) (kWp)

$I_{R\ Site}$ = Irradiation on the module plane of array during a clearly specified amount of time (measured with a pyranometer installed on the array plane) (kWh/sq. m)

$I_{R\ STC}$ = Irradiance at STC (kW/ sq. m)

$T_{cellavg}$ = Average cell/ module temperature (^oC)

T_{cell} = STC cell/ module temperature (^oC)

α = temperature coefficient of power (negative in sign) corresponds to the installed Module (%/^oC)

10.2 Monitoring System for PR Verification

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).

10.3 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.

10.4 The Contractor shall show the specified PR for Operational Acceptance and committed CUF for Final Acceptance (i.e. after one year form the date of commissioning).

11 Capacity Utilization Factor (CUF)

11.1 Capacity Utilization Factor shall be calculated as per the following formula:

$$\text{CUF} = \frac{EN}{8760 * Pnom * CF}$$

Where,

EN is number of units recorded at the ABT metre at 33 kV local bus bar in Plant Facilities after excluding auxiliary consumption

Pnom- 55,000 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 final acceptance of the Plant) X (Actual Radiation / Reference Radiation).

Reference Radiation = 1865 kWh/m^2

Example for the purpose for illustration, considering at the end of third year if it is observed that the annual radiation is 1750 kWh/m2, the CUF Correction Factor (CF) will become; CF= (1-0.0075) x (1750/1865) = 0.0.931

11.2 However, in order to meet CUF requirement Contractor may install higher DC capacity without overloading other system components.

Civil, Mechanical & Plumbing Works

This section of Technical Specifications describes detailed technical and functional requirements of all civil, Mechanical & Plumbing works included in the scope excluding civil works for Transmission Line towers, Tower extensions & Tower accessories.

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: 800, 802 or 802 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 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 x20m 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 and transmission towers 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 80% 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 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, chemical analysis 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, transmission line (TL) towers 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 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 LABL accredited Laboratory or any Gov. Engineering college as approved by the Employer.

15 Roads

15.1 Suitable approach road from nearest public road up to plant Main gate, access road from Main gate to Main control cum office room (MCR), internal access roads connecting MCR and other facilities/ buildings like Local control room(s) (LCR)/ Inverter room(s) (IR), Substation, Switch yard etc. and internal peripheral road along the boundary fence shall be provided for safe and easy transportation of materials and equipment during construction and maintenance phase and for public transport.

15.2 The Approach road connecting nearest public road and the Main gate shall be 5m wide plus 0.5m wide shoulders on either side. The access road connecting Main gate and MCR and internal access road(s) connecting MCR to various facilities/ buildings shall be 3.5m wide with 0.5m wide shoulders on either side while the peripheral road shall be 2.5m wide with 0.5m shoulders on either side. All roads including shoulders shall be of WBM. Approach road to the plant and access road from Main gate up to MCR building shall have wearing course of bitumen while other roads shall be provided with top layer of Murum. The top of road (TOR) elevation shall be minimum 200 mm above FGL to avoid flooding of roads during rains. The roads shall be provided with alongside drains as per design requirements of storm water drainage system. The roads shall be designed as per IRC 37 corresponding to design vehicular traffic of 20 million standard axles (msa) and critical field CBR value.

15.3 The details of minimum road section to be adopted shall be as follows:

15.3.1 Topping: wearing coarse of pre-mix carpet 20mm thick (for approach road to plant & access road from main gate up to Main Control Room building) & 75mm thick murum layer in case of other internal roads.

15.3.2 WBM, compacted 75mm thick, Grade III.

15.3.3 WBM, compacted 100mm thick, Grade II.

15.3.4 Granular sub-base, compacted 250mm thick, Grade I.

15.3.5 Well compacted sub grade under road and shoulders to achieve min. 95% of standard proctor modified dry density (MDD). CBR value of sub-grade shall not be less than 4%. In case the CBR is less than 4% in a particular stretch, then the material shall be modified with increase in GSB thickness as per IRC standard.

15.3.6 The construction of roads shall conform to relevant IRC/ MORST standards.

15.3.7 Drain, cable or any other crossing shall be provided with RCC slab or precast concrete pipe culvert. The culvert design shall conform to relevant IRC standard. The pipes for road crossings shall be of minimum class NP3 conforming to IS 458.

15.3.8 Maintenance pathways of min. 1.0m width shall be provided between SPV arrays for easy movement of maintenance staff, tools, equipment and machinery, washing of modules etc. The pathway area shall be levelled well compacted manually/ mechanically. Areas of depression, valley zones or wherever there is noticeable change in topography shall be levelled matching surface with ground topography/ grade to avoid accumulation of water in the region by allowing its free flow to keep the area free from mud/ sludge.

15.3.9 The design and drawings for all internal roads and culverts shall be submitted to the Employer for approval before execution.

16 Surface/ Area drainage

16.1 The contractor shall design and construct storm water drainage network for smooth disposal of storm water from the Plant to the nearest available drainage outlet. The storm water drainage system shall be designed and planned to ensure no water stagnation in the Plant. Necessary input data for maximum hourly rainfall intensity to be taken for drainage design shall be obtained by the contractor from Indian Metrological department.

16.2 The drainage system shall be designed as per the provisions of relevant IRC standard and best Industry practices.

16.3 The drainage scheme shall be designed considering the Plant plot area and the catchment area contributing to the Plant area drainage. The storm water drainage system shall be a network of open surface drains (with rectangular or trapezoidal cross section) and shall generally be designed to follow the natural flow of water and ground

contours. Suitable size peripheral drain (min.500x500mm) along inside of Plant boundary shall be provided for smooth channelization of outside storm water and to avoid flooding of the Plant area.

16.4 All the drains shall be lined with either brick or RR masonry/ concrete or stone slabs as suitable to the site conditions. The min. Thickness of the lining shall be 115mm for brick masonry, 75mm for concrete slabs, 150mm for RR masonry and 100mm for stone slabs. The concrete slab/ stone cladding shall have suitable CM (1:4) bedding. The lining work shall be in CM (1:4) and the joints shall be raked and pointed with CM (1:3), however, the joints in peripheral drain lining shall be without pointing.

16.5 The design shall be as per provisions of relevant BIS standards and good industry practice. The drain outfall shall be connected to the nearest existing natural drain(s)/ water body outside Plant premises and it shall be ensured that the drainage water shall not encroach/ flood in the adjacent property/ plot. The proposed drainage scheme along with design calculations shall be submitted to the Employer for review/ approval before start of construction.

16.6 The contractor shall provide rain water harvesting system for water conservation by constructing suitable collection wells along the drains, detention ponds etc.

17 Peripheral boundary Wall & Fence

17.1 The boundary wall/fence shall be provided along the Solar PV Plant boundary to demarcate the Plant boundary and to keep away the unauthorised access to the Plant. The boundary wall/fence shall be provided with Main entry gate.

17.2 The fencing shall be with 2.4m height above grade level including 400mm dia. GI concertina wire at the top to be supported on Y shape angle brackets provided at top. The main gate shall be min. 5.5m wide (4m carriage way + 1.5m wicket gate). As there will be some explosive testing activities will be happening on southern side of the plot, it is mandatory to construct Reinforced brick boundary wall of width not less than 12 cm & height 2.4 meters on southern side of the Plot to stop sound waves from damaging the Plant components. This particular side of the plot is highlighted in Annexure-A.

17.3 The fencing shall be of GI chain link mesh fabric, max. mesh size 40x40mm (minimum wire gauge 3.15mm), both ends twisted conforming to IS 2721 with suitable internal, corner and stay posts of GI angles along with230 thick brick/ 300 thick RR masonry toe wall, 150mm height above GL.

17.4 The brick masonry toe wall shall be plastered with 15 thick CM (1:4) plaster on both faces and shall have min. 50 thick PCC (1:2:4) coping finished smooth and projecting

40mm on either side of the wall and top sloping inwards. In case of pond/ drain area suitable grid of MS angles of min. Size 50x50x6 mm shall be provided in place of toe wall.

17.5 Minimum size of angle for internal, corner and stay post shall be 75x75x6 mm. Spacing of intermediate posts shall not be more than 2.5m. Every 10th intermediate post shall be provided with a stay post along fence and every corner post shall be provided with two stay posts along either side fence. The Main entry gate shall of rugged design with GI steel sections. The gate shall be complete with MS flat guide track, castor wheel(s), all fittings and fixtures like hinges, aldrop, locking arrangement, posts etc.

18 Plant Layout

18.1 The contractor shall submit drawing showing proposed Project Plant Layout.

18.2 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, Main Approach road to the plant, 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.

18.3 The Plant Layout drawing shall be in suitable scale to have proper representation of the information.

18.4 The Plant layout drawing shall be submitted by the contractor for review/ approval by the Employer

19 Design Loads

Unless otherwise specified elsewhere, Dead load, Live load, Wind load and Seismic load for buildings and structures shall be considered as per provisions of relevant IS standards.

19.1 The following minimum imposed load as indicated for some of the important areas shall, however be considered for the design. If actual expected load is more than the specified minimum load, then actual load is to be considered.

