

Notice Inviting Tender

(Invited through e-Tendering mode only)

GeM Availability Report ID: GEM/GARPTS/08072021/GNCZDTW9VK5J

For

DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH

| Sl.No. | PACKAGE NO. | DETAILS OF PACKAGES |
|--------|-------------|---|
| 1 | PACKAGE 1 | 50 MW _{AC} SOLAR PV POWER PLANT AT VILLAGE GUJRAI, TEHSIL AKBARPUR, DISTRICT KANPUR DEHAT. |
| 2 | PACKAGE 2 | 75 MW _{AC} SOLAR PV POWER PLANT AT VILLAGE GURHAH, TEHSIL ORAI, DISTRICT JALAUN DISTRICT. |

No. RECPDCL/Solar/e-Tender/2020-21/836 Dated: 28.07.2021

REC Power Distribution Company Limited (RECPDCL)

(A wholly owned subsidiary of REC Ltd., a 'Navaratna CPSE' Under Ministry of Power, Govt. of India)

CIN No. of RECPDCL: U40101DL2007GOI165779

Corporate office

REC Power Distribution Company Limited,
Plot Number 1-4, REC World Headquarters, D-Block
Sector-29, Gurugram – 122001, Haryana
Website: www.recpdcl.in

Description of task, e-tender submission format and procedure is provided in the NIT document available on RECPDCL website (www.recpdcl.in), REC website (www.recindia.nic.in), e-tendering website (www.tenderwizard.com/REC), Central Public Procurement Portal www.eprocure.gov.in

| Important Dates | |
|--|---------------------------|
| Date of Release of NIT / Tender | 28.07.2021 |
| Last date for queries/ seeking clarification | 06.08.2021 at 18:00 Hours |
| Pre Bid Meeting | 06.08.2021 at 11:00 Hours |
| Last date of submission of Bid | 12.08.2021 at 15:00 Hours |
| Date of Opening of Bids | 12.08.2021 at 17:00 Hours |
| Timeline for Site Visit | 02.08.2021 to 04.08.2021 |

Note: Online registration has to be done at e-tendering website i.e. www.tenderwizard.com/REC in general; activation of registration may take about maximum 24 hours subject to the submission of all requisite documents required in the process.

-Sd-
(Valli Natarajan)
Addl. C.E.O.

[This document is meant for the purpose of engaging of Agencies against this tender and should not be transferred, reproduced or otherwise used for purposes other than specified/issued]

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SECTION-I

NOTICE INVITING TENDER (NIT)

REC POWER DISTRIBUTION COMPANY LIMITED

(A Wholly owned subsidiary of REC Limited, a “Navratna CPSE”
under Ministry of Power, Govt. of India)

NOTICE INVITING TENDER

BID DOCUMENT NO: RECPDCL/SOLAR/e-TENDER/2021-22/836, Dated: 28:07:2021

SUBJECT: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

| Sl.No. | PACKAGE NO. | DETAILS OF PACKAGES |
|--------|-------------|---|
| 1 | PACKAGE 1 | 50 MW _{AC} SOLAR PV POWER PLANT AT VILLAGE GUJRAI, TEHSIL AKBARPUR, DISTRICT KANPUR DEHAT. |
| 2 | PACKAGE 2 | 75 MW _{AC} SOLAR PV POWER PLANT AT VILLAGE GURHAH, TEHSIL ORAI, DISTRICT JALAUN DISTRICT. |

1.1 RECPDCL, invites online bids from eligible Bidders on Single Stage Two Envelope (i.e. Envelope-I: Techno-Commercial Bid and Envelope-II: Price Bid) with reverse auction for “Design, Engineering, Supply, Erection, Testing, Commissioning and Operation & Maintenance for three years under two packages having cumulative capacity of 125 MW_{AC} solar PV power project at two locations in Uttar Pradesh”.

1.2 Accordingly, RECPDCL invites online e-tender from the EPC vendors in accordance of the terms & conditions stipulated in this Bid Document.

1.3 BRIEF DETAILS/KEY DATES

| Sl. No. | Description of Item | Particulars |
|---------|---------------------|--|
| 1. | Brief Scope of Work | Design, engineering, supply, erection, testing, commissioning and operation & maintenance for three years under two packages having cumulative capacity of 125 MW _{AC} solar PV power project at two locations in Uttar Pradesh |
| 2. | Sale of Power & PPA | RECPDCL intends to enter into Power Purchase Agreement with DISCOMS (UPPCL) in response to “Request for Selection (RfS) Issued Vide RfS No. 01/UPNEDA/Solar Park/RfS/2021 dated 29.01.2021” |

| Sl. No. | Description of Item | Particulars |
|---------|--|---|
| 3. | (a) Duration of Engineering, Procurement and Construction (EPC). (b) Duration of Operation & Maintenance. | (a) 10 months from the date on which letter issued to the contractor for handing over of land by RECPDCL which shall be based on handing over of the land by SPIA/LSPDCL (Lucknow Solar Power Development Corporation Limited) on as is where is basis. (b) 03(three) years from the date of completion of operational acceptance. |
| 4. | Cost of bid document (non-refundable) | Nil |
| 5. | Bid Security/Earnest Money Deposit (EMD) | Declaration of bid security/Earnest Money Deposit requirement as per Attachment-3 |
| 6. | Bid Document available for downloading | From 28.07.2021 at 14:00 Hrs. to 12.08.2021 till 15.00 Hrs. |
| 7. | Website for downloading of Bid Document / uploading of filled in Bid Response Sheets(BRS) only in e-mode | www.recpdcl.in , www.tenderwizard.com/REC or www.eprocure.gov.in |
| 8. | Date & Time of Pre-Bid meeting | 06.08.2021 at 11.00 Hrs. |
| 9. | Venue of Pre-Bid Meeting | REC World Headquarters, D-Block, Plot No.1-4, Sector-29, Gurugram – 122001, Haryana |
| 10. | Last date and time of submission of bid | 12.08.2021 & Time: 15:00 Hrs |
| 11. | Date & time of opening of Techno-commercial Bid | Date 12.08.2021 & Time :17:00 Hrs |
| 12. | Date & time of opening of Price Bid | Will be notified to techno commercially qualified Bidders. |
| 13. | Last date of submission of documents in hard copy. | Date 12.08.2021 & Time :17:00 Hrs |

| Sl. No. | Description of Item | Particulars |
|---------|--|--|
| 14. | Date and Time Start for E –Reverse Auction (if Conducted) | Will be informed by RECPDCL to qualified Bidders |
| 15. | Address for submission of sealed hard copy of Techno-commercial bid & opening of Bids. | Additional CEO, REC World Headquarters, D-Block, Plot No.1-4, Sector-29, Gurugram-122001, Haryana |
| 16. | Currency of bid | Indian Rupees (INR) |
| 17. | Bidder's Eligibility Criteria | Bidders intending to participate in this bid shall fulfill the Eligibility Criteria as per Clause 1.4 of the NIT |
| 18. | Period of bid Validity | 180 days from the last date of submission of bids prescribed by RECPDCL and any extension thereof. |
| 19. | Address for submission of queries regarding NIT, if any | Additional CEO, REC World Headquarters, D-Block, Plot No.1-4, Sector-29, Gurugram-122001, Haryana |

1.4 BIDDER'S ELIGIBILITY CRITERIA

The EPC vendors who qualifies eligibility criteria as per Clause No 1.4.1 & 1.4.2 are eligible to participate in this NIT (hereinafter called "Bidders")

1.4.1 TECHNICAL CRITERIA:

| Eligibility criteria | Supporting Documents |
|--|---|
| <p>The Bidder should have experience of providing EPC services of Grid Connected Solar PV Power Plant:</p> <p>1. Single work order having cumulative capacity of minimum 100 MW_{AC} in which at least one plant should not be less than 60 MW_{AC}.</p> <p style="text-align: center;">OR</p> <p>2. Two work orders each having cumulative capacity of atleast 62.5 MW_{AC} in which at least one plant should not be less than 37.5 MW_{AC}.</p> <p style="text-align: center;">OR</p> | <p>1. Relevant Work Order duly sealed and signed by Bidder.</p> <p>2. Work commissioning Certificate duly sealed and signed by Bidder.</p> <p>3. CEI certificate/ any other relevant supporting document, which should clearly define commercial operational date of Solar Plant.</p> |

| | |
|---|--|
| <p>3. Three work orders each having cumulative capacity of at least 50 MW_{AC} in which at least one plant should not be less than 30 MW_{AC}.</p> <p>These plant(s) must have been in successful operation for at least six (6) months prior to the date of techno-commercial bid opening.</p> | |
|---|--|

1.4.2 FINANCIAL CRITERIA:

- i) The Bidder should have an Annual Average Turnover for the last three (03) Financial Years, ending on [31st March of the last Financial Year] as below:-

| ELIGIBILITY CRITERIA | SUPPORTING DOCUMENTS |
|--|--|
| Annual Average Turnover for the last three (03) Financial Years, ending on 31 st March of the last Financial Year should be at least 340 Crore. | 1. Audited Balance Sheet for F.Y. 2019-20, F.Y. 2018-19, F.Y. 2017-18. |

- ii) The Net Worth must be positive during last financial year ending 31st March. Further, out of the last three financial years, the Net Worth should be positive in minimum two years. Computation of Net Worth shall be based on unconsolidated audited annual accounts of the last financial years immediately preceding the application submission deadline.

- iii) Following evidence/proof is to be submitted by the applicant in support of fulfillment of **“Financial Criteria”**:

- Annual report, Audited financial statements.
- Net worth Certificate, in support to clause 1.4.2(i)/1.4.2 (ii) above.
- Besides Annual report/Audited financial statements, the Bidders are required to submit Statutory Auditor/CA Certificate in support of Net worth, turnover & working capital etc.

Such certificate(s) should contain Unique Document Identification Number (UDIN), duly generated by Statutory Auditor/ chartered accountant.

- iv) **Note for Clause No 1.4.2:**

- For Annual Turnover indicated in foreign currency, the exchange rate as on last date of the closing of the Financial Year, year wise will be considered. The rate of SBI Bill selling rate on closing basis will be considered for evaluation purpose of annual turn over, Net-Worth etc.
- The definition of Net-Worth shall be as below:
“net worth” means the aggregate value of the paid-up share capital and all

reserves created out of the profits, **securities premium account and debit or credit balance of profit and loss account**, after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off, as per the audited balance sheet, but does not include reserves created out of revaluation of assets, write-back of depreciation and amalgamation.

- c) For the purposes of meeting financial requirements, only unconsolidated audited annual accounts shall be used. However, audited consolidated annual accounts of the Bidder may be used for the purpose of financial requirements provided the Bidder has at least twenty six percent (26%) equity in each company whose accounts are merged in the audited consolidated accounts.
- d) In case the Bidder does not satisfy the annual turnover criteria, stipulated above on its own, its Holding Company would be required to meet the stipulated turnover requirements as above, provided that the Net Worth of such Holding Company as on the last day of the preceding financial year is at least equal to or more than the paid-up share capital of the Holding Company. In such an event, the Bidder would be required to furnish a Letter of Undertaking from the Holding Company along with its Bid as per the format enclosed at **Attachment-18**, supported by the Holding Company's Board Resolution, pledging unconditional and irrevocable financial support for the execution of the Contract by the Bidder in case of award.

1.4.3 Bidders who have been banned/ de-listed/ black listed/ debarred from business by any PSU/any Government Department/Ministry during last 03 (three) years shall be ineligible to bid. Self-declaration in this regard is to be submitted as per **Attachment-05** of Section-V: BRS & Annexures.

1.5 SCOPE OF WORK

The Scope of works of the contractor under the contract shall involve end to end delivery of the commissioned plant to RECPDCL, which will include (but not limited to) the development of land, design, engineering, procurement of equipment and material, testing at manufacturer's works, packing and forwarding, transportation, supply, receipt and unloading at site, storage, insurance at all stages, associated civil works, electrical works, services, permits, licenses, installation, erection, testing, commissioning, performance demonstration and operational acceptance of 75MW_{AC} & 50MW_{AC} Grid Interactive Solar PV Power Plant on turnkey basis along with Operation & Maintenance of 3 (three) years thereafter.

The scope of the contractor shall be deemed to include all equipment, materials and services which although are not specifically mentioned in the Bid Document and/or in contractor's proposal but are necessary for the satisfactory operation of the Solar PV system and its integration with evacuation system provided by State Electricity Authority(s)/ CTU.

Detailed scope of Supply and Services is mentioned in Part-B of Section-IV: Technical Specifications) of this Bid Document.

1.6 PROCEDURE/REQUIREMENTS FOR E-TENDERING

1.6.1 PRE REQUISITE OF E-TENDERING:

(i) **Bidder shall be a registered user of RECPDCL e-tendering portal i.e.**

(ii) <http://www.recpdcl.in>, <http://www.tenderwizard.com/REC>

(iii) **System Requirements:**

(a) An Internet connection with minimum 1 Mbps speed

(b) Operating System should be Windows XP Service Pack -3 / Vista / Windows 7 / Windows 8

(c) Supported Browsers : Internet explorer – 6.0 or Higher/ Mozilla Firefox 13.0 or Higher / Google Chrome

(d) System Access with Administrator Rights

(e) Digital Certificate: To participate in an e-Tender/NIT, you need to have a valid Digital Certificate (Signing + Encryption) from certifying authority of India as per the IT Act, 2000.

Detailed information for System Requirements along with screen-shots for procedure of system settings is also available at the portal. Bidder may download a document pertaining to “Minimum System Requirements” from the link given below:

(iv) <http://www.tenderwizard.com/REC>

1.6.2 DIGITAL SIGNATURE CERTIFICATE:

For participating in e tendering (i.e. for login, uploading & downloading the NIT document & submission of e-Bids), the Bidder must have a Digital Signature/Digital Security Certificate in the name of authorized representative of the Bidder. Digital signature can be obtained from any of the authorized agencies of CCA (Controller of Certifying Authorities). For this, a separate processing fee would be payable to the authorized agency of CCA.

1.6.3 REGISTRATION ON RECPDCL E-TENDERING PORTAL

(i) The Bidder intending to participate in the e-tendering has to register themselves in the portal <http://www.tenderwizard.com/REC> as mentioned above in clause.

(ii) If a Bidder is already registered and going to participate in the tender, the Bidder shall ensure that his registration in the system is valid till the completion of the entire tendering process.

(iii) **Relevant information to be required during the registration process are also available on the portal. Bidder may download the Bidder manual from the link given below:**

(iv) <http://www.tenderwizard.com/REC>

(v) All the Bidders are requested to get themselves registered well in advance and no extra time will be considered for the delay in on-line Bidder Registration, if any. In

case Bidders wait till the last moment for registration/uploading of Bids, and if any technical problem is encountered at that time and the closing time lapses, RECPDCL shall not be responsible in any manner for such delay/ or any other reason thereof.

(vi) **Registration Fee:** The fees for Vendor Registration is free

1.6.4 DOWNLOADING BID DOCUMENT

(i) The detailed Notice Inviting Tender (NIT) shall be available on RECPDCL website i.e. <https://www.recpdcl.in>. The Notice Inviting Tender (NIT) shall also be available on www.recindia.com and CPP portal i.e. <http://eprocure.gov.in>

(ii) In case of any amendment/addendum/corrigendum (s) to this NIT, the same shall be issued on <http://www.tenderwizard.com/REC>, www.recpdcl.in and <https://eprocure.gov.in>. No notice shall be issued in any other form.

(iii) Bidder needs to access e-Tender portal of RECPDCL (<https://www.tenderwizard.com/REC>) to access Bid document, after completing registration formality and successful login Bidder can download details tender document.

Download Document link is available at the end of every tender notice along with access to Corrigendum.

1.6.5 BID SUBMISSION

- Bidder needs to login first on the tendering portal www.tenderwizard.com/REC and follow the instruction as provided.

1.6.6 Bidders shall be required to arrange all resources, including digital signature and internet connections at their own cost, for participating in online tenders/ bids at the portal.

1.6.7 All the Bidders are requested to get themselves registered well in advance and no extra time will be considered for the delay in on-line Vendor/Bidder Registration, if any. In case Bidder waits till the last moment for uploading bids, and if any technical problem is encountered at that time and the bid closing time may elapses, RECPDCL shall not be responsible in any manner for such delay/ or any other reason thereof .

1.6.8 E-REVERSE AUCTION:-

RECPDCL may also opt for e-Reverse Auction subsequent to opening of Price Bids. The intimation of the same shall be given to eligible Bidders in advance. The procedure for e-Reverse Auction shall be as specified in **Annexure 9** of Section-V: Bid Response Sheets & Annexure (BRS) of this bid document.

1.6.9 ASSISTANCE/CLARIFICATION REGARDING E-TENDERING PROCESS

For any assistance/clarification for registration, downloading of document, submission of bids and any other information regarding e-Tendering, Bidders may contact to E – Tender wizard (Service Provider) having the following contact details:

E-Tender wizard

Help desk No - 011-49424365, twhelpdesk680@gmail.com

1.7 EARNEST MONEY DEPOSIT (EMD)

- 1.7.1** The Bidder shall furnish a Declaration of bid security/Earnest Money Deposit requirement as per **Attachment-3**.
- 1.7.2** Any bid not accompanied by requisite Declaration of bid security/Earnest Money Deposit as per **Attachment-3** shall be rejected by RECPDCL as being non-responsive.
- 1.7.3** Preference to MSME/SSI registered with MSME/National Small Industries Corporation (NSIC)/Designated Agency/Startups as recognized by DIPP will be governed by the regulation(s) of the Government of India issued from time to time. Bidders are required to submit a copy of MSME/NSIC Certificate/Certificate of recognition as start up from DIPP/relevant certificate along with their bids in accordance with the procedure stipulated in the Bid Documents in a separate envelope at the time of submission of bid as per provision of NIT. Non-submission of NSIC Certificate along with the bid may lead to denial of exemption/ preference sought / allowed.
- 1.8** All the Bidders shall enter into an Integrity Pact (to be executed on plain paper) with the Employer at the time of submission of bids. Successful Bidder shall submit duly executed Integrity Pact on Non-Judicial Stamp Paper of appropriate value prior to signing of contract agreement.
- 1.9** Bidders are required to submit their bids as per the date and time indicated under Clause No. 1.3.
- 1.10 SELECTION OF EPC CONTRACTOR FOR PROJECT**
- EPC Contractor who intends to participate in this e-tender and meets the eligibility criteria as mentioned at Clause No 1.4 of this Bid Document will have to submit their Techno-commercial Bid and Price Bid (“Offer”) in accordance with the procedures, terms and conditions as mentioned in this Bid Document. RECPDCL will declare the Bidder as the Successful Bidder, who meets the specified qualifying requirements, whose Bid has been determined to be substantially responsive to the Bid Document, and who has offered the **lowest Cost** in pursuance to the bidding conditions.
- 1.11** RECPDCL reserves the right to reject any or all bids or cancel/withdraw the Notice Inviting Tender (NIT) and annul the process at any time prior to the issuance of letter of Award to the Successful Bidder without assigning any reason whatsoever and shall bear no liability whatsoever consequent upon such a decision.
- 1.12** Bidders are requested to keep themselves updated with the websites www.tenderwizard.com/REC, www.recpdcl.in and eprocure.gov.in on regular basis for any addition / deletion / modification / clarification or notification in respect of this NIT. No separate notification or information will be issued in any other media.
- 1.13** The “Request for Selection (RfS) issued vide RfS No. **01/UPNEDA/Solar Park/RfS/2021 dated 29.01.2021** is attached as Section-VI.
- 1.14** For any enquiry/ clarification regarding detailed NIT for this assignment, the Bidder may contact at the following address for communication:

1. Shri Alok Singh
General Manager (Tech.)
Email: aloksingh@recpdcl.in

2. Sh. Swapn Piyoosh
Dy. Manager (Tech.)
Ph: 8527730111
Email: swapn.piyoosh@recpdcl.in

3. Sh. Deepanshu Singh Jadon
Executive (Tech)
Ph: 9649856574
Email: deepanshu.jadon@recpdcl.in

*******END OF SECTION*******

SECTION – II

INSTRUCTIONS TO BIDDERS (ITB)

Section –II: Instructions To Bidders

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Section –II: Instructions To Bidders

2.1 PROFILE OF RECPDCL

2.1.1 REC Power Distribution Company Limited (RECPDCL) an ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 certified company, a wholly owned subsidiary of REC Ltd, was incorporated on 12th July, 2007. It received certificate of commencement of business on 31st July, 2007. The company focus is on facilitating the power utilities in the areas of their operation specifically related to the Power Distribution sector, by providing expertise to capitalize on the emerging needs and demands of Power Sector.

2.1.2 RECPDCL is providing Consultancy and Fee based services to the Power Utilities in the areas of rural & urban electrification under the following heads:

- AT & C Loss reduction.
- Smart Grid Projects implementation covering Smart Metering & SCADA.
- Real Time Data Acquisition System (RT-DAS) for feeders.
- GIS Implementation
- IT implementation under IPDS including setting up of Data Centre, Customer Care Centre, etc.
- Development of Utility Scale Solar PV Plants
- DPR preparation & Project Management Consultancy for Power Distribution projects
- Power Distribution Strengthening works
- Energy Efficiency projects and Quality & Quantitative Surveillance/ Inspections of the works executed.

2.1.3 OBJECTIVE

RECPDCL intends to develop Solar PV Projects with a cumulative capacity of 125 MW_{AC} in the state of Uttar Pradesh. Location of Projects is as under:

| Sl.No. | Name | Capacity (MW _{AC}) | Coordinates of Solar Park | Distance from Solar Park to 132 kV Relevant S/S |
|--------|---|------------------------------|--------------------------------|---|
| 1 | Gujrai, Dist: Kanpur Dehat of Uttar Pradesh | 50 | 26°17'54.36"N 79°56'45.92"E | 12 KM |
| 2 | Gurhah, Dist: Jalaun of Uttar Pradesh | 75 | 25°51'0.94"N 79°32'45.11"E | 20 KM |

2.2 ELIGIBLE BIDDERS

The Bidding process is open to all EPC Vendors who meet the Eligibility Criteria as per clause 1.4 of Section-I: Notice Inviting Tender.

2.3 GENERAL INSTRUCTIONS

2.3.1 The Bidder shall be deemed to have carefully examined the terms and conditions, procedures, Specifications, Forms and Formats, Annexure/ schedules, Attachments etc. in

Section –II: Instructions To Bidders

this Bid Document 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, the proposed Solar Power System(s), site conditions and all relevant matters & details. The Bidders shall also be deemed to have carefully examined the terms & conditions, specification etc of the RfS Document issued vide **RfS No. 01/UPNEDA/Solar Park/RfS/2021 dated 29.01.2021** (including its subsequent amendments/clarifications) by UPNEDA (hereinafter as “RfS Document”) for this opportunity. All relevant terms and conditions of the RfS Document relating to the execution and operation of the project/plant shall be binding on the contractor whether or not explicitly mentioned in this Bid Document.

- 2.3.2** Though adequate care has been taken while preparing the Bid Document, the Bidder shall satisfy himself that the document is complete in all respects. It is Bidder’s responsibility to satisfy itself that the information/documents are adequate and that there is no conflict between various documents/stipulations. No dispute or claims will be entertained on this account. Bid preparation is the responsibility of the Bidder and no relief or consideration will be given for errors and omissions.
- 2.3.3** Bids shall be evaluated based on the information/ documents submitted in the Bid. Hence, Bidder should ensure that all information listed under this Bid Document to be submitted with the bid has been attached /enclosed in appropriate envelopes. Failure to furnish relevant information and documentary evidences as stipulated in the Bid Document or submission of a Bid that is not substantially responsive to the Bid Document in all respects shall be liable to be rejected.
- 2.3.4** Bidders may note that the successful Bidder selected by RECPDCL based on this NIT, shall set up Solar Power Project in compliance with the provisions of the RfS Document and Standard Power Purchase Agreement (PPA).
- 2.3.5** The specification provided with this Bid Document outlines the functional requirement. The Bidder must submit the Bid based upon their own design, meeting the functional requirements as specified in the specifications.
- 2.3.6** RECPDCL has issued this Bid Document to all the enlisted parties to submit their bids against this NIT.
- 2.3.7** Prospective Bidder acknowledges and agrees that response to the NIT is purely voluntary action on their part and for any expenditure on this account by them; RECPDCL will have no obligation or liability to the Bidders in the event of cancellation of NIT.
- 2.3.8** While the Employer has invited this NIT and has requested Bidders to submit their Bids, the Employer shall always be at the liberty to withdraw this NIT at any time before issue of LOA to the successful Bidder by RECPDCL.

2.4 COST OF BIDDING

The Bidder shall bear all costs associated with the preparation and submission of the bids. In no case, RECPDCL shall be responsible for these costs regardless of the conduct or outcome of the bidding process.

Section –II: Instructions To Bidders

2.5 THE BID DOCUMENT

2.5.1 Notice Inviting Tender (NIT)/Bid Document comprises of the documents listed below and addendum issued in accordance with Clause No 2.7:-

- **Section-I** : Notice Inviting Tender(NIT)
- **Section-II** : Instructions to Bidders (ITB)
- **Section-III** Conditions of Contract (CC)
- **Section-IV** : Technical Specifications (TS)
- **Section-V** : Bid Response Sheets (BRS) & Annexures (BRS & Annexure)
- **Section-VI** : RfS Document

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

2.6 BIDDERS' QUERIES/CLARIFICATIONS

2.6.1 Bidders may submit their queries/clarifications regarding the Bid Document, if any, in writing either by email or post and it must be received to RECPDCL one (01) days before the scheduled pre-bid meeting date.

2.6.2 RECPDCL shall not be obliged to respond to any request for clarification received later than the above period. Further, the mere request for clarification from the Bidders shall not be a ground for seeking extension in the deadline for submission of bids. Employer's response (including an explanation of the query but not identification of its source) will be uploaded on portal, where the Bidder can see clarification/reply to query/ amendment to the Bid Document, if any.

2.7 AMENDMENTS OF BID DOCUMENT

2.7.1 At any time prior to the deadline for submission of Bids, RECPDCL may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder(s), modify the Bid Document by issuing addendum/corrigendum and shall be available only on following websites:

- a) www.recpdcl.in
- b) www.tenderwizard.com/REC

No press note will be released in this regard

2.7.2 All such addendum/ corrigendum shall be integral part of Bid Document. The amendments to the Bid Document will be binding on the prospective Bidders and the notification of the amendment communicated through portal, shall be deemed to be construed that such amendment(s) to the Bid Document have been taken into account by the Bidder in its bid/proposal.

2.7.3 In order to allow prospective Bidders reasonable time in which to take the amendment into account in preparing their Bids, RECPDCL, at its discretion, may extend the deadline for the submission and opening of Bid.

2.8 BID SECURITY/EARNEST MONEY DEPOSIT (EMD)

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The Bidder shall furnish a Declaration of bid security/Earnest Money Deposit (EMD) requirement as per **Attachment-3**.

2.8.1 The Bidders are required to submit the declaration regarding Bid security/EMD requirement as per format specified at **Attachment-3** of Section-V : BRS & Annexures of the Bid Document .

2.8.2 Any bid not accompanied by declaration of Bid Security/Earnest Money Deposit requirement shall be rejected by RECPDCL as being non-responsive.

2.8.3 The employer will declare Bidder ineligible as per clause 2.32 in any of the following cases:

a) If the Bidder withdraws or modify its bid during the period of bid validity specified by the Bidder in the bid document;

b) If the Bidder is found involved in Fraudulent and Corrupt Practices.

c) To recover compensation for damages stipulated in Integrity Pact between RECPDCL and Bidder.

d) In the case of a successful Bidder, if the Bidder fails:

(i) To accept the Letter of Award within stipulated time as mentioned in Clause No 2.26.2.

OR

(ii) To sign the Contract Agreement

OR

(iii) To furnish the required CPSG within period stipulated under Clause No 3.48.1.

2.9 LANGUAGE OF BID

The bid prepared by the Bidder and all correspondence and documents related to the bid exchanged by the Bidder and the Employer shall be written in English language. Supporting documents and printed literature furnished by the Bidders with their bids may be in another language, provided they are accompanied with a certificate of the authorized translator certifying therein an accurate translation of the relevant passages in the above stated language, in which case, for the purposes of interpretation of the Bid, the translation shall prevail. Failure to comply with this may disqualify a bid.

2.10 BID CURRENCY

The Bidder shall quote all prices in Indian Rupees only. No other currency shall be acceptable.

2.11 PERIOD OF BID VALIDITY

2.11.1 Bids shall remain valid for a period of 180 days after the closing date prescribed by

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RECPDCL for the submission of bids. A bid valid for a shorter period shall be rejected by the Employer as being non-responsive.

- 2.11.2** In exceptional circumstances, prior to expiry of the original bid validity period, RECPDCL may request the Bidders to extend the period of bid validity for a specified additional period. The request and the responses thereto shall be made in writing or by e-mail/fax. A Bidder agreeing to the request will not be required or permitted to modify its bid. If Bidder refuse to extend the period of bid validity, the bid of such Bidder shall not be considered for further evaluation.

2.12 FORMAT AND SIGNING OF BID

- 2.12.1** The Bid submitted by the Bidder must be digitally signed by the person duly authorized to sign on behalf of the Bidder. Each page of the Bid should be numbered and properly signed. Contents and pages should be indicated in the index page. The name of the person signing the bid should also be typed or printed below the signature.
- 2.12.2** Bid must be signed with the legal name of the Corporation /Company by the person authorized to sign the bid on behalf of such Corporation / Company in the matter.
- 2.12.3** Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished on non-judicial stamp paper of an appropriate value with the hard copy of bid in the form of a Power of Attorney, duly notarized by a Notary Public along with copy of Board Resolution (in original or notary attested copy), indicating that the person signing the bid has the authority to sign the bid and that the bid is binding upon the Bidder during the full period of its validity.
- 2.12.4** Each Bid shall contain no overwriting, alterations, omissions, or additions, unless such corrections are initiated by the person or persons signing the Bid. Corrections if any shall only be made by scoring out the cancelled portion, writing the correction, initiating and dating it by the person or persons signing the Bid.
- 2.12.5** The Bidder shall provide all the information sought under this NIT. RECPDCL will evaluate only those Bids that are received in the required formats and complete in all respects.
- 2.12.6** The Bid must be typed or written in indelible ink and signed and sealed at each page by the Bidder with his usual signature before submission.
- 2.12.7** The Bidder's name stated on the proposal shall be the legal exact name of the firm.
- 2.12.8** Bids not conforming to the above requirement of signing even after the clarifications sought in this regard by the Employer, shall be disqualified.

2.13 DEVIATIONS

The Bidders are required to submit a “**No Deviation Certificate**” as per the **Attachment No-6 of Section V: Bid Response Sheets (BRS)** and Annexures to this bid document. The Bidder also undertakes that in the event the Project is awarded to it, during execution of the Project, it shall not seek to alter any agreed contractual terms, conditions and specifications.

2.14 DOCUMENTS COMPRISING THE BID

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2.14.1 The Bid submitted by the Bidder shall comprise the following documents:

- (i) Bid Form duly completed and signed by the Bidder, together with all Attachments identified in Clause No 2.14.2 below.
- (ii) Price Bid to be submitted online in the given format by the Bidder.

2.14.2 Bidder shall submit with its bid the following attachments:

i) Attachment-1: Power of Attorney

A power of attorney, as per Clause No 2.12.3, indicating that the person(s) signing the Bid has the authority to sign the Bid and that the Bid is binding upon the Bidder during the full period of its validity in accordance with Clause No 2.11.

ii) Attachment-2: Submission of GST Details

Bidders have to submit the GST details of their company at Attachment- 2 of Section-V :BRS & Annexure of this Bid Document.

iii) Attachment-3: Declaration regarding Bid Security/Earnest Money Deposit requirement

Bidder shall submit the declaration regarding Bid security/EMD requirement as per format specified at **Attachment-3** of Section-V :BRS & Annexure of this Bid Document.

iv) Attachment-4:Pre- Contract Integrity Pact

Integrity Pact duly signed between Employer and the Bidder in accordance with Clause No 2.30.

v) Attachment-5: Declaration regarding Blacklisting

vi) Attachment-6 :No Deviation Certificate

The Bidders shall submit a “*No Deviation Certificate*” to the updated bidding document in accordance with Clause No 2.13 of this Bid Document.

vii) Attachment-7: Electronic Fund Transfer (EFT) details of the Bidder, If any

viii) Attachment-8: Financial data of the Bidder

Bidder shall submit the financial data as Attachment-8 of this Bid Document along with scanned copy of all the supporting documents (Annual reports, Annual Financial statements, Net worth certificate etc.) to demonstrate fulfillment of the financial criteria as per Clause No. 1.4.3 of this Bid Document.

ix) Attachment-9: Estimated Bill of Quantities

x) Attachment-10: Net Annual Guaranteed Generation for the proposed Solar PV Power Plant

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Bidder shall quote the Net Annual Guaranteed Generation for three years to be determined as per Appendix-A to Attachment-10 along with the documentary proof for arriving at the Declared Net Annual Guaranteed Generation (NAGG) such as Energy Estimation Report using the latest software such as PV Syst, Meteonorm.

xi) Attachment -11: Time Schedule

Bidder shall submit the detailed activity wise Time schedule (L1 Schedule) in the form of PERT Chart covering all aspects like ordering, site preparation, Supply, erection, installation, testing & commissioning, etc. along with the bid.

xii) Attachment-12: List of Vendors/sub-contractors proposed to be engaged.

xiii) Attachment-13: Mandatory Information to be submitted by the Bidder.

xiv) Attachment-14 : Undertaking regarding offline submission.

xv) Attachment 15: Format for Month Wise Target Generation for the proposed Solar PV Power Plant

xvi) Attachment -16 : Undertaking regarding restrictions imposed by the Government of India.

xvii) Attachment -18 : Declaration by Holding Company pursuant to clause 1.4.2 (i)

xviii) Attachment-19: Schedule of Tools & Tackles for Erection, Testing, Commissioning and O&M.

2.14.3 The bid should be serially numbered and properly indexed mentioning all constituents of bid including any enclosures/attachments etc. and their location page numbers in the bid. Failure to submit the bid in systematic manner as above may result oversight of any important information provided by the Bidder for which RECPDCL shall not be responsible.

2.14.4 BID PRICES

- i)** This is a Turnkey EPC and O&M Contract. Unless otherwise specified in the Bid document, Bidders shall quote for the entire scope of work on a "single responsibility" basis such that the total bid price covers all the Contractor's obligations mentioned in or to be reasonably inferred from the Bid Document. The Bidder shall quote the price on FIRM price basis as per **Price Bid Response Sheet No I to V** of Section-V: Bid Response Sheets and Annexures. No price variation shall be applicable except in cases of variations in statutory taxes, duties, levies etc.
- ii)** It is for the Contractor to assess and ascertain applicability of taxes, duties, levies etc., applicable under the Contract. It is clearly understood that except for the specific

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provision covered in these conditions, RECPDCL will also not have any liability, whatsoever, on account of taxes, duties, levies etc

iii) The contractor while bidding (if any) must consider cost for Scheduling and Forecasting & Deviation Charges for the solar plant. Contractor shall be liable to pay any penalty (including Deviation Charges payable to State DSM Pool) levied on RECPDCL on account of any deficiency in obligation w.r.t. Scheduling & Forecasting schedule by the designated Agency (if any).

iv) Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Bid Response Sheet (PBRs) in Section-V: BRS & Annexures of this Bid Document as below:

a) **PBRs No-I: Summary of Prices**

b) **PBRs No II: Schedule of Price for Supply of Plant and Equipment at site complete in all respect.**

The price of Plant and Equipment complete in all respect, Type Tests and Specified Spares (PBRs No-II) shall be inclusive of all costs as well as duties and taxes paid or payable on components and raw materials incorporated or to be incorporated in the facilities.

However, the applicable GST in respect of direct transactions between the Employer and the Bidder shall not be included in the Price.

c) **PBRs No III: Schedule of Price for Erection, Testing, Commissioning of Plant & Equipment, Performance Demonstration and Operational Acceptance including, Unloading, Handling at Site, Insurance Covers, Storage of the Plant & Equipment supplied under First Contract and all Civil, Architectural & Structural Works complete in all respect.**

The Basic price of erection, testing, Commissioning of Plant & Equipment, Performance Demonstration and Operational Acceptance including, Unloading, Handling at Site, Insurance Covers, Storage of the Plant & Equipment including prices for all labour, contractor's equipment, temporary works, consumables and all matters and things of whatsoever nature etc. identified in the Bid Document, as necessary for the proper execution of the Installation Services shall be quoted separately in PBRs No-III, inclusive of duties, levies and charges payable. However, the applicable GST in respect of direct transactions between the Employer and the Bidder shall not be included in the Price.

d) **PBRs No IV: Schedule of Price for Operation & Maintenance of the Solar PV Power Project for 3 years from the date of Operational Acceptance including O&M spares and consumables.**

Operation & Maintenance charges including all taxes and duties shall be quoted by the Bidder in PBRs No. IV. The Prices in this schedule shall be quoted inclusive of all applicable duties, fees, Octroi, royalty, levies etc. However, the applicable GST in respect of direct transactions between the Employer and the Bidder shall not be included in the Price.

e) **PBRs No V: Schedule of applicable existing GST Rate on the equipment supplied under the First Contract, Second and third contract (as on the date seven (7) days**

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prior to deadline for date of submission of Bids).

2.15 SUBMISSION OF BID

2.15.1 The Bid shall be submitted online in two parts as stated hereunder in this Clause. Submission of the online bid by any other means shall not be accepted by the Employer in any circumstances.

2.15.2 Authorized signatory holding Power of Attorney with his digital signature on behalf the Bidder shall upload Bid Response Sheets and requisite documents along with copies of certificates/supporting documents on the website www.tenderwizard.com/REC before the last date & time set for submission of bids in the following two envelopes.

Envelope - I: Techno-commercial Bid

Envelope- II: Price Bid

2.15.3 ENVELOPE – I: TECHNO-COMMERCIAL BID

Techno- commercial Bid shall contain the following:

- (a) Bid Form duly completed and signed by the Bidder
- (b) Attachments No. 1 to 19 as mentioned in Clause No 2.14.2 together with all supporting documents, which the Bidder wishes to submit as part of his Techno-commercial Bid.
- (c) Scanned copies of Technical Particulars in accordance with the **Section-IV**: Technical specifications (TS).

Techno-Commercial Bid should not contain any price content entry. In case, the Techno-Commercial Bid is found to contain any price content, such bid shall be out rightly rejected.

2.15.4 ENVELOPE-II: PRICE BID

Price Bid shall contain the **Price Bid Response Sheet (PBRs) No-I to V** as mentioned in Clause No 2.14.3. The Price Bid shall be duly filled in electronic form in conformity with the Bid Document on the RECPDCL e-tender portal only. No material relating to any technical matters shall be included in the Price Bid.

2.15.5 SUBMISSION OF DOCUMENTS IN PHYSICAL FORM:

The following documents shall also be submitted in physical form on or before the Last date and time for submission of Bids through post/courier or by hand on the address mentioned in Bid Document. The sealed envelope shall be super-scribed “Documents to be submitted in Physical form against **NIT Ref No. RECPDCL/SOLAR/e-TENDER/2021-22/836**”

- i. DD towards cost of bidding document / NEFT/RTGS – transaction slip
- ii. Declaration regarding Bid Security/Earnest Money Deposit requirement as per **Attachment -3**.
- iii. Original Duly signed and stamped Integrity Pact (As per **Attachment -4** of Section V:BRS & Annexures)

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- iv. Power of attorney duly notarized by a Notary Public along with copy of Board Resolution (in original or Notary attested copy) for the authorized signatory.

OR

alternatively, considering the lockdown/other statutory limitations in postal/courier services, Bidders can submit the scanned copies as per clause 2.15.3 and hard copies of the following documents will be requisitioned at a later stage when situation improves. In this case, Bidders have to submit an undertaking as per **Attachment no. 14** as mentioned in clause 2.14.2 above.

2.16 SUBMISSION OF COPIES OF CERTIFICATES/ DOCUMENTARY PROOF

Bidders are required to submit/upload copies of all supporting certificates/ documentary evidences as well as the other requisite documents required as per bid document. Non-submission of copies of requisite certificates/documents may render the bid non-responsive, and shall be liable for rejection.

2.17 DEADLINE FOR SUBMISSION OF BIDS

- 2.17.1** The complete Bids must be uploaded on the RECPDCL e-tendering portal and the complete set of documents to be submitted in physical form must be received by RECPDCL at the address specified in the bid document not later than the time and date stated in the NIT. In the event of the specified date for submission of bids being declared a holiday for RECPDCL, the bids will be received up to the appointed time on the next working day. However, the date and time for online submission of the Bids shall continue to be the date and time specified or amendment notified in this regard.

- 2.17.2** RECPDCL may, at its discretion, extend this deadline for submission of bids by amending the Bid Document, in which case, all rights and obligations of RECPDCL and Bidders will thereafter be subject to the deadline as extended.

2.18 LATE BIDS

Online submission of the Bid will not be permitted on the portal after expiry of submission time and the Bidder shall not be permitted to submit the same by any other mode. Similarly, hard copies of the Off-line documents, if received by the Employer after the deadline for submission of Bids prescribed in NIT, then it will be considered as 'Late Bid' notwithstanding the fact that the Bidder has uploaded the Bid online within the stipulated deadline. In such a case, the uploaded online Bid on the portal shall be considered as non-responsive and shall not be processed further. Employer shall not bear the responsibility of delay in submission of Bid due to Courier/postal delays.

2.19 MODIFICATION AND WITHDRAWAL OF BIDS

- 2.19.1** In case any clarifications are sought by the Employer after opening of Techno-commercial Bids, then the replies of the Bidder should be restricted to the clarifications sought. Any Bidder who modifies its Bid (including a modification which has the effect of altering the value of its Price Bid) after opening of Bid without specific reference by the Employer, shall render the Bid liable to be rejected and Bidder shall be treated as ineligible as provisions specified in clause 2.32.

- 2.19.2** No Bid may be withdrawn in the interval between the bid due date and the expiration of the validity period of the Bid. Withdrawal or unsolicited modification of a Bid during this

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interval shall result in the Bidder's ineligibility to participate in RECPDCL NIT as per provisions specified in clause 2.32.

2.20 BID OPENING

- 2.20.1** The Employer shall open, examine and evaluate the Bids in accordance with the provisions set out in this bid document. In case of the unscheduled holiday being declared on the prescribed opening day of the Bid, the next working day shall be treated as the scheduled day of opening of the Bid.
- 2.20.2** The Techno-commercial and price bids will be opened at the time and date set for opening for bids in the presence of representatives who may wish to be present.
- 2.20.3** The price bid of techno-commercially qualified Bidders shall be opened in the presence of representative of such Bidders who wish to be present at a subsequent date and time for which the separate intimation will be sent to the techno commercially qualified Bidder.
- 2.20.4** Bidder's representatives shall sign a register only as proof of their attendance.
- 2.20.5** Bidder's names, bid prices, the presence or absence of bid security/EMD declaration and other such details as the Employer, at its discretion, may consider appropriate, will be announced at the opening of Bids.
- 2.20.6** Bids not covering the entire scope shall be treated as incomplete and hence may be rejected.
- 2.20.7** The Employer further, reserves the right to reject any bid, which is not submitted according to the instructions stipulated above.

2.21 CLARIFICATION ON BIDS

- 2.21.1** During the evaluation of the Bids, RECPDCL may at its discretion seek clarification(s)/ confirmation(s) from the Bidders on their bids. The request for such clarification(s)/ confirmation(s) shall be in writing and no change in the price or substance of the bid shall be sought, offered or permitted. The Bidder will be required to submit their clarification within the time as specified by the Employer in the request for clarification letter. If the clarification(s)/ confirmation(s) sought from the Bidder are not received in stipulated period, then evaluation will be done based on available data in their bids and non-submission of requisite supporting document/data by the Bidder may lead to non-responsive/rejection/disqualification of bids. No clarification at the initiative of the Bidder after submission of bids shall be entertained.
- 2.21.2** Submission of such clarification(s)/confirmation(s)/historical information shall not be considered as material deviations. However, these information can only be submitted by the Bidder, if RECPDCL requests for such information.

2.22 EVALUATION OF BIDS

2.22.1 EVALUATION OF TECHNO-COMMERCIAL BIDS

- i) Evaluation of the Techno-Commercial Bids shall be carried out first. This will be done on the basis of documents furnished by the Bidder, completeness & conformity of the bids with respect to requirements of the Bid Document.

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- ii) Prior to the detailed evaluation, the Employer will determine the substantial responsiveness of each Bid to the Bid Document.

A bid shall be considered substantially responsive only if:

- a. It is received by the bid due date and time having bid validity as specified in the bid document including any extension thereof;
- b. It is accompanied by declaration regarding Bid security/EMD as specified in Bid Document
- c. It is accompanied by the power of attorney in the name of authorized signatory.
- d. It has “No Deviation Certificate” required as per the Format provided at Attachment-6 of Section V: Bid Response Sheets & Annexures.
- e. It is accompanied by Integrity Pact.
- f. It is accompanied by Undertaking for Black listing.

- iii) The Employer reserves the right to reject any bid, which is not substantially responsive and may not subsequently be made responsive by the Bidder by correction of the nonconformity. The Employer will evaluate and compare Bids, which have been determined to be substantially responsive.

- iv) RECPDCL will carry out evaluation of the Techno-Commercial bids previously determined to be substantially responsive in order to determine whether the bids are in accordance with the requirements set forth in the Bid Document. In order to reach such a determination, RECPDCL will examine the bids on the basis of the information supplied by the Bidders, taking into account the overall completeness and compliance with the Technical Specifications and other terms and conditions of the Bid Document in the formats as specified in Section V: Bid Response Sheets (BRS) and Annexures. The bid that does not meet minimum acceptable standards of completeness will be rejected.

- v) The bids of those Bidders who have declared Net Annual Guaranteed Generation (NAGG) less than that provided at **Appendix-A to Attachment -10** of this Bid Document “*Minimum Net Annual Guaranteed Generation*” to be achieved every year by the contractor” will be summarily rejected.

2.22.2 EVALUATION OF PRICE BIDS:

- i. Price bids of only techno-commercially responsive Bidders shall be opened.

ii. Evaluation Criteria for 125 MW_{AC} (50 MW_{AC} & 75 MW_{AC}) capacity Solar PV Power Project shall be based on Cost as per the following formula:

Price evaluation of the bids shall be carried out by calculating overall **Cost** with following considerations:

Evaluated Bid Value (EBV) = X

Where,

X=X1 +X2

X1= Quoted EPC Price by Bidder (as per Price Bid Response Sheet No. P-I.) in INR

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X2= NPV of Quoted O&M charges for 03 years (as per Price Bid Response Sheet No. P-IV) considering discount factor @ 10 % in. INR.

- iii. The prices quoted by the Bidder in the **Price Bid Response Sheet I to V**: Format for Price Bid of Section V: Bid Response Sheets and Annexures shall be considered for evaluation.
- iv. To determine the successful Bidder, e-RA will be carried out as per terms and conditions mentioned at Annexure-9.
- v. Sample sheet for calculating EBV is enclosed at **Annexure -8** of this Bid Document.

2.23 CORRECTION OF ERRORS

2.23.1 The errors /discrepancies in respect of the specified amount in Bid Response Sheets for an individual item and/or sub-item and/or in the sub-total of a Bid Response Sheet and/or in the Grand total of a Bid Response Sheet and/or in the lump sum price of the package either due to discrepancy between figures and words and/or simple arithmetical error while adding and/or multiplying and /or due to wrong extension of unit rates etc. the error will be rectified and computed by RECPDCL as per the following method:

- i) In case of discrepancy between figures and words, the value specified in the words will be considered for computation.
- ii) Firstly the unit rates / percentage rate in words will be considered for computation.
- iii) In case unit rates / percentage rates are not indicated in words then unit rates indicated in figure will be considered and will be used for deriving the amount from the quantities specified in the Bid Document.
- iv) In case error is due to variation of quantities, the quantities as specified in the Bid Document will be considered and multiplied by the quoted unit rates to obtain the amount.
- v) The items for which Bidder does not quote his price i.e. indicated as 'NIL', leaves the rate / amount columns blank, puts a (-) mark or indicates 'NA' etc. in the rate / amount column; cost shall be considered as “Inclusive” for bid evaluation for such items.

2.23.2 After computation of the amounts as above, the values as computed shall be considered for evaluation. If the Bidder does not accept the above consideration, his bid will be rejected and further action shall be initiated as per clause 2.32.

2.24 INFLUENCING THE EMPLOYER/ CONSULTANT

2.24.1 No Bidder shall contact the Employer/Consultant (if appointed by the Employer) on any matter relating to its bid, from the time of the opening of bids to the time the contract is awarded.

2.24.2 Any effort by a Bidder to influence the Employer/Consultant in the Employer's bid evaluation, bid comparison or contract award decisions may result in rejection of the Bidder's bid.

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2.25 EMPLOYER'S RIGHT TO ACCEPT / REJECT ANY BID

The Employer reserves the right to accept or reject any bid, and to annul the bid process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

2.26 AWARD OF CONTRACT

2.26.1 The Successful Bidder shall not be entitled to seek any deviation from the Bid Document, and its Clarifications/ Amendments by the Employer (if any).

2.26.2 LETTER OF AWARD (LOA)

RECPDCL will issue Letter of Award (LOA) to the Bidder whose bid has been determined to be substantially responsive and having the lowest cost after evaluation of the bid as per the methodology mentioned at Clause No 2.22. The successful Bidder shall be required to confirm its unequivocal acceptance within seven (07) days from the date of issue of Letter of Award. The Letter of Award (LOA) will constitute the formation of the contract and will be considered for all purposes of execution of contract provisions till such time the signing of the Contract Agreement.

2.26.3 RECPDCL may place three (03) separate Letter of Awards on the successful Bidder for implementation of the Solar power project as mentioned below:

1. **“FIRST CONTRACT”** i.e. “Supply of all Plant and Equipment at site complete in all respects” for 125 MW_{AC} (Cumulative Capacity) Solar PV Power Project.
2. **“SECOND CONTRACT”** i.e. “Erection, Testing, Commissioning of Plant & Equipment, Performance Demonstration and Operational Acceptance including, Unloading, Handling at Site, Insurance Covers, Storage of the Plant & Equipment supplied under First Contract and all Civil, Architectural & Structural Works complete in all respect”. This Contract shall also cover all activities other than those in the scope of the “First Contract”, including but not limited to Design, Engineering and Procurement Services.
3. **“THIRD CONTRACT”** i.e. “ Operation & Maintenance of the Solar PV Power Project for 03 years from the date of Operational Acceptance including O&M Spares and Consumables”. The O&M contract shall be effective from the date of Operational Acceptance as per scope provided in the Technical Specifications under Bid Document.

2.26.4 Notwithstanding anything stated above, RECPDCL reserves the right to assess the Bidder's capability and capacity to perform the contract satisfactorily, should the circumstances warrant such assessment in the overall interest of RECPDCL.

2.27 SIGNING OF THE CONTRACT AGREEMENT

2.27.1 The Contract Agreement(s) will be signed in two (2) originals on non-judicial stamp paper of

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appropriate value within 21 (twenty-one) days of issue of Letter of Awards and the Contractor shall be provided with one signed copy of original Agreement and the other will be retained by the Employer. Two separate contract signed against projects i.e Project A & Project B Contracts.

2.27.2 Subsequent to signing of the Contract(s), the Contractor at his own cost shall provide the Employer with at least ten (10) copies of Agreements (Hard Bound) within thirty (30) days after signing of the Contracts along with its soft copy.

2.28 CORRUPT OR FRAUDULENT PRACTICES

2.28.1 The Employer requires the Bidders to observe the highest standard of ethics during the procurement and execution of the Contract. In pursuance of this policy, the Employer defines, for the purposes of this provision, the terms set forth below as follows:

- (i) **"Corrupt practice"** means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution; and
- (ii) **"Fraudulent practice"** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the owner, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the owner of the benefits of free and open competition;
- (iii) **"Collusive practice"** means a scheme or arrangement between two or more Bidders, with or without the knowledge of the Owner, designed to establish bid prices at artificial, non-competitive levels.
- (iv) **"Coercive Practice"** means harming or threatening to harm, directly or indirectly, persons or thereto influence their participation in the procurement process or affect the execution of a contract.

2.28.2 The Employer will reject a proposal for award if it determines that the Bidder recommended for award has engaged in Corrupt or Fraudulent or Collusive or Coercive practices in competing for the contract in question.

2.28.3 The Employer will declare a Bidder ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in Corrupt or Fraudulent or Collusive or Coercive practices in competing for, or in executing, a contract of the Employer.

2.29 IMMUNITY TO GOVERNMENT OF INDIA .

2.29.1 It is expressly understood and agreed to by and between the Bidder and RECPDCL that RECPDCL is entering into this contract solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this contract and has no liabilities, obligations or rights hereunder.

2.29.2 It is expressly understood and agreed that RECPDCL is an independent legal entity with power and authority to enter into contracts solely in its own behalf under the applicable laws

Section –II: Instructions To Bidders

of India and general principles of contract law. The Bidder expressly agrees, acknowledges and understands that RECPDCL is not an agent, representative or delegate of the Govt. of India. It is further understood and agreed that the Govt. of India is not and shall not be liable for any acts, omissions and commissions, breaches or other wrong arising out of the contract. Accordingly, the Bidder hereby expressly waives, release and forgoes any and all actions or claims including cross, impleader, claims or counter claims against the Govt. of India arising out of this contract and covenants not to sue the Govt. of India as to any manner, claim cause of action or thing what so ever arising of or under this Agreement.

2.30 ADOPTION OF INTEGRITY PACT

- 2.30.1** In order to ensure transparency, equality and competitiveness in its procurement, RECPDCL has decided to adopt Integrity Pact. The Integrity Pact (IP) envisages an agreement (As per Proforma annexed at **Attachment-4**) between the prospective Bidders/ contractors and the Employer committing the person(s)/ official(s) of both the parties, not to exercise any corrupt influence on any aspect of the contract. Towards implementation on Integrity Pact, an MoU along with Integrity Pact Programme has already been signed between ‘RECPDCL’ And ‘Transparency International India’.
- 2.30.2** All Applicants shall enter into an Integrity Pact (to be executed on plain paper) with the Employer at the time of submission of their Bids. Only those Bidders who have entered into Integrity Pact with the Employer shall be eligible to participate in the bidding process. Entering into Integrity Pact as per Performa provided in the Section Forms & Procedure is a basic qualifying requirement.
- 2.30.3** The Integrity Pact digitally signed on behalf of the Employer is provided as Attachment-4 in Section-V: BRS & Annexures. The Integrity Pact shall be downloaded, printed and signed by the Applicant and the hard copy shall be submitted.
- 2.30.4** Successful Bidder shall submit duly executed Integrity pact on Non-Judicial Stamp paper of appropriate value prior to signing of Contract Agreement.
- 2.30.5** For this package, RECPDCL may appoint Owners Engineer for monitoring and quality control of the project.
- 2.30.6** The Owners Engineer will monitor the NIT process and the execution of the contract for compliance with the principles mentioned in the Integrity Pact enclosed with this bid document.
- 2.30.7** In order to deal with any grievance (s)/ dispute (s) and to oversee implementation and effectiveness of the Integrity Pact programme pertaining to this Notice Inviting Tender, Bidder(s) may refer the same to Owners Engineer.
- 2.30.8** All pages of the Integrity Pact duly signed by authorized representatives of the Bidder and duly witnessed shall be submitted along with their Bid in accordance with NIT. Failure to submit the original signed copy of the Integrity Pact by the Bidder shall lead to outright rejection of the Bid.

2.31 RESTRICTIONS IMPOSED BY GOVT OF INDIA

Section –II: Instructions To Bidders

Any Bidder from a country which shares a land border with India will be eligible to bid in this NIT only if the Bidder is registered with the Competent Authority specified in Annexure-I of Ministry of Finance, Government of India order no F. No. 6/18/2019-PPD dated 23.07.2020 and various amendment/clarification issued in this regard. The Bidders for the purpose of compliance and its procedure for registration from Competent Authority etc. as mentioned in above order are attached as **Annexure-10 of Section –V**. The Bidder has to submit the undertaking as per **Attachment -16** regarding compliance of above mentioned order. In case the undertaking given by the Bidder whose NIT has been accepted by the Employer is found false at the later stage, this would be a ground for immediate termination and further legal action shall be taken in accordance with law.

2.32 INELIGIBILITY FOR PARTICIPATION IN RE-TENDER

- 2.32.1** If a Bidder after opening of tenders where EMD is NIL/not applicable or exempted for such Bidders as per policy guidelines of Government of India, withdraws or modifies its offer within the validity period of the offer, then such Bidder shall be treated as ineligible for future tenders issued by RECPDCL for the period of 01 year from the date of default as notified by RECPDCL.
- 2.32.2** If a Bidder after having been issued the Letter of Award of the package where EMD is NIL/Not applicable or exempted for Bidder as per policy guidelines of Govt. of India, either does not accept the Letter of Award within stipulated time or does not sign the Contract Agreement or does not submit an acceptable Contract Performance Security as stipulated in CC clause 3.48, then such Bidder shall be treated ineligible for participation in re-tendering of this particular tender.

*******END OF SECTION*******

SECTION – III

CONDITIONS OF CONTRACT

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3.1 DEFINITIONS

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

- 3.1.1 **“Authorized Representative”** shall mean any authorized personnel of the Employer or the contractor to perform the duties and obligations of the Contract as the context may require.
- 3.1.2 **“Applicable Law”** shall mean 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.
- 3.1.3 **“Bid”** shall mean the Techno Commercial bid and the Price bid submitted by the Bidder along with all documents/credentials/attachments annexure etc., in response to this NIT, in accordance with the terms and conditions hereof.
- 3.1.4 **“Bought out items”** shall mean the items purchased by the Contractor for the purpose of supply as covered under Contract Agreement.
- 3.1.5 **“Commercial Operation Date (COD)”** shall mean the date as defined in the relevant clause (s) in the RfS Document.
- 3.1.6 **“Contract/ Contract Agreement/ Agreement”** shall mean the Agreement entered into between the Employer and the Contractor signed by the parties including all attachments and appendices thereto and all documents incorporated by reference therein.
- 3.1.7 **“Contract Document”** shall mean collectively the documents listed in Clause 3.3 including any amendments thereto.
- 3.1.8 **“Contractor/EPC Contractor”** means the successful Bidder whose bid to perform the Contract has been accepted by the Employer for issue of the Letter of Award and is named as such in the Contract Agreement and includes the legal Successors or permitted assigns of the Contractor.
- 3.1.9 **“Contractor’s Equipment”** means all Plant, facilities, equipment, machinery, tools, apparatus, appliances or things of every kind that are to be provided by the Contractor and required in or for installation, completion of the Facilities and maintenance thereof, but does not include Plant and Equipment, or other things intended to form or forming part of the Facilities.
- 3.1.10 **“Contract Price”** means the firm sum specified in the Contract Agreement, subject to such additions and adjustments thereto or deductions therefrom, as may be made pursuant to the Contract.

- 3.1.11 **“Contract Year”** shall have the same meaning as defined in the RfS Document.
- 3.1.12 **“CTU” or “Central Transmission Utility”** shall mean the Central Transmission Utility as defined in sub-section (10) of Section 2 of the Act i.e Power Grid Corporation of India Limited (PGCIL).
- 3.1.13 **“Declared Net Annual Guaranteed Generation (NAGG)”** shall mean the units of electrical energy quoted by the contractor in Attachment-10 of this bid document.
- 3.1.14 **“DISCOM”** means Power Distribution Company of the state, responsible for distribution of Electrical power in the region and associated activities.
- 3.1.15 **“Drawings”, “Plans”** shall mean all Drawings or Plans submitted by the Contractor with his Bid, Drawings, Engineering data and Plans submitted by the Contractor during the progress of the work.
- 3.1.16 **“Effective Date of the PPA”** shall mean the date as on 30th day from the date of issuance of Letter of Intent (LOI) by UPNEDA to RECPDCL as per RfS Document.
- 3.1.17 **“Employer’s Representative”** shall mean any person, persons or consulting firm appointed by the Employer to supervise the work, inspect and examine workmanship and test materials/equipment to be supplied.
- 3.1.18 **“Engineer-in-Charge” or “EIC”** means the person appointed by the Employer to perform the duties delegated by the Employer.
- 3.1.19 **“E-Procurement Website”** shall mean RECPDCL E-Tendering Portal i.e. www.tenderwizard.com/REC
- 3.1.20 **“Equipment”, “Stores” and “Materials”** shall mean and include plant & equipment, stores and materials to be supplied by the Contractor under the Contract.
- 3.1.21 **“EPC Contract Price”** means sum value of contract prices for the First and Second Contracts.
- 3.1.22 **“Facilities”** shall mean all Plant and Equipment, Tools and Works to be supplied, erected, tested and commissioned as well as pre-commissioning, commissioning and all related services to be carried out in accordance with the contract by the Contractor under this Contract.
- 3.1.23 **“Final Acceptance”** shall be as defined in Clause No. 3.41.1 of the Bid Document.
- 3.1.24 **“CC”** shall mean the Conditions of the Contract under which the current project is executed/ operated.
- 3.1.25 **“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 Performance Guarantees as specified in the Technical Specifications.

- 3.1.26 **“IEEMA”** shall mean the “Indian Electrical & Electronics Manufacturers’ Association”.
- 3.1.27 **“Implementing Agency (IA)” or “Solar Park Implementing Agency” or “SPIA”** shall have the same meaning as defined in the RfS Document.
- 3.1.28 **“Inspector”** shall mean the Employer or any other person nominated by the Employer from time to time, to inspect the equipment, stores and the works under the Contract and/or the duly authorized representative of the Employer.
- 3.1.29 **“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, PG Test, operation, maintenance, the provision of operations and maintenance manuals, training of Employer’s Personnel etc.
- 3.1.30 **“Interconnection Point/Delivery Point /Metering Point”** shall have the same meaning as defined in the RfS Document.
- 3.1.31 **“Labourer”** shall mean all categories of labour engaged by the Contractor, his sub-Contractors and his piece workers for work in connection with the execution of the work covered by the specifications. All these labourers will be deemed to be employed primarily by the Contractor.
- 3.1.32 **“Letter of Award”** shall mean the official notice issued by the Employer notifying the Contractor that his bid has been accepted.
- 3.1.33 **“MNRE”** shall mean the Ministry of New and Renewable Energy, Government of India.
- 3.1.34 **“Manufacturer’s Works” / “Contractor’s Works”** shall mean the place of work used by the manufacturer, the Contractor or the Sub-Contractors for the performance of the work.
- 3.1.35 **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 fulfillment of the Contract in respect of **Performance Guarantee Test** of the Facilities.
- 3.1.36 **“Operation & Maintenance” or “O&M”** shall mean operation and maintenance of the entire Solar Power Plant which inter-alia include provisions of manpower, spares, special tool or such material/equipment that may be required for maintaining the Solar Power Plant in

operation including Scheduling, Forecasting and Deviation Settlement.

- 3.1.37 **“Party”** shall mean the Employer or the Contractor, as the context requires.
- 3.1.38 **“Person”** shall include firms, companies, corporations and associations or bodies of individuals, whether incorporated or not. ‘Singular’ or ‘masculine’ includes ‘plural’ or ‘feminine’ and vice-versa in their respective context.
- 3.1.39 **“PPA”** shall mean the Power Purchase Agreement signed between the Employer and Implementing Agency in accordance with the terms and conditions of the standard PPA enclosed with RFS Document.
- 3.1.40 **“Plant and Equipment”** shall mean permanent plant, equipment, machinery, apparatus, system, articles and things of all kinds to be provided and incorporated in the facilities by the Contractor under this Contract including the spare parts, tools and tackles to be supplied by the Contractor but does not include Contractor’s equipment.
- 3.1.41 **“Project”** shall be Cumulative Capacity of 125 MW_{AC} (50 MW_{AC} AND 75 MW_{AC}) Solar PV plant along with three (03) years O&M as per scope specified in the bid document.
- 3.1.42 **“Project Commissioning” or “Commissioning”** The Project will be considered as commissioned if all equipment as per rated project capacity has been installed and energy has flown into grid, in line with the Commissioning procedures defined in the RfS/ PPA.
- 3.1.43 **“Purchaser”/ “Employer” / “Owner”/ “Corporation”/“RECPDCL”** shall mean the RECPDCL including its legal representatives, successors, executor and permitted assigns.
- 3.1.44 **“RfS Document”** shall mean the Request for Selection document published by UPNEDA vide RfS No. 01/UPNEDA/Solar Park/RfS/2021 dated 29.01.2021 including all its enclosures and subsequent Amendments/Clarifications thereto.
- 3.1.45 **“SCOD” or “Scheduled Commercial Operation Date”** shall be the date as on 12 months from the RECPDCL Date of Issue of Work Order.
- 3.1.46 **“Specifications”** shall mean collectively, all the terms and stipulations contained in this Bid Document including the conditions of Contract, technical specifications and Annexure thereto and list of corrections and amendments.
- 3.1.47 **“Site”** shall mean and include the land on, under, in, or through which the works are to be executed or carried out and such lands as may be specified under the contract to be used by the Contractor or Employer in the performance of the Contract.
- 3.1.48 **“STU”** shall have the same meaning as defined in the RfS Document.
- 3.1.49 **“Subcontractor”** including vendors, means any person, firm or company 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.

3.1.50 **“SPD”** shall mean Solar Power Developer.

3.1.51 **“Technical Requirements/Technical Specifications/”** shall mean technical details requirements as specified in Section-IV (Technical requirements) of this Bid Document.

3.1.52 **“Tender Document/Bid Document”** means all the Sections of this document, including its Annexure, Addendums, Clarifications, Amendments (if any) issued by Employer.

3.1.53 **“Week”** shall mean a continuous period of 7 (seven) days.

3.1.54 **“Works”** means and includes the Plant & Equipment to be supplied and the Scope of works to be executed as defined and set out in the specifications and includes all extra work, additions, substitutions and variations ordered by the Engineer - in - Charge in accordance with the provisions of the Contract and any other items not specifically written but essential to complete the entire activity defined in the Contract.

3.1.55 **“Zero Date (ZD)”** shall mean the date on which letter of handing over land to the contractor by the employer which shall be based on handing over of the land by SPIA/LSPDCL (Lucknow Solar Power Development Corporation Limited) on as is where is basis.

3.1.56 **“HSE”** shall mean Health, Safety and Environment

3.2 GENERAL USAGE OF LANGUAGE AND INTERPRETATION

3.2.1 Conditions of Contract shall be read in conjunction with the Notice Inviting Tender (NIT), Instructions to Bidders (ITB), Technical Specifications, Quality Assurance plan and any other document forming part of this contract, wherever the context so requires.

3.2.2 Words imparting ‘persons’ shall include firms, companies, Employers and association or body of individuals, whether incorporated or not.

3.2.3 Any error in description, quantity in Bill of Quantities or any omission there from shall not vitiate the Contract or release the Contractor from execution of the whole or any part of the Works comprised therein according to drawings and Specifications or from any of his obligations under the Contract.

3.2.4 **Headings, Marginal notes and captions:** The Headings, Marginal Notes and Captions to any Clause of the Contract shall not limit, alter or affect the meaning of the specifications or conditions of bidding. These have been provided for the facility of references only and shall not affect or control the construction of the Contract.

3.2.5 **Language and measurement:** All documents pertaining to the Contract, including specifications, schedules, notices, correspondences, operation and maintenance instructions, drawings or any other documents shall be written in English language. The Metric system of

measurement shall be used exclusively in the Contract.

- 3.2.6 Unless otherwise specifically mentioned, the references of Clause No given under various clauses shall be deemed to be pertaining to this Bid Document.

3.3 CONTRACT DOCUMENT

- 3.3.1 The term Contract document shall mean and include the following (including subsequent amendments, if any) which shall essentially form an integral part of the contract.

- i) Contract Agreement
- ii) Bid Document including subsequent amendments/clarifications, if any.
- iii) Contractor's Bid Proposal along with Bid Response Sheets, Annexure, etc.
- iv) Letter of Award (LoA), duly accepted by you together with its amendments, if any.
- v) Final/Approved Quality Assurance Plans for manufacturing and site/field activities for all major/critical items.
- vi) Integrity Pact
- vii) Activity Chart/Project Schedule
- viii) Manpower Chart
- ix) Any other document forming part of the Contract

- 3.3.2 All the aforesaid documents shall form an integral part of the Contract, in so far as the same or any part thereof conform to the Bid Document and what has been specifically agreed to by the Employer and brought out in Letter of Award issued by the Employer. Any matter inconsistent therewith, contrary or repugnant thereto or any deviation taken by the Contractor in its Bid but not agreed to specifically by the Employer in its Letter of Award shall be deemed to have been withdrawn by the Contractor.

- 3.3.3 In case of any contradiction in any of the terms & conditions to the extent that the two provisions cannot co-exist, the following shall prevail in order of precedence.

- i) Contract Agreement
- ii) Letter of Award
- iii) Technical Specifications
- iv) Conditions of Contract
- v) Instructions to Bidder
- vi) Any other document

3.4 USE OF CONTRACT DOCUMENTS AND INFORMATION

- 3.4.1 The Contractor, without the Employer's prior written consent, shall not disclose the Contract, or any provisions thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the Employer in connection therewith, to any person other than the person employed by the Contractor in the performance of the Contract. Disclosures to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.

- 3.4.2 The Contractor, without the Employer's prior written consent, shall not make use of any document or information enumerated in various Contract documents except for the purpose of performing the Contract.
- 3.4.3 Any document, other than the Contract itself, enumerated in various Contract documents, shall remain the property of the Employer and shall be returned (in all copies) to the Employer on completion of the Contractor's performance under the contract if so required by the Employer.
- 3.4.4 The Contractor shall not communicate or use in advertising, publicity, sales releases or in any other medium, photographs and other reproductions of the works under the Contract or descriptions of the site, dimensions, quantity, quality or other information concerning the works unless prior written permission has been obtained from the Employer.

3.5 SCOPE OF THE CONTRACT

- 3.5.1 The contractor's obligations under the contract shall include Design, Engineering, Supply, Erection, Testing, Commissioning and O&M for Three Years of 125 MW_{AC}(50 MW_{AC} & 75 MW_{AC} of Solar Power Project at Kanpur Dehat and Jalaun District in Uttar Pradesh on turnkey basis completely covering the scope of supply & services and associated activities as described in this Bid Document.
- 3.5.2 All Works to be carried out under this contract shall be in accordance with the requirements, conditions, appendices etc. given in Technical Requirements/ Specifications (Section-IV) together with those stated in other Sections/Sub-sections of this Bid Document, which shall be considered as a part of this volume completely as if bound herewith. Further, all the works to be carried out under the scope should also comply all the technical requirements of RfS document issued by the Implementing Agency for this project.
- 3.5.3 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

3.6 CONSTRUCTION OF THE CONTRACT

- 3.6.1 Notwithstanding anything stated elsewhere in the Bid Document, the Contract to be awarded shall be on the following basis on a single source responsibility

1. "FIRST CONTRACT" i.e. "Supply of all Plant and Equipment at site complete in all respect" for 125 MW_{AC} (50 MW_{AC} & 75 MW_{AC}) Solar PV Power Project.

2. "SECOND CONTRACT" i.e. "Erection, Testing, Commissioning of Plant & Equipment, Performance Demonstration and Operational Acceptance including, Unloading, Handling at Site, Insurance Covers, Storage of the Plant & Equipment supplied under First Contract and all Civil, Architectural & Structural Works complete in all respect". This Contract shall also cover all activities other than those in the scope of the "First Contract", including but not limiting to Design,

Engineering and Procurement Services.

3. “THIRD CONTRACT” i.e. “ Operation & Maintenance of the Solar PV Power Project for 03 years from the date of Operational Acceptance including O&M spares and consumables”. The O&M contract would be effective from the date of Operational Acceptance as per scope provided in the Technical Specifications under Bid Document

3.6.2 A breach in the performance of any of the above contracts mentioned at Clause No 3.6.1 above shall be considered as a breach in performance of the other contracts, which shall confer a right to RECPDCL to terminate the other contracts also at the risk and cost of the Contractor without prejudice to other rights, RECPDCL may have as per terms & conditions of respective order.

3.6.3 Entire responsibility with regard to Design, Engineering, Supply, Erection, Testing, Commissioning and O&M for Three Years of 125 MW_{AC} (50 MW_{AC} & 75 MW_{AC}) of Solar Power Project at Kanpur Dehat and Jalaun District in Uttar Pradesh will remain with Contractor irrespective of the modality of the contracts and the Contractor shall coordinate all activities for smooth and timely completion of the project in such a manner, as if there has been no split in the scope.