Sl.No.	Area	Imposed Load
a	Roof	150 kg/ Sqm
b	Building floors	1000 kg/ Sq
c	RCC Floors (General)	500 kg/ Sqm
d	Outdoor platforms, Stairs, Landing and Balconies, Walkway, Chequred plate & Grating floor	500 kg/ Sqm

e	Road	As per IRC Standard
f	Road culverts & allied structures over drain & pipe crossings	Design for class -'AA' loading (Wheeled & Tracked both) and check for Class – 'A' loading as per IRC Standard
g	Underground structures such as Sumps, Pits, Trench, Drain etc.	In addition to Earth pressure and Ground water table at FGL, a surcharge of 1 T/Sqm shall also be considered
h	Pre-cast cover over cable trench	400 kg/ Sqm

19.1.1 Primary Loads

1. Dead Load (DL)
2. Live Load (LL)
3. Wind Load (WL) – Both along X & Z directions
4. Seismic Load (EL) – Both along X & Z direction

WL for MMS design

(i) Load due to fair (positive pressure) wind direction on design tilt angles of MMS members

(ii) Load due to adverse (negative pressure) wind direction on design tilt angles of MMS members

(iii) Load due to wind on side face of MMS members.

19.1.2 Design Load combinations

1. DL+LL
2. DL+LL ± WLx
3. DL +LL± WLz
4. DL+LL ± ELx
5. DL+LL ± ELz

Note - For MMS design, WL corresponding to (iii) shall be considered along with (i) & (ii) as applicable in calculation of WL under Primary Load (3).

19.1.3 All buildings, structures and foundations shall be designed to withstand loads corresponding to worst design load combinations. Unless otherwise specified elsewhere in the specifications, the DL, LL, WL and EL shall be estimated as per provisions of relevant BIS standards.

19.1.4 Wind Load Factors K2, K2 and K3 – As per IS 875 (Part-3). However, minimum value for K1, K2 and K3 shall be 1.0.

19.1.5 Unless otherwise specified elsewhere in the specifications, the Seismic Load shall be considered corresponding to Earth quake zone at site as per IS: 1893 – (Part- 4)

20 Foundations

20.1 Contractor shall design all foundations for buildings, equipment, HT line Towers, Switch yard structures, Transformer, MMS & other structures as per relevant BIS standards and recommendations of Geotechnical investigation report.

20.2 All design drawings shall be submitted to the Employer for approval before execution.

20.3 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 1500mm 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 1500 mm.

20.4 The pile shall project minimum 250mm above grade level to avoid any damage to the MMS column/sub support due to direct contact of rain water/ surface run-off.

20.5 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.

20.6 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.

20.7 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.

21 Module Mounting Structure (MMS)

21.1 The ground mounting structure design must follow the existing land profile.

21.2 The structure shall be designed to allow easy replacement of any module and shall be in line with the site requirements.

21.3 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.

21.4 The minimum thickness (BMT) of various elements of MMS structure shall be as following: Stub/ column – 3.15mm, Rafter – 2.5mm & Bracing/Purlin & other members

– 2.0mm. Final thickness of the members shall be arrived by structural analysis considering combination of all possible loads.

21.5 The contractor can also propose new light gauge structural steel or structural 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

21.6 The primary loads and load combinations for design of MMS structure shall be as specified under “Design Load” above.

21.7 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.

21.8 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/ 180

21.9 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).

21.10 MMS shall support SPV modules at a given orientation & tilt, absorb and transfer the mechanical loads to the ground properly.

21.11 Welding of structure at site shall not be allowed and only bolted connections shall be used.

21.12 The MMS structure shall be hot dip galvanized with minimum thickness of coating not less than 80 microns on each side. Galvanization shall conform to IS-2629, 4759 & 4736 as applicable. 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.

21.13 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.

21.14 Modules shall be clamped & bolted with the structure properly. The material of clamps shall be Al / Steel having weather resistant properties. Clamp – bolt shall use EPDM rubber and shall be designed in such a way so as not to cast any shadow on the active part of a module.

21.15 The MMS foundation shall be designed as per the loads specified under clause “Design Loads” above.

21.16 The array structure shall be grounded properly using maintenance free earthing kit.

21.17 The Contractor shall specify installation details of the PV modules and the support structures with appropriate diagram and drawings.

21.18 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.

21.19 For multiple module mounting structures located in a single row, the alignment of all modules shall be within an error limit of maximum 10mm.

21.20 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.

21.21 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.

21.22 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.

22 Concrete Works

22.1 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.

22.2 The contractor shall carry out concrete mix design well in advance prior to construction through NABL accredited laboratory/ Reputed Engineering Institute (IITs/NITs/

Government Engineering Institutes only).

22.3 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.

22.4 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.

22.5 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/ mm2 at 28 days.

23 Miscellaneous Steel Works

23.1 Unless otherwise specified all structural steel work shall be designed as per provisions of IS: 800 with working stress method of design (WSD).

23.2 Structural steel hot rolled sections, flats and plates shall conform IS: 2062.

23.3 Structural Pipes shall be medium (M)/high (H) grade conforming to IS: 1161.

23.4 Chequered plate shall conform to IS: 3502 and Hollow steel sections for structural purposes shall conform to IS: 4923.

24 Buildings

24.1 Plant buildings are required to be constructed for housing the electrical equipment/ panel (Local Control Room Building - LCR) and control room with office cum store facilities (Main Control Room Building - MCR) for operation and maintenance of Photovoltaic Solar Power Plant. Security room(s)/ cabin(s) shall also be required at strategic locations to secure the Plant from any theft/ burglary.

24.2 All buildings except Security room/ cabin shall have RCC framed structure and brick panel/ partition walls.

24.3 The Plant building design shall be as per the OEM requirements to ensure desired life of equipment.

24.4 The security room/ cabin shall be of prefabricated structure.

24.5 The contractor shall submit the proposed layout drawings to the Employer for approval before development of Architectural drawings.

24.6 The building layout, exterior elevations shall be aesthetically designed following good architectural practices to get a please look, Horizontal/ vertical bands through projections/ groves in external plaster may be provided to break the monotony.

24.7 Roof slab shall have projection of 400mm beyond external walls with 500mm parapet wall all around for smooth drainage of rain water which shall form a projected band at roof level.

24.8 All doors and windows shall be provided with 450mm RCC chajja for weather protection

24.9 The construction of the buildings shall be as under;

24.9.1 Main Control Room (MCR) Building

For operation & maintenance of SPV Plant MCR building shall provide following facilities;

i) Air conditioned area (with provision of split A/C unit of adequate capacity) for SCADA room (min. 16 Sqm) & Conference room (min. area 35 Sqm)
ii) Inverter/ Switchgear, equipment room(s) as per requirement
iii) Supervisor cabin and office area (min. area 25 Sqm)
iv) Store cum record room (min. area 20 Sqm)
v) Battery room as per requirement & (vi) One toilet block with gents and ladies wash room facilities (min. area 12 Sqm)
vi) There shall be suitable provision for easy/ smooth passage for O & M personnel, cable trenches etc.

24.9.2 LCR/ Inverter Building.

i) Inverter room/ LCR consists of data loggers, battery, Inverter, Electrical panels etc. as per requirement.
ii) There shall be suitable provision for easy/ smooth passage for O & M personnel, cable trench, repair & replacement of the installed equipments etc.

24.9.3 Security Room/ Watchman Cabin.

i) Contractor shall provide adequate number of prefabricated watchman cabins and one no. security Room at main entry gate.
ii) The minimum size of watchman's cabin shall be 1.2x1.8m and height 2.5m.
iii) The watchman cabins shall be located at strategic locations and at corners of the plot.
iv) The Security cabin shall be of size 3mx3m and height 2.75m
v) Security room/ Watchman cabin shall be a prefabricated structure. The walls and roof of the building shall fabricated with double skin permanently colour coated insulated sandwiched Al-Zn alloy coated high tensile steel metal panels (BMT-0.6mm, Al-Zn alloy coating -150 GSM total on both sides).
vi) The insulation shall be of PUF, density 40 kg/ cum with adequate thickness.
vii) Roof shall be provided with suitable slope (preferably 100) for proper drainage of rain water and shall project 300mm beyond the walls.
viii) The make and colour shade of the metal panels shall be subject to approval by the Employer. The security cabin shall be provided with 0.75m wide and 2.1m height AL glazed door on one face and shall have Aluminium glazed sliding windows with Aluminium grill, 1.2m wide with 1.0 m height, on remaining three

sides for Security Room while there shall be 1 no. window on side face of watchman cabin of size 0.8mx1.0m with 1.0 m height.

ix) All glazing shall be of clear float glass with thickness of 4mm for window and 6mm for door panel. The door and windows shall be provided with all necessary fitting and fixtures like handles, tower bolts, mortise lock for door, stays etc.

x) All aluminium sections for doors and windows shall be anodized (40 microns) for protection against weather. The cabin shall be installed on PCC 1:2:4 platform, 250 thick.

xi) The PCC platform shall project 200mm beyond the walls. Special coated/ SS self-drilling screws/l fasteners conforming to class 3 as per ASTM: 3566.1 and 3566.2 shall be used. Anchor/ foundation bolts shall conform to IS: 5624 and relevant IS code.

25 Flooring, Skirting and Dado

Store area, Equipment Room	40 mm thick Cement concrete (IPS) flooring (1:2:4), aggregate size 10 mm down conforming to IS 2571 with 2mm thick Heavy duty epoxy coating (Industrial grade), with 10mm thick matching skirting of 100mm height
SCADA Room, Control cum Office Room, Supervisor Room and Lobby	40 mm thick Heavy duty vitrified tile (8mm thick) flooring with matching 100m high skirting
Battery Room	Acid/ Alkali resistant tile flooring and dado 2100 high, Floor and dado tiles - 20mm and 12 mm thick respectively
Toilet	40 mm thick Ceramic tile (8mm thick) flooring and glazed tile (6mm thick) 2100 height dado
Pantry	40 mm thick heavy duty vitrified tile (8 mm thick) flooring and glazed tile (6mm thick) 2100 mm height dado
Steps	Kota stone – 20 thick/ 50 thick cement concrete (IPS) flooring conforming to IS 2571

26 Doors and Windows

26.1 Doors, windows and ventilators shall be made of aluminium sections (minimum average thickness 2mm), industrial grade and of approved manufacture. All sections, fittings and fixtures shall be anodized with minimum thickness of coating 20 microns. Where specified the sections shall be powder coated (TFT 50 microns) with approved make & colour shade. The window and door shutters shall be with combination of compact sheet and clear float/ wired glass as per design/ functional requirements. However, all doors of toile area shall be of steel framed solid core flush shutter conforming to IS: 2202.

26.2 The area of the openings shall be designed to have adequate ventilation/ natural light and to meet functional requirements.

26.3 All doors, windows and ventilators shall be provided with all necessary fittings and

fixtures like handles, tower bolts, wind stays, hinges etc. of heavy duty Aluminium.

26.4 All doors shall be provided with hydraulic door closure of required capacity.

26.5 All windows shall be provided with suitable Aluminium grill of anodized sections with adequate thickness.

26.6 The glazing shall be of clear float glass with minimum 4mm thickness for windows and 6mm thickness for door shutter.

26.7 Minimum size of all doors shall be 2.1m high and 1.2m wide except for toilet where min. width shall be 0.75m.

26.8 Rolling shutters of required size shall be made of cold rolled steel strips with adequate gauge thickness (min. thickness 18 gauge) and shall conform to IS 6248. Rolling shutter shall be provided with all fixtures, accessories, paintings etc. all complete.

27 Roofing

27.1 The roof shall be provided with min. slope of 1:100 for effective drainage of rain water. The slope shall be achieved either by application of screed concrete grade 1:2:4 (with 12.5mm down coarse aggregate) with min. 25thick CM 1:4 on top to achieve smooth surface to facilitate application of water proofing treatment.

27.2 The water proofing treatment shall be in situ five course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd & 4th courses of bonding material @ 1.20 kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd layer of roofing membrane APP modified Polymeric membrane 2.0 mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100 micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20 micron HMHDPE film.

27.3 The top most layer (5th layer) shall be finished with brick tiles of class designation 10 grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12 mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat. The roof shall be designed for minimum superimposed load to 150 kg/m2.

27.4 The corners at parapet wall and slab shall be provided with 50 thick fillet/ golla in CM 1:3. Required no. of rain water down take pipes with khurra and MS grill at inlet, min. 100mm dia. PVC pipes (UV resistant), shall be provided for rain water disposal.

27.5 Pipes and associated fittings and fixtures shall conform to relevant BIS standards.

28 Plinth protection and peripheral drain

28.1 750mm wide plinth protection with min. 75mm thickness of PCC (1:3:6) over bed of dry brick ballast, 40mm nominal size well rammed and consolidated and grouted with fine sand, with min. 75mm thickness shall be provided around all the buildings.

28.2 A peripheral drain (except for Security room/ cabin) of min. size 250mm x 250mm internal size with brick walls in CM and 100mm thick PCC (1:3:6) bedding shall be provided along the periphery of the plinth protection for collection and disposal of rain water from building roof including plastering and coping as specified elsewhere.

29 Plinth filling for buildings

29.1 Plinth beam, when provided, shall be taken minimum 200mm below FGL. The plinth filling below Ground floor (GF) for all buildings shall be provided with following specifications;

i) Well compacted sub-grade
ii) 235 thick well compacted bounder soling with interstices filled with sand.
iii) 75 thick PCC 1:3:6
iv) 100 thick PCC 1:2:4 .
v) 40 thick floor finish

30 Sanitary Works

30.1 Toilet block with wash room facilities for both Genders shall be provided in MCR building. The toile block shall have following min. fittings:

i) Wall mounted WC (Western type) 390 mm high with toilet paper roll holder and all fittings.
ii) Wall mounted Urinal (430 x 260 x 350 mm size) with all fittings for male toilet only.
iii) Wash basin (550 x 400 mm) above platform with all fittings.
iv) Bathroom mirror (600 x 450 x 6 mm thick clear float glass) with hard board backing.
v) CP brass towel rail (600 x 20 mm) with C.P. brass brackets.
vi) Soap holder and liquid soap dispenser.
vii) Ventilators – Mechanical exhaust facility.
viii) Overhead PVC water storage tank – Capacity 1000 litres
ix) The toilet block shall have a provision for installation of Water Cooler.
x) One toilet room with provision of WC shall be provided at Security Room near main gate.
xi) Necessary plumbing lines (for water supply & waste disposal) shall be provided for MCR building and Security room near main gate.
xii) All sanitary ware, plumbing fixtures & shall be of reputed Make and Type and approved by the Employer.

xiii) All fittings, fastener, grating shall be of CP brass conforming to relevant IS code.

31 Painting & Finishes

31.1 Painting and white wash/ colour wash for the buildings shall conform to relevant BIS standards. The make and colour shade of the finish shall be as advised and approved by the Employer.

Internal Walls except toilets & battery room	Acrylic emulsion (for MCR & Oil Bound distemper for LCR/ Security Room)
Battery room	Acid/ Alkali resistant tiled dado of 2100 mm height & Chlorinated rubber paint above dado
Toilet	Oil bound distemper
External Walls	All weather proof cement based acrylic emulsion paint, exterior grade
MMS foundations/Earth pit Enclosure	Cement paint
Underside of roof slab	White wash
Air conditioned areas	Underside of roof slab- Under deck insulation with 50mm thick mineral wool, min. density 45 kg/ m3 and Gypsum board false ceiling with GI grid/ Gypsum tile (600x600 mmx12 thick) false ceiling with AL grid as per manufacturer's details
Battery room	Acid resistant resin based epoxy Paint

31.2 Air conditioning & Ventilation for MCR and Other Buildings

i) All buildings shall be equipped with appropriate numbers of fans for effective heat dissipation.

ii) In MCR building, the supervisor room, Conference room and SCADA cabin shall have split type air conditioning units.

31.3 Fire Extinguishers

i) LiquefiedCO2/ foam/ ABC type fire extinguisher shall be upright type of capacity 10kg having IS: 2171. 7, IS:10658 marked.

ii) 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.

31.4 Sand Bucket

Sand buckets should be wall mounted made from at least 24SWG sheet with bracket fixing on wall conforming to IS: 2546. 4 No. of Bucket stands with four buckets on each stand shall be provided in the Transformer Yard.

31.5 Sign Boards

The sign board containing brief description of major components of the power Plant as well as the complete power Plant in general shall be installed at appropriate locations of the power Plant as approved by Employer.

32 Masonry Work

i) The masonry work shall be of bricks or concrete blocks.
ii) All external walls of buildings shall be 230mm and internal walls shall be 230/ 115mm as per requirements.
iii) All concrete block masonry walls shall be min. 200mm thick.
iv) Brick work shall be in cement mortar (CM) 1:6 & 1:4 for 230 mm and 115 mm thick brick wall respectively.
v) Bricks shall be of class designation 7.5 conforming to IS: 1077, IS: 2212 & IS: 3495.
vi) All concrete blocks shall be of min. compressive strength of 7.5 N/mm2 and shall be of Grade-A conforming to IS: 2185.
vii) Suitable damp proof course (DPC) shall be provided.
viii) The DPC shall be with PCC (1:2:4) using 6 down coarse aggregate and water proofing admixture. The min. thickness of DPC shall be 40mm

33 Plastering, Pointing & Coping Works.

33.1 All brick masonry work shall be provided with plaster.

33.2 Wall and ceiling plaster shall be in cement mortar (CM) – 1:6 and 1:3 respectively. Thickness of plaster shall be 18mm and 12mm for rough and smooth surface of the brick wall respectively. The ceiling plaster shall be 6mm thick.