3.7 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.

3.8 POWER TO VARY OR OMIT WORK

- a) 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.
- b) If any suggested variations would, in the opinion of the Contractor, if carried out 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 instructions.
- c) The differences in cost, if any, occasioned by such variations, shall be added to or deducted from the Contract Price, as the case may be
- d) 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.

- e) 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 after the receipt of such instructions, inform in writing the Employer of such claim for additional payment.

3.9 CONTRACT AGREEMENT

- 3.9.1 The Contract Agreement(s) will be signed in two (2) originals on non-judicial stamp paper of appropriate value within twenty-one (21) days of issue of Letters of Award. Signing of the Contract Agreement will be done at office of RECPDCL. The Contract Agreement shall be signed only after Contractor provides Contract performance cum Security Guarantee (CPSG) to the Employer as per information specified in Clause 3.48 of the Bid Document and completes other activities which are required to be carried out by the contractor prior to signing of Contract Agreement as per the Bid Document. The format for Contract Agreement is specified in Annexure 1 of Section-V: Bid Response Sheets and Annexures.
- 3.9.2 Unless and until a formal Contract Agreement is prepared and executed, Letter of Award, in conjunction with the Bid Document will constitute a binding Contract. After signing of the Contract Agreement, 10 (Ten) true hard copies of the same shall have to be made by the Contractor and shall be submitted to the Employer along with the soft copy within 30 days from the date of signing of the Contract Agreement.

3.10 ASSIGNMENT AND SUBLETTING OF CONTRACT

- 3.10.1 The Contractor shall not assign, sublet or sub-contract any part of the contract without prior specific written approval by the Employer other than to those vendors/ sub-contractors already identified/qualified/approved in the contract. Such Assignment/sub-letting/sub-contracting under the contract as above without prior written approval of Employer shall be void. Such approval by the Employer for any of the Subcontractors shall not relieve the Contractor from any of its obligations, duties or responsibilities under the Contract. The contractor shall notify the Employer in writing of all sub contracts awarded under the contract, if not already specified in his bid.
- 3.10.2 In case, the Contractor engages any Sub-Contractor to carry out a part of the work, the Sub-Contractor should have requisite Government License as applicable for carrying out such part of the work.

3.11 CONTRACTOR'S VENDORS /SUPPLIERS/ SUBCONTRACTORS

- 3.11.1 Save for any material/minor details/parts of the equipment/services for which origin/makes are identified in the contract, the Contractor shall not procure equipment/services or part thereof for incorporation in his supplies/services from other vendors/suppliers/sub-contractors without applying in writing to the Engineer-in-Charge for his examination and getting his prior written approval thereon. Any change in the vendors/suppliers/sub-contractors already identified in the contract as per the Clause no. 4.2.4.4 of Section (IV) shall also be subject to approval by the Engineer-in-Charge. If the Contractor finds it necessary to have vendors/suppliers/sub-contractors for additional items/materials or to change the already identified (in the contract)

vendors/suppliers/subcontractors, the relevant application to the Engineer-in-Charge shall include the experience list of such equipment vendors/suppliers/sub-contractors of such materials/equipment. Any approval by the Engineer-in-Charge for any of the vendors/suppliers/sub-contractors of the Contractor shall not relieve the Contractor from any obligation, or responsibility under the contract.

- 3.11.2 The contractor shall furnish, for such bought out items/components, a copy of the Purchase Order without price details but together with detailed purchase specifications, quality plans and delivery conditions to the Engineer-in-Charge.

3.12 RESPONSIBILITIES OF THE CONTRACTOR

- 3.12.1 The Contractor shall design, procure/ manufacture (including associated purchases and/or subcontracting), install, commission and complete the Facilities, carry out the Operational Acceptance tests and Operation and Maintenance (O&M) of the entire plant for the prescribed period with due care and diligence in accordance with the Contract provisions.
- 3.12.2 The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities provided by the Employer and assessed by himself at the site location, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site (if access thereto was available) and of other data readily available to it only after proper due diligence relating to the Facilities prior to bid submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.
- 3.12.3 The Contractor shall acquire, on behalf of Employer, in the name of the Employer, all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country/state where the Site is located that are necessary for the setting up of the plant mentioned under the Contract. In this regard, any document required from Employer shall be intimated by the Contractor to the Employer at least 21 days prior to submission. Contractor has to ensure safe keeping of the documents and diligent use.
- 3.12.4 The Contractor shall acquire in its name all permits, approvals and/or licenses from all local, state or national government authorities or public service authorities 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 laying down of HT cables/lines as applicable, 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 Clause No 3.13 of this Bid Document hereof and that are necessary for the Performance of the Contract.
- 3.12.5 Contractor shall also seek for any exemption applicable for the project as per the orders released from GOI time to time. 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 at least 10 days in advance.

Similarly, contractor shall take into account of all the Input Tax Credits (ITC) available to the Facilities or during Operation and Maintenance Contract while quoting its prices as per the provisions of GST Act.

- 3.12.6 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.
- 3.12.7 Unless otherwise specified in the Contract or agreed upon by the Employer and the Contractor, the Contractor shall provide/ deploy sufficient, properly qualified personnel for Erection, Testing, Commissioning and Operation & Maintenance of the Plant; 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 Commissioning, Performance Guarantee Tests/Operational Acceptance Test, all in accordance with the provisions of the bid document within the time specified under Clause No. 3.17 (Timelines) hereof and in the manner thereupon specified in the bid document.
- 3.12.8 The Contractor shall be responsible for the Operation & Maintenance of the Facilities after Commissioning and related operation of the plant till the Operational Acceptance is achieved before proper hand over of the site by contractor.
- 3.12.9 On completion of the work, the Contractor shall inform the Engineer-in-Charge in writing about the Date of Completion and shall request him for a Completion Certificate. No such certificate will be given nor shall the work be considered as completed, until the Contractor has removed from the premises on which the work has been executed, all surplus materials and rubbish, which he may have had possession/generated for the purpose of the execution thereof and the area is fully cleared to the satisfaction of the Engineer-in-Charge and if the Contractor fails to do so on or before the date fixed for completion of the work, the Engineer-in-Charge may do so and may sell such scaffolding and materials as have not been removed by the Contractor and the expenditure so incurred shall be recovered from the Contractor's outstanding dues. The Contractor shall have no claim in respect of any such scaffolding or surplus materials as aforesaid.

3.13 RESPONSIBILITIES OF THE EMPLOYER

- 3.13.1 The Employer shall provide all information and/or data to be supplied by the Employer as described in the Scope of Works and Supply by the Employer to the Contractor, except when otherwise expressly stated in the Contract.
- 3.13.2 The Employer shall enter into Right to Use/Lease Agreement with the Implementing Agency/SPIA within the timeline and in accordance with the provisions of the RfS document. Within 07 days of getting possession/allotment of land from the SPIA, the Employer shall

handover the land to the contractor.

3.13.3 The Employer shall pay fees for all permits, approvals and/or licenses from all local, state or national government authorities or public service authorities 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 as specified in the Scope of the Bid Document.

3.13.4 If requested by the Contractor and upon Employer's sole discretion, the Employer shall 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.

3.14 PATENT RIGHTS AND ROYALTIES

The Contractor shall at all-time indemnify RECPDCL against all claims which may be made in respect of the plant and machinery for infringement of any right protected by patent, trademark, intellectual Property rights and / or industrial design rights arising from use of the Goods or any part thereof in India and / or other country. Provided always that in the event of any claim in respect of any alleged breach of patent, trademark, intellectual Property rights and / or industrial design rights arising from use of the Goods or any part thereof in India and / or other country made against RECPDCL, the same shall be notified to the Contractor and Contractor shall at his own cost either settle such dispute amicably or conduct any litigation that may arise there from.

3.15 EFFECTIVENESS OF CONTRACT

The contract shall be considered as having come into force from the date of issuance of Letter of Award by RECPDCL to the Contractor unless otherwise provided in the Letter of Award.

3.16 TIME - THE ESSENCE OF CONTRACT

The time and the date of successful completion of scope of work as stipulated in the contract by RECPDCL without or with modifications, if any, and so incorporated in the Letter of Award, shall be deemed to be the essence of the contract for all intents and purposes. The Contractor shall so organize his resources and perform his work as to complete it not later than the date agreed to in the Contract.

3.17 TIMELINES

3.17.1 All works envisaged in this Contract shall be completed within the time limit specified at Clause No 3.17.2 below with or without modifications, if any, and so incorporated in the Letter of Award and no deviation shall be allowed whatsoever. The Contractor shall so organize his resources and perform his work as to complete it not later than the date agreed to in the timeline schedule. The time for completion of his works contracted for, shall be reckoned from the date of issue of the Letter of Award (LoA) by the Employer unless otherwise provided in the LoA. The Contractor's liability for delay in completion shall be as stipulated under the Clause No. 3.49 (Liquidated Damages for EPC Contract) of Section III:

Conditions of Contract of this bid document.

3.17.2 Entire scope of supply and works under this contract shall be completed within the timeline as mentioned below:

| Sr. No. | Stage | Reference from Zero Date (ZD) (In Days) |
|----------------|--|--|
| 1) | Date on which letter issued to the contractor for handing over of land by the employer which shall be based on handing over of the land by SPIA/LSPDCL (Lucknow Solar Power Development Corporation Limited) on as is where is basis | ZD |
| 2) | Commencement of site development work | ZD + 30 |
| 3) | Submission of DPR for the Project | ZD + 45 |
| 4) | Completion of fencing work of the project area. | ZD + 60 |
| 5) | Completion of Site development Work | ZD + 70 |
| 6) | Commencement of Civil Work | ZD + 75 |
| 7) | Completion of supply of major balance of Items (MMS, Power Conditioning Units, Transformers, cables etc.) | ZD + 225 |
| 8) | <i>Completion of Erection of 50% Modules</i> | ZD + 255 |
| 9) | Completion of Civil Work & Erection of MMS as per agreed schedule | ZD + 255 |
| 10) | Completion of Civil Work for Inverter Room, Control room, Switchyard & general civil work as per agreed schedule | ZD + 255 |
| 11) | <i>Completion of supply of Solar PV Modules as per agreed schedule.</i> | ZD + 265 |
| 12) | <i>Completion of Erection & Interconnection of Modules</i> as per agreed schedule | ZD + 280 |
| 13) | Installation and interconnection of all DC & AC circuit | ZD + 295 |
| 14) | Interconnection of entire Plant & Testing | ZD + 300 |

| | | |
|-----|--|----------|
| 15) | Commissioning of Entire Plant in line with the procedure elaborated in Standard PPA document | ZD + 300 |
| 16) | Operational Acceptance Test | ZD + 430 |
| 17) | Final Acceptance | ZD + 450 |

Note:

The contractor shall submit activity wise Project Master Schedule (PMS) i.e. L1 schedule including all the activities mentioned above along with the bid and Project co-ordination schedule (PCS) i.e. L2 schedule within 21 days after the date of issue of Letter of Award by the Employer as per Clause No 3.21.3.

- 3.17.3 The contractor shall provide the full program of supply in details and delivery schedule along with work schedule thereto. Strict adherence and guaranteed delivery schedule mentioned in terms and conditions shall be the essence of the contract and delivery schedule must be maintained.

3.18 PROTECTION AT WORK

The contractor shall have total responsibility for protecting his work till it is finally taken over by the Employer. No claim will be entertained by the employer for any damage or loss to the contractors' works and the contractor shall be responsible for the complete restoration of the damaged work to its original condition to comply with the specifications and drawings. Should any such damage to the contractor's work occur because of other party not under his supervision or control, the contractor shall make his claim directly with the party concerned. If disagreement or conflict or dispute develops between the contractor and the other party or parties concerned regarding the responsibility for damage to the contractor's works, the same shall be resolved amicably by the Contractor with other party. The contractor shall not cause any delay in the repair of such damaged work because of any delay in the resolution of such disputes. The contractor shall proceed to repair the work immediately and no cause thereof will be assigned pending resolution of such dispute.

3.19 PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY

- 3.19.1 The contractor shall be responsible for any damage resulting from his operations. The Contractor shall also be responsible for protection of all persons including members of public and employees of the Employer and the employees of other contractors and sub-contractors and all public and private property including structures, building, other plants and equipment and utilities either above or below the ground.
- 3.19.2 The contractor will ensure provision of necessary safety equipment such as barriers, sign-boards, warning lights and alarms, etc. to provide adequate protection to persons and property inside the plant premises. The contractor shall be responsible to give reasonable notice to the Employer and the employers of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his work and shall

make all necessary arrangements with such Employers, related to removal and/or replacement or protection of such property and utilities.

3.20 WORK EXECUTION

3.20.1 All the work shall be executed in strict conformity with the provisions of the contract documents, explanatory detailed drawings, specifications and instructions by the Engineer-in-Charge whether mentioned in the contract or not. The contractor shall be responsible for ensuring that works are executed in the most substantial, proper and workman like manner using the quality materials and labour, throughout the job Completion in strict accordance with the specifications and to the entire satisfaction of the Engineer-in-Charge. The Contractor shall, at all times during execution of the Contract, carry out the work with such labour force and equipment as are sufficient to complete it within the specified completion period. Engineer-in-Charge reserves the right to direct the Contractor to supplement the construction plant capacity, change sequence and method of operation and/or increase the manpower employed to execute the contract, if it is felt that the same is not sufficient achieving the completion target of the work as per schedule, without any extra cost to the Employer. In case temporary supply from DISCOM is limited or not available, Suitable alternative with DG sets shall be arranged by Bidder at own cost. The fuel and consumable shall be also in the scope of bidder.

3.20.2 **REPRESENTATIVE OF EMPLOYER:** - Within seven (07) days of the signing of Contract Agreement, the Employer shall appoint and notify the Contractor in writing of the name of the Engineer-in-Charge (herein after referred as EIC). The Employer may from time to time appoint some other person as the Engineer- in-Charge 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 Engineer-in-Charge 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 Engineer-in-Charge, except as herein otherwise provided in the contract.

3.20.3 **REPRESENTATIVE OF CONTRACTOR:** -

- a) Within seven (07) days of issue of LOA by the Employer, the Contractor shall appoint a senior level executive as the **“Project Manager”** for Project Planning, execution and management who shall be the single point of contact for all issues related to design & engineering, dispatch, civil, architectural and structural works, erection, testing commissioning and Performance Guarantee Test of the equipment. The appointed Project Manager should have experience in independently handling at least one similar project.
- b) From the commencement of installation of the Facilities at the Site until completion of facilities, the Contractor shall appoint a suitable person 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 the execution of the Project for proper Performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed by the contractor to act as his or her deputy.
- c) During the execution of the contract, such persons appointed by the Contractor shall report to

the Engineer-in-Charge or his authorized representative, for smooth execution and timely completion of the work.

3.20.4 CONSTRUCTION POWER & WATER SUPPLY

- i. The Contractor has to arrange Construction Power and water at the site for construction & operation purpose at its own cost.
- ii. 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.

3.20.5 CONTRACTOR'S OFFICE AT SITE

- a) The Contractor shall also provide and maintain an office at the site for the Contractor's staff and the Employer's Officials. Such office shall be open at all reasonable hours to receive instructions, notices or other communications. The contractor shall also provide office space for Employer's officials properly equipped with basic facilities such as office furniture, with requisite number of ACs of adequate capacity (min 1.5 Ton capacity), washroom, drinking water dispenser, at least two computers along with the computer tables, high speed internet connectivity and other necessary amenities which shall be finalized in consultation of the Employer after award of the contract. The office should have at least one (1) room with minimum 2 tables, 5-6 revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) and proper sanitary arrangement. The contractor shall construct the site office within two (02) months from the date of issue of LOA otherwise the Employer reserves the right to withhold any amount at its discretion from due payment to Contractor.
- b) The Contractor shall deploy sufficient number of qualified engineers and staff to carry out the work and they shall be available at work sites during execution of the project. The Contractor shall provide and deploy only qualified engineers, staff and technical personnel who are skilled and experienced in their respective area of specialization and supervisory staff who are competent to adequately supervise the work at hand. The Contractor shall supply to the Employer a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities before signing of contract agreement. The chart shall include the identities of the key personnel to be deployed for execution of works. The Contractor shall promptly inform the Employer in writing of any revision or alteration of such an organization chart. The contractor shall ensure the deployment of manpower as finalized above.

3.21 CONTRACTOR'S FIELD OPERATION

- a. The contractor shall keep the EIC informed in advance regarding his field activity plans and schedules for carrying out each part of the work. Any review of such plan or schedule or method of work by the EIC shall not relieve the contractor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the EIC or the Employer or any of his representatives and no claim of the contractor will be entertained because of the failure

or inefficiency of any such plan or schedule or method of work reviewed. The contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.

- b. The contractor shall have the complete responsibility for the conditions of the work site including the safety of all persons employed by him or his Sub-contractor(s) and all the properties under his custody during the performance of the Contract. The liability shall continue till the completion of the contract and shall not be limited to normal working hours

3.21.1 WORKING HOURS

The contractor shall ensure working hours at site as per the applicable statutory regulation(s)/government guidelines in the state where the project is located. Shift working at 2 or 3 shifts per day may also become necessary to complete the work on time and during operation of the plant and the Bidders should take this aspect into consideration for formulating his rates for Price Bid. No extra claims will be entertained by the Employer on this account. The contract shall provide display boards showing progress and labour strength at work site, as directed by the Engineer-in-Charge.

3.21.2 DISCIPLINE OF WORKMEN

The contractor shall adhere to the disciplinary procedure set out by the EIC in respect of his employees and workmen at site. The EIC shall be at liberty to object to the presence of any representative or employees of the contractor at the site, if in the opinion of the EIC, such employee has misconducted himself or be incompetent or negligent or otherwise undesirable, in such situation the contractor shall debar such person objected to and substitute him by another employee.

3.21.3 PROGRAM OF PERFORMANCE

- i) The Bidders shall be required to submit activity wise Project Master Schedule (PMS) (i.e. L1 schedule) considering the completion period as specified in Clause No 3.17 of Section-III: Conditions of Contract & any other dates and periods specified in this Bid document along with the bid. The above Project Master Schedule (PMS) (i.e. L1 schedule) and the key milestone dates will be discussed and finalized with the successful Bidder, if required before the issue of Letter of Award.
- ii) Within twenty one (21) days after the date of issue of Letter of Award by the Employer, the contractor shall prepare and submit Project Co-ordination Schedule (PCS) (i.e. L2 Schedule), made in the form of PERT Network (based on Critical Path Methodology (CPM)) and showing the sequence in which it proposes to design, manufacture, procurement/supply, transport, assemble, install and commission as well as starting date and completion date of different components/activity, each milestone achievement dates pertaining to project further exploded based on the Project Master Schedule (PMS) mutually agreed by the Employer and Contractor and make the presentation to EIC of their proposed PCS and organizational resources, equipment,

machineries, manpower to be deployed for timely completion of the project. This Project Co-ordination Schedule (PCS) shall form part of the contract.

- iii) PCS shall also define month-wise schedule of project components/milestones. The Contractor shall update and revise the program as and when appropriate or when required by the Employer, but without modification in the Times for Completion given in the contract and any extension granted in accordance with provisions of contract and shall submit all such revisions to the EIC.
- iv) Monthly Progress Review Meeting (MPRM) to be held on 26th of every month or in case 26th day being holiday, on the next working day. The month wise activity schedule shall be reviewed and detailed working schedule (week wise) for the next month shall be drawn up by the contractor jointly with the Engineer-in-Charge or his authorized representative in the MPRM).
- v) A Weekly Progress Review Meeting (WPRM) shall be held by EIC or its authorized representative, wherever possible at the works, wherein week wise schedule as finalized in MPRM shall be reviewed. In case of any lapses in the target, it shall be updated in Weekly Progress Review Meeting (WRPM).
- vi) The contractor shall be mandatorily required to attend the WPRM & MPRM. Minutes of WPRM/MPRM shall be recorded in triplicate and shall inter alia include the Weekly/Monthly Program as updated, progress of work 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. These Minutes of Meeting (MoM) shall be jointly signed by the EIC or his authorized representative and the Contractor and one copy of the signed MoM shall be handed over to the Contractor.
- vii) The contractor shall scrupulously adhere to these targets/ Schedules by deploying adequate personnel, construction tools and tackles, materials of his scope of supply in good time to achieve the targets/ schedules.
- viii) In all matters concerning the extents of targets set out in above schedules and the degree of achievement, the decision of the Engineer-in-Charge will be final and binding on the contractor.

3.21.4 EMERGENCY WORK

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work.

3.22 RIGHT OF WAY AND FACILITIES

SPIA will be responsible for ROW during construction and O&M for access to the 'Project Site'. However, minor work related with creation of proper access to the 'Project' shall be done by the EPC contractor.

3.23 SITE HINDRANCE REGISTER

The Contractor shall maintain a register at the site office and record hindrance, if any, in the site register to be duly signed by Contractor or his authorized representative and verified by EIC or his authorized representative.

3.24 WORK AND SAFETY REGULATIONS

- 3.24.1 The contractor shall ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to the Employer or to others, working at or near the site. The contractor shall also be responsible for provisions of all safety notices and safety equipment required both by the relevant legislations and the EIC as he may deem necessary.
- 3.24.2 All equipment used in construction and erection by contractor shall meet Indian/ International Standards and where such standards do not exist, the contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the contractor in accordance with manufacturer's operation manual and safety instructions and as per Guidelines/Rules of RECPDCL in this regard.
- 3.24.3 The contractor shall provide suitable safety equipment of prescribed standard to all employee and workmen according to the need or as may be directed by EIC who will also have right to examine these safety equipment to determine their suitability, reliability, acceptability and adaptability.
- 3.24.4 The contractor shall provide safe working conditions to all workmen and employees at the site including safe means of access, railings, stairs, ladders, scaffoldings etc. The Scaffoldings shall be erected under the control and supervisions of an experienced and competent person. For erection, good and standard quality of material only shall be used by the contractor.
- 3.24.5 The EIC shall have the right at his sole discretion to stop the work, if in his opinion the work is being done in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove short comings immediately.
- 3.24.6 The contractor shall not be entitled for any damages/compensation for stoppage of work due to safety reasons as provided in Clause No. 3.24.5 above and the period of such stoppage of work will not be taken as an extension of time for completion of work and will not be the ground for waiver of levy of liquidated damages.
- 3.24.7 The contractor shall follow and comply with all RECPDCL Safety Rules and relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any demur, protest or content or reservation. In case of any inconformity between statutory requirement and RECPDCL Safety Rules, if any, referred above, the statutory requirement/provisions shall be binding on the contractor. RECPDCL shall provide safety manual to the successful Bidder. Contractor shall provide all the documents required for HSE activities, by the applicable law, update it whenever the activities change and keep a copy on site, or immediately available to an

inspector or a client inspection. These documents shall include but not limited to health and safety plan, method statement and risk assessment etc.

3.25 ACCESS TO SITE AND WORKS ON SITE

No persons other than the Employer's representative, the contractor or his duly appointed representative, Sub-contractor(s) and workmen, shall be allowed to do work on the site, except by the special permission, in writing of the EIC or his representative.

3.26 PROGRESS REPORT

- 3.26.1 The Contractor shall monitor progress of all the activities specified in the work schedule/Timelines referred in Clause No 3.17, and submit the progress report to the Engineer- in Charge. The progress report shall be in a form acceptable to the Engineer- In Charge and shall include percentage completion achieved compared with the planned percentage completion for each activity, where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken and any such other information as required by the EIC.
- 3.26.2 The Contractor shall furnish, along with the progress report, photographs indicating various stages of civil, architectural, erection, testing and commissioning activities, each Photograph shall contain the date, the name of the Contractor and the title of the view taken
- 3.26.3 If at any time the Contractor's actual progress falls behind the schedule referring to in Clause No 3.17.2 (Timelines), or it becomes apparent that it will so fall behind, the Contractor shall, prepare and submit to the Engineer- In Charge a revised program, taking into account the prevailing circumstances, and shall notify the Engineer- In Charge of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion as mentioned under Clause No 3.17 (Timelines), any extension thereof entitled under Clause 3.61 (Time Extension), or any extended period as may otherwise be agreed upon between the Employer and the Contractor.

3.27 SPECIFICATIONS AND DRAWINGS

- 3.27.1 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. The Contractor shall be responsible and shall pay for any alterations of the work 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/reviewed by the Engineer-in-Charge or not.
- 3.27.2 The materials, design and workmanship shall satisfy the applicable standards, specifications contained herein and codes referred to. Where the Contract Document stipulates requirements in addition to those contained in the standard codes and specifications, those additional requirements shall also be satisfied.
- 3.27.3 3 (Three) prints of all relevant drawings along with soft copies of drawings in pdf in DVD/CD/USB drive as defined in the technical specifications, shall be submitted by the

contractor. No extension in Contract completion time shall be allowed on account of the time consumed in submission and examination of defective drawings and re-submission of corrected drawings.

- 3.27.4 In addition to the drawings defined in the technical specification, the Contractor will furnish any other drawing, which, in his opinion, is necessarily required to describe the equipment in full details and interconnection thereof and any drawings which EIC may request.
- 3.27.5 These drawings, shall become the property of the Employer and shall not be departed from it in anyway, whatsoever, except with the written permission of the Engineer-in-Charge hereinafter provided.
- 3.27.6 The Contractor shall also furnish 5 (Five) bound sets of “as built” drawings and the list of all “as built” drawings bearing drawing numbers after commissioning, incorporating all site modifications/changes etc.
- 3.27.7 The Employer/EIC shall have the right to serve notice in writing to the Contractor on any grounds of objections, which he may have in respect of any drawings, equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the EIC giving reasons therein, that no modifications are necessary to comply with the contract. The Contractor has to satisfy the objection, otherwise, The Employer/EIC at its liberty may reject all or any component of plant or workmanship connected with such work.

3.28 APPROVAL / REVIEW OF DRAWINGS & DOCUMENTS

The Contractor shall prepare and furnish to the EIC the documents as per Contract Agreement for its approval or review. EIC shall review the documents furnished by the contractor and give the feedback or approval within 07 days from the date of submission of documents by the contractor. Any part of the Facilities covered by or related to the documents to be approved by the EIC shall be executed only after the EIC’s approval thereof. Document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract.

3.29 PACKING, FORWARDING

- 3.29.1 The Contractor shall be responsible for securely protecting and packing the plant and equipment, taking special care for protruding parts and such other vulnerable parts as per prescribed standards enforced to withstand the journey and ensuring the safety of materials and also arrival of materials at destination in good and original condition for contemplated use, so as to avoid damage under normal conditions of transport, loading & unloading, handling and storage at site till the time of erection and such conditions as specified in the Contract. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Each bundle or package shall have the following marking on it:-
- i. The name and address of the consignee.
 - ii. The relevant marks, reference numbers etc., for identification.

iii. Directions for handling the materials

Each package shall also be accompanied with detailed packing list to facilitate checking of the contents at the destination

- 3.29.2 The Contractor shall also give all dispatch information concerning the weight, size and content of each package, including any other information which the Employer may require.
- 3.29.3 The Proof of dispatch three copies shall be mailed to the Engineer-in-Charge within three (03) days from the date of dispatch to enable the Employer to make progressive payment to the Contractor.
- 3.29.4 In case of imported equipment, the Contractor shall make shipping arrangements as per Government of India Guidelines. The Contractor shall, wherever applicable, pack all equipment, crate, preserve, make it seaworthy and fit for long storage in tropical climate in accordance with internationally accepted export practices and in such manner so as to protect it from damage and deterioration in transit by sea, rail and road, and during storage at the site till the time of erection. The Contractor shall be responsible for all damage due to improper packing. Customs clearance shall be the responsibility of the Contractor. The Contractor shall notify the Employer of the date of each shipment from the port of such shipment at the designated point of arrival. The Contractor shall give complete shipping information concerning the weight, size, content of each package including any information the Employer may require.
- 3.29.5 All demurrage, wharfage and other expenses incurred due to delayed clearance of the material and which are attributable to the Contractor and Sub-Contractor during transportation shall be to the account of the Contractor.

3.30 TRANSPORTATION

- 3.30.1 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.
- 3.30.2 The Contractor shall notify the Employer/EIC the details of dispatch for every month from his works and the expected date of arrival at the site for the information of the Employer. The Contractor shall furnish the Employer/EIC with relevant shipping documents to be agreed upon between the parties.
- 3.30.3 The Contractor shall prepare detailed challan / packing list of all packages dispatched to site. The Contractor shall further be responsible for making all necessary arrangement for loading, unloading and other handling right from his work to and at the site.
- 3.30.4 In case the contractor decides to transport the goods by road within the Employer country, then such goods necessarily be transported through a registered common carrier as per "The Carriage by Road Rules 2011".

3.31 DELIVERY OF PLANT EQUIPMENT

- 3.31.1 The Contractor shall deliver the plant / equipment / materials at the place(s) and in the manner as specified in the Contract. The Contractor shall comply with all instructions that may be given by the Employer from time to time regarding transportation of the plant/equipment/materials. The contractor shall, immediately after dispatch, provide delivery information to the Employer.
- 3.31.2 In case of any damage or loss occurred in transit, it shall be the liability of the Contractor to initiate or pursue the claim with the Insurance Company. He shall also take immediate steps to repair the damages or to replace the loss and damages as per the instruction of the Engineer-in-charge.
- 3.31.3 Property or title of the plant / equipment / goods shall not pass to the Employer unless these are actually delivered at the designated Project without any damage.
- 3.31.4 The Employer shall not be responsible to the Contractor to secure/arrange/provide means of transport. Similarly, any road license and or permit, if necessary, shall be arranged by the Contractor. However, if any documentary assistance is necessary to facilitate transportation, these will be supplied to the Contractor to the extent possible.
- 3.31.5 No material shall be dispatched from the manufacturer's works before the same is accepted, subsequent to pre-dispatch final inspection including verification of records of all previous tests/inspections by the EIC/Authorized representative of Employer and duly authorized for dispatch by issuance of Material Dispatch Clearance Certificate (MDCC).

3.32 MATERIALS HANDLING AND STORAGE

- 3.32.1 All the equipment supplied under the contract and arriving at site shall be promptly received against indemnity bond, unloaded, transported and stored in the designated storage facilities arranged/constructed by the contractor. All the equipment shall be stored as per standard storage and preservation instructions etc. of the suppliers/manufacturers. The equipment stored shall be properly protected to prevent damage either to the equipment or to the floor where they are stored and also from theft, pilferages etc. The storage facilities shall also include enclosed storage space(s) of suitable size(s) and shall be weatherproof, with good ventilation and solid floors.
- 3.32.2 The following parts shall be stored inside enclosed storage space(s):
Bolts, pins, packing, tools, insulation materials, electrical parts with electrical devices attached, electric motors and PCU inverters, instruments, welding material and equipment, all small parts and all parts of the plant which already have been finally painted.
If large parts are stored in the open air, they shall be provided with weather resistant and fire-resistant covers. Electrical parts, which are not packed suitably and those so packed, but whose packing has been damaged shall be kept in suitable places from the moment of storage to the moment of installation.
- 3.32.3 Contractor shall be responsible for examining all the dispatches and notify the EIC immediately of any damage, shortage, discrepancy, etc. for the purpose of EIC's information only. The contractor shall also submit to the EIC every week a report detailing receipt of material at site, material issued for installation/erection, balance material at store. However,

the contractor shall be solely responsible for any shortage or damage in transit, handling and/or in storage and erection of the equipment at the site. Any demurrage, warpage and other such charges claimed by the transporters shall be to the account of the contractor.

All equipment shall be handled very carefully and shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.

3.32.4 INDEMNITY BOND

The contractor shall sign and submit Indemnity Bond(s) in the format as attached at **Annexure 5** of the Bid Document and shall be obliged and shall remain absolutely responsible for the safe transit protection and custody of the Equipment of RECPDCL against all Contractor's risks whatsoever till the Equipment are duly used/erected and commissioned in accordance with the terms of the Contract till the same is taken over by EIC. Subsequent to commencement of Operation and Maintenance of the Plant, the contractor shall again sign and submit Indemnity Bond in the format as attached at **Annexure-7** of the Bid Document. The Contractor shall keep Employer harmless against any loss or damage that may be caused to the Equipment. The Contractor shall ensure that the Equipment shall be used exclusively for the performance /execution of the Contracts strictly in accordance with its terms and conditions and no part of the equipment shall be utilized for any other work or purpose whatsoever. The non-observance of the obligations under the Indemnity 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.

3.33 MATERIALS AND WORKMANSHIP

3.33.1 The Contractor shall also guarantee that the plant, equipment and materials shall be new and of best quality workmanship and the materials shall have no defect in design and/or manufacture, and shall meet the requirements of the specification and shall be in all respects suited for purposes intended.

3.33.2 The Contractor shall guarantee, inter-alia, the following: -

- a. Use of best quality and strength of materials.
- b. Satisfactory Performance during the period of operation
- c. Achievement of Performance figures as specified for all parts under the severest condition of operation

3.33.3 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.

3.33.4 The Contractor shall remedy, without any cost to the Employer, all defects in design materials and workmanship which may develop under normal use and which have been called to the attention of the Contractor prior to the expiry of the warranty period.

3.34 NO WAIVER OF RIGHTS

3.34.1 Subject to Clause No 3.34.2 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.

- 3.34.2 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.

3.35 INSPECTION AND TESTING

- 3.35.1 The Engineer-in-charge or his duly authorized representative and/or an external inspection agency acting on behalf of the Employer shall have access, at all reasonable time to inspect and examine the materials and workmanship of the plant / equipment during its manufacture, erection, shop assembly and testing and if part of the plant is being manufactured or assembled on another premises or works, the Contractor shall obtain for the Engineer-in-charge and his duly authorized representatives, permission to inspect it as if the works were manufactured or assembled on Contractor's own premises or works.
- 3.35.2 The Contractor shall give the written notice to Employer, for testing of any material being ready for inspection/testing at least 15 (Fifteen) days in advance from the date of actual inspection/testing at the premises of the Contractor or elsewhere. Such Inspection / testing shall be carried out to the Contractor's account except for the expenses of the representative of the Employer. However, the Employer at its own discretion may waive the inspection / testing in writing under very special circumstance. The Engineer-in-Charge or his representative (s), unless the inspection of the tests is in writing waived, shall attend such tests on the date of which the equipment is notified by the Contractor as being ready for test / inspection, failing which the Contractor may proceed with the tests which shall be deemed to have been made in the Employer's presence. The Contractor shall forthwith forward to the Engineer-in-charge duly certified copies of test results in quadruplicate, for approval of the Engineer-in-charge. However, waiver accorded by the EIC will not absolve the Contractor towards the execution of the Contract in conformity with the Contract Agreement.
- 3.35.3 The Engineer-in-Charge shall, within 15 (Fifteen) days from the date of inspection as defined herein, give notice in writing to the Contractor, of any objection to any drawing, testing procedure and testing facility and all / or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objection and shall make the modifications that may be necessary to meet the said objection at no extra cost to the Employer.
- 3.35.4 When the factory tests have been completed at the Contractor's or Sub-Contractor's works, the Engineer-in-Charge shall issue a certificate to this effect within 15 (Fifteen) days after completion of tests. However, if the tests are not witnessed by the Engineer-in-Charge, the certificate shall be issued within 15 (Fifteen) days of receipt of the Contractor's test certificate by the Engineer- in-Charge only when the tests have been carried out as per relevant codes / standards. The completion of these tests or the issue of the certificate, shall not bind the Employer to accept the equipment, should it, on further tests after erection, be found not to comply with the Contract.

- 3.35.5 In all cases where the Contract provides for inspection/ tests to be carried out, whether at the premises of the Contractor or of any Sub-Contractor, the Contractor/Sub-Contractor shall provide free of charges such items as labour, materials, electricity, fuel, water, stores, apparatus, instruments etc. as may reasonably be demanded by the Engineer-in-Charge or his authorized representative(s) to carry out efficiently such test / inspection of the plant / equipment in accordance with the Contract and shall give facilities to the EIC or to his authorized representative to accomplish testing. Charges for any special test(s), other than those specified in the Contract, if required, will be paid by the Employer. Rate(s) for such special test(s) shall be mutually discussed and agreed.
- 3.35.6 All inspection, measuring and test equipment used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by RECPDCL. Wherever asked specifically, the Contractor shall re- calibrate the measuring/test equipment in the presence of EIC.
- 3.35.7 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.
- 3.35.8 The Contractor has to provide the necessary testing reports to the Employer as and when required.
- 3.35.9 The Contractor shall submit 3 (three) copies of purchase order for materials purchased / to be purchased for use in the works, which will require inspection / testing by the Employer's representative at the places other than the Contractor's works before shipment. In such cases, all the above-mentioned clauses will apply. When the inspection/test has been satisfactorily completed, the Employer will issue a certificate to that effect.
- 3.35.10 Neither the waiver of inspection / testing nor acceptance after inspection and or testing by the Employer shall relieve the Contractor in way of the responsibility of supplying the plant/equipment/materials strictly in accordance with the specifications, drawings, etc. In any case, the Contractor shall remain fully responsible for satisfactory performance of the plant/equipment/materials.