33.3 All joints in stone masonry shall be raked and pointed in cement mortar (CM) – 1:3 except specified otherwise. Exposed top surface of brick or stone masonry shall be provided with 50 thick plain cement concrete (PCC) coping (1:2:4) with trawl finish. All exposed coping shall be provided with suitable slope and projection for easy drainage of water.

34 Building Water Supply & Plumbing Works

34.1 GI pipes of Medium quality conforming to IS: 1239 (part-I) shall be used for all water supply. All sewerage, waste water and ventilation pipes be CI pipes conforming to relevant IS.

34.2 Required plumbing lines shall be provided for MCR building and Security room conning to Sewage treatment/disposal facility including all associated works like Manholes etc.

34.3 Sewage Treatment facility: The Contractor shall design & provide soak pit and RCC Septic tank for treatment of sewage and waste water for MCR building and Security room. However, in case of ground water within 1.5m of finished grade level or the soil strata being of low permeability, packaged sewage treatment Plant shall be provided. The packaged sewage treatment Plant shall be of proven design and of approved make. The sewage treatment facility shall be designed for total of 15 people.

35 Pipe and Cable Trenches

35.1 All internal 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.

35.2 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.

36 Transformer Yard Civil Works

36.1 Transformer and equipment foundations shall be founded on piles/isolated spread footings depending on the final geotechnical investigation report.

36.2 Transformer foundations shall have its own pit which would cover the area of the transformer and cooler banks, so as to collect any spillage of oil or oil drainage in case of emergency.

36.3 The oil pit shall be filled with granite stone gravel of 40 mm size uniformly graded. The retention capacity of the transformer pit shall be min. 1/3 volume of the transformer oil which is filled with gravel with 300mm free space above gravel fill.

36.4 The individual transformer oil pit shall be connected to an oil collection pit which shall be sized to accommodate full oil volume of the transformer connected to it, without backflow. The oil collection pit shall be connected to oily water drainage system. Dimensions of the discharge pipe shall consider rainfall intensity also. The water shall be discharged into the nearest drain by gravity flow or pumping.

36.5 Both, the transformer pit and the oil collection pit shall be of RCC. The oil collection pit shall be provided with RCC cover.

36.6 The area around the transformer and equipment shall be covered with gravel. The area shall be provided with galvanized chain link fence of height min 1.8 m with and gate. The specifications for fencing shall be similar to those specified under clause No. 16 above except fence post which shall be 50X50X6 MS angles spaced at 2.5m c/c.

36.7 The Gate of size 3.5m shall be of MS pipe frame with welded wire fabric mesh including all accessories and fittings. MS angle posts shall conform to IS: 2062. The portion of the fence covering towards rail track shall be made of removable type for movement of transformer during erection /removal.

36.8 In addition a small gate, 1.2 m wide shall be provided for man entry for maintenance purpose. The transformer yard fencing work shall conform to CEIG requirements.

36.9 Transformer track rails shall conform to IS: 3443. The requirement of fire barrier wall between transformers shall be as per Electricity Rules and IS: 1646 recommendations. Minimum wall thickness shall be 230mm for RCC wall and 300mm for masonry wall.

37 Water Supply & Cleaning of Modules

37.1 Water used for cleaning purpose shall be fit for cleaning the PV modules, cleaning procedure and pressure requirement shall be as per the recommendation of PV module manufacturer.

37.2 A suitable arrangement of water shall be ensured to cater the day-to-day requirement of drinking water and needs of Solar Photovoltaic Plant during entire O&M period.

37.3 The Contractor shall estimate the water requirements for cleaning the photovoltaic modules at least once in every week or as per the soiling conditions prevailing at site, in order to operate the Plant at its guaranteed Plant performance. Also, Contractor is required to plan the water storage accordingly.

37.4 Contractor has to plan and install the effective module cleaning system as per the prevailing conditions at Site. The system may include the storage water tanks, pumps, laying of GI/HDPE/UPVC pipes, flexible pipes, taps/ valves, pressure gauges etc. as per the planning by the Contractor. Contractor has to submit the drawing/ plan for the proposed module cleaning system.

37.5 All the pipes thus laid must be buried in ground at least 150mm below FGL. Road crossings and drain crossings, the pipes must be passed through GI/ Hume pipes as applicable.

38 Underground RCC Water Tank

38.1 Contractor shall estimate the water requirement for cleaning the modules with a frequency of at least once a week or as per the soiling conditions prevailing at site.

38.2 The frequency of cleaning shall be mutually agreed and approved during the detail engineering in order to achieve the guaranteed performance.

38.3 The Contractor shall construct underground RCC water tank (of required capacity) with silting chamber for filtration of the water before the inlet which will match with invert level of Storm water drain. However minimum storage capacity of the tank shall be 15000 Litres.

38.4 The top of the tank shall be 250 mm above FGL. Suitable sized pump shall also be installed to maintain the water pressure at the extreme ends, required for proper

cleaning of modules.

38.5 The tank shall have clear free board of 300mm above MWL.

38.6 The tank bottom shall have a slope of 1:250 towards drainage sump (500x500x500 mm deep). The slope shall be provided either in structural slab or with screed concrete 1:2:4 neat finished at top.

38.7 1000x1000 mm size Manhole in roof slab and 20 mm GI rung ladder shall be provided for easy access to the storage tank and silting chamber for periodic cleaning. The manhole shall be covered with RCC precast cover. 50x50x6 mm MS angles shall be provided around precast cover along supporting edges for edge protection.

38.8 The underground RCC tank shall be designed for following load conditions

i) External earth pressure + hydrostatic pressure due to ground water table to be considered at FGL for design purposes) + Surcharge of 2 T/ Sqm and Tank Empty.

ii) Tank full up to MWL and no Earth pressure, Hydrostatic pressure due to ground water table and surcharge from outside.

38.9 The design shall conform to IS: 3370 with maximum crack width of 0.1mm for Wall, bottom slab and roof slab. Min. grade of concrete shall be M30 conforming to IS: 456. PVC water bars 230x8 mm thick, conforming to relevant IS shall be provided at all construction joints. Water proofing admixture conforming to relevant IS and of approved make shall be added to concrete.

38.10 The underground water tank shall be tested for water tightness as per the provisions of IS 3370. In case any leakage is noticed the same shall be repaired by injection of cement grout installing suitable nozzles around affected areas.

38.11 A Manhole of appropriate size (with removable RCC Cover) with permanent access ladder to be provided in the Water tank for its maintenance and cleaning shall be provided.

Inspection & Testing

39 Inspection:

39.1 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.

39.2 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.

39.3 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.

39.4 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.

39.5 The Employer will nominate its representatives (max. of 2 nos.) for inspection of stage manufacturing and testing at works & 7 days training at premises of SPV module and PCU manufacturer. The notice of such inspection shall be given 30 days in advance in case of countries outside India and 15 days in India.

39.6 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

40 Load Trials & Reliability test at Site

40.1 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

40.2 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.

40.3 All the equipment supplied by the vendor will be tested as per relevant standard/ Quality

assurance plan at site conditions and the performance monitored.

41 Quality Considerations

41.1 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.

41.2 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.

41.3 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.

41.4 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.

41.5 Contractor will associate/fully witness in each inspection being carried out at their/their sub-vendor's works by our authorized inspection engineer(s).

41.6 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.

42 Performance and Functional Warranty / Guarantees

42.1 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 80% at the end of 25 years.

42.2 The modules shall be warranted for at least 10 years for failures due to material defects and workmanship.

42.3 The mechanical structures, electrical works and overall workmanship of the grid connected solar power Plant must be warranted for a minimum of 5 years.

42.4 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.

42.5 The warranty / guarantee period shall be as follows:

- Solar PV Modules: Modules shall be warranted for a minimum period of 25 years in the Contractor's detailed Warranty / Guarantee certificate.
- Power Conditioning Units (PCU): PCUs shall be warranted for a period of minimum 5 years 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 warrantied for minimum 5 years against its performance and workmanship.
- 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.

42.6 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.

42.7 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.

42.8 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.

42.9 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.

42.10 During the O&M period, the Contractor, in concurrence with the Employer, is encouraged to carry out the PR test in similar fashion for a period of 7 days, at regular intervals, in order to check the continued performance of the Plant and to determine the necessary steps to meet the CUF commitment. However, for the O&M period committed CUF shall be considered only. CUF shall be determined for every year for the performance obligations of the Contract.