3.36 THIRD PARTY INSPECTION AGENCY

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 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.

3.37 AUTHORIZED TEST CENTRES FOR TEST CERTIFICATES

3.37.1 The Solar 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 the equipment for which such Test facilities may not exist in India, test certificates from reputed ILAC Member body accredited Labs abroad (with proper proof of accreditation) will be acceptable.

3.38 COMMISSIONING

3.38.1 As soon as installation of the Facilities, in the opinion of the Contractor, has 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 Engineer-in-Charge in writing to witness the pre-commissioning of the Facility.

3.38.2 After all the 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 Engineer-in-charge in writing. The commissioning of the facilities shall be carried out in the presence of the Engineer-in-charge or his representative(s) in accordance with RfS Document, in line with the commissioning procedure of Implementing Agency and as per procedures detailed in this Specifications. The Authorized representative of Implementing Agency /State Nodal Agency may also witness or validate the commissioning procedure at site.

3.39 PART COMMISSIONING

Part commissioning of the Project shall be allowed in two parts as mentioned below:

- i. Minimum project capacity to be commissioned in the first part shall be 50 MW (AC).
- ii. Balance capacity in the second part.

3.40 OPERATIONAL ACCEPTANCE

3.40.1 Operational Acceptance shall occur in respect of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts) when the Performance Guarantee Test, as specified and in accordance with the procedure(s) specified in Clause No 4.4.6.2 of Section-IV: Technical Specifications, have been successfully completed.

3.40.2 At any time after successful completion of Guarantee Test(s) for Operational Acceptance, the Contractor shall give a notice to the Employer requesting the issue of Operational Acceptance Certificate in respect of the Facilities or the part thereof specified in such notice. The Employer shall issue an Operational Acceptance Certificate upon the receipt of such notice provided Commissioning Certificate has been issued by the State Nodal Agency or Implementing Agency and COD of the entire plant or part thereof has been declared.

3.40.3 In case of any shortfall in the Performance Guarantee, the contractor shall make all necessary

corrections in minimum possible time and shall repeat the Plant Performance Guarantee Test (PG Test) and any other Guarantee Tests as specified in the specifications in accordance with the procedure specified in the specifications within fifteen (15) days of unsuccessful PG attempt, so as to demonstrate the PG as specified in Clause No 4.4.6.2 Section: IV of Technical Specification.

3.40.4 The period of O&M shall commence immediately after the Operational Acceptance of the entire Plant by the Employer.

3.41 FINAL ACCEPTANCE AND WORK COMPLETION CERTIFICATE:

3.41.1 Final acceptance shall occur when:

- a) Contractor has completed the supply installation, testing & commissioning of all the components of the Plant & Equipment along with its associated infrastructure & facilities in all respect, successfully completed all outstanding works and completion of all facilities in accordance with scope of works as specified in Technical Specifications as per satisfaction of Engineer-in-Charge and has submitted all technical documentation and acceptance of the same by Engineer-in-Charge.
- b) The Employer/EIC has issued Operational Acceptance Certificate for the entire capacity of the project and the same has been handed over to the Contractor for Operation & Maintenance for a period of 3 (three) years.
- c) The Contractor has submitted the requisite Contract Performance Cum Security Guarantee (CPSG) as per Clause No. 3.48.
- d) The Contractor has paid the Liquidated Damages as per the Clause No. 3.49 (if applicable)

3.41.2 Work Completion Certificate will be issued by Employer /EIC on occurrence of Final Acceptance.

3.42 REJECTION OF DEFECTIVE PLANT

3.42.1 If, during the progress of works, the Engineer-in-Charge shall decide and inform in writing to the Contractor that the Contractor has assembled any plant or part of the plant unsound or imperfect or has furnished any plant inferior to the quality specified, the Contractor, on receiving details of such defects or deficiencies shall, at his own expense, within 7 (Seven) days of receiving notice or otherwise, and for a period of time as may be decided by the Engineer-in-Charge for making it good, proceed to alter, reconstruct or remove such work and furnish fresh equipment up to the standard of specifications. In case the Contractor fails to do so, the Engineer-in-charge may, on giving the Contractor minimum 7 (Seven) days' notice in writing of his intentions to do so, proceed to remove the portion of the work so complained of

and at the risk and cost of the Contractor, perform all such work or furnish all such equipment, provided that nothing in this Clause shall be deemed to deprive the Employer of or affect any rights under the Contract which the Employer may otherwise have in respect of such defects and deficiencies.

3.42.2 In case of such replacement / rectification by the Employer, the Contractor shall be liable to pay to the Employer the extra cost, if any, for such replacement/by delivery and/or erected, as provided for in the original Contract, such extra cost being the ascertained difference between the price by the Employer under the provision above mentioned, for such replacement and the Contract price for the plant so replaced. If the Employer/EIC does not so replace the rejected plant, the Contractor shall be liable only to repay to the Employer/EIC all money paid by the Employer to him in respect of such plant.

3.42.3 In the event of such rejection, the Employer shall be entitled to the use of the plant in responsible and proper manner till a time reasonably sufficient to enable him to obtain other replacement plant.

3.43 WARRANTY

3.43.1 In addition to the defect liability specified under clause No. 3.44, the Contractor shall also provide warranty for any such component of the Facilities and during the period of time as may be specified in Section- IV: Technical Specification.

3.44 DEFECT LIABILITY

3.44.1 The contractor shall warrant that the equipment will be new & in accordance with the contract documents, relevant standards and free from defects arising due to deficiencies in design & engineering and from defects in material and workmanship **for a period of 12(Twelve) calendar months from the date of Operational Acceptance of the entire plant.** The Contractor shall be liable to replace/ upgrade with the specific consent of RECPDCL, any defective parts in the equipment supplied and erected by him under the contract arising solely from faulty design, materials and /or workmanship. All replaced defective parts shall be returned to the Contractor unless otherwise arranged by RECPDCL.

3.44.2 If it becomes necessary for the contractor to replace or renew any defective component/part of the plant, the provision of this clause shall apply to such component/part of the plant so replaced or renewed and the Defect Liability Period for such replaced or renewed component/part of the plant shall be extended for a period of *12 (twelve)* calendar months from the date of such replacement/renewal or thirty-six (36) calendar months from the date of Operational Acceptance of the entire plant, whichever first occurs. The rectification / replacement / repairs shall be done at the shortest possible time to minimize the loss of the Employer and as mutually agreed to. If any defects are not remedied within a reasonable time, RECPDCL may proceed to do the work as per Clause No. 3.64, but without prejudice to any other rights, which RECPDCL may have against the contractor in respect of such defects.

3.44.3 The repaired or new parts will be furnished and erected free of cost by the Contractor. If any

repair is carried out on contractor's behalf by RECPDCL at the site through some other Agency, the Contractor shall bear the cost of such repairs.

3.44.4 The cost of any special or general overhaul rendered necessary during the defect liability period due to defects in the plant or defective work carried out by the Contractor shall be borne by the Contractor.

3.44.5 The acceptance of the equipment by the RECPDCL shall in no way relieve the Contractor of his obligations under the Contract.

3.44.6 The Contractor shall be responsible for any loss or damage to the plant until the O&M contract is over.

3.45 COMPENSATIONS FOR SHORTFALL IN NET ANNUAL GUARANTEED GENERATION DURING O&M

3.45.1 CRITERIA FOR GENERATION

For each year of O&M, the contractor shall demonstrate actual delivered energy at CTU/STU end metering point as compared to the Declared Net Annual Guaranteed Generation (kWh) as per Attachment 10 of Section V: Bid Response Sheets and Annexures for that particular year.

3.45.2 SHORTFALL IN GENERATION DURING O&M

- a) If the contractor fails to achieve declared Net Annual Guaranteed Generation (kWh) as per Attachment 10 of Section V: Bid Response Sheets and Annexures, at delivery point (accounted annually for each year of O&M), the contractor shall pay to the employer the compensation towards shortfall in declared Net Annual Guaranteed Generation along with applicable GST as per Technical Specification Clause 4.4.12.
 - b) The generation loss shall be relaxable to the extent of grid non-availability for evacuation which is beyond the control of the contractor and other factors not attributable to the contractor as per the provisions of RfS document.
- 3.45.3 In case the project fails to generate any power continuously for two (2) months any time during the O&M period (due to reason(s) attributable to the contractor) it shall be considered as an event of default. Upon occurrence of any such event of default, RECPDCL shall have right to encash the entire amount of O&M Bank Guarantee or equivalent amount from CPSG submitted by the contractor and recover the losses from any payment due.

3.45.4 EXCESS GENERATION DURING O&M

In case the generation is more than 10% of the declared annual CUF by RECPDCL in the PPA signed as per RfS Document, the Employer will be free to sell it to any other entity provided first right of refusal will vest with the UPPCL. In case the UPPCL purchases the excess generation, it will do so at 75% (seventy-five per cent) of the PPA tariff.

3.46 MANUALS AND DESCRIPTIVE LITERATURE

The Contractor shall furnish 3 (Three) copies of Instruction Manuals at least 2 (Two) months prior to commencement of Pre-Commissioning activities. The manuals shall contain full details such as drawings of all the equipment furnished, storage procedures and operation and maintenance procedures of the equipment. Descriptive literature and data on various equipment shall also be furnished along with these manuals.

3.47 SPARES

- 3.47.1 The Contractor shall supply and maintain adequate inventory of all the spares (including software) required for safe, reliable and trouble-free operation & maintenance of the complete Solar PV Plant during the period of contract. The price of these spares shall be deemed to be included in the contract price.
- 3.47.2 The list of mandatory spares envisaged by the Employer has been mentioned at Clause No. 4.4.9 of Section-IV: Technical Specifications. The Contractor may note that it shall be the responsibility of the Contractor to ensure sufficient spares including but not limited to the mandatory spare list to maintain its contractual obligations.
- 3.47.3 All spares for the equipment under the Contract will strictly conform to the specification and will be identical to the corresponding main equipment /components supplied under the Contract and shall be interchangeable.
- 3.47.4 Without any extra cost, the Contractor shall provide the Employer with the catalogues, drawings, part numbers and any other information/documents required by the Employer in the form of manual(s) so as to enable the Employer to identify the spares required during the whole life of all the equipment to be supplied.
- 3.47.5 The Contractor shall ensure the long-term availability of spares for the equipment covered under the Contract. In case, any spare becomes obsolete, the Contractor will ensure adequate inventory of other equivalent make of such obsolete spare and shall also provide to the Employer, detailed information (catalogues, make, part number, drawings etc.,) of the same.
- 3.47.6 Further in case of discontinuance of supply of spares by the Contractor or his Sub-Contractors, the Contractor will provide the Employer with full information for replacement of such spares with other equivalent make.
- 3.47.7 The Contractor shall provide a list of all the spares required to maintain the facility for two (02) years. The Contractor agrees to supply such spare parts, as recommended or otherwise required for efficient operation and maintenance of the Facilities.

3.48 CONTRACT PERFORMANCE CUM SECURITY GUARANTEE

- 3.48.1 Within twenty eight (28) days from the date of issue of Letter of Award by the Employer, the Successful Bidder shall furnish to the Employer, an unconditional /irrevocable Contract Performance cum Security Guarantee (CPSG) for an amount equivalent to 3% of total value of EPC Contract Price (sum of contract price of the First Contract and the Second Contract

mentioned at Serial No. 1 & 2 of Clause No. 3.6.1 herein above) with a validity up to sixty (60) days beyond the expiry of Defect Liability Period as per Clause No 3.44 of this Bid Document.

- 3.48.2 The Contractor shall submit a CPSG for an amount equivalent to **INR 50000/- per MW for Cumulative Capacity of 125 MW_{AC}** with initial validity up to next 01(one) year, 30 days prior to expiry of earlier CPSG submitted by the contractor as per Clause No 3.48.1.

Every year a fresh bank guarantee shall be submitted by the Bidder, having validity for the subsequent year, one month prior to expiry of existing Bank Guarantee or the existing bank guarantee can be amended suitably for specified amount every year till 60 days beyond the O&M contract Period.

- 3.48.3 The Bank Guarantee against CPSG submitted by the contractor as per Clause No 3.48.1 shall be discharged by the Employer and returned to the Contractor without any interest, not later than sixty (60) days after issuance of Defect Liability Certificate of the equipment under the contract and acceptance thereof by the Employer; provided, however, that if the Defects Liability Period has been extended on any part of the Facilities pursuant to Clause No 3.44.2 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part. This security shall be returned to the Contractor immediately after 60 days beyond the Defects Liability period of such equipment(s).

The Bank Guarantee against CPSG submitted by the contractor as per Clause No 3.48.2 shall be discharged by the Employer and returned to the Contractor without any interest, not later than sixty (60) day after the completion of O&M contract period provided however that the entire plant is handed over by the contractor to the Employer as per provisions of the contract and acceptance by the Employer.

- 3.48.4 The above performance Bank Guarantees shall be issued by any Scheduled Bank / Nationalized Bank and denominated in the currency of the contract and shall be in the form of irrevocable Bank Guarantee in the format attached at **Annexure-2 & Annexure-3** of this Bid Document.

- 3.48.5 The original Bank Guarantee against the CPSG should be sent to RECPDCL directly under Regd. Post (A.D.) by the issuing Bank / Branch. Where the original Bank Guarantee against CPSG is handed over to the Contractor by the issuing Bank / Branch, the Contractor shall ensure that a copy of the Bank Guarantee against CPSG duly signed by the authorized person of the issuing Bank/Branch along with Covering Letter has been sent immediately by the issuing Bank/Branch under Regd. Post (A.D.) directly to RECPDCL.

- 3.48.6 The proceeds of the Bank Guarantee against CPSG shall be payable to the Employer as compensation for any loss resulting from the Contractor's failure to complete its obligations under the contract.

- 3.48.7 In case of any shortfall at any stage on account of recovery of any dues from the CPSG, Contractor shall make-up the recovered amount by furnishing a separate CPSG for such amount.

3.48.8 In the event of failure of the Contractor to extend the CPSG for the required period, the Employer reserves the right to invoke the CPSG in favour of Employer on the date of its expiry.

3.48.9 The interest @ 15.5 % per annum shall be charged on delay period for breach in timely submission of CPG without prejudice to right of RECPDCL to other remedies available under the contract

3.49 LIQUIDATED DAMAGES(LD) FOR EPC CONTRACT

3.49.1 Time is the essence of the Contract. Except otherwise specifically provided in the contract, if the performance of the Contract is delayed beyond the time schedule as specified in the Contract due to reasons attributable to the Contractor, the Employer shall, without prejudice to its other remedies under the contract, retain/recover the damages specified in Clause 3.49.3 & 3.49.4.

3.49.2 The project shall be commissioned by Scheduled Commercial Operation Date (SCOD). However, maximum time period allowed for commissioning of the full Project Capacity with applicable liquidated damages shall be limited to the date as on 6 months from the Scheduled Commercial Operation Date (SCOD).

3.49.3 LIQUIDATED DAMAGES DUE TO DELAY IN ACHIEVING COD:

(i) In case of delay in commissioning of the Project beyond the SCOD until the date as on 21 months from the Effective Date of the PPA, as part of liquidated damages, the total CPSG amount pursuant to clause 3.48.1 shall be encashed on per-day basis. For e.g., if commissioning of entire Project capacity is delayed by 18 days beyond the SCOD, then the liquidated damages shall be: CPSG amount \times (18/180). For the purpose of calculations of Liquidated Damages, the month shall be considered consisting of 30 days.

(ii) In case the Commissioning of the Project is delayed beyond the date as on 21 months from the Effective Date of the PPA, the contracted capacity of PPA shall be reduced to the project capacity commissioned upto the date as on 21 months from the effective date of PPA.

Accordingly, the Employer shall accept the capacity of the project which commissioned upto the date as on 21 months from the effective date of PPA and EPC Contract Price as well as O&M Contract Prices shall also be reduced in consonant to the accepted capacity. Further, the amount paid to the contractor in respect of capacity not commissioned shall be adjusted against any amount due to the contractor or from CPG/retention money etc. However, contractor shall be allowed to take all the balance equipment of un-utilized capacity excluding the common equipment used for commissioning of the project.

3.49.4 LIQUIDATED DAMAGES FOR PG DEVIATION

During the Operational Acceptance, any shortfall in the Performance Guarantee (PG) will be determined through the PG Test Procedure specified in Clause 4.4.6.2 of Technical Specifications: Section IV. Any shortfall will attract Liquidated Damages (LD) as under:

In Case the plant is not able to achieve the target generation, as per the performance guarantee procedure during the test period then the LD of an amount equivalent to loss of generation based on tariff for complete life of plant shall be applicable maximum up to 20% of the contract value of EPC Contract (First and Second Contract). Sample calculation for LD is shown in table –B, technical specification clause no 4.4.6.2

3.49.5 The amount of Liquidated Damages along with applicable GST shall be payable by the Contractor whenever demanded by the Employer and /or Employer can recover the amount of Liquidated Damages (to the extent leviable at any time) along with applicable GST from the amounts payable to the Contractor/Bank Guarantee available with the Employer under this contract.

3.49.6 LD can be recovered from any dues of the party.

3.50 TERMS AND PROCEDURES OF PAYMENT

3.50.1 GENERAL

- a. The Employer shall pay to the Contractor after signing the Contract Agreement, in the following manner and at the following terms, on the basis of the Price Break-up given in the Letter of Award subject to any deduction which the Employer may be authorized to make under this contract and/or to any additions or deductions provided for in this contract.
- b. The Contractor's request(s) for payment shall be made to the Engineer-In-Charge in writing, upon fulfillment of required obligations stipulated in the contract.
- c. The contractor shall submit the Invoice in triplicate showing description, quantity, Unit rate and total amount with all supporting documents as per terms of the contract. After due verification, the Employer shall process the verified Bill for release of payment. In case contractor fails to submit the Invoice with all the required documents, the Employer reserves the right to hold the payment against such bills.
- d. Payments shall be made by the Employer within thirty (30) days after submission of an invoice along with all supporting documents as per terms of contract by the Contractor.
- e. In case the payments in respect of amount payable as per contract are delayed beyond 45 days, the contractor will be entitled for interest at the rate of one-year SBI MCLR applicable as on the date of payment.
- f. The contractor shall raise the invoice on monthly basis.

- g. The contractor shall ensure to make timely payments to its sub-contractor(s)/sub-vendor(s) engaged in the execution of project to ensure timely completion of works. However, in case of delayed payment/non-payment by the contractor to its approved sub-contractor(s)/sub-vendor(s), the Employer reserves the right to make direct payment to such sub-contractor(s)/sub-vendor(s) as per the terms of payment on the request of Contractor or on the request of approved sub-contractor(s)/sub-vendor(s) or otherwise, in the interest of completion of project.

3.50.2 INVOICE DETAILS FOR TAXES AND DUTIES

Except as otherwise specifically provided in the contract, the Employer shall pay to the Contractor GST & Cess thereon, applicable if any, on submission of GST Invoice containing mainly the following contents:

- i. Name, Address & Contact Detail of the Service Provider/contractor.
- ii. GSTIN of the Service Provider/Contractor.
- iii. PAN of the Service Provider/Contractor.
- iv. GSTIN of the Employer/Owner
- v. HSN/SAC of the respective item(s)

3.50.3 E- PAYMENT

RECPDCL shall make all the payments in respect of Contractor through e-payment system. Contractor shall open its account with banks having Core Banking Facility (CBS Branch) and fill in Electronic Fund Transfer (EFT) Form (to be submitted at signing of Contract Agreement) and return to Employer duly signed and stamped by its bankers. In case Contractor fails to provide requisite information as sought, it may result in delay in payment for which RECPDCL will not be responsible. Any directions, instructions or orders issued by the Government of India from time to time regarding any or all matters arising or pertaining to the Import License shall be binding on the Contractor.

3.50.4 TERMS OF PAYMENT AGAINST “FIRST CONTRACT”

The payment for First Contract shall be made as per following:

- i. **15 % (Fifteen Percent)** of the supply value of the Contract i.e. ‘First Contract’ may be given as “Initial Advance” , at the interest rate of 50 basis point above one-year MCLR (Marginal Cost of Funds based Lending Rate) of State Bank of India prevailing on the date of payment and to be compounded quarterly shall be released on submission of following documents:
 - a) An unconditional acceptance of the Letter of Awards and signing of the Contract Agreement.
 - b) Unconditional and irrevocable Bank Guarantee for an amount equivalent to the 110% advance payment to be paid to the contractor as per **Annexure-4** to be valid up to (ninety) 90 days beyond the schedule date for Completion of the last facility

covered under the Package. However, in case of delay in completion of the facilities covered under the package, the validity of this Bank Guarantee shall be extended by the period of such delay.

- c) Submission of Unconditional Bank Guarantee towards Contract Performance cum Security Guarantee (CPSG) as per Clause No. 3.48.1.
- d) Submission of a detailed PERT Network chart based on the work schedule as per clause 3.21.3.

NOTE: In case any contractor does not require Initial Advance payment, the above 15% payment shall be paid alongwith the payment on dispatch of material from manufacturer's work. In such a case, the total payment on dispatch of material from manufacturer's work as indicated at Clause No. 3.50.4 (ii)(a) below will become 75% instead of 60%.

- ii. (a) **55% (Fifty-Five percent)** of Price Component of the First Contract of each identified equipment shall be paid, Pro-rata basis along with 100% of GST, on dispatch of material from manufacturer's work on production of the following: -
 - a. Application of payment along with three (3) copies of GST Invoice.
 - b. Material Dispatch Clearance Certificate (MDCC) issued by the Employer, wherever applicable as per relevant clause(s) of this Bid Document.
 - c. Indemnity Bond as per the **Annexure-5** of section V: Bid Response Sheets & Annexures.
 - d. Submission of Storage & Erection All Risk Insurance policy as per clause no. 3.56, only with the first Invoice.
- ii (b) **10% (Ten Percent)** of Price Component of the First Contract of each identified equipment shall be paid, Pro-rata basis, on receipt of material at Site on production of the following:-
 - a. Application of payment along with three (3) copies of GST Invoice.
 - b. Physical Verification & discrepancy report by RECPDCL for the equipment/material received and stored at site. Payment shall be released after making adjustment of discrepancies only.
- iii. **2.5 % (Two and half percent)** of Price Component of the First Contract shall be paid, pro-rata basis, on completion of erection of each identified equipment upon certification by the EIC.
- iv. **2.5 % (Two and half percent)** of Price Component of the First Contract shall be paid, pro-rata basis, on issuance of commissioning certificate of the entire plant or part thereof, as allowed by the Implementing agency (IA).

- v. **15 % (Fifteen percent)** Price Component of the First Contract shall be paid on final acceptance of the entire plant and issue of Work Completion Certificate by the Employer.

NOTE: The contractor may take MNRE exemption for taxes and duties & shall consider the same while submission of the Price Bid. All required documentation for getting any types of exemption in taxes falls with the Contractor's scope. Contractor may also consider High Sea Sales, Sale in Transit while submission of the Price Bid. However, all risks/responsibilities, costs, obligations and liabilities shall be with EPC Contractor. The Employer will endorse/sign the relevant documents wherever and whenever required.

3.50.5 TERMS OF PAYMENT FOR "SECOND CONTRACT"

The payment for the second contract shall be made as per following:

Maximum **10% (Ten percent)** of the value of the 'Second Contract' may be given as Mobilization Advance, at the interest rate of 50 basis point above one-year MCLR (Marginal Cost of Funds based Lending Rate) of State Bank of India prevailing on the date of payment and to be compounded quarterly. Without prejudice to any other mode of recovery available to the Employer, recovery of the Mobilization Advance shall start after the Contractor has received payment towards the Contract equivalent to 10% of Price Component of the 'Second Contract' and shall be effected on pro-rata basis against running bill of EPC contract in such a way that the full advance with interest there upon is recovered by the time 60% of the Price Component of the second Contract is to be paid or full amount shall be recovered within 10 months from the effective date of contract, whichever is earlier.

Advance shall be released on production of the following documents: -

- a) Unconditional and irrevocable Bank Guarantee for an amount equivalent to 110% of the advance amount as per **Annexure-4**.
- b) A copy of unconditional acceptance of the Letter of Award and signing of the Contract Agreement (if not submitted earlier against 3.50.4 (i)).
- c) Unconditional Bank Guarantee towards Contract Performance cum Security Guarantee (CPSG) as per Clause No. 3.48.1 (if not submitted earlier against 3.50.4 (i)).

The interest shall be calculated on the outstanding amount of principal from the date of release of advance till the date of recovery of the amount from the running bill of the contractor with quarterly compounding. The recovery of interest shall be started from the first running bill of second contract.

I. "Erection, Testing, Commissioning of Plant and Equipment including Handling and Unloading at site, Insurance Covers, Storage of the Plant and Equipment supplied under First Contract"

- i. **75% (Seventy Five Percent)** of Price component of Second Contract shall be paid, on Pro-rata basis along with 100% of GST, on production of the following: -
 - a) Application of payment along with three (3) copies of GST Invoice.

- b) Declaration from Contractor on claim of completed activities as per project schedule approved by RECPDCL.
 - c) Certification from EIC for completion of erection activities of claimed equipment.
 - d) Submission of documentary evidence by the Contractor towards having taken the insurance policy(ies) in terms of relevant provisions of Clause No 3.56.1 (Insurance).
- ii. **10 % (Ten percent)** of Price component of Second Contract shall be paid on successful completion of Performance Guarantee (PG) test of the complete Power Project and upon issue of Operational Acceptance Certificate by the Employer.
 - iii. **15 % (Fifteen percent)** of Price component of Second Contract shall be paid on Final Acceptance of the entire plant and issue of Work Completion Certificate by the Employer.

II. “All Civil, Architectural & Structural Works complete in all respects”

- i. **75% (Seventy Five Percent)** of the total Civil Works Price Component under the Second Contract shall be paid progressively along with 100% of GST, on production of the following:-
 - a) Application of payment along with three (3) copies of GST Invoice.
 - b) Certification by the EIC for the quantum of work completed/Milestones achieved and by the Employer’s field quality surveillance representative for the successful completion of quality check points involved in the quantum of work / Milestones billed.
 - c) Submission of documentary evidence by the Contractor towards having taken the insurance policy(ies) in terms of relevant provisions of Clause No. 3.56.1 (Insurance).
- ii. **(10%) Ten percentage** of total Civil Works Price Component under the Second Contract shall be paid on successful commissioning of the entire plant on production of the following:
 - a) Application of payment along with three (3) copies of GST Invoice.
 - b) Certification by EIC with regard to successful commissioning as specified in the Bid Document.
- iii. **(15%) Fifteen percentage** of total Civil Works Price Component under the Second Contract shall be paid on production of the following:
 - a) Application of payment along with three (3) copies of GST Invoice.
 - b) Certification by EIC with regard to Operational Acceptance as specified in the Bid Document.

3.50.6 TERMS OF PAYMENT FOR “THIRD CONTRACT”

- i. The payment for Third Contract shall be made on quarterly basis including GST on production of the following:
 - a) Application of payment for O&M Charges along with three (3) copies of GST Invoice.
 - b) Submission of Certificate for satisfactory performance of service issued by EIC.
 - c) Submission of documentary evidence towards having taken the insurance policy(ies) in terms of relevant provisions of Clause No. 3.56.2 (Insurance).
- ii. The quarter will be defined as a period of three months ending on 30th June, 30th September, 31st December and 31st March except last quarter of the third contract wherein, payment will be made for the number of days covered till the last scheduled date of the third contract on pro rata basis.

Also, payment for the first quarter of the third contract will be made for the number of days covered during this quarter on pro rata basis.
- iii. The payment for the last quarter of a Financial Year of the O&M contract will only be paid after deducting the compensation amount, to be calculated as per the Clause No-3.45, towards shortfall in Net Annual Guaranteed Generation (if any), pertaining to that year. This will, however, be relaxed to the extent of grid non-availability for evacuation and Force Majeure, during daylight power generation hours, which is beyond the control of the contractor.
- iv. Compensation amount towards the penalty imposed by Implementation Agency on RECPDCL, if any, due to reasons solely attributable to the contractor, shall be recovered from the O&M charges due for the quarter.
- v. If the amount payable under any interim bill is not sufficient to cover the compensations due as specified above in Clause 3.50.6 (iii), 3.50.6 (iv) and calculated as per clause 3.45, the balance outstanding shall either be recovered from the next payment immediately falling due or Contract Performance Guarantee towards O&M Contract.

3.50.7 DELAYED PAYMENT

Omissions on the part of the EIC to pay the amount due upon measurement or otherwise shall neither vitiate nor make the contract void. Further, no claim for interest or damages will be entertained or payable by the Employer upon

- (i) any Bank Guarantee or payments in arrears or retention of amount due to non-fulfillment of obligation on the part of the contractor
- (ii) any balance amount (to be paid if any) which may become due on final settlement/re-conciliation of the account at the time of closure of the contract or
- (iii) Amount withheld by the Employer owing to any dispute or difference between the parties.

The Contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy.

3.50.8 FINAL BILL

The final bill relating to the EPC Contract shall be prepared only when the equipment has been installed and tested for Final acceptance under Clause No 3.41 and it will include adjustment of all claims against the Contractor by the Engineer-in-Charge. The amount equivalent to losses or damages for which Contractor fails to settle claim with the insurer before completion of entire work would also be recovered from any amount due to contractor.

3.51 CONTRACT PRICE AND PRICE ADJUSTMENT

The Bidder shall give prices of EPC contract and O&M contract for 03 years as prescribed under Bid Response Sheet I to IV except otherwise specifically mentioned in the bid document, the prices shall remain FIRM during the entire period of Contract.

3.52 TAXES, DUTIES AND CESS

- a) Except as otherwise specifically provided in the contract, the Contractor shall bear and pay all taxes, duties, cess, levies and charges assessed on the Contractor, by all municipal, state or central government authorities.
- b) The contractor shall furnish proof of GST registration with GSTN Portal in the State in which the Project is being executed, covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the contractor on RECPDCL for this project/ work.
- c) Contractor shall submit to RECPDCL the GST compliant tax invoice/debit note/revised tax invoice on the basis of which RECPDCL may claim the input tax credit in its return.
- d) Tax invoice/debit Note/revised tax invoice shall contain all such particulars as prescribed in GST law.
- e) TDS under GST as applicable shall be deducted at prevailing rates from the running bills.
- f) The Contractor shall be responsible for the issuance of e-way bill and other compliances relating to e-way bill as per GST law. The existing provisions regarding road permit will continue till such time if applicable.

3.53 STATUTORY VARIATIONS

If, after the date seven (7) days prior to deadline for 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 items in respect of direct transactions between the Employer and the Contractor and Bought out items (to be dispatched directly from the sub-vendor's works to Employer's site). These adjustment shall not be applicable on procurement of raw materials, intermediary components etc. by the Contractor.

Benefits, if any allowed by UPNEDA and/or concerned authority regarding applicability of Safeguard Duty shall be covered under "statutory variations" beyond the effective date of contract till 29.07.2021 (as per Notification No. 02/2020-Customs (SG) on Solar Modules). Further, modification/changes in the rates of custom duty and/or antidumping duty shall also be covered under statutory variations, if allowed under change in law clause of RFS issued by UPNEDA.

The above adjustment however shall be restricted to schedule date of dispatch or actual whichever is less.

However impact of basic custom duty which will be applicable as per MNRE OM No: 283/3/2018-GRID SOLAR shall not be considered under Change in law.

3.54 NEW TAXES/LEVIES

- a. In case Government imposes any new levy / tax, after the date seven (7) days prior to deadline for date of bid submission, during the tenure of the contract, RECPDCL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of RECPDCL that such new levy / tax is applicable to this contract.
- b. Unless otherwise stipulated in Clause No. 3.53, any liability occurs due to, increase in the rate of GST or it is found that the actual rate of GST on any item is higher than the quoted rate, the same shall be borne by the contractor or recovered from any payment/amount due to the contractor if it is already paid/submitted or to be paid/submitted by RECPDCL to the statutory body/concerned authority.
- c. As regards the Indian Income Tax, Surcharge on Income Tax and any other Corporate Tax the Employer shall not bear any tax liability whatsoever. The Contractor shall be liable and responsible for payment of such tax, if attracted under the provisions of the law existing or subsequent and Employer will make tax deductions at source (TDS) as applicable.

3.55 DEDUCTION FROM CONTRACT PRICE

- 3.55.1 All costs, claims, damages or expenses which the Employer may have paid for which the Contractor is liable under the Contract, shall have to be refunded by the Contractor within 21 (Twenty-One) days of receipt of the bills. If the bills are not paid within the said period, this may be deducted by the Engineer-in-charge from the Performance Guarantee or from any money due or which will become due to the Contractor under this Contract.
- 3.55.2 The Employer shall be entitled to recover all dues in terms of the Contract including, but not limited to, Liquidated Damages for delay etc. by way of deductions from the payments due to the Contractor or that may become due to the Contractor in future or from any securities/guarantees under the Contract and/or otherwise.

3.55.3 In case of any dispute, the sum of money so obtained under this clause by the Employer will be kept withheld or retained as such by the Employer till all the claims arising out of the Contract is either mutually settled or determined by the Arbitrator, or by the competent Court, as the case may be, and that the Contractor shall have no claim for interest or damages whatsoever on this account ,subject to compliance of the Govt. of India Guidelines.

3.56 INSURANCE

3.56.1 INSURANCE FOR EPC CONTRACT

The Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified below. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, who should not unreasonably withhold such approval.

- I. Cargo/Marine All Risk Insurance:** Covering loss or damage occurring, while in transit from the Contractor's or Subcontractor's works or stores until arrival at the site including unloading, to the Plant and Equipment (including spare parts thereof) and to the Contractor's Equipment.

This policy shall cover 'ALL RISKS' under and /or on deck as per Institute Cargo Clause 'A'.

II. ERECTION ALL RISKS INSURANCE

Covering any physical loss or damage to the equipment during handling, transportation, storage, erection of the Facilities at the Site, occurring prior to completion of the Facilities, with extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the Defects Liability Period while the Contractor is on the Site for the purpose of performing its obligations during the Defect Liability Period.

III. THIRD PARTY INSURANCE

Before receipt of equipment at site but without limiting his obligations and responsibilities under this clause hereof, the Contractor shall insure against his liability for any equipment, material, property (including the Employer's property and any parts of the facilities that have been accepted by the Employer), or physical damage covering bodily injury or death suffered by third parties (including the Employer's personnel) by or arising out of the execution of the contract or in the carrying out of contract.

IV. WORKMEN'S COMPENSATION INSURANCE

The contractor shall protect himself against all claims applicable under the Workmen's Compensation Act, 1923. This policy shall also cover the contractor against claims for injury, disability, disease or death of his or his sub-contractor's employees, which for any reason are not covered under the Workmen's Compensation Act, 1923. The liabilities under Workmen's Compensation Insurance shall be as per statutory provisions.

Employer shall not be liable for or in respect of any damage or compensation payable in law in respect or in consequence of any accident or injury to any workman or other person in the employment of the contractor(s) or any sub-contractor(s), save and except an accident or

injury resulting from any act or default of the Employer.

3.56.1.2 The contractor shall at his own expense take out and maintain insurance cover during the performance of the contract as below:

| S.No. | Insurance | Sum Insured | Deductibles | Conditions | Validity Period |
|-------|---|---|---------------------------------|--|--|
| A. | Cargo/Marine all risk Insurance | Sum of (A+B) A= 100% of total Plant & Equipment F.O.R price i.e. sum of the total price of BRS P-II . B= 25% of A to cover taxes & duties etc | Minimum as per insurance policy | Open policy All risk insurance, SRCC (Strikes, Riots, Civil Commotion), terrorism etc | From 1st shipment to last shipment. |
| B. | Storage & Erection All Risk. | Sum of (A+B+C) A= 100% of total Plant & Equipment F.O.R price i.e. sum of the total price of BRS P-II . B= 100% of Erection, Commissioning & Civil/ structural works cost as per BRS P-III . C= 25% of Sum of (A+B) to cover taxes & duties etc. | Minimum as per insurance policy | <ul style="list-style-type: none"> • Installation risk, RSMD (Riots, Strikes, Malicious Damages), Earthquake Cover • Air Freight cover • Maintenance cover • Extra Charge Cover • Contractor's Plant & Machinery • Rs. 100 Lakhs Cross Liability • Employer & Contractor's Sub Contractor to be named as co-insured • Wind Gusting | From commencement of work on Site to the End of Defects Liability Period |
| C. | Third Party Liability (Extension EAR Policy) | INR 10.00 Crore Single Event Limit for bodily injury and property damage. (Ratio of 1:4) | Rs.2,50,000/- | Contractors, subcontractors to be named as co-insured. | From commencement of work on Site to the End of Defects Liability |

Note:

- The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Clause 3.56 except for Third Party Liability, Workman's

Compensation. Payment shall be released to the Contractor by the Insurance Company after receipt of NOC from the Employer. The appropriate Clause shall be incorporated in the Insurance Policy taken by Contractor to ensure this requirement.

- ii. In case the Contractor has taken/takes blanket insurance policy for “Erection All Risk policy” during storage and erection, such policy shall also be acceptable to Employer provided that; the name of the Employer and the Project is endorsed in the said policies.
- iii. The Contractor shall provide the Engineer-in-Charge with copies of all insurance policies and documents taken out by him in pursuance of the contract. Any amendment (s) of Insurance Policies, if required, shall be informed to the Contractor by Engineer-in-Charge. The Insurance Policies shall be amended by the Contractor within 15 days of the receipt of such request. In case, Contractor fails to submit amended Insurance Policy than no future/progressive payment shall be released.
- iv. The Contractor shall ensure that, where applicable, its Sub- contractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Subcontractors are covered by the policies taken out by the Contractor.
- v. It shall be the responsibility of the contractor to extend the period of insurance policy (ies) if required to comply with the provisions of contract. The Engineer-in-Charge shall inform the Contractor in writing at least thirty (30) days in advance from the date of expiry for the extension of the Insurance Policy. If the Contractor fails to extend the said policy within 15 days of notice period, RECPDCL reserves the right to extend the said policy and the cost of the premium paid towards extension of said policy shall be recovered/deducted from the amount payable/due to the Contractor.
- vi. The Contractor shall be responsible for preferring of all claims and make good the damages or loss by way of repairs and / or replacement of the work, damaged or lost. The Transfer of Title shall not in any way relieve the Contractor of the above responsibility during the period of contract. The Employer shall give to the Contractor all such reasonable assistance with respect to insurance claims in which the Employer’s interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the Employer.
- vii. Notwithstanding the insurance requirements mentioned above, it would be the Contractor's responsibility to take adequate insurance cover as may be pertinent to protect his interest and interest of the Employer. If at any point of time during execution of the Contract, the insurance policies are found to be inadequate, the Contractor shall take fresh insurance policies meeting aforesaid requirements.
- viii. 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 make good the damages or loss by way of repairs and/or replacement of plant and equipment damaged or lost and 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. Notwithstanding the extent of insurances cover and the amount of claim available from the underwriter, the contractor shall be liable to make good the full replacement/rectification of all the equipment/materials and to ensure their availability as per project requirement without additional financial liability to the Employer.

- ix. All cost on account of insurance liabilities covered under the contract will be to the Contractor's account and will be included in contract price.
- x. The Contractor shall arrange insurance with Indian Insurance Companies.

3.56.2 FOR O&M CONTRACT

INSURANCE DURING OPERATIONAL ACCEPTANCE AND O&M PERIOD

The Contractor shall at its expense take out and maintain in effect the insurances set forth below during Operational Acceptance and O&M Period. The insurances provided shall be seamless with the insurance provided during the construction period by the Bidder with no gap between the two:

I. FIRE & ALLIED PERIL INSURANCE

Insurance policy for Fire and allied perils must include clauses such as earthquake, flood, storms, cyclone, tempest, hurricane, inundation, typhoon, theft & burglary and Public Liability Insurance (Third Party), burglary, reinstatement/replacement value clause, earthquake cover, and RSMTD cover.

II. WORKMEN'S COMPENSATION INSURANCE

This insurance shall protect the Contractor against all claims applicable under the Workmen's Compensation Act, 1948

Workmen's Compensation Provisions As per Statutory

Employee's Liability Provisions As per Statutory

- ##### **III. COMPREHENSIVE GENERAL LIABILITY INSURANCE:**
- The insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others, due to any act or omission on the part of the Contractor, his agents, his employees, his representatives and Sub Contractors or from riots, strikes and civil commotion.

Note: The contractor is obliged to take all the O&M Insurances mentioned above for the project immediately after the commissioning of the plant.

3.57 DELAYS BY EMPLOYER OR ITS AUTHORIZED REPRESENTATIVE(S)

- 3.57.1 In case the Contractor's performance is delayed due to any act of omission on the part of the Employer, then the Contractor shall be given due extension of time for completion of the work, to the extent such omission on the part of the Employer has caused delay in the Contractor's performance of the contract. Regarding reasonableness or otherwise of the extension of time, the decision of the Engineer -in Charge shall be final.

- 3.57.2 In addition, the Contractor shall be entitled to claim demonstrable and reasonable

compensation if such delays have resulted in any increase in cost. The Employer shall examine the justification for such a request for claim and if satisfied, the extent of compensation shall be mutually agreed depending upon the circumstances at the time of such an occurrence.

3.58 DELAYS IN THE CONTRACTOR'S PERFORMANCE

3.58.1 Delivery of the Goods and performance of Services shall be made by the Contractor in accordance with the time schedule prescribed by the Employer in Bid Document.

3.58.2 Except as provided under Conditions of Contract Clause No 3.59, a delay by the Contractor in the performance of its obligations shall render the Contractor liable to the imposition of liquidated damages pursuant to Conditions of Contract Clause 3.49 unless an extension of time is agreed upon pursuant to Conditions of Contract Clause 3.61 without the application of liquidated damages.

3.59 FORCE MAJEURE

3.59.1 Notwithstanding the provisions of Condition of Contract Clause No. 3.49, 3.64 and 3.58, the Contractor shall not be liable for forfeiture of its Contract Performance Guarantee, liquidated damages or termination for default if and to the extent that the delay in performance or other failure to perform its obligations under the contract is the result of an event of Force Majeure.

3.59.2 "Force Majeure" shall mean any event beyond the reasonable control of the Employer or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected, and shall include, without limitation, the following:

- i. war, hostilities or war like operations (whether as state of war be declared or not), invasion, act of foreign enemy and civil war,
- ii. rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion and terrorist acts,
- iii. confiscation, nationalization, mobilization, commandeering or requisition by or under the order of any government or de jure or de facto authority or ruler or any other act or failure to act of any local state or national government authority,
- iv. sabotage, embargo, import restriction, port congestion, lack of usual means of public transportation and communication, shipwreck, shortage or restriction of power supply, epidemics, quarantine and plague; but does not include any strike/ lockout and any type of agitation/gherao/dharna by local communities causing restriction/blockade to the 'right of way' to the site or causing hindrance to the working of the Project,
- v. earthquake, landslide, volcanic activity, fire, flood/ flash flood or inundation, tidal wave, typhoon or cyclone, hurricane, storm, lightning, or other inclement weather condition, nuclear and pressure waves or other natural or physical disaster; but does not include incessant rain,
- vi. Shortage of labour, materials or utilities where caused by circumstances that are

themselves Force Majeure.

vii. Any other condition(s) specific to the opportunity/RfS.

3.59.3 If a Force Majeure situation arises, the Contractor shall promptly notify RECPDCL in writing of such condition and the cause thereof. Unless otherwise directed by RECPDCL in writing, the Contractor shall continue to perform its obligations under the contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

3.59.4 The Contractor or RECPDCL shall not be liable for delays in performing their respective obligations resulting from and to the extent applicable and necessitating rescheduling, if any, of the balance critical activities to any Force Majeure causes as referred to and/or defined above. The date of completion will, be extended by a reasonable and justifiable time.

3.59.5 The delay in fulfilment by the Parties of their obligations under this Contract shall not exceed the duration of Force-Majeure circumstances and also their consequences.

3.59.6 If the performance of the contract is delayed for more than six (6) months for one of the reasons mentioned above, the performance of contract shall be continued on mutual terms & conditions.

3.59.7 Force majeure shall not apply to RECPDCL's obligations to make payment for the work done under the contract.

3.59.8 The contractor shall not claim any compensation for force majeure conditions and shall take appropriate steps to ensure man & material utilized by it under the contract well in advance.

3.60 SUSPENSION OF WORK

3.60.1 The Employer reserves the right to suspend and reinstate execution of the whole or any part of the work. Order for suspension or reinstatement of the works will be issued by the Engineer-in-charge to the Contractor in writing. The Time for Completion of the works will be extended for a period equal to the duration of the suspension.

3.60.2 Any necessary and demonstrable costs incurred by the Contractor, as a result of such suspension of the works, will be paid by the Employer, provided that such costs are substantiated to the satisfaction of the Employer. The Employer shall not be responsible for any liabilities if suspension or delay is due to some default on the part of the Contractor or his Sub-Contractor

3.61 EXTENSION OF TIME FOR COMPLETION

3.61.1 Except where otherwise specifically provided in the Contract, if at any time during performance of the contract, the Contractor should encounter conditions impeding timely delivery of the Goods/execution of the contracts, the Contractor shall promptly notify the Employer in writing of the fact of the delay, its likely duration and its cause(s) together with particulars of the event or circumstance and supporting documents/data/records, hindrance register, evidence(s) justifying such extension as soon as reasonably practicable after the

commencement of such event or circumstance. Following documents shall become principal basis for consideration of time extension: -

- i. Records maintained in the Hindrance Register
- ii. Minutes of Weekly Project Review Meeting
- iii. Minutes of Monthly Project Review Meeting
- iv. Written notices issued by EIC or his authorized representative to contractor in relevant period.

As soon as practicable after receipt of the Contractor's notice, the Employer shall evaluate the situation and may at its discretion extend the Contractor's time for performance, with or without levy of Liquidated Damages, in which case the extension shall be ratified by the parties by amendment of the contract.

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

3.62 BANKRUPTCY

3.62.1 If the Contractor shall become bankrupt or have a receiving order made against him or compound with his creditors, or being a Corporation commence to be wound up, not being a voluntary winding up for the purpose only of amalgamation reconstruction, or carry on its business under a receiver for the benefit of its creditors or any of them, the Employer will be at liberty.

- a) To terminate the contract forthwith by notice in writing to the liquidator or receiver or to any person in whom the contract may become vested and to act in the manner entitled 'Contractor's Default', as though the last-mentioned notice has been the notice referred to in such clause and the equipment and materials have been taken out of the Contractor's hands
- b) To give such liquidator, receiver, or other person the option of carrying out the contract subject to his providing a guarantee, for the due and faithful performance of the contract, up to an amount to be determined by the Employer.

3.63 CONTRACTOR'S DEFAULT

3.63.1 If the Contractor shall neglect to execute the works with due diligence and expedition or shall refuse or neglect to comply with any reasonable orders given to him in writing by the Engineer-in-charge in connection with the works, or shall contravene the provisions of the Contract, the Employer may give notice of default, in writing to the Contractor to make good the failure, neglect or contravention complained of. Should the Contractor fail to comply with the notice within thirty (30) days or otherwise, for a period of time as may be decided by the Engineer-in-charge from the date of service thereof, then and in such a case, the Employer shall be at liberty to employ other workmen and forthwith execute such part of the works as the Contractor may have neglected to do or, if the Employer shall think fit, without prejudice to any other right he may have under the Contract, to take the works wholly or in part out of the Contractor's hand and enter into a separate Contract with any other person or persons to complete the works or any part thereof. In such event, the Employer shall have free use of all

the Contractor's equipment that may have been at that time at the site in connection with the works, without being responsible to the Contractor for wear and tear thereof and to the exclusion of any right of the Contractor over the same, and the Employer shall be entitled to retain and apply any balance which may otherwise be due under the Contract by him to the Contractor, or such part thereof as may be necessary, to the payment of cost of executing the said part of the works or of completing the works, as the case may be. If the cost of completing the works or executing a part thereof as aforesaid shall exceed the balance due to the Contractor, the Contractor shall pay such excess amount. Such payment of excess amount shall be independent of the Liquidated Damages for delay that the Contractor shall have to pay if the completion of works is delayed.

3.63.2 In addition, such action by the Employer as aforesaid shall not relieve the Contractor of his liability to pay Liquidated Damages for delay in completion of works as defined in the Contract.

3.63.3 The termination of the Contract under this Clause shall not entitle the Contractor to reduce the value of the Contract Performance Guarantee nor the time thereof. The Performance Guarantee shall be valid for the full value and for the full period as originally stipulated in the Contract, including Guarantee Period.

3.64 TERMINATION OF CONTRACT ON CONTRACTOR'S DEFAULT

3.64.1 RECPDCL, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Contractor, by registered A/D may terminate this contract in whole or in part in any of the following cases:

(a) If the Contractor fails to perform any obligation(s) under the contract or

(b) If the Contractor, in the judgment of RECPDCL has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

3.64.2 In the event RECPDCL terminates the contract in whole or in part, pursuant to Condition of Contract Clause 3.64.1, RECPDCL may procure, upon such terms and in such manner as it deems appropriate, Goods or Services similar to those undelivered at the risk and cost of the Contractor and without any prejudice to any right of the Employer provided in the Contract. The Contractor shall be liable to RECPDCL for any excess costs for such similar Goods or Services. However, the Contractor shall continue performance of the contract to the extent not terminated. The Contractor, however, shall under no circumstances, be entitled to any gain on account of such action by the Employer

3.64.3 In case of termination of the contract due to contractor's default, the contractor may be debarred from participation in future tenders by the employer, through a communication in writing for a period to be specified therein.

3.65 TERMINATION OF THE CONTRACT ON THE EMPLOYER'S INITIATIVE

3.65.1 The Employer reserves the right to terminate the Contract either in part or in full due to reasons other than those mentioned under the Clause No 3.63 & 3.64 of this Bid Document. The Employer, shall, in such an event, give 30 (Thirty) days' notice in writing to the Contractor of his decision to do so.

3.65.2 The Contractor, upon receipt of such notice, shall discontinue the work on the date and, to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and Contracts to the extent they are related to the work terminated and upon terms favourable to the Employer, stop all further sub-Contracting or purchasing activity related to the work terminated, and assist the Employer in maintenance, protection and disposition of the works acquired under the Contract by the Employer.

3.65.3 In the event of such termination, the Contractor shall be paid compensation, equitable and reasonable dictated by the circumstances prevalent at the time of termination, as decided by the Employer.

3.66 TERMINATION DUE TO INSOLVENCY

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

3.67 FORECLOSURE OF CONTRACT IN FULL OR PART DUE TO ABANDON OR REDUCTION IN SCOPE OF WORK

If at any time after acceptance of the Bid the Employer decides to abandon or reduce the scope of the works for reason whatsoever and hence does not require the whole or any part of the work to be carried out, the Engineer-In-Charge shall give notice in writing to that effect to the Contractor and the Contractor shall have no claim to any Payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he could not derive in consequence of the foreclosure of the whole or part of the works. The Contractor shall be paid at Contract rates for actual amount of the works executed at site

3.68 SETTLEMENT OF DISPUTES

3.68.1 ADJUDICATOR

- i) 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.
- ii) The dispute adjudication board (DAB) shall consist of either one or three suitably qualified persons ("the Members").
- iii) 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.

- iv) 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 one hundred eighty (180) 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.
- v) Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not fulfilling its functions in accordance with the provisions of the Approvals 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 (the CMD, RECPDCL Ltd). 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.

3.68.2 **ARBITRATION**

- i. 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 one hundred eighty (180) 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.
- ii. Any dispute in respect of which a notice of intention to commence arbitration has been given, in accordance with the above clause, shall be finally settled by arbitration. Arbitration may be commenced prior to or after completion of the Facilities.
- iii. **In case the Contractor is a Public Sector Enterprise or a Government Department:/Organization**

In the event of any dispute or difference relating to the interpretation and applications of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations(excluding disputes concerning Railways, Income Tax, Customs & Excise Department) such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative mechanism for resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE (GM)/FTS-1835 dated 22-05-2018 and any subsequent amendment(s) issued from time to time .

- iv. **In case the contractor is not a Public Sector Enterprise or a Government Department/Organization:**

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.

- a) 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 (the CMD, RECPDCL Ltd).

- b) 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.
- c) 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 and a substitute shall be appointed in the same manner as the original arbitrator.
- d) Arbitration proceedings shall be conducted in accordance with the Arbitration and Conciliation Act, 1996 and any amendment(s) thereto as issued by the Govt of India from time to time. The venue of arbitration shall be at Delhi/ the place where the Solar Power Project is located.
- e) 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.
- f) The arbitrator(s) shall give reasoned award.
- g) Notwithstanding any reference to the arbitration herein, the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree.

3.69 GOVERNING LANGUAGE

The bid prepared by Bidder and all correspondence/ drawing/ documents relating to the bid between Bidder and RECPDCL shall be written in English language only. In case the literature is furnished in another language, same may be accompanied by English translation duly authenticated by the authorized translator. The English version shall govern in case of any variation.

3.70 APPLICABLE LAW/ JURISDICTION

The Contract shall be governed by and interpreted in accordance with the laws of land. The Courts governing the territorial jurisdiction of the Solar Power Project shall have exclusive jurisdiction in all matters arising under the contract.

3.71 TRANSFER OF OWNERSHIP

3.71.1 The title of the equipment and materials supplied by the Contractor to RECPDCL would be

transferred to RECPDCL upon receiving the goods at site. This Transfer of Title shall not be construed to mean the acceptance and the consequent “Final Acceptance” of equipment and material. The Contractor shall continue to be responsible for the quality and performance of such equipment and material and for their compliance with the specification during the entire period of the performance of the contract.

- 3.71.2 This transfer of Title shall not relieve the Contractor from the responsibility of all risks of loss and damage to the equipment and material as specified under the Clause No 3.19 of this Bid Document.

3.72 INDEMNITY TO RECPDCL

- 3.72.1 The Contractor shall at all times indemnify and keep indemnified RECPDCL against all losses and claims for injuries or damages to any person or property whatsoever which may arise out of consequence of the execution of the works and against all claims, demands, proceedings including civil and criminal, damages, cost, charges and expenses whatsoever in the respect of or in settlement thereto.
- 3.72.2 The Contractor shall at all times indemnify RECPDCL against any claim which may be made under Workmen’s Compensation Act or any statutory modifications thereof or otherwise for or in respect of any damage or compensation payable in consequence of any accident or injury sustained by any workman or other person whether in the employment of the Contractor or not.
- 3.72.3 The Contractor shall at all times keep RECPDCL indemnified against all claims, damages or compensation under the provisions of payment of Wages Act, 1936, Minimum Wages 1948, Employees Liability Act 1938, The Workmen’s Compensation Act, 1923, Equal remuneration Act-1976, Employment of Child Labor Act –1938, Abolition of bonded labor Act and the Contract Labour (Regulation and abolition) Act-1970 or any other Acts regulating the employment of Labour by Contractor.
- 3.72.4 The Contractor shall at all times indemnify RECPDCL against all claims which may be made in respect of the plant and machinery for infringement of any right protected by patent, registration of design and trade mark. Provided always that in the event of any claim in respect of any alleged breach of patent, registered designs or trade mark made against RECPDCL, the same shall be notified to the Contractor and Contractor shall at his own cost either settle any such dispute or conduct any litigation that may arise there from

3.73 LAW PERTAINING TO LABOUR

- 3.73.1 This contract shall be governed by the various Labour Laws for the time being in force in India or in the state where the project is located. The Contractor shall be responsible for compliance of all applicable central, state & municipal laws, Panchayat Raj Act& rules & legislation in force from time to time at work site & shall be solely responsible to comply with all obligations & payments there under.
- 3.73.2 No compensation will be entertained for the liabilities arising out of any provision of any act, Law, rules, & legislation in force from time to time pertaining to labour. In case RECPDCL is liable to pay any charges/penalty arising out of noncompliance by the Contractor, the same

shall be recovered from the Contractor.

- 3.73.3 The contractor shall provide an updated list of sub-contractors and their laborers every month and ensure that all the payments are made to the Subcontractor/vendors using digital payment methods.
- 3.73.4 Identification of designated place(s) to store different types of waste such as not recycled and hazardous waste materials. Waste shall be segregated at a source and removed by a licensed waste removal contractor.
- 3.73.5 Broken PV panels must be collected as electric and electronic equipment waste paying particular attention to avoid environmental pollution by parts of the panel.

3.74 COMPLIANCE WITH REGULATIONS

- 3.74.1 Unless otherwise specified, all works / supply, to the extent applicable, shall be carried out in accordance with the Indian Electricity Act, 2003, the Indian Electricity Rules, 1956 or any amendment / order thereof, which may be issued during the currency of the Contract and the requirements of any other Rules, Regulations and Act in India to which the Employer may be subjected to.
- 3.74.2 The Contractor shall comply with all applicable laws, or ordinances, codes, approved standards, rules and regulations and shall procure all necessary Municipal and Government permits, licenses etc., at his own cost. The Contractor shall leave the Employer and Engineer-in-charge harmless as a result of any infraction thereof.

3.75 REGULATIONS OF LOCAL AUTHORITIES

- 3.75.1 The Contractor shall, throughout the continuance of the Contract and in respect of all matters arising out of the performance thereof, comply the laws, rules and regulations of the Local Authorities. The contractor shall also comply with the Minimum Wages Act, 1948, Payment of Wages Act 1936, the Contract (Regulation and Abolition) Act 1970 and other Act, Laws, Rules and Regulations applicable in performance of the Contract. All registrations, permissions, inspections, rights etc., required for execution of the Contract shall be arranged by the Contractor himself at his own cost. The Employer will provide the necessary documentary assistance to the extent possible, in obtaining the same. The Employer shall not, be responsible for delay on this account.
- 3.75.2 If, under any statute/law, any registration, permission, inspection, right etc., is required to be arranged specifically by the Employer, this shall be brought to the notice of the Employer by the Contractor along with the Bid.

3.76 NOTICES

- 3.76.1 Any notice given by one party to the other pursuant to this contract shall be sent to the other party in writing or by E-mail or facsimile and confirmed in writing to the other party's address specified in Contract Document.
- 3.76.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

3.77 ENVIRONMENTAL LAWS

The Contractor shall comply with all applicable codes, laws, rules and regulations relating to actual or potential effect of the activities on and at the project contemplated by executing this project on the environment, the disposal of material, the discharge of chemicals, gases or other substances or materials into the environment, or the presence of such materials, chemicals, gases or other substances in or on the project.

3.78 DISPOSAL OF SCRAP

3.78.1 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.

3.78.2 The term 'Scrap' shall refer to scrap/waste/remnants arising out of the unpacking of equipment, construction debris, 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.

3.78.3 The disposal of such Scrap shall vest with the Contractor for the items supplied by contractor and issued by the Employer under this contract for installation and construction without any adjustment to the Contract Price. 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.

3.78.4 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 Annexure 6 of Section-V: Bid Response Sheets and Annexures). 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

The Contractor has to ensure that all Solar PV Modules after their end of useful life (when they become defective/ non-operational /non repairable), are disposed in accordance with "E-Waste (Management and Handling Rules)-2011' notified by the government as revised / amended from time to time

3.79 POWER OF ENTRY

3.79.1 In case the Contractor does not execute the work in the manner described in the contract documents or if he shall at any time in the opinion of the Engineer-in-Charge:

- i) Fail to operate & maintain the plant in conformity with contract document or
- ii) Substantially suspend work or the works for a continuous period of 15 days without permission from the engineer in charge, or
- iii) Fail to carry on and execute the works to the satisfaction of the engineer in charge, or

iv) Commit or suffer or permit any other breach of any of the provisions of the contract on his part to be performed, or

v) If the Contractor abandons the works, or

vi) If the Contractor during the continuance of the contract becomes bankrupt.

3.79.2 In any of such events, RECPDCL shall have the power to revoke the Contract Agreement to operate and maintain the plant. Contractor shall vacate the project premises immediately and shall have no right of entry thereafter. RECPDCL will de-facto control the plant, materials, spares, equipment, tools, stocks etc. and continue to have access to common facilities thereon.

3.80 VACATION OF THE PROJECT PREMISES AFTER EXPIRY OF TERM

After the expiry of the period of contract or extension thereof as the case may be, Contractor shall ensure that the plant is in operationally fit and running condition. The Contractor shall demonstrate Performance Guarantee test of the whole plant. While vacating the project premises, Contractor shall hand over all technical documents, literature, and instruction manuals, lists of spare parts, tools & tackles etc. Contractor shall also hand over all the relevant record/documents.

3.81 SCHEDULING AND FORECASTING

The contractor shall be responsible for scheduling & forecasting for the Solar power project on behalf of the Employer as specified elsewhere in the Contract documents, to comply with statutory requirements, Regulations, Orders etc as per applicable Regulations, guidelines, Orders etc issued by CERC/SERC/STU/CTU/SLDC /designated agencies. Contractor shall provide Communication Connectivity of pooling station to STU/CTU Grid for the purpose of scheduling & forecasting.

3.82 DEFECTS/ NON ACHIEVEMENT OF PLANT DEPENDABLE CAPACITY AT THE TIME OF VACATING PROJECT PREMISES

In order that the Contractor could obtain a Vacation Certificate, he shall rectify any defect / non-achievement of plant dependable capacity in accordance to the norms of manufacturer arising from the defective Operation & maintenance practices or noncompliance of Prudent Utility Practices or that may have been noticed or developed during/ after the project premises has been vacated, the period allowed for carrying out such works will be normally one month. If any defect could not be remedied or plant dependable achievement capacity in accordance to the norms of manufacturer could not be achieved within a reasonable time, RECPDCL may proceed to do the work at Contractors risk and cost and recover such amount, as may be decided by RECPDCL from any amount due. Non-realization of such amount shall not debar RECPDCL to recover the amount through Court of Law.

All the aforesaid safeguards /rights provided for RECPDCL shall not prejudice its other rights/remedies elsewhere provided herein and/or under law.

3.83 GRAFTS AND COMMISSIONS ETC

Any graft, commission, gift or advantage given, promised or offered by or on behalf of the Contractor or his partner, agent, officers, director, employee or servant or any one on his or their behalf in relation to the obtaining or to the execution of this or any other contract with

the Employer, shall, in addition to any criminal liability which it may incur, subject the Contractor to the cancellation of this and all other contracts and also to payment of any loss or damage to the Employer resulting from any cancellation. The Employer shall thus be entitled to deduct the amounts so payable from any monies otherwise due to Contractor under the contract.

3.84 CORRUPT AND FRAUDULENT PRACTICE

- 3.84.1 **"Fraudulent Practice"** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
- 3.84.2 **"Corrupt Practice"** means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.
- 3.84.3 **"Collusive practice"** means a scheme or arrangement between two or more Bidders, with or without the knowledge of the Employer, designed to establish bid prices at artificial, non-competitive levels.
- 3.84.4 **"Coercive Practice"** means harming or threatening to harm, directly or indirectly, persons or thereto influence their participation in the procurement process or affect the executive of a contract.

3.85 LIMITATION OF LIABILITY :

- 3.85.1 Except in cases of criminal negligence or willful misconduct,
- a) The Contractor shall not be liable to the Employer, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the contractor to pay liquidity damages to the employer and
 - b) The aggregate liability of the Contractor to the employer, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to any obligation of the contractor to indemnify the employer with respect to patent infringement.

*****END OF SECTION*****

SECTION V

BID RESPONSE SHEETS (BRS)

AND

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BID FORM

To

**Additional CEO
REC World Headquarters
Plot Number 1-4, D-Block
Sector-29, Gurugram – 122001, Haryana**

Subject: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND O&M FOR THREE YEARS OF 125 MW_{AC} (50 MW_{AC} & 75 MW_{AC}) OF SOLAR POWER PROJECT AT KANPUR DEHAT & JALAUN DISTRICT IN UTTAR PRADESH

Dear Sir,

1. After examining / reviewing the Bid Document for “NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.”
2. vide Bid Document No - RECPDCL/CHQ/ECD/SPP-UPNEDA/2021 comprising “Notice Inviting Tender”, “Instructions to Bidders”, “Technical Specification”, "Conditions of Contract", "Bid Response Sheets [BRS], Attachments & Annexures” etc.; including amendments/ addendums/ corrigendum / clarifications to the Bid Document, the receipt of which is hereby duly acknowledged, we, the undersigned Bidder, express to execute the whole part of the work in conformity with the said Bid Document.
3. We hereby confirm that this Bid is valid for a period of 180 Days "from the last date of bid closing as per NIT or any extension thereof", and it shall remain binding upon us and may be accepted by any time before the expiry of that period.
4. Until a final Agreement is prepared and executed, the Bid together with your written acceptance thereof in your Letter of Award shall constitute a binding Agreement between us.
5. We understand that Bid Document is not exhaustive and any action and activity not mentioned in Bid Document but may be inferred to be included to meet the intent of the Bid Document shall be deemed to be mentioned in Bid Document unless otherwise specifically excluded and we confirm to perform for fulfilment of "Agreement" and completeness of the Work in all respects within the time frame and agreed price.
6. **Attachments to the Bid Form**
In line with the requirement of the Bid Document, we enclose herewith the following Attachments to the Bid Form:
 - (i) **Attachment-1: Power of Attorney**
A power of attorney, as per Clause No 2.12.3, indicating that the person(s) signing the Bid has the authority to sign the Bid and that the Bid is binding upon the Bidder

during the full period of its validity in accordance with Clause No 2.11.

(ii) Attachment-2: Submission of GST Details

Bidders have to submit the GST details of their company at Attachment- 2 of Section-V :BRS & Annexures of this Bid Document.

(iii) Attachment-3: Declaration regarding Bid Security/Earnest Money Deposit requirement

Bidder shall submit the declaration regarding Bid security/EMD requirement as per format specified at Attachment-3 of Section-V :BRS & Annexures of this Bid Document.

(iv) Attachment-4:Pre- Contract Integrity Pact

Integrity Pact duly signed between Employer and the Bidder in accordance with Clause No 2.30.

(v) Attachment-5: Declaration regarding Blacklisting

(vi) Attachment-6 :No Deviation Certificate

The Bidders shall submit a “No Deviation Certificate” to the updated bidding document in accordance with Clause No 2.13 of this Bid Document.

(vii) Attachment-7: Electronic Fund Transfer (EFT) details of the Bidder

(viii) Attachment-8: Financial data of the Bidder

Bidder shall submit the financial data as Attachment-8 of this Bid Document along with scanned copy of all the supporting documents (Annual reports, Annual Financial statements, Net worth certificate etc.) to demonstrate fulfilment of the financial criteria as per Clause No. 1.4.3 of this Bid Document.

(ix) Attachment-9: Estimated Bill of Quantities

(x) Attachment-10: Net Annual Guaranteed Generation for the proposed Solar PV Power Plant

Bidder shall quote the Net Annual Guaranteed Generation for three years to be determined as per Appendix-A to Attachment-10 along with the documentary proof for arriving at the Declared Net Annual Guaranteed Generation (NAGG) such as Energy Estimation Report using the latest software such as PV Syst, Meteonorm.

(xi) Attachment -11: Time Schedule

Bidder shall submit the detailed activity wise Time schedule (L1 Schedule) in the form of PERT Chart covering all aspects like ordering, site preparation, Supply, erection, installation, testing & commissioning, etc. along with the bid.

- (xii) **Attachment-12: List of Vendors/sub-contractors proposed to be engaged.**
- (xiii) **Attachmnt-13: Mandatory Information to be submitted by the Bidder.**
- (xiv) **Attachment-14 : Undertaking regarding offline submission.**
- (xv) **Attachment 15: Format for Month Wise Target Generation for the proposed Solar PV Power Plant**
- (xvi) **Attachment -16 : Undertaking regarding restrictions imposed by the Government of India.**
- (xvii) **Deleted**
- (xviii) **Attachment -18 : Declaration by Holding Company pursuant to clause 1.4.2 (i)**
- (xix) **Attachment-19: Schedule of Tools & Tackles for Erection, Testing, Commissioning and O&M.**

PRICE SCHEDULES

In line with the requirements of the Bid Document, we confirm that we have uploaded & submitted the following Price Schedules on the portal www.RECPDCL.abcprocure.com, duly filled-in as per your Performa

- a) **PBRS No-I:** Summary of Prices
- b) **PBRS No II:** Schedule of Price for Supply of Plant and Equipment at site complete in all respect.
- c) **PBRS No III:** Schedule of Price for Erection, Testing, Commissioning of Plant & Equipment, Performance Demonstration and Operational Acceptance including, Unloading, Handling at Site, Insurance Covers, Storage of the Plant & Equipment supplied under First Contract and all Civil, Architectural & Structural Works complete in all respect.
- d) **PBRS No IV:** Schedule of Price for Operation & Maintenance of the Solar PV Power Project for 3 years from the date of Operational Acceptance including O&M spares and consumables.
- e) **PBRS No V:** Schedule of applicable existing GST Rate on the equipment supplied under the First Contract, Second and third contract (as on the date seven (7) days prior to deadline for date of submission of Bids).

Place:

Date:

Name:

Designation:

Name of company

Duly authorized to sign Bid for and on behalf of _____
(name of firm/company)

Business Address for communication:

Telephone No :

Fax No :

E-mail address :

Legal status : Company/Firm:

Place of incorporation :

ATTACHMENT-1

POWER OF ATTORNEY

Bidder to furnish Power of Attorney in accordance with ITB Clause No 2.12.3 of this Bid Document.

ATTACHMENT-2

GST DETAILS

Bidders have to submit the GST details of their company.

ATTACHMENT-3

FORMAT FOR DECLARATION OF BID SECURITY/EARNEST MONEY DEPOSIT

No.

Date

Subject: Declaration of bid security/EMD Requirement.

We _____ (insert name of the Bidder) hereby provide this undertaking to RECPDCL, in respect to our response to NIT vide no RECPDCL/CHQ/ECD/SPP-UPNEDA/2021. We undertake that we will abide by the provisions of the NIT including bid document, during the bid validity period.

We undertake not to withdraw or modify our bid during the bid validity period, in line with provisions of the NIT including bid document. In case we withdraw or modify our response to the NIT including bid document during the bid validity period, or violate other provisions of the NIT including bid document which make the bid non-responsive under Clause 2.32.1 of ITB part of bid document. We, _____ (insert name of the Bidder) shall be treated as ineligible from participating in any of the upcoming tenders issued by RECPDCL for a period of 01 year from the date of default as notified by RECPDCL.

Further, We _____ (insert name of the Bidder) shall be ineligible from participation in re-tendering of this particular tender.

(Name and Signature of the Authorized Signatory)

FORMAT FOR PRE-CONTRACT INTEGRITY PACT

Between

_____, a company incorporated under the relevant law in the matter and having its registered office at _____, hereinafter referred to as “The Employer” which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns of the **First Part**.

And

M/s _____, a company/ firm/ individual (status of the company) constituted in accordance with the relevant law in the matter and having its registered office at _____ represented by Shri _____, hereinafter referred to as “The Bidder/Contractor” which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns of the **Second Part**.

WHEREAS the Employer proposes to procure under laid down organizational procedures, contract/s for ----- (Name of the work/ goods/ services) and the Bidder/Contractor is willing to offer against NIT No.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

Enabling the Employer to obtain the desired said (work/ goods/ services) at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling the Bidder(s)/Contractor(s) to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the Employer will commit to prevent corruption, in any form, by its officials by following transparent procedures.

1.0 Commitments of the Employer

1.1 The Employer undertakes that no official of the Employer, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the Bidder/Contractor, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

- 1.2. The Employer will, during the pre-contract stage, treat all the Bidders/Contractors alike, and will provide to all the Bidders/Contractors the same information and will not provide any such information to any particular Bidder/Contractor which could afford an advantage to that particular Bidder/Contractor in comparison to other Bidders/Contractors.
- 1.3. All the officials of the Employer will report to the appropriate Authority any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.
- 1.4 In case any such preceding misconduct on the part of such official(s) is reported by the Bidder to the Employer with full and verifiable facts and the same is prima facie found to be correct by the Employer, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the Employer or Independent External Monitor and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the Employer the proceedings under the contract would not be stalled.