SHEET-1

Guaranteed Technical Particular data Sheet for Solar PV Module

(To be furnished by the bidder)

S. No.	Particulars	Unit	Type/ value	
1	PV Module Manufacture (Name & Country)			
2	PV Module type (Crystalline- Mono/ Multi)			
3	Product Code (commercial)			
4	No. of PV cells per Module	cells	60	72
5	Mounting arrangement for Solar Module			
6	Solar Module frame material (if framed)			
7	Module dimensions			
8	Output Cables (viz., Polarized Weather Proof DC rated multi-contact connector)			
9	Construction Front glass description and thickness Back sheet details Encapsulating details	%	60	
10	Construction Front glass description and thickness Back sheet details Encapsulating details			72
11	Cell efficiency			
12	Module efficiency	%		
13	Nominal Wattage (P_{nom})	W		
14	Power Tolerance (≤+5W)	W		
15	Peak power voltage (V_{mp})	V		
16	Peak power current (I_{mp})	A		
17	Open circuit voltage (V_{oc})	V		
18	Short circuit current (I_{sc})	A		
19	Weight of each module	kg		
20	Fill Factor	%		
21	Standards/Approvals from International Agencies	IEC 61215 IEC 61730 IEC 61646 IEC 61701 IEC 62716 Others		
22	Module is suitable to operate up to 50° ambient	Yes/No		

SHEET-2

Technical Particular Data Sheet for Power Conditioning Unit

(To be furnished by the bidder)

Particulars	Unit	Value
Make		
Capacity		
Origin		
AC Side		
Nominal AC power @ 25°C	kW	
Nominal AC power @ 50°C	kW	
Output AC voltage	V	
Output AC Current	A	
Frequency (and Variation)	Hz	
Total Harmonic Distortion (< 3%)	%	
AC over/under voltage, over/under frequency protection		
Phase shift (cos phi)		
DC Side		
Maximum Input DC power	kW	
Maximum DC voltage	V	
MPPT voltage range	V	
Maximum DC current	A	
DC over voltage protection		
DC voltage ripple	%	
Others		
Maximum Efficiency	%	
Euro Efficiency	%	
Ambient temperature range	°C	
Humidity (non-condensing)	RH	
Quiescent power	kW	
Degree of protection	IP	
Dimensions approx. (H x W x D)	mm	
Weight	kg	
Compliances (Reference Standards)		

SHEET -3

TECHNICAL PARTICULARS OF STEP-UP TRANSFORMER

(To be furnished by the bidder)

S. No.	Description	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.	Duty	
12.	Short circuit level	
13.	Off circuit tap changer: a) Range % b) In steps of c) Tapping provided on HV side	
14.	Tap changer type	
15.	Impedance voltage at 75°C a) At principal tapping %	
16.	Temperature rise above 50°C ambient a) Top of oil by thermometer °C b) Womdomg by resistance °C	
17.	Terminal details a) HV side b) LV side	
18.	Losses (at 75°C and principal tapping) a) No load loss at rated voltage kW and frequency b) Load loss at rated current kW	

S. No.	Description	Guaranteed particulars to be filled in by the manufacturer
	(ONAN) c) Total loss at maximum rated power kW	
19.	Efficiency at 75°C and 0.9 PF a) At full load (ONAN) % b) At 75% load (ONAN) % c) At 50% load (ONAN) %	
20.	Hot spot temperature in winding limit to °C	
21.	Shipping dimensions a) Height m b) Breadth m c) Length m	
22.	Painting	
23.	Reference Standards	

SHEET- 4

Guaranteed Technical Particulars of LED lights

(To Be Submitted By the Bidder)

S. No.	Parameter	Guaranteed Value
1.	LED Operating Current	
2.	Output Luminous Flux	
3.	Beam Angle	
4.	Illuminance	
5.	Photometric Curve	
6.	Material of Luminaire	
7.	Dimension	
8.	Weight	
9.	Impact Resistance	
10.	LED Life	

Section – VI

Forms and Formats

(NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50)

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

D – 3, Ist floor, Wing A, Religare Building, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989224, Fax: 011 – 71989241

(i) Appendix 1: Format for Bid Letter

(ii) Appendix 2: Format for Details of Bidder

(iii) Appendix 3: BID Evaluation Criteria (BEC)

(iv) Appendix 4: Details of Power Plant Performance Guaranteed parameters

(v) Appendix 5: Format for Financial proposal

(vi) Appendix 6: Details of qualified technical staff for EPC and O&M separately

(vii) Appendix 7: Format for Declaration of Compliance

(viii) Appendix 8: Format for No Deviation Certificate

(ix) Appendix 9: Format for Declaration on Bidder's relation to Directors

(x) Appendix 10: Format for Execution Timeline

(xi) Appendix 11: Not Applicable

(xii) Appendix 12(a): Format of Bank Guarantee for Bid Security

(xiii) Appendix 12(b): Format of Bank Guarantee for Performance Security during EPC

(xiv) Appendix 12(c): Format of Bank Guarantee for Performance during O&M

(xv) Appendix12 (d): Checklist for Bank Guarantee Verification

(xvi) Appendix 13: Terms of payment

(xvii) Appendix 14: Format for Contract Agreement

(xviii) Appendix 15: Format for Power of Attorney for signing of Bid

(xix) Appendix 16: Format of Board Resolution

(xx) Appendix 17: Format for Indemnity Bond to be executed by The Contractor for The Removal / Disposal of Scrap/Disposal of Surplus Material

(xxi) Appendix 18: Format for Indemnity Bond to be executed by the contractor for the plant handed over to Employer for Performance of its O&M Contract (Entire Solar PV Plant)

(xxii) Appendix 19 (a): Format for 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)

(xxiii) Appendix 19(b): Format for indemnity bond to be executed by the contractor for the equipment handed over in instalments by the employer for performance of its contract.

(xxiv) Appendix-20 :Format of Bank Guarantee for Mobilization Advance:

(xxv) Appendix-21: Details of Project.

(xxvi) Appendix 22: Not Applicable.

(xxvii) Appendix 23: Not Applicable.

(xxviii) Appendix 24: Format for Satisfactory operation

Appendix 1: Performa for Bid Letter (on Bidders' letter head)

Date: --/--/----

To,

General Manager (C&P)

Solar Energy Corporation of India Limited

1st Floor, A Wing, Religare Building

D-3, District Centre, Saket, New Delhi - 110017

Subject: Submission of the bid (NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50) Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India).

Dear Sir,

We, the undersigned, have considered and complied with the "Instructions to Bidders" and have accepted the terms stipulated in the Tender Document. The scope of work shall include but not be limited to Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years from the date of operational acceptance of the Plant on turnkey basis at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India) being established by THDCIL.. All the above shall be done as per Tender Document No. SECI/C&P/PMC/NIT/2016/THDCIL/50 dated __/__/____

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 Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (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 Tender documents at the prices accompanying this Bid.

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 **(360) Three Sixty 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.

We further agree and stipulate as follows:

1. 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.
2. Unless explicitly mentioned, the Employer will not supply any men, material & logistics. In all respects we shall be fully self- sufficient in the Performance of the work.
3. I/ We understand that Employer is not bound to accept the lowest of the Bid you may receive.
4. I/ We shall make available to the Employer any additional information it may find necessary or require to supplement or authenticate the qualification statement.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. We understand that the selected Bidder shall be an existing Company incorporated under the Indian Companies Act, 1956 or 2013.

11. 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.
12. I/ We agree and undertake to abide by all the terms and conditions of the NIT document.
13. We agree to keep the bidding valid for acceptance for a period of 180 days from the date of opening of Techno-Commercial 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.
14. We also undertake not to vary/ modify the Bid during the validity period or any extension thereof.
15. 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.
16. 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.
17. 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.
18. 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.
19. 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.
20. 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.

21. We agree to guarantee Plant Performance parameters including Performance Ratio (PR), CUF and Plant availability / uptime as mandated by the relevant clause of the tender document.

Dated this _____ day of _____ 2016

Signature: _____

In the capacity of:_

Duly authorized to sign Tenders for and on behalf of (Name & Address)

_

_

Witness

_____

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:

2. Brief description of the Company including details of its main lines of business and proposed role and responsibilities in this Project:

3. 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:

4. Particulars of the Authorised Signatory of the Bidder:
   a. Name:
   b. Designation:
   c. Address:
   d. Phone Number:
   e. Fax Number:

5. Detail of the Bank from where the BID Security is issued and submitted along with bid.
   a. Name of Contact Person:
   b. Name of Bank:
   c. Address:
   d. Phone No.: Fax No.: E-mail:

Appendix 3: Bid Evaluation Criteria (BEC)

1. Following factors shall be required for evaluation of Bid:

a) 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. Supply, Erection and Civil 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 to be calculated at a Discount rate of 10.81 % p.a.

Evaluated Bid value (EBV) = (1) EPC price + (2) NPV of O&M Contract Price

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. However, the award shall be placed excluding of taxes and duties. 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. The same shall be paid/reimbursed based on the documentary evidence submitted by the bidder during execution, subject to the maximum limit, mentioned by the bidder and considered during evaluation.
- 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.
- In Table 5B, Summary of Taxes and Duties, if bidder does not mention any tax amount against any type of tax and writes –Extra at actuals or leave blank or writes-NIL or writes any other comment, the same shall be considered as ZERO and it is presumed that bidder has incorporated effect of these Taxes somewhere else in the price bid.

Appendix 4: Power Plant Performance Guarantee Test for

- 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	
DC installed Capacity Proposed (in kW)	
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. 55 MWp) 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.
- PR should be determined as per the formula and procedure specified in Clause 7 of Section V: Technical Specifications.