2.0 Commitments of the Bidder(s)/Contractor(s)

The Bidder(s)/Contractor(s) commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following :-

- 2.1 The Bidder(s)/Contractor(s) will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.
- 2.2 The Bidder/Contractor further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with Employer for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with Employer.
- 2.3 The Bidder(s)/Contractor(s) shall disclose the name and address of agents and representatives and Indian Bidder(s)/Contractor(s) shall disclose their foreign principals or associates.
- 2.4 The Bidder(s)/Contractor(s) shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid/contract
- 2.5 The Bidder, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the Employer or their family members, agents, brokers or any other

intermediaries in connection with the contract and the details of services agreed upon for such payments.

- 2.6 The Bidder/Contractor will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 2.7 The Bidder/Contractor will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.
- 2.8 The Bidder/Contractor shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the Employer as part of the business relationship, regarding plans, technical proposals and business details, including information contained in electronic data carrier. The Bidder/Contractor also undertakes to exercise due and adequate care lest any such information is divulged.
- 2.9 The Bidder(s)/Contractor(s) commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.
- 2.10 The Bidder(s)/Contractor(s) shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.
- 2.11 If the Bidder/Contractor or any employee of the Bidder/Contractor or any person acting on behalf of the Bidder/Contractor, either directly or indirectly, is a relative of any of the officers of the Employer, or alternatively, if any relative of an officer of the Employer has financial interest/stake in the Bidder(s)/Contractor(s) firm(excluding Public Ltd. Company listed on Stock Exchange), the same shall be disclosed by the Bidder/Contractor at the time of filling of tender.

The term 'relative' for this purpose would be as defined in Section 2(77) of the Companies Act 2013.

- 2.12 The Bidder(s)/Contractor(s) shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the Employer.
- 2.13. The Bidder/supplier shall follow all rules and regulations of India including statutory requirements like minimum wages, ESIC and EPF.

3.0 Previous Transgression

- 3.1 The Bidder(s)/Contractor(s) declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any country in respect on any corrupt practices envisaged hereunder or with any Public Sector Enterprise / Government Department in India and in _____ (*Employer's country*).

- 3.2 The Bidder agrees that if it makes incorrect statement on this subject, Bidder can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

4.0 Earnest Money (Security Deposit)

The provision regarding Earnest Money/Security Deposit as detailed in the Notice Inviting Tender (NIT) and Instruction to Bidders (ITB) section of the Bid Document is to be referred.

5.0 Sanctions for Violations

- 5.1 Any breach of the aforesaid provisions by the Bidder/Contractor or any one employed by it or acting on its behalf shall entitle the Employer to take action as per the procedure mentioned in the “**Guidelines on Banning of Business Dealings**” attached as **Annex-A** and initiate all or any one of the following actions, wherever required:-

- (i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the Bidder/Contractor. However, the proceedings with the other Bidder(s)/Contractor(s) would continue.
- (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is Signed) shall stand forfeited either fully or partially, as decided by the Employer and the Employer shall not be required to assign any reason thereof.
- (iii) To immediately cancel the contract, if already signed, without giving any compensation to the Contractor. The Bidder/Contractor shall be liable to pay compensation for any loss or damage to the Employer resulting from such cancellation/rescission and the Employer shall be entitled to deduct the amount so payable from the money(s) due to the Bidder/Contractor.
- (iv) To encash the Bank guarantee, in order to recover the dues if any by the Employer, along with interest as per the provision of contract.
- (v) To debar the Bidder/Contractor from participating in future bidding processes of Employer, as per provisions of “Guidelines on Banning of Business Dealings” (**Annex-A**), which may be further extended at the discretion of the Employer.
- (vi) To recover all sums paid in violation of this Pact by Bidder(s)/Contractor(s) to any middleman or agent or broker with a view to securing the contract.
- (vii) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the Employer with the Bidder/ Contractor, the same shall not be opened/operated.
- (viii) Forfeiture of Performance Security in case of a decision by the Employer to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

- 5.2 The Employer will be entitled to take all or any of the actions mentioned at para 5.1 (i) to (viii) of this Pact also on the Commission by the Bidder/Contractor or any one employed by it or acting on its behalf (whether with or without the knowledge of the

Bidder/Contractor), of an offence as defined in Chapter IX of the Indian Penal Code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption in Employer's country.

- 5.3 The decision of the Employer to the effect that a breach of the provisions of this Pact has been committed by the Bidder / Contractor shall be final and conclusive on the Bidder / Contractor. However, the Bidder/Contractor can approach the Independent External Monitor(s) appointed for the purposes of this Pact.

6.0 Independent External Monitor(s)

- 6.1 The Employer has appointed Independent External Monitor(s) (hereinafter referred to as Monitors) for this Pact.
- 6.2 The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.
- 6.3 The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.
- 6.4 Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings. The right to access records should only be limited to the extent absolutely necessary to investigate the issue related to the subject tender/contract.
- 6.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform CMD/CEO/MD of Employer and request Employer to discontinue or take corrective action, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- 6.6 The Bidder(s)/Contractor(s) accepts that the Monitor has the right to access without restriction, to all Project documentation of the Employer including that provided by the Bidder/Contractor. The Bidder/Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractor(s). The Monitor shall be under contractual obligation to treat the information and documents of the Bidder/Contractor/Subcontractor(s) with confidentiality.
- 6.7 The Employer will provide to the Monitor sufficient information about all meetings among the parties related to the project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings as and when required.
- 6.8 The Monitor will submit a written report to the CMD/CEO/MD of Employer within 10 days from the date of reference or intimation to him by the Employer/Bidder and should the occasion arise, submit proposals for correcting problematic situations.
- 6.9 The word 'Monitor' would include both singular and plural.

7.0 Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the Employer or its agencies shall be entitled to examine all the documents including the Books of Accounts of the Bidder/Contractor and the Bidder/Contractor shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

8.0 Law and Place of Jurisdiction

This Pact is subject to _____ (Employer's Country) Law. The place of performance and jurisdiction is the Registered Office of the Employer. The arbitration clause provided in the tender document/contract shall not be applicable for any issue/dispute arising under Integrity Pact.

9.0 Other Legal Actions

9.1 The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

9.2 Changes and supplements as well as termination notice need to be made in writing.

9.3 If the Contractor is a partnership or a consortium or a joint venture, this pact must be signed by all partners of the consortium/joint venture.

10.0 Validity

10.1 The validity of this Integrity Pact shall be from date of its signing and extend upto 5 years or the complete execution of the contract to the satisfaction of both the Employer and the Bidder/Contractor/Seller, including warranty period, whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract or six months from the date of opening of price bids, whichever is earlier.

10.2 Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intention.

11.0 The Parties hereby sign this Integrity Pact at _____ on _____.

Employer

Bidder

Name of the Officer

(Authorised Person)

Designation

(Name of the Person)

Designation

Place-----

Date-----

Witness1._____

(Name and address)

2._____

(Name and address)

Place-----

Date-----

Witness1._____

(Name and address)

2._____

(Name and address)

Guidelines on banning of business dealings**Contents**

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Guidelines on Banning of Business Dealings

1.0 Introduction

- 1.1 Employer deals with Agencies viz. parties/ contractors/ suppliers/ Bidders, who are expected to adopt ethics of highest standards and a very high degree of integrity, commitments and sincerity towards the work undertaken. It is not in the interest of Employer to deal with Agencies who commit deception, fraud or other misconduct in the tendering process.
- 1.2 Since banning of business dealings involves civil consequences for an Agency concerned, it is incumbent that adequate opportunity of hearing is provided and the explanation, if tendered, is considered before passing any order in this regard keeping in view the facts and circumstances of the case.

2.0 Scope

- 2.1 The Information for Bidders/ Instruction to Bidders and even the General Conditions of Contract (GCC) of Employer generally provide that Employer shall have the rights to remove from list of approved suppliers / contractors or to ban business dealings if any Agency has been found to have committed misconduct or fraud or anything unethical not expected from a reputed contractor.
- 2.2 The procedure of (i) Removal of Agency from the List of approved suppliers / contractors; (ii) Suspension and (iii) Banning of Business Dealing with Agencies, has been laid down in these guidelines.
- 2.3 These guidelines shall apply to all the Projects/ Power Stations/ Regional Offices/ Liaison Offices of RECPDCL including its subsidiaries and JVs.
- 2.4 It is clarified that these guidelines do not deal with the poor performance of the contractors/ Agencies.
- 2.5 The banning shall be with prospective effect, i.e. future business dealings.

3.0 Definitions

In these Guidelines, unless the context otherwise requires:

- i) **“Party / Contractor / Supplier / Bidders”** shall mean and include a public limited company or a private limited company, a joint Venture, Consortium, HUF, a firm whether registered or not, an individual, cooperative society or an association or a group of persons engaged in any commerce, trade, industry, etc. “Party / Contractor/ Supplier / Bidder” in the context of these guidelines is indicated as ‘Agency’.
- ii) **“Unit”** shall mean the Project/ Power Station/ Regional Office/ Liaison Office.
- iii) **“Competent Authority”** and **‘Appellate Authority’** shall mean the following:
The concerned Director shall be the ‘Competent Authority’ for the purpose of these guidelines.
CMD shall be the ‘Appellate Authority’ in respect of such cases.
- iv) **“Investigating Committee”** shall mean any Officer/Committee appointed by Competent Authority to conduct investigation.
- v) **“List of approved Agencies viz Parties / Contractors / Suppliers/Bidders”** shall mean and include list of Parties/ Contractors / Suppliers / Bidders etc if registered with Employer.

4.0 Initiation of Banning / Suspension

Action for banning /suspension business dealings with any Agency shall be initiated by the department responsible for invitation of bids after noticing the irregularities or misconduct on the part

of Agency concerned. Besides the concerned department, Vigilance Department of each Unit/ Corporate Vigilance may also be competent to initiate such action.

5.0 Suspension of Business Dealings.

- 5.1 If the conduct of any Agency dealing with Employer is under investigation, the Competent Authority may consider whether the allegations (under investigation) are of a serious nature and whether pending investigation, it would be advisable to continue business dealing with the Agency. If the Competent Authority, after consideration of the matter including the recommendation of the Investigating Committee, if any, decides that it would not be in the interest to continue business dealings pending investigation, it may suspend business dealings with the Agency. The order of suspension would operate for a period not more than six months and may be communicated to the Agency as also to the Investigating Committee. The Investigating Committee may ensure that their investigation is completed and whole process of final order is over within such period. However, if investigations are not completed in six months time, the Competent Authority may extend the period of suspension by another three months, during which period the investigations must be completed.
- 5.2 The order of suspension shall be communicated to all Departmental Heads of RECPDCL (including its subsidiaries and JVs) and Heads of the Units. During the period of suspension, no business dealing may be held with the Agency.
- 5.3 As far as possible, the existing contract(s) with the Agency may continue unless the Competent Authority, having regard to the circumstances of the case, decides otherwise.
- 5.4 If the Agency concerned asks for detailed reasons of suspension, the Agency may be informed that its conduct is under investigation. It is not necessary to enter into correspondence or argument with the Agency at this stage.
- 5.5 It is not necessary to give any show-cause notice or personal hearing to the Agency before issuing the order of suspension.

6.0 Ground on which Banning of Business Dealings can be initiated:

- 6.1 If the security consideration, including questions of loyalty of the Agency to Employer so warrants;
- 6.2 If the director /owner of the Agency, proprietor or partner of the firm, is convicted by a Court of Law for offences involving moral turpitude in relation to its business dealings with the Government or any other public sector enterprises, during the last three years.
- 6.3 If business dealings with the Agency have been banned by the Department of Power, Government of India and the relevant government department of Employer's Country.
- 6.4 If the Agency has resorted to corrupt, fraudulent practices including misrepresentation of facts;
- 6.5 If the Agency uses intimidation / threatening or brings undue outside pressure on Employer or its official for acceptance / performances of the job under the contract;
- 6.6 If the Agency misuses the premises or facilities of Employer, forcefully occupies or damages Employer's properties including land, water resources, forests / trees or tampers with documents/records etc. (Note: The examples given above are only illustrative and not exhaustive. The Competent Authority may decide to ban business dealing for any good and sufficient reason).

7.0 Banning of Business Dealings

- 7.1 A decision to ban business dealings with any Agency shall apply throughout RECPDCL including its subsidiaries/JVs.

7.2 There will be an Investigating Committee consisting of officers not below the rank of AGM/DGM from Indenting Division, Finance, Law and Contracts. Member from department responsible for invitation of bids shall be the convener of the committee. The functions of the committee shall, inter-alia include:

- i) To study the report of the unit/division responsible for invitation of bids and decide if a prima-facie case for banning exists, if not, send back the case to the Competent Authority.
- ii) To recommend for issue of show-cause notice to the Agency by the concerned unit/division as per clause 9.1.
- iii) To examine the reply to show-cause notice and call the Agency for personal hearing, if required.
- iv) To submit final recommendations to the Competent Authority for banning or otherwise.

8.0 Removal from List of Approved Agencies - Suppliers/ Contractors, etc.

8.1 If the Competent Authority decides that the charge against the Agency is of a minor nature, it may issue a show-cause notice as to why the name of the Agency should not be removed from the list of approved Agencies - Suppliers / Contractors, etc.

8.2 The effect of such an order would be that the Agency would not be qualified for competing in Open Tender Enquiries or Limited Tender Enquiries till the period mentioned in the order.

8.3 Past performance of the Agency may be taken into account while processing approval of the Competent Authority for award of the contract.

9.0 Show-cause Notice

9.1 In case where the Competent Authority decides that action against an Agency is called for, a show-cause notice has to be issued to the Agency, Statement containing the imputation of misconduct or misbehavior may be appended to the show-cause notice and the Agency should be asked to submit within 15 days a written statement in its defense.

9.2 If the Agency requests for inspection of any relevant document in possession of Employer, necessary facility for inspection of documents may be provided.

9.3 The Competent Authority may consider and pass an appropriate speaking order:

- a) For exonerating the Agency if the charges are not established;
- b) For removing the Agency from the list of approved Suppliers / Contractors, etc.
- c) For banning the business dealing with the Agency.

9.4 If it decides to ban business dealings, the period for which the ban would be operative may be mentioned.

10.0 Appeal against the Decision of the Competent Authority

10.1 The Agency may file an appeal against the order of the Competent Authority banning business dealing etc. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the date of receipt of the order banning business dealing, etc.

10.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the Agency as well as the Competent Authority.

11.0 Circulation of the names of Agencies with whom Business Dealings have been banned

- i) The concerned unit shall forward the name and details of the Agency(ies) banned to IT&C Division of RECPDCL's Corporate Office for displaying the same on RECPDCL website.

- ii) Corporate Contracts Department shall also forward the name and details of the Agency(ies) banned to the Ministry of Power, GoI besides forwarding the name and details to the contracts/procurement group of all CPSUs of power sector.
-

FORM OF DECLARATION OF ELIGIBILITY

UNDERTAKING

I / We, M/s(Name of Bidder) hereby certify that I / we have not been banned /de-listed/ black listed / debarred from business by any PSU / Govt. Department during last 03 (three) years on the grounds mentioned in para 6 of Guidelines on banning of Business dealing, ITB Clause.....of Tender Document.

(Seal & signature of the Bidder)

PROFORMA FOR BLACK LISTING

UNDERTAKING

Sub: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4
Sector-29, Gurugram 122001, Haryana

Dear Sir,

I / We, M/ s..... (Name of Bidder) hereby certify that I / we have not been banned / de-listed / black listed / debarred from business by any PSU / Govt. Department during last 03 (three) years. I/We will immediately inform to Client (RECPDCL) in case of any change in the situation any time hereinafter.

Yours sincerely,

Authorized Signature [*In full and initials*]:

Name and Title of Signatory:

Name of the Bidder:

Address:

Seal of the Bidder:_____

NO DEVIATION CERTIFICATE

To
Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4Sector-29, Gurugram 122001, Haryana

Dear Sir,

SUB: NO DEVIATION CERTIFICATE REGARDING NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

Dear Sir,

We, [Bidder's name], confirm our acceptance to all terms and conditions mentioned in the Bid Document Ref No RECPDCL/CHQ/ECD/SPP-UPNEDA/2021 dated including all subsequent clarifications/ amendment/addendum/corrigendum(s), in totality and withdraw all deviations raised by us, if any.

.....
(Seal & Signature of the Bidder)

Place:

Date:

ATTACHMENT-7

PROFORMA FOR ELECTRONIC FUND TRANSFER (EFT)

To
Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4Sector-29, Gurugram 122001, Haryana

Dear Sir,

Ref: Authorization for payments through Electronic Fund Transfer System.

Dear Sir,

We, hereby authorize RECPDCL Ltd. (Complete address of the Unit with Postal Code) to make all payments due to us through Electronic Fund Transfer System. The details for facilitating the payments are given below:

(TO BE FILLED IN CAPITAL LETTER)

1. NAME OF THE BENEFICIARY

[illegible]

- ## 2. ADDRESS

[illegible]

3. TELEPHONE NO (WITH STD CODE)

[illegible]

4. FAX NO. (WITH STD CODE)

[illegible]

- ## 5. BANK PARTICULARS:

A) BANK NAME

[illegible]

B) BANK TELEPHONE NO. (WITH STD CODE):

[illegible]

C) BRANCH ADDRESS (WITH BRANCH CODE)

[illegible]

[illegible][illegible][illegible][illegible]

| SAVING | CURRENT | LOAN | CASH CREDIT | OTHERS |
|--------|---------|------|-------------|--------|
|--------|---------|------|-------------|--------|

| | | | | | | |
|--|--|--|--|--|--|--|
| | | | | | | |
|--|--|--|--|--|--|--|

[illegible][illegible]

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
|--|--|--|--|--|--|--|--|

[illegible]

| | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

OFFICIAL STAMP

BANK CERTIFICATION

It is certified that above mentioned beneficiary hold a Bank Account No..... with our branch and the Bank particulars mentioned above are correct

SIGNATURE

Date:

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
|--|--|--|--|--|--|--|--|

(AUTHORISED SIGNATORY OF THE BANK)

Authorization No.....

NAME:

| | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

OFFICIAL STAMP

(Seal & Signature of the Bidder)

Place :

Date:

FINANCIAL DATA OF THE BIDDER

To,

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4Sector-29, Gurugram 122001, Haryana

SUB: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

| Particulars | FY 1 [specify currency] | FY 2 [specify currency] | FY 3 [specify currency] |
|--|----------------------------|----------------------------|----------------------------|
| 1. Share Capital | | | |
| 2. Paid up Capital | | | |
| 3. Free Reserve (gross) | | | |
| 4. Share Premium | | | |
| 5. Revaluation Reserves | | | |
| 6. Unallocated balance surplus | | | |
| 7. Expenses not written off and carry forwarded losses | | | |
| 8. Total current assets | | | |
| 8.1. Total cash and deposits | | | |
| 8.2. Deposits with bids or otherwise as guarantees (due within ninety (90) days) | | | |
| 8.3. Amounts receivable from completed contracts (due within ninety (90) days) | | | |
| 8.4. Amounts receivable from completed contracts after retention (due within ninety (90) days) | | | |
| 8.5. Stocks and bonds at present market value (original currency) | | | |
| 8.6. Any other current assets (due within ninety (90) days) (original currency) | | | |
| 9. Closing stock if any | | | |
| 10. Total current liabilities (give in details) (original currency) | | | |
| 11. Intangible Assets | | | |
| 12. Total assets | | | |
| 13. Total liabilities | | | |
| 14. Contingent Liability (give in details) (original currency) | | | |

| Particulars | FY 1 [specify currency] | FY 2 [specify currency] | FY 3 [specify currency] |
|--|-----------------------------------|-----------------------------------|-----------------------------------|
| 15. Total profit before tax | | | |
| 16. Total profit after tax | | | |
| 17. Total loss (gross) | | | |
| 18. Turnover during the financial year (in original currency) | | | |
| 19. Net Worth | | | |

Date.....

Place.....

(Name & Signature of Authorised Representative with
Seal/Stamp of Company)

ESTIMATED BILL OF QUANTITY

To

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

SUB: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

Dear Sir,

Estimated Bill of Quantity for plant of capacity 50 MW_{AC} (Bidder is expected to provide detailed Bill of Quantity) [Sample BoQ attached along with the Tender Document]

| Sl. No. | Description | Qty | Rate |
|---------|--|-----|------|
| 1 | Solar Photo Voltaic(PV) Modules | | |
| 2 | Inverters | | |
| 3 | Module Mounting Structure(MMS) | | |
| 4 | String Combiner Box | | |
| 5 | Inverter Transformers | | |
| 6 | Power Transformers | | |
| 7 | Auxiliary Transformers | | |
| 8 | LT Switchgear | | |
| 9 | HT Switchgear | | |
| 10 | DC Cables (Module to SCB) | | |
| 11 | DC Cables(SCB to Inverter) | | |
| 12 | AC Cables (HT <) | | |
| 13 | 132 KV Switchyard | | |
| 14 | Balance of item includes all the equipment, materials, spare, accessories etc. excluding items from 1 to 13. | | |

Date.....

.....

Place.....

.....

(Name & Signature of Authorised
Representative with Seal/Stamp of Company)

ESTIMATED BILL OF QUANTITY

To

Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4
Sector-29, Gurugram 122001, Haryana

SUB: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

Dear Sir,

Estimated Bill of Quantity for plant of capacity 75 MW_{AC} (Bidder is expected to provide detailed Bill of Quantity) [Sample BoQ attached along with the Tender Document]

| Sl. No. | Description | Qty | Rate |
|----------------|--|------------|-------------|
| 15 | Solar Photo Voltaic(PV) Modules | | |
| 16 | Inverters | | |
| 17 | Module Mounting Structure(MMS) | | |
| 18 | String Combiner Box | | |
| 19 | Inverter Transformers | | |
| 20 | Power Transformers | | |
| 21 | Auxiliary Transformers | | |
| 22 | LT Switchgear | | |
| 23 | HT Switchgear | | |
| 24 | DC Cables (Module to SCB) | | |
| 25 | DC Cables(SCB to Inverter) | | |
| 26 | AC Cables (HT <) | | |
| 27 | 132 KV Switchyard | | |
| 28 | Balance of item includes all the equipment, materials, spare, accessories etc. excluding items from 1 to 13. | | |

Date.....

.....

Place.....

.....

(Name & Signature of Authorised
Representative with Seal/Stamp of Company)

To

Additional CEO
 REC Power Distribution Company Limited
 REC World Headquarters, D-Block, Plot No.1-4
 Sector-29, Gurugram 122001, Haryana

FORMAT FOR DECLARED NET ANNUAL GUARANTEED GENERATION (NAGG) FOR THE PROPOSED SOLAR PV POWER PLANT

Name of Bidder M/s

| | |
|---|--|
| Installed Capacity proposed (in MWp) for Package 1 | |
| Installed Capacity proposed (in MWp) for Package 2 | |

Proposed Net Annual Guaranteed Generation (NAGG):

| O&M Years | Proposed Net Annual Guaranteed Generation (NAGG) at the Delivery Point (in MUs) for Package 1 | Proposed Net Annual Guaranteed Generation (NAGG) at the Delivery Point (in MUs) for Package 2 |
|---|--|--|
| 1st Year | | |
| 2nd Year | | |
| 3rd Year | | |
| Sum of Proposed Net Annual Guaranteed Generation (NAGG) at the Delivery Point (in MUs) for 3 years | | |

NOTE: - Bidders to submit the documentary proof for arriving at the Declared Net Annual Guaranteed Generation (NAGG) such as Energy Estimation Report using the latest software such as PV Syst, Meteonorm.

Date.....

.....

Place.....

.....

(Name & Signature with Seal/Stamp
of Company)

To

Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4
Sector-29, Gurugram 122001, Haryana

**MINIMUM NET ANNUAL GUARANTEED GENERATION (NAGG) TO BE ACHIEVED
EVERY YEAR BY THE CONTRACTOR**

| S.No | Year | Minimum Net Annual Guaranteed Generation (NAGG) to be generated each year (in MU)* (For Package 1) | Minimum Net Annual Guaranteed Generation (NAGG) to be generated each year (in MU)* (For Package 2) |
|------|---------------------------------------|--|--|
| 1. | 1st Year of O&M | 110.98 MU | 166.48 MU |
| 2. | 2nd Year of O&M | 110.31 MU | 165.48 MU |
| 3. | 3rd Year of O&M | 109.65 MU | 164.49 MU |

*Degradation (MCF) for 3 years shall be as 0.6% every year.

Note: This is the minimum number of units, which needs to be generated by the Contractor every year. The Contractor, however, shall quote the actual number of unit generation as per the **Attachment 10**. The Bids containing the less generation as indicated in this annexure shall be rejected.

To

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

SUBMISSION OF TIME SCHEDULE

SUB: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

We hereby confirm the acceptance to the time schedule (.....month for completion of Facilities) as specified in the Clause No. 3.17 of the Bid Document. Further, we are submitting the detailed activity wise Time schedule (L1 Schedule) in the form of PERT Chart covering all aspects like ordering, site preparation, Supply, erection, installation, testing & commissioning, etc. along with the bid.

Place:

Date:

Name:

Designation:

Name of company

To

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

LIST OF SUB-CONTRACTORS /VENDORS PROPOSED TO BE ENGAGED

SUBJECT: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

| LIST OF SUBCONTRACTORS / VENDORS PROPOSED BY THE BIDDER | | | |
|--|--|--|---|
| Sl. No. | Name of the equipment/system | Make Proposed by the Bidder (For Package 1 & 2) | Source of Material (Name of Country) |
| 1. | Solar Photo Voltaic (PV) Modules | | |
| 2. | Inverters | | |
| 3. | Module Mounting Structure (MMS) | | |
| 4. | String Combiner Box | | |
| 5. | Inverter Transformers | | |
| 6. | Power Transformers | | |
| 7. | Auxiliary Transformers | | |
| 8. | LT Switchgear | | |
| 9. | HT Switchgear | | |
| 10. | DC Cables (Module to SCB) | | |
| 11. | DC Cables (SCB to Inverter) | | |
| 12. | AC Cables (HT <) | | |
| 13. | 132 KV Switchyard Yard | | |
| 14. | Balance of item includes all the equipment, materials, spare, accessories etc. excluding items from 1 to 13. | | |

Place:**Date:****Name:****Designation:****Name of company**

To,
Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4
Sector-29, Gurugram 122001, Haryana

**PERFORMA FOR MANDATORY INFORMATION REQUIRED TO UPLOAD THE
AWARD DETAILS ON CENTRAL PROCUREMENT PORTAL (CPP) i.e.
<https://eprocure.gov.in/cppp>**

**SUBJECT: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY,
ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR
THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125
MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.**

| | |
|---|----------------------|
| 1. Company Name | <input type="text"/> |
| 2. Registration Number | <input type="text"/> |
| 3. Registered Address | <input type="text"/> |
| 4. Name of Partners/ Directors | <input type="text"/> |
| 5. Bidder Type : Indian/ Foreign | <input type="text"/> |
| 6. City | <input type="text"/> |
| 7. Postal Code | <input type="text"/> |
| 8. Company's Establishment Year | <input type="text"/> |
| 9. Company's Nature of Business | <input type="text"/> |
| 10. Company's Legal Status (Tick <input type="checkbox"/>) | Limited Company |

Undertaking

Joint Venture

Partnership

Others

11. Company Category (Tick ☐)

Micro Unit as per MSME

Small Unit as per MSME

Medium Unit as per MSME

Ancillary Unit

Project Affected Person of this Company

SSI

Others

Contact Details:

Enter Company's Contact Person
Details

Title (Tick ☐)

Mrs.

Mr.

Ms.

Dr.

Shri

Contact Name

Date of Birth (DD/MM/YYYY)

Correspondence Email

Designation

Phone Details e.g. : +91 044
22272449

Mobile Number

I, the undersigned, Proprietor/Director/authorized signatory of [*Insert name of the Firm/Agency/Bidder*] do hereby solemnly declare and affirm that the details furnished above are true and correct to the best of my knowledge and belief.

Date.....

.....

Place.....

.....

(Name & Signature of Authorised
Representative with Seal/Stamp of Company)

To,
Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4
Sector-29, Gurugram 122001, Haryana

UNDERTAKING REGARDING OFFLINE SUBMISSION

I / We, M/s(Name of Bidder) hereby state that I/We have submitted the scanned copies of original documents listed in clause 2.15 of ITB on e-mode and hard copies shall be submitted to RECPDCL as and when requisitioned. Further, if at any point of time, any discrepancy is found in the documents submitted by us, RECPDCL shall be at liberty to summarily reject the bid as well as take appropriate legal action, besides forfeiture of bid security and banning of business dealings, as per provisions of Integrity Pact.

Date.....

Place.....

(Name & Signature of Authorised
Representative with Seal/Stamp of Company)

To

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

**FORMAT FOR MONTH WISE TARGET GENERATION FOR THE PROPOSED SOLAR
PV POWER PLANT**

Name of Bidder M/s

| Month | Solar Insolation (kWhr/m ²) | Target Generation (in MWh) Fixed Tracking (1MWp) Quoted by Bidder # | Final Month wise Target Generation for Bidder (Package 1) (in MWhr) | Final Month wise Target Generation for Bidder (Package 2) (in MWhr) |
|-----------|---|--|--|--|
| | | A | B1=A X 75 | B2=A X 105 |
| January | 118 | | | |
| February | 135 | | | |
| March | 179 | | | |
| April | 187 | | | |
| May | 202 | | | |
| June | 165 | | | |
| July | 138 | | | |
| August | 135 | | | |
| September | 143 | | | |
| October | 138 | | | |
| November | 114 | | | |
| December | 106 | | | |
| | 1760 | | | |

#RECPDCL has right to question the rationality of the month wise quoted generation.

Place**Date**

(Signature)

1. UNDERTAKING FOR FIRST CONTRACT

(In compliance of Ministry of Finance, Government of India order no F. No. 6/18/2019-PPD dated 23.07.2020)

I have read the clause regarding restrictions on procurement from a Bidder of a country which shares a land border with India.

I certify that(name of Bidder) is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that(name of Bidder) fulfills all requirements in this regard and is eligible to be considered.

Note:- Evidence of valid registration by the Competent Authority shall be attached (if applicable)

Place

Date

(Signature)

2. UNDERTAKING FOR SECOND AND THIRD CONTRACT

(In compliance of Ministry of Finance, Government of India order no F. No. 6/18/2019-PPD dated 23.07.2020)

I have read the clause regarding restrictions on procurement from a Bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries.

I certify that(name of Bidder) is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that (Name of Bidder) fulfills all requirements in this regard and is eligible to be considered.

Note: - Evidence of valid registration by the Competent Authority shall be attached (if applicable)

Place

Date

(Signature)

(TO BE EXECUTED ON LETTERHEAD OF THE HOLDING COMPANY)

To

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

Sir(s),

1.0 We, M/s..... *[Insert name of Holding Company]*..... declare that we are the holding company of M/s *[Insert name of Bidder]*..... and have controlling interest therein.

M/s. *[Insert name of Bidder]*..... proposes to submit the Bid for “**DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.**” having reference no. RECPDCL/CHQ/ECD/SPP-UPNEDA/2021 datedand have sought financial strength and support from us for meeting the stipulated Financial Qualifying Requirement as per Clause No. 1.4.2(i) [Financial Criteria].

2.0 We hereby undertake that we hereby pledge our unconditional & irrevocable financial support for the execution of the contract for “**DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.**” to M/s. *[Insert name of Bidder]*.....in case of award.

We further agree that this undertaking shall be without prejudice to the all contractual liabilities that M/s *[Insert name of Bidder]*..... would be required to undertake in terms of the Contract.

3.0 This undertaking is irrevocable and unconditional, and shall remain in force till completion of the Contract.

4.0 We are herewith enclosing a copy of the Board Resolution in support of this Undertaking.

Date.....

.....

Place.....

.....

(Name & Signature of Authorised
Signatory on behalf of the Holding
Company)

To
Additional CEO
REC Power Distribution Company Limited
REC World Headquarters, D-Block, Plot No.1-4
Sector-29, Gurugram 122001, Haryana

Following are the details of Tools & Tackles for Erection, Testing, Commissioning and O&M of 125MW_{AC} (50 MW_{AC} & 75 MW_{AC}) of Solar Power Project at Kanpur Dehat and Jalaun District in Uttar Pradesh:

For Package 1

| Sl. No. | Description of Tools | Quantity (Nos.) |
|---------|----------------------|-----------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

For Package 2

| Sl. No. | Description of Tools | Quantity (Nos.) |
|---------|----------------------|-----------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Date.....
Place.....

.....
.....
(Name & Signature of Authorised
Representative with Seal/Stamp of Company)

ANNEXURES

ANNEXURE-1

SUB: NOTICE INVITING TENDER FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, COMMISSIONING AND OPERATION & MAINTENANCE FOR THREE YEARS UNDER TWO PACKAGES HAVING CUMULATIVE CAPACITY OF 125 MW_{AC} SOLAR PV POWER PROJECT AT TWO LOCATIONS IN UTTAR PRADESH.

FORMAT OF CONTRACT AGREEMENT

This Contract Agreement (hereinafter called the “CONTRACT”) is made, on the [Insert day] day of [Insert month] in the year [Insert year] at [Insert place].

Between

RECPDCL , a Company incorporated under the Companies Act 1956, having its registered office at REC World Headquarters, D-Block, Plot No. 1-4, Sector-29, Gurugram-122001, Haryana, (hereinafter referred to as “RECPDCL”, which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and assigns) of the one part.

And

[Insert name of the Contractor] a Company incorporated under the Companies Act 1956/Companies Act 2013, having its registered office at [insert address of the registered office of the contractor] (hereinafter referred to as the “CONTRACTOR”, which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and assigns) of the other part

WHEREAS the aforesaid RECPDCL has invited Notice Inviting Tender (NIT) for [Insert Title of Tender] vide Bid Document No. [Insert Bid Document No. and date] and the aforesaid CONTRACTOR had participated in the above referred Tender vide their Bid dated [Insert the reference no. and date of the bids of the contractor] and RECPDCL has accepted their aforesaid Tender and awarded the CONTRACT for [Insert scope of the works for this contract] on the terms and conditions contained in RECPDCL’s Letter of Award No.[Insert Letter of Award No.]..... dated [Insert Date of Letter of Award No.]..... and the documents referred to therein, which have been unequivocally and unconditionally accepted by CONTRACTOR vide their acceptance dated [Insert reference of acknowledgment and its date] to this Letter of Award resulting into this CONTRACT hereinafter called [Insert name of this Contract]

AND WHEREAS THE CONTRACTOR has agreed to execute the aforesaid work for the sum of [Insert value of the Contract] ([Insert value of the Contract in words] upon the terms and subject to the conditions herein mentioned in this CONTRACT.

NOW THEREFORE the CONTRACTOR and RECPDCL hereby undertake and agree as follows:

1. The following Documents attached hereto shall be deemed to form an integral part of THE CONTRACT:

- i. Contract Agreement
- ii. Bid Document including subsequent amendments/clarifications, if any.
- iii. Your Bid Proposal along with Bid Response Sheets, Annexure, etc.

- iv. RECPDCL's Letter of Award (LoA) ,duly accepted by you together with its amendments, if any.
 - v. Final/Approved Quality Assurance Plans for manufacturing and site/field activities for all major/critical items.
 - vi. Integrity Pact
 - vii. Activity Chart/Project Schedule
 - viii. Manpower Chart
 - ix. Any other document forming part of the Contract
2. The mutual rights and obligations of the RECPDCL and the CONTRACTOR shall be as set forth in the CONTRACT, in particular:
- i) THE CONTRACTOR shall do and perform all works and things in this contract mentioned and described or which are implied therein or there from respectively or are reasonably necessary for the completion of the works as mentioned and at the times, in the manner and subject to the terms & conditions and stipulations contained in this CONTRACT, and in consideration of the due provision, executions, construction and completion of the works agreed to by the CONTRACTOR.
 - ii) THE RECPDCL 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 payment to be made at such times and in such manner as laid down in the CONTRACT.
 - iii) The conditions and covenants stipulated herein before in this CONTRACT are subject to and without prejudice to the rights of the RECPDCL to enforce Liquidated Damages 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, drawing, etc., attached with this CONTRACT.
 - iv) 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.
3. RECPDCL has also entered into the following Contracts with the Contractor.
- (i)
 - (ii)
 - (iii) -----

A breach in the performance of any of the Contracts as indicated herein above including this Contract shall be considered as a breach in performance of the other Contracts, which shall confer a right to the RECPDCL to terminate the other Contracts also at the risk and cost of the Contractor without prejudice to other rights, the RECPDCL may have as per terms & conditions of respective Contract.