Appendix 5: Performa for Financial Proposal (on Bidders' Letter head)

Date:--/--/----

To,

General Manager (C&P)

Solar Energy Corporation of India Limited

1st Floor, D-3, A Wing, Religare Building

District Centre, Saket, New Delhi - 110017

Sub: Submission of the Financial Proposal SECI/C&P/PMC/NIT/2016/THDCIL/50) Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India) .

Sir,

I,_____, against NIT No. SECI/C&P/PMC/NIT/2016/THDCIL/50 for Engineering, Procurement, Construction, Installation, Testing, interconnection/ interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India), in response to NIT document No. SECI/C&P/PMC/NIT/2016/THDCIL/50 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, 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.

TABLE 5A: Total EPC Contract Price(including Taxes/Duties and other Levies)				
S. No.	**Item**	**Final Price for 50 MW (AC) SPV Plant**		**Direct / Bought out**
		(In Rs.)		(Mention)
Part - B: Supply Works package(upto site)		Base Price	Price Inclusive of tax	
1	PV Modules up to site (mention quantity & wattage)			
2	Mandatory Spares (0.25% of total supply of solar modules)			
3	Inverters up to site (mention Quantity and Capacity)			
4	Supply of Balance of System includes all equipment, materials, spares, accessories, MMS etc. excluding 1,2 & 3 above up to site			
5	transformer & switch yard including interconnection and interfacing at 33kV/110kV system			
Part - C: Erection Works Package		Price Inclusive of tax		
6	General works including erection, commissioning, testing etc. of entire plant including MMS erection, excluding 7 below			
Part - D: Civil and allied Works Package		Price Inclusive of tax		
7	Civil and allied works including construction of buildings, MMS foundations, perimeter etc.			
8	Total (1+2+3+4+5+6+7) Including Taxes (In Figures)			
Total Contract Price, Including Taxes (in Words)				

Table 5B: Summary of Taxes and Duties (Included in Table 5A, Part-B Supply Work Package)		
S. No.	Items No.	Total Price (INR)
1	**TOTAL EXCISE DUTY**	
	Total Excise Duty for Direct transaction between the contractor and the Employer (identified in Table 5A as 'Direct'), as applicable	
2	**TOTAL SALES TAX**	

	Total Sales tax for Direct transaction between the contractor and the Employer (identified in Table 5A as 'Direct'), as applicable	
3	**TOTAL VAT**	
	Total VAT for Direct transaction between the contractor and the Employer (identified in Table 5A as 'Direct'), as applicable	
4	**TOTAL OCTROI**	
	Total Octroi as applicable for destination site/ state on all items of supply on all items under BOQ of the scope of contract, as applicable	
5	**TOTAL ENTRY TAX**	
	Total Entry Tax as applicable for destination site/ state on all items of supply on all items of the BOQ under the scope of contract, as applicable	
6	**TOTAL OTHER TAXES AND DUTY**	
	*Total other levies payable in India (please specify) as applicable for the destination site/ state on all items of supply, as per the provisions of bidding documents, on all items of BOQ under the scope of contract, as applicable	
7	**TOTAL CUSTOM DUTY**	
	Total Custom Duty on all the imported items	
8	**GRAND TOTAL [1+2+3+7] (in Fig.)** This total does not include Octroi, entry tax, other tax & duties quoted by bidder at S. No. 4, 5 & 6	
	(in Words)	
9	**GRAND TOTAL [4+5+6] (in Fig.)** This total includes Octroi, entry tax, other tax & duties quoted by bidder at S. No. 4, 5& 6	
	(in Words)	

* Service Tax, Work Contract tax should not be mentioned in Table 5B as these are not payable separately.

NOTES:

1. The reimbursement of Excise duty, Custom Duty, sales tax/ VAT and other levies as per Sl. No. 1,2, 3 & 4 in table 5A subject to only direct transactions between the contractor and the Employer, for which the mode of transaction indicated in Table 5A is 'Direct'. In case the of those items mentioned in the said Table 5A against which the mode of transaction is left blank,

the same shall be deemed to be 'Bought out' for the purpose of evaluation and award of contract and the price indicated in Table 5A against such items shall be deemed to be inclusive of all such taxes, duties and levies.

2. Total evaluated price (sum of all work packages viz. Supply, Erection and Civil Works) shall be inclusive all taxes, duties and levies as prices quoted by the bidder. However, the award shall be placed without taxes, duties and levies.
3. No variation due to change in forex rate shall be admissible.
4. Payment shall be made in Indian National Rupees (INR) only. Bidder(s) has to quote their rate in INR only.
5. Arithmetical errors will be rectified on the following basis: 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.
6. The payments as mentioned under SCC Clause 14 will be for the purpose of an account running payment instalments, which shall finally be reconciled with the final bill of items of this sheet along with invoice taxes and duties.
7. Taxes, duties and levies shall be reimbursable by the Employer based on the documentary evidence submitted by the bidder subject to maximum of which have been mentioned by the bidder and considered during evaluation.
8. Bidder is required to ascertain correctness of Taxes, Duties and other levies, as Taxes, Duties and other levies mentioned by the bidder shall be considered during evaluation. In case the bidder has mentioned these wrongly in the financial bid format other than the applicable taxes, duties and levies, Employer will consider the mentioned taxes, duties and levies by the bidder and the same shall be paid/reimbursed based on the documentary evidence submitted by the bidder, subject to maximum of which have been mentioned by the bidder and considered during evaluation.
9. Bidders are required to include Service Tax, Work Contract tax in the table 5A and same shall not be payable separately and should not be mentioned in table 5B.
10. In case, any of the item/ component from the entire supplies, is imported by the bidder, then the price break 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 of GCC Clause 8.5 and as per applicable law/ rules/ regulations, then same shall be mentioned by the bidder.

TABLE 5C: Total Price for O&M Contract (Excluding taxes)		
Sr. No.	**Item**	**Price (excluding service tax) (in INR)**
1	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **First YEAR**	
2	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **SECOND YEAR**	
3	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **THIRD YEAR**	
4	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system **FOURTH YEAR**	
5	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **FIFTH YEAR**	
	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **SIXTH YEAR**	
	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **SEVENTH YEAR**	
	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **EIGHT YEAR**	
	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **NINTH YEAR**	
	Operation and Maintenance of the 50 MW (AC) PV Grid Interactive Power Plant including transmission & evacuation system for **TNETH YEAR**	
Total O&M Contract Price excluding ST (in figures)		
Total O&M Contract Price excluding ST (in Words)		

Signature: **Designation:**

Name: **Organization:**

Address: **Phone:**

Email: **Seal Of the Company**

Note: Bidders are required to submit their financial proposal as per the above format in excel sheets provided on the TCIL portal.

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	Remarks
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: **Designation:**

Name: **Organization:**

Address: **Phone:**

Email: **Seal Of the Company**

Appendix 7: Declaration of Compliance (On bidders' Letter head)

Date:--/--/----

To,

General Manager (Solar)

Solar Energy Corporation of India Limited

1st Floor, D-3, A Wing, Religare Building

District Centre, Saket, New Delhi - 110017

Sub: Declaration of Compliance (NIT No.: SECI/C&P/PMC/NIT/2016/THDCIL/50) Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (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:	**Designation:**
Name:	**Organization:**
Address:	**Phone:**
Email:	

Appendix 8: No Deviation Certificate (On bidders' Letter head)

Date:

To

General Manager (Solar)

Solar Energy Corporation of India Limited

1st Floor, D-3, A Wing, Religare Building

District Centre, Saket, New Delhi - 110017

Sub: No Deviation Certificate (NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50) Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (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.

_____

SEAL AND SIGNATURE OF BIDDER

Date: _____

Appendix 9: Declaration on Bidder's relation to Directors (On bidders' Letter head)

This has reference to our proposed bid/ Contract (NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50) Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India) to be entered into Agreement with Employer (THDCIL and SECI).

We certify that to the best of my/our knowledge;

- I am not a relative of any Director of THDCIL and SECI ;
- We are not a firm in which a Director of THDCIL and SECI or its relative is a partner;
- I am not a partner in a firm in which a Director of THDCIL and SECI, or its relative is a partner;
- We are not a private company in which a Director of THDCIL and SECI is a member or director;
- We are not a company in which Directors of THDCIL and SECI hold more than 2% of the paid-up share capital of our company or vice-versa.

_____

Authorised Signatory of the Contracting Party

Place:

Date:

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 entire work is completed within (360) Three Sixty Days of issue of LOI/NTP/PO.

SIGNATURE OF BIDDER

NAME

DESIGNATION

COMPANY SEAL

DATE

Appendix 11: Performa of acknowledgement letter for receipt of NIT Documents

Not Required as NIT document can be downloaded from TCIL's website

Appendix 12(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:_____

BID SECURITY, BANK GUARANTEE FORMAT FOR TENDER /NIT No. SECI/C&P/PMC/NIT/2016 /THDCIL/50

In consideration of the ----------[Insert name of the Bidder] (hereinafter referred to as 'Bidder') submitting the response to NIT inter alia for (NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50) for Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India), in response to the NIT No. SECI/C&P/PMC/NIT/2016/THDCIL/50 dated _____ issued by Solar Energy Corporation of India Limited (SECI) on behalf of THDC India Limited (THDCIL) 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 SECI at [Insert Name of the Place from the address of SECI] forthwith on demand in writing from SECI 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].