4. The effective date of this CONTRACT shall be reckoned from [Insert Date of commencement of the contract]

IN WITNESS WHEREOF, the Parties hereto have caused this Contract to be signed in their respective names as of the day, month and year first above written

For and on behalf of RECPDCL

For and on behalf of M/s.

NAME:

NAME:

DESIGNATION:

DESIGNATION:

SIGNATURE.....

SIGNATURE.....

WITNESS:

WITNESS:

1.

1.

2.

2.

ANNEXURE-2

PROFORMA FOR BANK GUARANTEE FOR CONTRACT PERFORMANCE CUM SECURITY GUARANTEE (IN ACCORDANCE WITH CLAUSE NO 3.48.1)

(To be stamped in accordance with Stamp Act)

Bank Guarantee No.

Date

To,

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

Dear Sir,

In consideration of the [*Employer's Name*]..... (hereinafter referred to as the 'Employer,' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) having awarded to M/s. [*Contractor's Name*] with its Registered/Head Office at (hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a Contract by issue of Employer's Letter of Award No. dated and the same having been unequivocally accepted by the Contractor, resulting into a contract bearing No..... dated valued at for and the Contractor having agreed to provide a Contract Performance cum Security Guarantee for the faithful performance of the entire Contract equivalent to (*) % (..... percent) of the said value of the Contract to the Employer.

We [*Name & Address of the Bank*] having its Head Office at (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any and all money payable by the contractor to the extent of (*) as aforesaid at any time upto (@) [*days/month/year*] 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 or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes that the guarantee shall be irrevocable and valid till the completion of faithful performance of the Contract to the satisfaction of the Employer and/ or the Employer in writing discharges the Guarantee.

The Employer shall have the fullest liberty, without affecting in any way the liability of the Bank under this guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by

the Employer or by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the Bank.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

Our liability under the captioned guarantee is restricted to Rs..... (Rupees in words.....) and the guarantee will remain in force upto and including the date (date of validity) and unless the claim under the guarantee is made on us before the date (within 60 days beyond the validity date), all your rights under the said guarantee shall be forfeited and we shall be released and discharged from all liabilities thereafter.

WITNESS

| | |
|-------------|-------------------------------|
| | |
| (Signature) | (Signature) |
| | |
| (Name) | (Name) |
| | |
| | (Official Address) |
| | (Designation with Bank Stamp) |
| | Power of Attorney No. |
| | Date |

- Notes: (*) This amount will be in accordance with Clause No 3.48.1 of this Bid Document as the case may be.
- (@) This date will be in accordance with Clause No 3.48.1 of this Bid Document as the case may be.
1. The original bank guarantee against the CPSG should be sent to RECPDCL Ltd. directly under Regd. Post (A.D.) by the issuing bank / branch. Where the original bank guarantee against CPSG is handed over to the Bidder, the Bidder shall ensure that a copy of the bank guarantee against CPSG duly signed by the authorized representative of issuing bank along with covering letter has been sent immediately by the issuing bank/branch under Regd. Post (A.D.) directly to RECPDCL Ltd. at the address mentioned in the bid document.
 2. The bank guarantee shall be issued by any Nationalized Bank / Scheduled Bank

ANNEXURE 3

PROFORMA FOR BANK GUARANTEE FOR CONTRACT PERFORMANCE CUM SECURITY GUARANTEE (IN ACCORDANCE WITH CLAUSE NO 3.48.2)

(To be stamped in accordance with Stamp Act)

Bank Guarantee No.

Date

To,

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

Dear Sir,

In consideration of the [*Employer's Name*]..... (hereinafter referred to as the 'Employer,' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) having awarded to M/s. [*Contractor's Name*] with its Registered/Head Office at (hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a Contract by issue of Employer's Letter of Award No. dated and the same having been unequivocally accepted by the Contractor, resulting into a contract bearing No..... dated valued at for and the Contractor having agreed to provide a Contract Performance cum Security Guarantee for the faithful performance of the entire Contract equivalent to (*) % (..... percent) of the said value of the Contract to the Employer.

We [*Name & Address of the Bank*] having its Head Office at (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any and all money payable by the contractor to the extent of (*) as aforesaid at any time upto (@) [*days/month/year*] 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 or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes that the guarantee shall be irrevocable and valid till the completion of faithful performance of the Contract to the satisfaction of the Employer and/ or the Employer in writing discharges the Guarantee.

The Employer shall have the fullest liberty, without affecting in any way the liability of the Bank under this guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by

the Employer or by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the Bank.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

Our liability under the captioned guarantee is restricted to Rs..... (Rupees in words.....) and the guarantee will remain in force upto and including the date (date of validity) and unless the claim under the guarantee is made on us before the date (within 60 days beyond the validity date), all your rights under the said guarantee shall be forfeited and we shall be released and discharged from all liabilities thereafter.

WITNESS

| | |
|-------------|--------------------|
| | |
| (Signature) | (Signature) |
| | |
| (Name) | (Name) |
| | |
| | (Official Address) |

(Designation with Bank Stamp)

Power of Attorney No.

Date

Notes: (*) This amount will be in accordance with Clause No 3.48.2 of this Bid Document as the case may be.

(@) This date will be in accordance with Clause No 3.48.2 of this Bid Document as the case may be.

3. The original bank guarantee against the CPSG should be sent to RECPDCL Ltd. directly under Regd. Post (A.D.) by the issuing bank / branch. Where the original bank guarantee against CPSG is handed over to the Bidder, the Bidder shall ensure that a copy of the bank guarantee against CPSG duly signed by the authorized representative of issuing bank along with covering letter has been sent immediately by the issuing bank/branch under Regd. Post (A.D.) directly to RECPDCL Ltd. at the address mentioned in the bid document.

4. The bank guarantee shall be issued by any Nationalized Bank / Scheduled Bank

PROFORMA FOR BANK GUARANTEE FOR ADVANCE PAYMENT

(To be stamped in accordance with Stamp Act)

Bank Guarantee No

Date

To,

Additional CEO

REC Power Distribution Company Limited

REC World Headquarters, D-Block, Plot No.1-4

Sector-29, Gurugram 122001, Haryana

Dear Sir,

In consideration of *[Insert Employer's Name]* (hereinafter referred to as the 'Employer', which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/s *[Insert Contractor's Name]* with its Registered/Head Office at *[Insert address of Contractor's Registered Office]* (hereinafter referred to as the 'Contractor' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract, by issue of Employer's Letter of Award No. *[Insert Letter of Award No.]* dated *[Insert date of Letter of Award]* and the same having been unequivocally accepted by the Contractor, resulting into a Contract bearing No. *[Insert Contract Bearing No.]* dated *[Insert date of Contract]* valued at *[Insert Value of Contract]* for *[Insert Name of Contract]* (hereinafter called the 'Contract') and the Employer having agreed to make an advance payment to the Contractor for performance of the above Contract amounting *[Insert Amount of Advance as per Clause no. 3.50.4(i), in Figures]* (*[Insert Amount of Advance as per Clause no. 3.50.4(i), in words]*) as an Advance against Bank Guarantee to be furnished by the Contractor.

We *[Insert name and address of the Bank]* having its Head Office at *[Insert registered Head Office address of the Bank]* (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, immediately on demand any or, all monies payable by the Contractor to the extent of *[Insert a value equivalent to 110% of advance amount as per clause no 3.50.4(i), in figures]* (*[Insert a value equivalent to 110% advance amount as per clause no. 3.50.4(i), in words]*) as aforesaid at any time upto including.....(@).....without any demur, reservation, contest, 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 or any dispute pending before any Court, Tribunal, Arbitrator or any other authority.

The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantee herein contained shall be enforceable till thirty (30) days after expiry of its validity.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time to vary the advance or to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this guarantee, to postpone from time to time the exercise of any powers vested in the more of any right which they might have against the Contractor, and to exercise the same at any time in any manner,

and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of the more by reason of any other actor forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision, have the effect of relieving the Bank.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

Notwithstanding anything contained hereinabove our liability under this guarantee is limited to [Insert a value equivalent to 110% of advance amount] and it shall remain in force upto and including(@).....and shall be extended from time to time for such period (not exceeding one year),as may be desired by M/s[Contractor's Name] on whose behalf this guarantee has been given

Dated this..... day of20xx..... at.....

WITNESS

| | |
|-------------|--------------------|
| | |
| (Signature) | (Signature) |
| | |
| (Name) | (Name) |
| | |
| | (Official Address) |

(Designation with Bank Stamp)

Power of Attorney No.

Date

Note:

1. (@) This date shall be ninety (90) days beyond the date of Completion of the last facility covered under the Contract.
2. The Bank Guarantee shall be from a Nationalized/ scheduled Bank.
3. The BG should be on Non-judicial stamp-paper/e-stamp paper of appropriate value as per stamp Act prevailing in the state(s) where the BG is submitted or is to be acted upon or the rate prevailing in the state where the BG is executed, whichever is higher. The stamp paper/e-stamp paper shall be purchased in the name of Bidder/Bank issuing the guarantee.

Format 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..... 20xx..... by..... (Contractor's Name) a Company registered under the Companies Act, 1956/ the Companies Act, 2013/Partnership firm/Proprietary concern 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), a Company incorporated under the Companies Act, 1956 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 forvide its Notification of Award/Contract No.....dated..... and it's 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 Equipment 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 Equipment handed over to it by@..... for the purpose of performance of the Contract/Erection portion of the contract (hereinafter called the "Equipment")

NOW THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipment 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 equipment .The Contractor hereby acknowledges actual receipt of the initial installment of the Equipment etc. as per details in the Schedule appended hereto. Further, the Contractor agrees to acknowledge actual receipt of the subsequent installments of the Equipment 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 Equipment etc. in trust as a "Trustee" for and on behalf of.....@.....
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 Equipment 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 Equipment
3. The Contractor undertakes that the equipment 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 Employer of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The Equipment shall at all times be open

to inspection and checking by the Engineer-in-Charge or other employees/agents authorized by him in this regard. Further,@..... shall always be free at all times to take possession of the Equipment in whatever form the Equipment may be, if in its opinion, the equipments are likely to be endangered, mis-utilised 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 Equipment without any demur or reservation.

1. That this Indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment 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 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 Equipment 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.
2. 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 authorized representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE No.1

| Particulars of the Equipment handed over | Quantity | Particulars of Dispatch title Documents | | Value of the Equipment | Signature of Attorney in token of receipt |
|--|----------|---|--|------------------------|---|
| | | RR/GR/ Bill of lading No | | | |
| | | | | | |

(Please number subsequent schedules)

For and on behalf of

[Insert Contractor's Name]

Signature

Name

Designation of Authorized Representative

Common Seal of the Contractor

- 1 Signature ----- Name -----
- 2 Name ----- Signature -----
- 3 Address ----- Designation -----

Authorized representative*

1 Signature -----

2 Name -----

Common Seal

3 Address -----

* Indemnity Bonds are to be executed by the authorized 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.

In case of (ii), the original Power of Attorney if it is specifically for this contract or a Notarized copy of the Power of Attorney if it is a General Power of Attorney and such documents should be attached to Indemnity Bond.

**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/ the Companies Act, 2013/Partnership Firm/ Proprietary Concern and having its registered office(s) at(Office Address)....., hereinafter called the Indemnifier(s)/Contractor(s) (which expression shall, unless excluded by or repugnant to the context, be deemed to mean and include its successors, administrators, executors and permitted assigns).

IN FAVOUR OF

RECPDCL, a Government of India Enterprise, having its registered office at **RECPDCL**, RECPDCL Corporate Office Complex, REC World Headquarters, D-Block, Plot No. 1-4, Sector 29, Gurugram 122001, Haryana, (hereinafter referred to as “RECPDCL”)

3. RECPDCL has awarded the Contractor(s), contract for execution of work (“Scope of Work”) as mentioned in the contract agreement no..... dated, entered into between RECPDCL and Contractor(s), relating to(Name & Address of Project/Station)..... (hereinafter called ‘the Project’).
4. 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.
5. 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.
6. 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 RECPDCL 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 RECPDCL and keep RECPDCL indemnified from and against all claims, demands, actions, liabilities and expenses which may be made or taken against or incurred by RECPDCL by reason of the issue of necessary approval by RECPDCL 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 RECPDCL 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 RECPDCL 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 RECPDCL.

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)

INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE PLANT HANDED OVER BY RECPDCL FOR PERFORMANCE OF ITS O&M CONTRACT (ENTIRE SOLAR PHOTO VOLTAIC PLANT)

(On non-judicial stamp paper of appropriate value)

INDEMNITY BOND

THIS INDEMNITY BOND is made on this day of 20..... by a Company registered under the Companies Act, 1956/ the Companies Act, 2013/Partnership Firm/Proprietary concern having its Registered Office at..... (hereinafter called as "Contractor" or "Obligor" which expression shall include its successors and permitted assigns) in favour of RECPDCL, a Company incorporated under the Companies Act, 1956 having its Registered Office at and its Project at(hereinafter called "RECPDCL" which expression shall include its successors and assigns) :

WHEREAS RECPDCL has awarded to the Contractor a Contract for..... vide its Award Letter/Contract No..... dated and its Amendment No..... and Amendment No..... (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which RECPDCL 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. 3.32.4 of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of RECPDCL for the Solar Photo Voltaic Plant handed over to it by RECPDCL 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 RECPDCL 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 RECPDCL.
2. That the Contractor is obliged and shall remain absolutely responsible for the safe O&M/protection and custody of the Solar Photo Voltaic Project against all risks whatsoever till completion of O&M Contract in accordance with the terms of the Contract and is taken over by RECPDCL. The Contractor undertakes to keep RECPDCL 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 shall be utilized for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-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 RECPDCL is and shall remain the exclusive Employer 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 or other employees/agents authorized by him in this regard. Further, RECPDCL 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 or 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 or demand of RECPDCL to return the Solar Photo Voltaic Plant without any demur or reservation.

5. That this Indemnity 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 of RECPDCL 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 RECPDCL without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to RECPDCL 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 RECPDCL, 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 authorized representative under the common seal of the Company, the day, month and year first above mentioned

SCHEDULE

| 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.

Signature ----- Name -----

Name ----- Signature -----

Address -----

Designation -----

Authorized representative*

Common Seal

Signature -----

Name -----

Address -----

* Indemnity Bonds are to be executed by the authorized 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.

In case of (ii), the original Power of Attorney if it is specifically for this contract or a Notarized 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

SAMPLE SHEET FOR CALCULATION OF EBV

| Bidder | A | B | C | Remarks |
|---|----------|----------|----------|---------------|
| Capacity in MW (AC) | 75 | 75 | 75 | As per Tender |
| Total EPC Cost (X1) in Rs lakhs | 27500 | 29000 | 30000 | As Quoted |
| Total O&M Cost including statutory & Other charges/ Year -in Rs Lakhs | | | | |
| 1 | 350 | 360 | 390 | As Quoted |
| 2 | 368 | 378 | 410 | As Quoted |
| 3 | 386 | 397 | 430 | As Quoted |
| Discounting Factor | 10.00% | 10.00% | 10.00% | As per tender |
| NPV of O&M Price(X2) in Rs Lakhs | 912.32 | 937.94 | 1,016.45 | Derived |
| EBV Rs Lakhs | 28412.32 | 29937.94 | 31016.45 | X1+X2 |

Note: All values/cost Up to 3 decimal and arbitrary in nature.

BUSINESS RULES AND OTHER TERMS & CONDITIONS FOR E-REVERSE AUCTION (e-RA)

1. Reverse Auctions are carried out under the framework of rules as defined by RECPDCL and all bidders participating in Reverse Auction shall understand/accept and give an undertaking for compliance with the same to the RECPDCL in the prescribed format (**Annexure – 10**).
2. Reverse Auction shall be carried out amongst the bidders who have quoted within lowest price + **15%** of the evaluation criteria price. However in case no other bidders fall within +15% of L-1 quoted prices then as decided by RECPDCL shall be allowed to participate in the online Reverse Auctioning.
3. The overall lowest price quoted by the bidder will be considered as Reserve Base Price during reverse auction, further the item wise price of all items shall be arrived from the overall lowest quoted price in the same ratio as quoted by the bidders earlier in the financial bid and all the technically qualified bidders will be considered at same platform.
4. The minimum decrement step for e-Auctioning is in the multiples of Rs. **25, 00,000/- (INR Twenty five lacs only)** in EPC & NPV of O&M Price bid.
5. Preferably the time duration to be kept for conducting Reverse Auction process is from 11:00 AM to 3:00 PM with the incremental time duration of 30 minutes from the time of last quote considering that the bidder may be provided the sufficient time for quoting their best lowest rates. The window may be extended to accommodate 30 minutes, if required, response time. The auction will terminate either at the scheduled end time or as extended as per requirement till there is no response during the incremental time duration. However RECPDCL reserves the right to modify the process with pre-information to bidders if required.
6. The eligible bidders can participate in the online Reverse Auction from any place of their choice and need not to visit RECPDCL office for this purpose.
7. The User ID and password for online reverse auction is same as used in online bidding process/ provided at the time of bidder registration.
8. The Reserve Base Price for Reverse Auction will be informed after the Opening of Price Bid. This shall be the lowest rate received against the initial price bids submitted by participating bidders.
9. RECPDCL shall make all out efforts to rectify the problem(s) leading to system failure during the online reverse auction. However in case the system could not be restored within the reasonable time period as deemed fit by RECPDCL, the reverse auction event shall be suitable extended/ shall be restarted again after rectification by giving a new schedule for the same, which shall cover the left over time period as per the original schedule. On restart of reverse auction the last R1 price received during reverse auction at which the reverse auction event got terminated, shall be the starting price.
10. Where necessary, RECPDCL will facilitate training for participation in Reverse Auction either on its own or through the service provider for the Reverse Auction to familiarize the vendors/bidders with Reverse Auction process.
11. Any vendor/bidder not participating in training shall do so at his own risk and it shall not be open for him to make any complaint/grievance later.
12. No request for postponement/fixing of Training Date/Time shall be entertained.
13. The Date and Time of commencement of Reverse Auction shall be communicated to the shortlisted bidders **at least One day in advance**.
14. Any force majeure or other condition leading to postponement of auction shall entitle RECPDCL to postpone the auction.

15. Any bid once made through registered log-in ID / password by the vendor/ bidder cannot be cancelled. The bidder, in other words, is bound to sell the “Offering” as per the RFP at the bid price.
16. Every successive bid by the bidder / vendor being decremented bid shall replace the earlier bid automatically and the final bid as per the time and log-in ID shall prevail over the earlier bids.
17. No two bids can have identical price from two different vendors. In other words, there shall never be a “Tie” in bids.
18. All bidders will be able to view during the auction time the current lowest price in portal. Bidder shall be able to view not only the lowest bid but also the last bid made by him at any point of time during the auction time.
19. Names of bidders/ vendors shall be anonymously masked in the Reverse Auction process and vendors will be given suitable dummy names. After completion of Reverse Auction, the service provider /auctioneer shall submit a report to RECPDCL with all details of bid and the original names of the bidders and the L-1 bidder.
20. RECPDCL shall however, be entitled to cancel the procurement of Reverse Auction process, if in its view procurement or reverse auction process cannot be conducted in a fair manner and / or in the interest of RECPDCL.
21. No vendor shall involve himself / itself or any of his / its representatives in any price manipulation directly or indirectly with other bidders. If any such practice comes to the notice, RECPDCL shall disqualify the vendor /bidders concerned from the reverse auction process.
22. Bidder shall not disclose details of its bids or any other details concerning Reverse Auction process of RECPDCL to any other third party without specific permission in writing from RECPDCL.
23. Neither RECPDCL nor service provider / auctioneer can be held responsible for consequential damages such as no power supply, system problem, inability to use the system, loss of electronic information, power interruptions, UPS failure, etc. (RECPDCL shall, however, entertain any such issues of interruptions, problems with open mind and fair degree of transparency in the process before deciding to stop or extend the auction.)
24. Any aggrieved vendor / bidder through Reverse Auction process can represent in writing within 24 hours of the Reverse Auction to RECPDCL, failing which no representation/ complaint etc. shall be entertained.
25. RECPDCL decision on award of Contract shall be final and binding on all the Bidders.

**ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT
(To be signed and stamped by the bidder)**

In a bid to make our entire procurement process more fair and transparent, RECPDCL intends to use the reverse auctions as an integral part of the entire tendering process.

The following terms and conditions are accepted by the bidder on participation in the bid event:

1. RECPDCL shall provide the user id and password to the authorized representative of the bidder. (Authorization Letter in lieu of the same shall be submitted along with the signed and stamped acceptance Form).
2. RECPDCL's decision to award the work would be final and binding on the suppliers/ bidders.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of RECPDCL, bid process, bid technology, bid documentation and bid details to any other party.
4. The bidder is advised to fully make aware themselves of auto bid process and ensure their participation in the event of reverse auction, failing which RECPDCL will not be liable in any way.
5. In case of bidding through Internet medium, bidders are further advised to ensure availability of the infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs, power failure or any other reason shall not be the responsibility of RECPDCL.
6. In case of intranet medium, RECPDCL shall provide the infrastructure to bidders. Further, RECPDCL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case an auction event is restarted, the best bid as already available in the system shall become the basis for determining start price of the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out rightly rejected by RECPDCL.
8. The bidder shall be prepared with competitive price quotes on the day of the bidding event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR at site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of the auction event shall be considered by RECPDCL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

Signature & Seal of the Bidder

CERTIFICATE FOR SITE VISIT

This is to certify that the bidder has visited the site in person and he is well conversant with all detail and site conditions. The bidder is fully aware and satisfied with site conditions which are required for successful execution of work.

Dated the _____ day of _____ 2021

Thanking you

Yours Faithfully

[Signature, Name and Designation Person Authorized by the board]

SECTION – IV

TECHNICAL SPECIFICATION

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PART-A

PROJECT INFORMATION

PART A: PROJECT INFORMATION

4 SECTION – IV- TECHNICAL SPECIFICATION

4.1 PROJECT INFORMATION

i) Introduction

RECPDCL proposes to implement a **(125 MW (50 MW & 75 MW))** (AC) Solar Photovoltaic Grid Connected Power Plant to harness Solar Energy. The land for the proposed project is located at **KANPUR DEHAT AND JALAUN DISTRICT**. This project shall be implemented in a single EPC package under Domestic/ under Open category

ii) Project Capacity

| | |
|---------------------|-----------------------------------|
| Name of The Project | Gujrai & Gurhah |
| Project Capacity | 125 MW (50 MW & 75 MW) |
| Technology | SOLAR PV TECHNOLOGY |

iii) Location and Approach

| Sl.No. | Name | Capacity (MW _{AC}) | Coordinates of Solar Park | Distance from Solar Park to 132 kV Relevant S/S |
|--------|---|------------------------------|--------------------------------|---|
| 1 | Gujrai, Dist: Kanpur Dehat of Uttar Pradesh | 50 MW _{AC} | 26°17'54.36"N 79°56'45.92"E | 12 KM |
| 2 | Gurhah, Dist: Jalaun of Uttar Pradesh | 75 MW _{AC} | 25°51'0.94"N 79°32'45.11"E | 20 KM |

iv) Land Availability (Project dependent)

| | |
|----------------|--|
| Land Available | Please refer to the RfS document (Page 94-96) uploaded along with the Tender. |
| Plot No. | |
| Type of Land | |

| | |
|-------------------------------|--|
| Details of land in possession | |
|-------------------------------|--|

v) Power Evacuation System

| | |
|---|--|
| Details of Power Evacuation Arrangement | Please refer to the RfS document (Page 91-92) uploaded along with the Tender. |
|---|--|

vi) Other Details

| | |
|--|---|
| Water Requirement during operation & construction | Please refer to the RfS document (Page 56) uploaded along with the Tender. |
| Power Requirement during construction | |
| Any other Project Specific Details to be specified | |

PART-B

SCOPE OF SUPPLY AND SERVICES

4.2 SCOPE OF SUPPLY AND SERVICES

4.2.1 Intent of specification

- 4.2.1.1** The scope of the proposal for the Design, Engineering, Supply, Erection, Testing, Commissioning of **(125 MW (50 MW & 75 MW))** (AC) Grid connected Solar Power Project at **KANPUR DEHAT AND JALAUN DISTRICT** and **Three (03)** years Comprehensive Operation & Maintenance thereafter shall be on turnkey basis covering the activities & services as described in this specification.
- 4.2.1.2** All Works to be carried out as per the Scope detailed in this specification shall be in accordance with the requirements, conditions, appendices etc. given in Technical Specifications (Section-IV) together with those stated in other Sections/Sub-sections of Bid Documents, which shall be considered as a part of this volumes completely as if bound herewith. Further, all the works to be carried out under the scope should also comply all the technical requirements of RfS document issued by the **UPNEDA/Implementing Agency** for this project.
- 4.2.1.3** It is not the intent to specify herein all aspects of design and construction nevertheless, the equipment and civil works shall conform to all aspects to high standard of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the Employer, who will interpret the meaning of the Technical Requirements/ specification and drawings and shall have a right to reject or accept any work or material which in his assessment is not complete to meet the requirements of this specification and/or applicable Indian / International standards mentioned elsewhere in this specification.
- 4.2.1.4** The Contractor shall be responsible for providing all materials, equipment and services, specified or otherwise (unless specifically excluded) which are required to fulfil the intent of ensuring operability and the reliability of the complete Solar PV Plant covered under this specification.
- 4.2.1.5** Bidders are requested to carefully examine and understand the specifications /Technical requirements and seek clarifications, if required, to ensure that they have understood the specifications. Such clarifications should be sought within the time period as stipulated in section ITB. Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions.
- 4.2.1.6** Before submitting his bid, the Bidder should inspect and examine the site and its surroundings and should satisfy himself as to the nature of soil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by the Employer.

4.2.2 Scope of Supply and Services

The scope of Supply & Services shall include all Development of Land, Design, Engineering, Manufacture, Procurement of Equipment and material, Testing at Manufacturer's Works, Packing & Forwarding, Transportation, Supply, Receipt and Unloading at site, storage , Insurance at all stages , associated Civil, Electrical Works, Services, Permits ,Licenses, Installation, Erection, Testing, Commissioning, Performance Demonstration and Operational Acceptance of **125 MW (50 MW & 75 MW)** (AC) Grid

Interactive Solar PV Power Plant on turnkey basis along with **THREE (03) years** Comprehensive Operation & Maintenance thereafter.

The scope of the contractor shall be deemed to include all equipment, materials and services which although are not specifically mentioned in the bid documents and/or in contractor's proposal but are necessary for the satisfactory operation of the Solar PV system and its integration with evacuation system provided by State Electricity Authority(s)/ CTU.

4.2.3 Scope of Supply: The equipment and materials for Grid Interactive Solar PV Power Plant with all the associated system but not be limited to the Supply of the following :

4.2.3.1 DC System

- a) Solar PV Module
- b) Module Mounting Structure (MMS) including all necessary accessories
- c) String Combiner Box with String Monitoring System ,String Fuses, Surge Protection System including all necessary accessories with String Monitoring capabilities
- d) DC Array field Lightning Arrestors
- e) Power Conditioning Unit (PCU) including all necessary accessories
- f) Solar Cables along with lugs, glands, ferrules, straight/Y- connectors and other materials required for proper cable termination at both the ends.
- g) Junction Boxes & all necessary accessories
- h) DC Earthing system including all necessary accessories

4.2.3.2 AC Systems

- a) Power Transformers/Inverter Transformers, Auxiliary Transformers including all necessary accessories
- b) HT Switchgear
- c) LT Switchgear
- d) AC Cabling System-LT Power & Control, HT Cables, Cable Support System along with cable termination kits.
- e) Protection System
- f) **All equipments including HT/LT cables, Transformers, Inverters and associated equipments/accessories required for evacuation of power from PV module to 33/132 kV Switchyard shall be provided by the Contractor.**
- g) Energy Metering System
- h) Earthing System & Lightning Protection System with all necessary accessories
- i) Plant illumination system
- j) Auxiliary Power Supply System
- k) Battery System including all necessary accessories
- l) UPS with battery bank of sufficient capacity.
- m) SCADA System with all necessary accessories
- n) Telemetry & Grid interfacing for data transmission from Main Control Room to SLDC/RLDC along with communication system so as to meet statutory

requirements and comply with CERC code. All required hardware, Gateway Modem, Radio Link etc. required for data compliance with Regional Load Dispatch Centre (RLDC)/SLDC/STU/CTU.

4.2.3.3 General System

- a) Weather Monitoring Station
- b) Fire Detection and fire protection system in buildings, transformer yard, switchyard and pooling sub-station
- c) Module Cleaning system
- d) CCTV System for entire Solar PV Plant
- e) **The contractor shall make their own necessary arrangements for water supply for construction. However, during operations and maintenance of the Solar Power Plant, internal water supply arrangement from Bore Well is to be arranged by the Bidder. Further, charges if any claimed by any competent authorities in future for usage of water shall be payable by the contractor.**

4.2.3.4 Tools & Tackles

The Contractor shall supply all necessary tools and tackles and other instruments required for the erection, assembly, disassembly, Commissioning, testing, operation and proper maintenance of the plant and equipment and systems (including software). These tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. The price of each tool / tackle shall be deemed to have been included in the total bid price. **The bidder shall provide the same alongwith bid in attachment-19.**

4.2.3.5 Spares

The Contractor shall supply and maintain adequate inventory of all the spares (including softwares) required for safe, reliable and trouble free operation & maintenance of the complete Solar PV Plant during the period of contract. The price of these spares shall be deemed to be included in the contract price. List of Mandatory Spares to be provided by Contractor along with Bid is mentioned in Clause No. 4.4.9 of the Technical Specifications.

4.2.4 Scope of Services

The scope of services shall include all associated works & services in respect of above supplies that are needed to make the system complete in all respect for its safe, reliable, efficient and trouble free operation and shall not be limited to the following:

4.2.4.1 Arrangement of Land

Solar park developer SPIA shall make available the land and RECPDCL will enter into Right to Use / Lease Agreement with SPIA after allotment of the Project.

4.2.4.2 Assessment of site

The contractor is required to measure the Solar Radiation and other climatic conditions relevant to predict the plant performance. This is necessary to study solar parameters 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, parameters and climatic conditions.

4.2.4.3 Design & Engineering

Basic Engineering, Detailed Design and Engineering of Grid Interactive Solar PV Plant and its associated Civil, Electrical & Mechanical auxiliary systems including preparation of foundation drawings, single line diagrams, installation drawings, electrical layouts, design calculations etc. Design memorandum and other relevant drawings and documents required for engineering of all facilities within the scope to be provided under this contract, are covered under contractors scope of work.

- a) The Contractor shall submit to the Employer necessary documents, drawings, data design and engineering information in 3 (three) Hard & Soft copies from time to time as per the Engineering Information Schedule. The Engineering Information Schedule shall be finalized with the Employer prior to signing of Contract Agreement. The indicative list of documents to be submitted in the Engineering Information Schedule is mentioned in the Clause No 4.4.10.
- b) **Design Memorandum/Design Basis Report**

The Contractor shall prepare and submit to the Employer a “Design Memorandum/ Design basis Report” of the Plant fulfilling the contract specification/requirement. The memorandum shall include the design philosophy, methodology, system description, input parameters for design, major technical features, basic arrangement/ layout etc. The observations /comments of the Employer (if any) should-be duly incorporated by the contractor.

4.2.4.4 Finalization of Sub-Contractors/Sub-vendors

The Contractor shall be responsible for the finalization of sub-contractors/Sub-vendors for all the Supplies & services as required to make the system complete in all respect for its safe, reliable, efficient and trouble-free operation. The list of such sub-contractors /Sub vendors shall be provided by the Contractor for the approval of Engineer-in-Charge before finalization.

The vendors/Suppliers for Modules & PCUs shall be finalized by the contractor complying the requirements of respective provisions of Technical Specifications (Section-IV). The Contractor shall finalize the Vendors/ Suppliers of major Equipment including Modules, Inverters and MMS Material after the approval of Engineer-in-Charge and prior to signing of Contract Agreement.

4.2.4.5 Mobilization at site

Workforce: Accommodation for the workforce required for construction is in the contractor's scope.

Electricity: Arrangement of Power requirement during project construction is in contractor's scope.

Water: Arrangement of Water requirement during operation & construction phase of the project is in contractor's scope.

4.2.4.6 Packaging, Transportation, Unloading and Storage

Packing and Transportation from the manufacturer's works to the site including customs clearance & port clearance, payment of port charges, (if any), Receipt, Unloading, storage, preservation and conservation of equipment at the site shall be in the scope of the Contractor.

4.2.5 Civil Works

The scope of civil construction work shall include all Works required for the Solar PV Project but not limited to the following:

- a) **Geotechnical Investigation at site**
- b) **Soil Investigation at the site**
- c) **Site Preparation:** Site grading including slope protection, ground preparation/ filling/ levelling (if required) of the identified area and cutting, clearing and transporting of bushes/ vegetation/ trees etc.
- d) **Foundation:** Construction of foundation and Mounting structures as required for the equipment
- e) **Rooms/Cabins:** Construction of Control room, Inverter room, Store Room, security room /Cabins, Gate complex, Equipment Rooms etc., as required along with requisite furniture, workstations, Air Conditioning and other equipment as per specifications
- f) **Roads & Pathways:** Construction of service roads and pathways **(Main roads shall be provided by Solar Park developer i.e SPIA)**
- g) **Contractor shall make their own necessary arrangements for water supply for construction. However, during operations and maintenance of the Solar Power Plant, internal water supply arrangement from Bore Well is to be arranged by the Bidder.**
- h) **Drains:** SPIA shall lay and maintain the main drains along the main road. Design and construction of internal plant drainage system and its interface/connection with the Main Drainage System shall be in the scope of the contractor.
- i) **Fencing:** Fencing along the periphery of the allocated land for 125 MW (50 MW & 75 MW) .The fencing work shall be completed within time frame as specified in clause no 3.17.2.
- j) **Cable Routing:** Requisite cable routing through cable trenches/trestle and/ or cable tray, where ever required.
- k) **Power cables laying with proper cable tray arrangements.**
Construction of Switchyard for **33/132 kV** system including all equipments, panels and other accessories etc.

4.2.6 Installation, Erection, Testing, Commissioning

The scope of the contractor shall deemed to include Design, Engineering, Supply, Erection, Testing, Commissioning of all the equipment including successful completion of **Performance Guarantee Test** of Solar PV Project. The synchronization shall be done in accordance with the then applicable Grid Code and the state & central authority regulations.

4.2.7 Performance Guarantee Test

Bidder has to quote the first year annual generation in the relevant section of the bidding document. The same has to be demonstrated during the performance guarantee test.

The performance guarantee tests shall be carried out as specified elsewhere in the Technical Specification. All special equipment, tools and tackles instruments, measuring devices required for the successful conductance of PG test shall be provided by the bidder, free of cost. All costs associated with the PG tests shall be included in bid price.

The performance guarantee tests shall be carried out as specified in 4.4.6 of the Technical Specification/Requirement (Section- IV).

INPUT FOR LIQUIDITY DAMAGE FOR SHORTFALL IN PERFORMANCE DURING PERFORMANCE GARRANTEE TEST AND O&M PERIOD

Global Solar Insolation of the Site (125 MW (50 MW & 75 MW)) (AC) .

| <i>Month</i> | <i>Month wise Solar Insolation (kWhr/m²)</i> |
|---------------------|--|
| January | 118 |
| February | 135 |
| March | 179 |
| April | 187 |
| May | 202 |
| June | 165 |
| July | 138 |
| August | 135 |
| September | 143 |
| October | 138 |
| November | 114 |
| December | 106 |
| Year | 1760 |

Tariff for determination of Liquidated Damages for shortfall in generation during Performance Guarantee Test: Rate (Rs/ kWh) x 10.6454

Tariff for determination of Liquidated Damages for shortfall in generation during O&M Period: Rate (Rs/ kWh)

'Rate (Rs/ kWh)' to be read as Rs 2.69 for (125 MW (50 MW & 75 MW)) Solar Project.

4.2.8 Testing

- a) During detailed engineering, the contractor shall submit to the Employer the valid type tests reports for approval/review. These tests should have been conducted on the equipment similar to those proposed to be supplied under this contract at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit valid type test report(s) or in the case of type test report(s) are not found to be meeting the specification requirement, the contractor shall conduct all such tests under this contract at no additional cost to the employer.
- b) All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Quality Assurance Plan and reports shall be submitted to Employer.

4.2.9 Warranty

The contractor shall provide the warranty for the equipment as mentioned below:-

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.