SECI 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 SECI 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 SECI, made in any format, raised at the above mentioned address of the Guarantor Bank, in order to make the said payment to SECI.

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 SECI to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against SECI in respect of any payment made hereunder

This BANK GUARANTEE shall be interpreted in accordance with the laws of India and the courts at New Delhi 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 SECI 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 SECI 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 SECI and may be assigned, in whole or in part, (whether absolutely or by way of security) by SECI to any entity to whom SECI 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 SECI 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

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 as per Schedule 1: List of Banks only.
- This bank guarantee/ all further communication relating to the bank guarantee should be forwarded to THDCIL.
- 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 BID Security 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 bid security 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.

Appendix 12(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 NIT NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50 for Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India), in response to the NIT dated……. issued by Solar Energy Corporation of India Limited (SECI) on behalf of THDCIL 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 THDCIL at [*Insert Name of the Place from the address of THDCIL]* forthwith on demand in writing from THDCIL 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*]. THDCIL 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 THDCIL 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 THDCIL, made in any format, raised at the above mentioned address of the Guarantor Bank, in order to make the said payment to THDCIL.

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 THDCIL to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against THDCIL in respect of any payment made hereunder

This BANK GUARANTEE shall be interpreted in accordance with the laws of India and the courts at Hyderabad 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 THDCIL 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 THDCIL 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 THDCIL and may be assigned, in whole or in part, (whether absolutely or by way of security) by THDCIL to any entity to whom THDCIL 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 THDCIL 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

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 bank as per Schedule 1: List of Banks only.
- This bank guarantee/ all further communication relating to the bank guarantee should be forwarded to THDCIL.
- 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.

Appendix12(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 No. _____ issued by Solar Energy Corporation of India Limited (SECI) ON BEHALF OF THDC India Limited ("THDCIL") (hereinafter, the "Beneficiary") for Operation and Maintenance of Performance of 50 MW (AC) Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system.

And WHEREAS a Bank Guarantee for Rupees *[……]* valid till ……. *[Insert as per the relevant clause of the tender document]* 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.

This Guarantee 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 THDCIL.
- 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.

Appendix12 (d): Bank Guarantee Verification for Package-A

CHECKLIST			Yes	No
I.		Does the bank guarantee Compare verbatim with the format provided for it in this NIT	☐	☐
II.	a)	Has the executing Officer Of BG indicated his name Designation & power of Attorney No./signing power Number etc. on BG.	☐	☐
	b)	Is each page of BG duly signed/initialled by the executant, and last page is signed will full particulars and under the seal of the Bank.	☐	☐
	c)	Does the last page of the BG carry the signatures of two witnesses alongside the signatures of the executing Bank Manager?	☐	☐
III.	a)	Is the BG on non-judicial stamp Paper of appropriate value.	☐	☐
	b)	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.	☐	☐
IV.	a)	Are the factual details such As Bid Specification No., LOI No., contract price, Etc. correct.	☐	☐
	b)	Whether overwriting/cutting of any on the BG authenticated under signature & seal of Executant.	☐	☐
V.		Is the amount and validity of BG in line with terms of the NIT?	☐	☐
VI.	a)	Is the Bank Guarantee Issued from a Bank's Branch located outside India	☐	☐
	b)	If the response to VI. a) Above is yes, has the Bank Guarantee been routed through the correspondent branch in India for due verification of the signature(s) of the executant(s)?	☐	☐
VII.		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 13: Terms of Payment

In accordance with the provisions of Clause 14 of SCC: Terms of Payment.

Appendix 14: Contract Agreement

This agreement is made at Hyderabad, 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 THDC India Limited (THDCIL) having their Head Office at _____(insert office address of THDC India Limited) (Hereinafter called "THDCIL" which expression shall unless excluded by or repugnant to the context include its successors or assigns) of the other part.

WHEREAS the aforesaid THDCIL has accepted the tender of the aforesaid Contractor for ---------- ---------- as per THDCIL'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 THDCIL 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 WHEREAS THDCIL 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 therefrom 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, THDCIL 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 conditions and covenants stipulated herein before in this contract are subject to and without prejudice to the rights of the THDCIL to enforce penalty for delays and / or any other rights whatsoever including the right to reject and cancel on default or breach by the Contractor of the conditions and the covenants as stipulated in the general conditions, specifications, forms, or tender schedule, drawing, etc., attached with THDCIL's LOI Nos. ----------.

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 this 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 THDCIL,

In the presence of Name, Full Address & Signature:

i) ----------

ii) ----------

Appendix 15: 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 Engineering, Procurement, Construction, Commissioning, Operation and Maintenance of 50 MW AC Solar Photovoltaic Grid Interactive Power Plant using Photovoltaic at ----------, pursuant to the NIT document no. _____issued by Solar Energy Corporation of India Limited (SECI) on behalf of THDC India Limited ("THDCIL"),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 THDCIL.

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 Notarised

(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 16: 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 NO. – SECI/C&P/PMC/NIT/2016/THDCIL/50, for Designing, Engineering, Procurement & Supply, Erection, Construction, Testing & Commissioning of 50MW (AC) Grid connected Solar PV Power Plant along with associated interfacing at 33kV/110 kV Voltage system on turnkey basis, including performance demonstration and its O&M contract for 10 (Ten) years at Manjeswar (Kasaragod), Kasargod Solar Park in the state of Kerala (India), including signing and submission of all documents and providing information / response to Solar Energy Corporation of India Limited (SECI) or THDC India Limited (THDCIL), representing us in all matters before SECI/THDCIL, and generally dealing with SECI/THDCIL in all matters in connection with our bid for the said Project. (To be provided by the Bidding Company or the Lead Member of the Joint Venture)

Certified true copy

(Signature, Name and stamp of Company Secretary / Director)

Notes:

This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary / Director.

The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.

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 17: 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)……..., a Company registered under the Companies Act, 1956/ Companies Act, 2013 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 THDC India Limited, having its registered office at "_____" {insert registered office address of THDC India Limited} (hereinafter referred to as "THDCIL") .

1. THDCIL 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 THDCIL 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 THDCIL 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 THDCIL and keep THDCIL indemnified from and against all claims, demands, actions, liabilities and expenses which may be made or taken against or incurred by THDCIL by reason of the issue of necessary approval by THDCIL 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 THDCIL 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 THDCIL 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 THDCIL.

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:

Indemnifier

1. ……

2. ……

(Authorised Signatory)

Appendix 18: Indemnity Bond to be executed by the contractor for the plant handed over by THDCIL for Performance of its O&M Contract (Entire Solar Photo Voltaic Plant along with associated interfacing at 33kV/110 kV Voltage

(On non-judical stamp paper of appropriate value) INDEMNITY BOND

THIS INDEMNITY BOND IS made this..... day of ..... 20..... by ..... a Company registered under the Companies Act, 1956/ Companies Act, 2013 having its Registered Office at..... ..... (hereinafter called as "Contractor" or "Obligor" which expression shall include its successors and permitted assigns) in favour of THDC India Limited (THDCIL), having its Registered Office at "_____"{Insert registered office address}, India and its Project at Manjeswar (Kasaragod), Kasaragod Solar Park in the state of Kerala (India) (hereinafter called "THDCIL" which expression shall include its successors and assigns) :

WHEREAS THDCIL 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 THDCIL is required to hand over various Equipment and facilities provided under 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 THDCIL for the Solar Photo Voltaic Plant handed over to it by THDCIL 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 THDCIL 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 THDCIL.

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 THDCIL. The

Contractor undertakes to keep THDCIL 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 associated interfacing at 33kV/110 kV Voltage system 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 THDCIL 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 or other employees /agents authorised by him in this regard. Further, THDCIL 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 THDCIL 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 THDCIL 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 THDCIL without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to THDCIL 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 THDCIL, 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. .....

I. 1. Signature ---------- Name ----------

2. Name ---------- Signature ----------

3. Address ---------- Designation ----------

Authorised representative*

II. 1. Signature ----------

2. Name ---------- Common Seal

(In case of Company)

3. Address ----------

* Indemnity Bonds are to be executed by the authorised persons 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 Bonds, (iii) In case (ii) the original Power of Attorney if it is specifically for our contract or a Photostat copy of the Power of Attorney if it is a General Power of Attorney and such documents should be attached to Indemnity Bond.

\# The value shall be sum of Supply and Erection Contract value.

APPENDIX 19a : 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..... 20..... by..... (Contractor's Name) a Company registered under the Companies Act, 1956 or 2013 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 despatch 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 custdoy 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 Equipments

Signature of Attorney in token of receipt

WITNESSES :

For and on behalf of ..... (Contractor's Name)

1. 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 19b: Form of indemnity bond to be executed by the contractor for the equipment handed over in instalments 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) a Company registered under the Companies Act, 1956 or 2013 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 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 instalment 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 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 No.1 Particulars of Despatch title Documents

Particulars of the Equipments handed over

Quantity

RR/GR/ Bill of lading No & Date

Carrier

Value of the Equipments

Signature of Attorney in token of receipt

(Please number subsequent schedules)

WITNESSES:

For and on behalf of ..... (Contractor's Name)

1. 1. Signature..... Signature..... 2. Name..... Name..... 3. Address..... Designation of..... Authorised representative *

2.

1.

2.

Signature.....

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 20: Format of Bank Guarantee for Mobilization Advance

[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]

Reference No. ……. Bank Guarantee No. ……. Dated: …….

To:

WHEREAS the selected bidder has been issued LOI No.……. for "……." (hereinafter called "the Contractor"), having its registered office at …….. AND WHEREAS vide Section III: General Conditions of Contract, mobilization Advance up to 10% (10 percent) of the original contract value of Rs…….. is payable to the Contractor against Bank Guarantees, the Contractor hereby applies for Mobilization Advance of --% (--- percent) amounting to Rs……../- (Rupees……..) of the Contract Price, Now, we the undersigned, Bank of ……., being fully authorized to sign and to incur obligations for and on behalf of and in the name of Bank of ……..hereby declare that the said Bank will guarantee the Employer the full amount of Rs. ……../- (Rupees……..)1.1 times of the amount as stated above. We, …….[Insert Name of Bank], do hereby unconditionally, irrevocably and without demur guarantee and undertake to pay the Employer immediately on demand any or all money payable by the Contractor to the extent of Rs. ……/- (Rupees……..) without any demur, reservation, context, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor on any dispute pending before any court, Tribunal, Arbitrator or any other authority. We agree that the guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Employer discharges this guarantee. This guarantee is valid till ……..[*insert date of validity in accordance with ITB*] At any time during the period in which this guarantee still valid of the Contractor fails to fulfil its obligation under the Contract, it is understood that the Bank will extend this guarantee under the same condition for the required time on demand by the Employer at the cost of the Contractor. The Guarantee hereinbefore contained shall not be affected by any change in the constitution of the Bank or of the Contractor. The neglect or forbearance of the Employer in enforcement of payment of any money, the payment whereof is intended to be hereby secured or the giving of time by the Employer for the payment hereof shall in no way relieve the Bank of their liability under this Deed. The expressions "the Employer", "the Bank" and "the Contractor" hereinbefore used shall include their respective successors and assigns. Notwithstanding anything contained herein: Our liability under this

Bank Guarantee shall not exceed Rs……../- (Rupees…….) this bank Guarantee shall be valid up to……..[*insert date of validity in accordance with ITB*] We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before ……(date of expiry of Guarantee). In witness whereof we of the Bank have signed and sealed this Guarantee on the ……day of …….. being herewith duly authorized.

For

_____[Insert Name of the Bank]__

Banker's Stamp and Full Address.

Dated this ____ day of ____, 20__

Witness:

1. …….

Signature

Name and Address

2. ……..

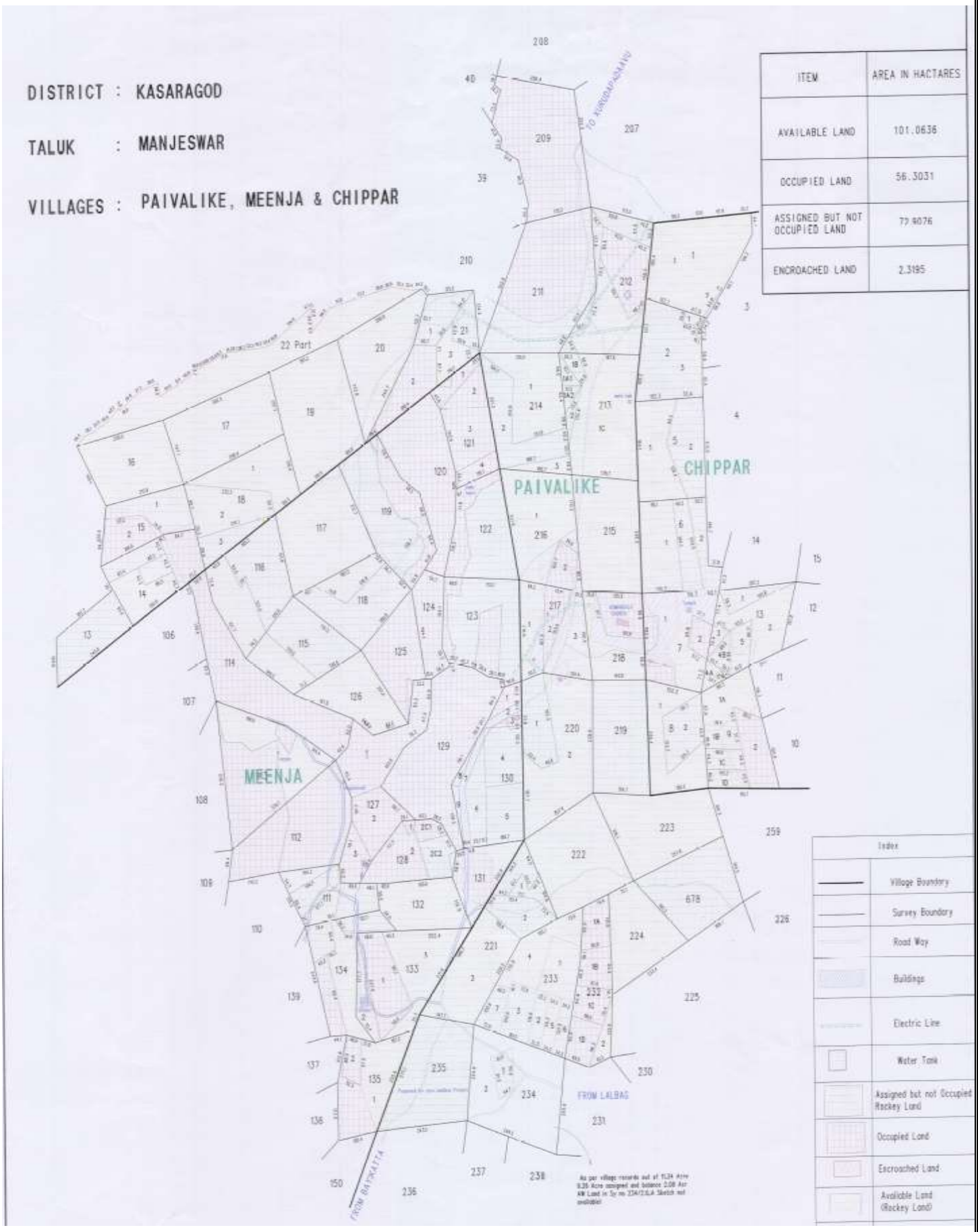
Signature

Name and Address

APPENDIX-21: DETAILS OF PROJECT

Particulars	Description
Details of proposed capacity of the solar power plant	50 MW (AC) SPV (Mono/ Multi crystalline) SPV plant
Type of Module	DCR i.e. modules used in the solar PV power plant must be made in India.
Taluk	Manjeswar
District	Kasaragod
State	Kerala
Location	In the premises of Kasargod Solar Park (Please refer to the attached land survey map)
Coordinates and other details of Inter-connecting Substation	Point 1: 12,42.393 N & 74,58.550 E Point 2: 12,42.445 N & 74,58.557E Point 3: 12,42.432 N & 74,58.641E Point 4: 12,42.373 N & 74,58.631E (Interconnection shall be done at the 33 kV side and for avoidance of any doubt the Contractor (successful bidder), shall be responsible for carrying out the scope of work mentioned in the tender document including but not limited to interconnection, interfacing, protection and metering as per applicable regulation.
Estimated life of PV Power plant	25 Years
Land Available	101.0636 Hectares (Please refer to the attached land survey map)
Minimum values of PR and CUF of the plant after netting off the auxiliary consumption.	PR : 0.78 & CUF : 18%

Arrangement for construction water & power shall be made by the contractor.


DISTRICT : KASARAGOD
TALUK : MANJESWAR
VILLAGES : PAIVALIKE, MEENJA & CHIPPAR
ITEM | AREA IN HACTARES
AVAILABLE LAND | 101.0636
OCCUPIED LAND | 56.3031
ASSIGNED BUT NOT OCCUPIED LAND | 77.4076
ENCROACHED LAND | 2.3195
PAIVALIKE
CHIPPAR
MEENJA
TO KUMBADAJA(V)
FROM LALBAG
FROM BATKALLA
Index
Village Boundary
Survey Boundary
Road Way
Buildings
Electric Line
Water Tank
Assigned but not Occupied Rockey Land
Occupied Land
Encroached Land
Available Land (Rockey Land)

APPENDIX-22 & 23: Not Applicable

Appendix-24

Format for Satisfactory operation (on Plant Owners' letter head):

Date:

TO WHOMSOEVER IT MAY CONCERN

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,