- a) The modules shall be warranted for at least 10 years for failures due to material defects and workmanship.
- b) The mechanical structures, electrical works and overall workmanship of the grid connected solar power plants must be warranted for a minimum of 3 years.
- c) The Inverters/PCUs installed in the solar power plant must have a warranty for 5 years.
- d) In addition to above, the contractor shall also provide warranty for the equipment/systems as per provisions of RfS (if any).
- e) All warranties shall be in the name of RECPDCL.

4.2.10 Approvals and Licenses

- I. The Contractor, on behalf of the Employer, shall obtain all **applicable** statutory approvals / clearances required from Government Departments/regulatory Authority including but not limited to the following:-
 - a) Pollution control board clearance, if required.
 - b) CEIG
 - c) Connectivity with State Transmission Company, Central Transmission Company
 - d) System Studies (if any)
 - e) Power Evacuation
 - f) Environment Clearance
 - g) Construction Power

- h) CT, PT and Metering System testing at Authorized lab as per Requirement of the concerned Agencies.
- i) Application for Open Access or as applicable
- j) Application for Connectivity
- k) SLDC Data Transmission/Integration at SLDC
- l) Any other approvals and permissions not specifically mentioned but may be required for smooth Construction and Operation & Maintenance of the Plant.
- m) **Payment to concerned agency for Connectivity Charges, Solar Park land cost, System Study Charges, Registration Charges and Statutory Charges (if any) shall be in the scope of the Employer. However, all required assistance and documentation shall be in the scope of the EPC Contractor.**

I. All Construction and O & M of the Plant shall be carried out through appropriate relevant Standards, regulations and procedures laid by SPIA/IMPLEMENTING AGENCY/MNRE/ CEA/CERC/SERC/ CEIG/ SPIA and other statutory and regulatory authorities as and when applicable. Further, this shall comply the applicable labour laws. The Contractor shall make himself aware of the same and shall not solely depend upon the Employer.

II. The Contractor shall make all required Liaisoning /co-ordination with the concerned agencies for obtaining such approvals including Solar Power Park Developer (SPIA), Chief Electrical Inspector General, STU, Statutory Authorities, concerned power utilities etc for interconnection/synchronization of the solar power plant with the State Grid, so as to commence utilization of power generated from solar power plant soon after its commissioning.

III. The Employer will obtain approvals and other necessary clearances from the concerned authorities related to land including allotment of land, its possession etc., for the project.

IV. The Contractor, in its own interest, is advised to get fully acquainted with the approvals and clearances within the state where the Solar Power Project is to be developed and obtain for himself on its own all information that may be necessary for such approvals and clearances.

4.2.11 Training of Employer's Personnel

The contractor shall provide training free of cost to the personnel of Employer for 7 man-days on Design/manufacturing/erection/testing/commissioning and O&M. Expenses towards travel, lodging, and boarding and other expenses for the personnel shall be borne by the Employer.

4.2.12 Insurance Coverage

The Contractor shall provide all the adequate insurances during EPC and O&M period to cater all Construction and O&M of the plant to indemnify the Employer in accordance with Clause No. 3.56 of Bid Documents.

4.2.13 Scope of Operation & Maintenance (O&M)

Comprehensive O&M of the solar PV plant (s) for a period of **Three (03)** years from the date of operational acceptance is in the scope of the Contractor. The Detailed scope of O&M Services has been specified in 4.4.8 of this section.

4.2.14 Energy estimation and scheduling

The work regarding the Estimation, Scheduling & Forecasting on daily basis in form of day ahead schedule as per applicable guidelines shall be in the scope of contractor without any additional cost to Employer during period of O & M Contract. Coordination with concerned Agencies (SLDC/RLDC etc.) for the above shall also be in the scope of the contractor. The Contractor shall be required to Schedule its power as per the applicable regulations /requirements / guidelines of CERC / SERC /SLDC / RLDC or any other competent agency and same being recognized by the SLDC or any other competent authority /agency as per applicable regulation/ law / direction and maintain compliance to the applicable Codes/ Grid Code requirements and directions, if any, as specified by concerned SLDC/RLDC from time to time. Any deviation from the Schedule will attract the provisions of applicable regulation / guidelines / directions and any financial implication on account of this shall be borne by the contractor.

4.2.15 Performance Monitoring

The performance monitoring of the system shall be as per the terms & requirements of RfS.

- a) The Contractor shall maintain the list of Module IDs along with performance characteristic data for each module (information stored in RF Identification Tags). This data shall be submitted to SPIA/MNRE/RECPDCL.
- b) The Contractor must install necessary equipment to continuously measure solar radiation on module plane, ambient temperature, wind speed and other weather parameters and simultaneously measure the generation of DC power as well as AC power generated from the plant. They will be required to submit this data to SPIA and MNRE on line and/or through a report on regular basis every month for the entire duration of O&M Period.
- c) The Contractor shall provide access to SPIA/MNRE/RECPDCL or their authorized representatives for installing any additional monitoring equipment to facilitate on-line transfer of data. All data shall be made available as mentioned above for the entire duration of the O&M Period.
- d) The SCADA System shall be built over Industrial IoT architecture with integrated Analytics, secure web access, enterprise software and Database in accordance with Clause No. 4.4.3.11. It shall be able to provide real time online data (including but not limited to irradiance, plant generation (instantaneous/daily/monthly/yearly), daily peak generation, temperature, wind speed etc.) to SPIA/MNRE/RECPDCL or any other Regulatory Agency as per requirement.

4.2.16 Handing over of the Plant

At the end of the contract period, the contractor shall hand over the plant and equipment back to the Employer in completely safe and healthy condition and without any pending defect. The items supplied by the Employer on returnable basis, such as spares parts, consumables, tools and plants, documents etc. shall be returned back to the Employer, else, suitable recoveries shall be made from the Contractor's bills.

4.2.17 Terminal point for the EPC Project

- a) Complete EPC work for **(125 MW (50 MW & 75 MW)) (AC)** Solar PV Project up to interconnection point /evacuation point as per the power evacuation plan indicated in **the RfS Document**.
- b) SPIA will construct/ provide transmission line from the Project up to interconnection point/delivery point as per SPIA agreement with RECPDCL. However, all coordination, work execution, paper work shall be carried out by the EPC Contractor. However, contractor shall be responsible for overall co-ordination with SPIA for construction of Transmission line. The maintenance of Transmission system up to the Inter-connection Point shall be adhered to as per the Terms and Conditions of SPIA & contractor shall be wholly responsible for the same.
- c) Solar Park Land cost will be paid by RECPDCL to SPIA.
- d) RECPDCL will directly pay to State Transmission authority for development of bay(s) at State Transmission authority end substation.
- e) Solar Park-O&M Annual Charges to SPIA will be paid by RECPDCL

4.3 PART C: GENERAL TECHNICAL REQUIREMENTS

4.3.1 Introduction

This part covers general technical requirements, which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical requirements brought out in this section.

4.3.2 Completeness of the Facilities

Contractors may note that this is a contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.

All equipment furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation & maintenance of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.

4.3.3 Codes and Standards

4.3.3.1

All the works shall be carried out as per the standards/codes (IEC, IS etc.) referred in the Technical requirements/ specification. All the standards and codes of practice referred to shall be the latest editions including all applicable official amendments and revisions. In case of conflict between this specification and those codes/standards referred the later shall prevail.

Unless covered otherwise by Indian codes & standards and in case nothing to the contrary is specifically mentioned elsewhere in the specifications, the latest editions (as applicable as on date of Issue of NTT), the International/ National standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment.

4.3.3.2

In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all statutory regulations and safety codes as applicable in India as well as of the locality where they will be installed including the following:-

- a) Bureau of Indian Standards (BIS)
- b) Indian electricity act
- c) Indian electricity rules
- d) Indian Factories Act and State Factories Act
- e) Regulations of the Central Pollution Control Board, India
- f) Regulations of the Ministry of Environment & Forest (MoEF), Government of India

- g) Pollution Control Regulations of Department of Environment, Government of India
- h) State Pollution Control Board.
- i) Rules for Electrical installation by Tariff Advisory Committee (TAC).
- j) Indian Electricity Grid Code (IEGC), CEA/CERC /SERC Regulations and other statutory regulations as applicable.
- k) Any other statutory codes / standards / regulations, as may be applicable

4.3.4 Instruction Manuals

The Contractor shall submit to the Employer, Instruction Manuals for all the equipment covered under the Contract. The manuals shall be specifically compiled for this project. The Contract shall not be considered to be completed for purposes of taking over until the Instructions manuals have been supplied to the Employer. The Instruction Manuals shall include (but not limited to) the following: -

4.3.4.1 Erection & Commissioning Manuals/Checklists

The erection & Commissioning Manuals/Checklists shall be submitted prior to the commencement of erection activities of particular equipment/system. The Erection Manual should include Erection strategy, Sequence of erection, Erection instructions, Critical checks and permissible deviation/tolerances, Bill of Materials, Procedure for erection, General safety procedures, Procedure for initial checking after erection, testing and acceptance norms , Procedure / Check list for pre-commissioning & Commissioning activities.

4.3.4.2 Operation & Maintenance Manuals

The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall be in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust all parts of the equipment. These shall give a step by step procedure for all operations likely to be carried out during the life of the plant / equipment including, operation, maintenance, dismantling and repair including periodical maintenance activities to be carried out for smooth functioning of the plant. List of spare parts along with their drawings and catalogues shall also be provided in the Manuals.

4.3.5 Progress Reports

The Contractor shall furnish to the Employer, Progress Reports with periodicity as decided by the Employer detailing out the progress achieved in the execution of the project including status of supply of material, progress on all erection activities as compared to the schedules. Colour photographs and video in VCD/DVD indicating various stages of erection and the progress of the work done at Site shall supplement this. The report shall also indicate the reasons for the variance between the scheduled and actual progress and the action proposed for corrective measures, wherever necessary.

4.3.6 Project Completion Report

The Contractor shall submit a Project Completion Report at the time of handing over the plant. Before the final acceptance of individual equipment /system by the Employer, the Contractor will update all original drawings, documents and BOM for the equipment/system to "as built" conditions and submit these as built drawings/documents to the

Employer. The Works shall not be considered complete for purposes of taking over under the terms of the General Conditions of the Contract until the Contractor has supplied the above documents.

4.3.7 Technical/Contract Co-ordination Meeting

The Contractor shall organize and attend progress Meetings (at least one monthly or as decided by the Employer) with the Employer/Employer's representatives during the period of Contract at mutually agreed venues for review of progress & resolving technical clarifications, if any. The Contractor shall attend such meetings at his own cost and fully co-operate with such persons and agencies involved during the discussions. The Contractor shall ensure availability of the concerned experts / consultants/ personnel who are empowered to take necessary decisions during these meetings.

4.3.8 Design of Facilities/Maintenance & Availability Considerations

The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice.

The Contractor shall be responsible for the selection and design of appropriate equipment to provide the best coordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Requirements/ Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the work shall be done while complying fully to or above minimum standards specified in this specification.

4.3.9 Design of Facilities, Specifications and Drawings

All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere.

The Contractor shall be responsible for the selection and design of appropriate equipment to provide the best coordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling.

The Contractor shall furnish engineering data/drawings for entire equipment covered under this specification in accordance with the schedule of information as specified in Technical Specification and Data sheets.

The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared and ensure that the discrepancies are removed, before their submission to the employer.

Any changes of the design of any part of the Works, which may become necessary after signing the Contract, have to be submitted in writing to the Engineer in-Charge for approval, being sufficiently substantiated and justified. However, there shall not be any cost implication due to these deviations on the employer

4.3.10 Standardization of Works:

Every effort shall be made to standardize parts and spares so as to minimize costs

throughout the Works in order to facilitate keeping stocks, maintenance, replacement, inter changeability, etc.

4.3.11 Availability and reliability:

The Contractor shall design each equipment, system or subsystem to provide 99 % availability, reliability, low maintenance and ease of maintenance. The Contractor shall optimize the various systems and subsystems to minimize the number of different components and associated spare parts. The Contractor shall also furnish details of availability records in the reference plants stated in his experience list

4.3.12 Material of Construction:

All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilized for various components shall be those, which have established themselves for use in such applications.

4.3.13 Safety

Handling provision: Lifting lugs, brackets, eyes, and other items required for attaching lifting devices shall be provided on all the major components of the equipment for safe handling. Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the contractor for lifting the equipment and accessories covered under the specification

Safety of operation: All equipment and services provided under this contract shall abide by commonly accepted standards for safety of operation.

4.3.14 Rating Plates, Name Plates & Labels:

Each main and auxiliary item of plant including instruments shall have permanently attached to it in a conspicuous position, a rating plate of noncorrosive and non-hygroscopic material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.

4.3.15 Protection and preservative shop coating

i.

Il coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a non-metallic protection device. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or over ground environment as the case may be. The Contractor's scope of work includes painting of all equipment and structures. The quality and finish of paints shall be as per standards of BIS or approved equivalent.

ii.

reservative Shop Coating: All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer.

Transformers and other electrical equipment if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.

Shop primer for all steel surfaces, which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor

4.3.16 Mechanical Works and Steel Structures

4.3.16.1 Materials

Materials shall be new and of high-grade quality, suitable for the purpose, free from defects and imperfections, and of the classifications and grade meeting specification requirement. Material specifications, including grade or class shall be shown on the appropriate drawings.

All materials or parts used in the equipment shall be tested in conformity with the standards.

Certified Material Test Report for the materials of major/important components and/or materials for special application shall be furnished to the Employer as soon as possible after the tests are performed. Each test certificate shall identify the components for which the materials are used and shall contain all information necessary to verify compliance with the contract.

4.3.16.2 Metal Work

The contractor shall supply & install all anchors, fasteners, embedded metal work, piping, & sleeves associated with & required for the equipment to be installed under this contract, except if otherwise mentioned in the specifications.

The Contractor shall be responsible for the determination and details of all loads and forces exerted by his equipment and transferred to the foundation.

Galvanizing: Unless otherwise specified, all structural steel including ladders, platforms, hand rails and the like and all exterior and interior steel surfaces of outdoor Works, as well as bolts and nuts associated with galvanized parts shall be hot-dip galvanized, electrolytically galvanized or standardized, as may be appropriate to the particular case.

4.3.17 Instrumentation & Control

All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.

All instrument scales and charts shall be calibrated and printed in metric units and shall have linear gradation. The ranges shall be selected to have the normal reading at 75% of full scale.

All scales and charts shall be calibrated and printed in Metric Unit

4.3.18 Pre-Commissioning & Commissioning Facilities

i.

The pre-commissioning and commissioning activities of the equipment/systems furnished and installed by the contractor shall be the responsibility of the Contractor. The Contractor upon completion of installation of equipment and systems, shall conduct pre-commissioning and commissioning activities, to make the equipment/systems ready for safe, reliable and efficient operation on sustained basis at his expense. All pre-commissioning/commissioning activities considered essential for such readiness of the equipment/systems including those mutually agreed and included in the Contractor's quality assurance programme as well as those indicated in the technical Requirements/ specifications shall be performed by the contractor. The Contractor must strictly adhere to the Commissioning procedure as stipulated in RFS document.

ii.

The contractor shall give the concerned RLDC/SLDC, UPNEDA/IMPLEMENTING AGENCY, RECPDCL & UPNEDA (if applicable) at least sixty (60) days advanced preliminary written notice and at least thirty (30) days advanced final written notice, of the date on which it intends to synchronize the Power Project to the Grid System. The synchronization equipment and all necessary arrangements / equipment including RTU for scheduling of power generated from the Project and transmission of data to the concerned authority as per applicable regulation shall be responsibility of the Contractor.

iii.

The capacity of DC arrays to be installed shall be as per the terms & requirements of RFS

4.3.19 Packaging & Transportation

The Contractor is solely responsible for transporting the equipment/material, machinery with proper packaging and labour at his own cost and is also obliged to arrange for and obtain all necessary permissions, permits, consents and licenses. All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Upon indicating the items for which the contractor requires the C-forms, the employer may issue the C-form. Also arrangement of safe storage facility for preservation & conservation of all the incoming material is in the scope of the contractor.

Part – D

Detailed Technical Requirement

4.4 DETAILED TECHNICAL REQUIREMENTS

4.4.1 CIVIL WORKS

4.4.1.1 Topographical Survey

The Contractor shall refer the RFS document of Gujrai & Gurhah Solar Park attached as Section 6. Based on the above, the Contractor thereafter shall prepare a detailed general layout for complete solar PV Plant, with clear demarcation showing boundary wall, boundary pillars, location of control room, PV array yard, approach road, internal roads and general drainage etc. clearly marking the scope to be undertaken by the Contractor. The work shall be executed according to the specifications and good engineering practices necessary to fulfil the objectives of the survey work strictly as per requirement for execution of work.

4.4.1.2 Geo-Technical Investigations and Testing.

Geo-Technical Investigations and Testing of the proposed site shall be done by the Contractor at his own cost. All testing shall be done in a NABL accredited / Govt. Laboratory. This includes reputed government / autonomous laboratories / organizations, and other reputed testing laboratories. The test samples for such test shall be jointly selected and sealed by the contractor, in the presence of the Employer's representative and shall be sent to the concerned laboratory. The interim and final reports shall be made available as and when received, to the Employer.

Contractor is required to consider the Geo-Technical parameters of the proposed site as per the final Geo-Technical Investigations and Testing report vis-à-vis locations of various structures required for the project to design suitable foundations for the respective structures. Further, based on the Geo-Technical Investigations and Testing report, the Contractor shall arrange for Geo- Technical improvement wherever necessary.

4.4.1.3 Other Investigations

The contractor shall be responsible for collecting necessary data (earth quake data, wind velocity data, weather related data like Temperature, humidity, flood, rainfall etc) and carry out all other necessary studies/investigations (Shadow Analysis etc) as required for construction, execution and smooth operation of the plant.

4.4.1.4 Planning and Designing

- a) The solar plant shall be designed so as to conform to the latest engineering designs, architectural values and aesthetic features etc.
- b) The Contractor has to plan and design all the Civil Engineering Structures/works as per the topographical survey, Geo-Technical Investigations, Other Investigations/studies, Testing reports etc.
- c) The Contractor shall develop general layout drawing for the complete solar PV Plant including but not limited to plant array field, internal roads and pathways, drainage system, approach roads (ensuring no water logging in the plant premises) along with sanitary plumbing layout etc. All designs & drawings have to be developed based on specifications given in the Bid documents, soil report and relevant IS codes unless otherwise specified. All details related to internal electrification, water supply and sewerage system should be clearly shown in the drawings.
- d) Basic and Layout design of the project shall be in accordance with internationally

accepted practice. Appropriate IS Codes (latest version) shall be used wherever available. The Contractor should be able to provide various international and national references, when required by employer, to substantiate his design.

- e) All structures for civil works shall be designed for severe combination of loads, considering wind seismic loads etc. The Contractor shall get the structural design done as per the relevant IS codes or international practices

4.4.1.5 Site Development

Before commencement of work including land development of the project site, the Contractor must visit the site to assess the actual ground conditions and familiarize himself with the site conditions. All due attention necessary must be given to the drainage, water runoff and general slope/gradient of the terrain and plant area. As far as possible the excavated material, which is suitable for fill, shall be used in project area itself. In case the earth filled is brought from outside the plant, the contractor shall provide the necessary royalty challan. Waste material shall be disposed-off in sites to be identified and arranged by contractor himself at his own cost.

4.4.1.6 Site Levelling and Grading

The EPC contractor is responsible for making the site ready and easily approachable by clearing of bushes, felling of trees (if required with appropriate approval from concerned authority), levelling of ground (wherever required) etc. for commencing the project. It is to ensure that land must be graded and levelled properly for the flow of water. It is advisable to follow the natural flow of water at the ground. If the land pocket needs any filling of sand, it is to ensure that the filled earth must be well compacted as per the relevant IS standards.

4.4.1.7 Fencing of the Project

The complete project area shall to be protected from foreign ingress and unauthorized access by fencing all along its periphery. The Contractor shall provide GI Chain Link all around the periphery of the plant. The height of fencing shall be at least 2m above the finished ground level. The construction of peripheral fencing and Main Entry gate shall conform to the relevant IS Standards and practices. **The chain link fencing shall compromise of G.I chain link fencing with mesh size 75x75 mm with a nominal mesh size of 3.15 mm diameter . However,** the complete design, materials and the erection of chain link fencing shall be done as per standard engineering practices.

Fencing of Switchyard and Transformer Yard: The fencing work required for electrical switchyard shall be of barbed wire / twisted G.I. fencing wire in accordance with relevant IS Standards, CEIG and other statutory requirements (if any).

4.4.1.8 Foundations

The contractor is responsible for the detailed soil investigation and subsequent foundation design of the structures and equipment in the plant. The foundation design and drawing of the module mounting structures, buildings and other important equipments and structures shall be submitted to the employer for review & reference as per Engineering Information Schedule.

The foundation system shall be made which transfer loads safely to the soil for the module mounting structures, depending on Geotechnical Investigation, geographical condition, regional wind speed, bearing capacity, slope stability etc. The support structure & foundation shall be designed with reference to the existing soil conditions, Geotechnical investigation, geographical conditions, slope stability etc. and shall be capable to withstand wind speed applicable for the zone whichever is higher, using relevant Indian wind load codes. The structures and foundations shall also conform to the seismic conditions pertaining to the zone (using relevant Standards and codes).

Civil foundation design for Module Mounting Structure (MMS), Control Room, Inverter Room, Equipment Room and other equipment's shall be made in accordance with the National Building Code, relevant BIS Codes and as per site conditions.

In general, the MMS foundation shall be constructed using RCC/Concrete Pile foundation of required diameter and depth as per approved design

4.4.1.9

4.4.1.10 Pathways and Roads

Suitable approach road and internal roads shall be made to carry safe and easy transportation of equipment and material at the project site. These roads shall provide easy and fast approach to each location of the plant. Approach road from nearest main road to control room shall be flexible type bituminous road and shall be constructed with sufficient width (minimum 3.0 m) with 0.5 m wide shoulder on both side). The road must be well compacted as per the latest relevant IS codes and MORTH updated till date.

All Peripheral roads and pathways shall be provided for easy access and shall be hard roller type. However, the approach road from main gate to control room shall be of WBM type.

For illumination of all approach roads and peripheral pathways, reference shall be made to relevant Electrical Specifications

The Internal pathways between alternate row of solar panels shall be levelled and good enough for carrying panels, material, Module washing/cleaning, easy movement for carrying out smooth and trouble free operation and maintenance of the plant.

4.4.1.11 Drainage System

Drainage philosophy based on site area levels and invert levels of drains shall be developed by the contractor to ensure no water stagnation in the plant. Contractor shall design and construct suitable drainage system for rain & storm water, Flood water etc. Also, cross drainages shall be designed and constructed by contractor, if required and shall be designed as per site rainfall data flood data and other standard criteria and shall be constructed with brickwork/RCC/RR masonry as suitable for the site conditions. The construction shall include dressing of sides and ramming of bottoms including mucking of the excavated soil and disposal of surplus excavated soil as directed by the employer. The drains outfall shall be connected to the nearest **main** drain.

Keeping in view of the topography and flood levels of the area necessary cutting, filling & leveling work shall be taken up by the contractor to have different benches suitable to respective project (Plot) requirement as well as compatible with the Road network.

The drainage shall be planned according to the final contour of the area after finalizing/attaining the modified levels after the required cutting, filling & leveling work. There will be main storm drain along the Roadside which will receive inflows from the different blocks drainage system. The grade/ gradient shall be planned keeping in view of the NSL as well as the existing natural drainage line so that the storm water is safely drained off from the Plant/ Project area. This storm water can also be conserved in suitable Pool and can be utilized again.

4.4.1.12 Entry Gates

The Contractor shall provide suitable number of Entry Gates at suitable locations so as to ensure the safety of the plant as well as easy movement of the Vehicles carrying equipments, material etc during execution and O & M of the plant. **The entry gates shall include one main gate and another wicket gate for pedestrians and one number Security cabin/Guard room adjacent to each wicket gate.** The gate shall be provided with required paint and accessories necessary for smooth operation of gate. The main gate shall be of overall size of minimum 5m width by 3m height. The location, number and exact size of these gates shall be decided in consultation with employer during detailed engineering to meet site requirements.

4.4.1.13 Security Cabin/Guard Room

Security cabin/Guard room provided at entrance gate shall be of RCC type. Dimensions of security cabin shall be minimum 3m x 3m. In addition to this, Indian type W/C including wash basin and accessories shall be provided attached to the security cabin. All the necessary plumbing and sanitary lines shall be drawn. Necessary electrical connections for lighting and exhaust fan in W/C shall be provided.

4.4.1.14 Control Room Inverter Room and Equipment Room

The contractor shall construct Control Room, Inverter Room, Equipment Room and Buildings based on the Geotechnical Investigation, site conditions as per the system design for smooth execution as well as O & M of the Solar PV Plant. The Grade slab level of the Buildings shall be Minimum 600 mm above the surrounding ground level.

The control room for operation of the Solar PV Plant shall be made up of RCC/PEB Frame structure as per relevant Codes and site conditions. The layout, general arrangement etc shall be designed as per system requirement. Control Room shall also have the provision of Store room of adequate size for proper storage of Inventory/Spares/ Tools/ Tackles etc.

The building shall be constructed for housing Electrical MCC, Panels with space for Maintenance, Office Space with adequate furniture, SCADA Room, Battery Room , Conference Room suitable for minimum 10 persons, Rest Room for 02 persons, Toilet Block, Pantry and all other facilities and amenities required for smooth Operation & Maintenance of the Plant. The office space in the control room must have at least 6 Chairs of industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift),

a 10 seater conference table of min Width* Depth* Height dimensions as 700*1500*745 mm, adequate no. of fans, tube lights/LED(s), at least 2 storage cabinets etc.

The Control Room shall have minimum 02 numbers of Overhead tanks of minimum 2000 litre capacity of reputed make for proper water storage , one over the control Room and the other shall be for Toilet Block and Pantry Room with proper fresh water and sewage arrangement and septic tank with Soak pit shall be provided.

Electrical Panel Room shall have provision of ramp of adequate slope and width as well as rolling shutters of adequate size for loading and unloading of Electrical panels and machinery.

Inverter rooms shall be located at suitable locations corresponding to solar arrays. The number of Inverter rooms, layout etc shall be designed as per system requirement and the same submitted by the contractor for the review of the employer before commencement of work.

Inverter Rooms shall be Pre-Engineered Building (PEB) or standard RCC framed structures as per requirement with cable trench arrangement located in the PV array field and shall be constructed as per National Building Code and as per relevant BIS Codes.

The layout of Inverter room shall be designed so as to divert the heat generated from each inverter outside the room. The Contractor shall have to get the structural design done as per the prevailing IS codes.

Adequate nos. of split AC of reputed make units shall be provided by the Contractor in the Control Room & Inverter Room to maintain the required operating temperature and ensure trouble free operation of the equipment installed.

The Contractor shall submit Preliminary Drawings/Execution Drawings with Architectural and Structural design and details for review/approval of the Employer. The Employer reserves the right to modify the layout as per requirements. Based on any modifications/recommendations, the Contractor shall submit the Final Drawings for review/approval of the Employer. All kind of works shall be carried out as per the relevant standards

4.4.1.15 Specifications

I. Specification for Pre-Engineering Building

Specification

The purpose of this document is to define the specifications of Control Room Interior and Control Desk.

Scope of Work: The scope of the project includes designing; engineering, supply & installation Control Room Interiors. All the components like ceiling, flooring, panelling, Glass partitions, Control desks, ceiling light & luminaire's electrical etc. must look integrated and therefore it shall be treated as a part of one single solution i.e., Control Room. To ensure an integrated solution, to qualify as per the international control

room design & safety norms.

Designing, testing, integration etc., all complete, preparation of the related drawings, documents, etc. of the Control room shall be in the Control Room Interior Solution Provider scope. It is mandatory for the bidder that the control room should have all the components like ceiling, flooring, control desks, panelling, partitions & illumination to avoid interface & quality related issues.

The entire design proposal must be Flexible, Dynamic, Scalable, Expandable and re-deployable to accommodate any technological changes / future needs which are not envisaged now. Hence 100% modular interior system (prefabricated and ready to install) solution is required. In a typical control room the environment is defined by four major components viz : Ceiling, Flooring, Control Desks & Wall panelling is defined by these components. To achieve must needed quality in terms of integrity, functionality, safety & ergonomics and to avoid interface related issues during and after execution. It is mandatory for the bidder that the control room interior comply with ISO 11064 and completes the installation activities of the same.

Ceiling Material - Factory made acoustic modular metal false ceiling of powder coated panels. Make shall comprise of perforated & non-perforated metal panels made through CNC laser Cutting, bending & punching. Panel shall be of 0.6mm CRCA sheet of approved powder coating finish. Panels shall be designed to achieve shape and design as per the design consultant with the combination of acrylic panels with lights, designed to enhance visual feel, with provision for easy installation and maintenance, integrated lighting, and scope for integration of building services like HVAC and fire detection/ fighting system. Metal modular false ceiling must have Noise absorption coefficient (NRC) value 0.60 according to IS:8225-1987, ISO: 354-1985 and ASTM 423-90. Test Report to be submitted along with the technical Bid.

Modular Panelling - Factory made removable type self inter lockable metal panels with front sheet of Preformed Textured Hot dip galvanized sheet with rigid polyvinylchloride (PVC) film on one side and on the other side a coating to avoid rust (sheet thickness 0.6mm & PVC Coating atleast 0.11mm). The metal wall Panelling and Partitions surface finish shall be made up of EN ISO 11925-2, EN 13823 certified material. The back cover of the panel shall be made up of 0.6mm thick CRCA/GI sheet of approved colour. The panelling design shall comprise of specially designed combination of perforated and non-perforated panels through CNC laser Cutting, bending & punching. Panels shall be designed to achieve shape and design as per the design consultant and shall be fixed using GI/CRCA hook fitting on structure. Overall system thickness for panelling shall be 60mm to 90mm and for partition shall be 70mm to 120mm.

Wood, Gypsum, Aluminium Composite Panels, Laminates, Fabric and Paint are prone to damages & ageing. These components shall not be used to ensure maintenance free working environment. Control Room Interior Solution Provider to submit an undertaking on letterhead to comply the same.

As per design, panel shall comprise of perforation for making panelling and partitions acoustically sound. Acoustic grade fire retardant fabric (minimum 1mm thick) will be fixed (on the back side of perforated tiles) at some parts of the Control Room facility.

Modular Rigid PVC Metal Paneling

Straight Metal Paneling : Panelling/cladding tiles shall be designed to achieve shape and design as per the design consultant. To enhance the aesthetic, appeal the control room interior solution provider must include diffused & concealed light elements in the control room wall panelling. These illumination elements must have provision of for quick & easy installation & maintenance. These concealed lights shall have RGB combination and shall be controlled through a touch screen mounted on the supervisor/main control desk. Various light colours like blue for VIP visit, green for normal operations and red for emergency shall indicate different control room scenarios and shall have additional customizations also.

Design

The cladding panels shall be made up of combination of two sheets locked and riveted together and polystyrene shall be used as infill to achieve strength and acoustics. The front tile (PVC pre-coated metal sheet) shall be perforated/ non-perforated as per the design requirement and the back tile (Powder coated 0.6mm CRCA steel sheet and powder coating thickness 0.06mm to 0.09mm) shall be designed in such a manner that it fits on the back portion of the front tile. Once the tiles are assembled then these will be riveted. These tiles shall be bent through CNC, machine punched & laser Cut to achieve perfect accuracy.

Structure shall be made from modular, heavy duty powder coated CRCA frame (minimum sheet thickness 1mm) and shall allow uninterrupted flow of wires/cable/tubes of maximum diameter 25mm.

Structure shall be securely connected from wall, roof and floor. It shall be made up of minimum 1mm thick vertical slotted rolled C sections (Upright) and horizontal rolled 'C' connectors. Grid of desired dimension shall be formed by Vertical and horizontal sections having 20 to 50mm pitch.

Curved Acoustic Metal Panelling/Partition: - All the technical specifications shall be like straight metal panelling, but the shape shall be perfect curve to provide more space for mounting of the LED's.

Ergonomic compliance report as per latest ergonomic norms of ISO 11064 to be submitted. Being one of its kind facilities; the control room deserves a tested & proven product having genuine design.

Shutters & Side Legs: - Front, back shutters shall be of 18mm Laminated MDF Board with premium finish. Side leg shall be of 25mm of the same finish. Hinges shall have five year's warranty against manufacturing defects. Proposed console shall comply with the BIFMA X7.1 standard. The consoles (open plan) must not emit TVOC(A), Formaldehyde i.e. $152 \mu\text{g}/\text{m}^2\cdot\text{hr}$, $6.2 \mu\text{g}/\text{m}^2\cdot\text{hr}$ respectively. This is to ensure healthier air quality for the operators. Therefore, the proposed console must be Greenguard Gold certified. Control Room Solution Provider should have had this certificate for at least three years prior to April 1st, 2021. Valid certificate needs to be submitted from (UL/Intertek) along with the bid.

To avoid distraction of operators because of unwanted noise generated from movement of chairs/people in the control room it is necessary that the proposed

flooring shall damp such impact noises. The decorative acoustic flooring shall reduce impact sound by 14dB (ISO 717-2)). It shall be twin-layer linoleum built up from 2mm acoustic laminate and 2mm Corkment backing.

The modular metal panelling & metal ceiling must comply to the lead-free directive to ensure restriction of hazardous substances so that the final product does not contaminate the environment. The final product i.e. modular metal ceiling & modular metal paneling does not contain hazardous substances, so it is necessary that the modular metal panelling and modular metal ceiling shall be RoHS certified (from UL / Intertek). Valid Certificate to be submitted along with the technical bid.

It is well known that metal is resistant to fire as compared to wood & fabric. However, from fire and safety point of view, to ensure that the used material is not subjected to any kind of surface treatment which provokes fire. The proposed wall panelling and ceiling tiles should be Class A certified as per ASTM E84 (from UL/Intertek) for surface spread of flame and smoke generation. This is mandatory to ensure that the materials used in the interiors do not provoke fire. Valid Certificate/Report from UL/Intertek to be submitted along with the technical bid.

Seismic safety of user & control room equipment is a prime concern area. The metal ceiling and modular metal panelling must sustain the seismic vibrations as per design spectrum IS 1893 for zone 4 vibrations. The test must be carried out by authorized government agency. Test Report to be submitted along with the technical bid.

To provide acoustically superior environment and ensure proper attenuation of airborne sound, it is necessary that the sound transmission class (STC) value of wall panelling and partition should be 35 (According to IS: 9901 (Part III) – 1981, DIN 52210 Part IV- 1984, ISO: 140(Part III) -1995, test report to be submitted along with the technical bid.

The critical components of the control room i.e. designer metal ceiling, carpet/laminated flooring, modular metal wall panelling/partitions must not emit formaldehydes, TVOC beyond permissible limits i.e. 9 µg/m³, 0.22 mg/m³ respectively. This is to ensure healthier air quality for the operators. Therefore, the control room interior shall be Greenguard Gold Certified (Modular Metal Ceiling, Flooring & Modular Metal wall panelling) from UL/Intertek. Valid certificate needs to be submitted along with the bid.

Tiles Perforation – To achieve acoustics without deteriorating the aesthetical appeal of the control room it is necessary that the wall panelling and ceiling tiles have micro-perforations (less than 1.5mm diameter each) all over the surface with a density of 5000 holes per square feet. UL audit certified design feature on modular wall panelling tile having clean perforations and providing smooth finish on front fascia of tiles. The tile shall have 5000 holes per square feet on front side of the tile. Valid UL audit certificate to be submitted along with the technical bid.

Metal modular false ceiling must have Noise absorption coefficient (NRC) value 0.60 according to IS:8225-1987, ISO: 354-1985 and ASTM 423-90. Test Report to be submitted along with the technical Bid.

Structure shall be made from heavy duty powder coated CRCA steel sheet (minimum sheet thickness 0.8 to 1.6mm). It shall be securely grouted from roof with help of anchor fastener and GI self-threaded rods. It shall be formed with the help of slotted

rolled W sections (stiffener) and Master C section with help of M6 cage nut and bolts.

Illumination: - Control Room illumination shall be designed as per ISO 11064 norms. Valid lux level report to be submitted along with the bid.

To avoid dark spots/areas in the control room it is necessary that continuous linear lights are used across the width/length of the control room. UL audit certified design feature of integrated channel in ceiling for quick installation & replaceability of continuous linear light: The ceiling system having integrated inbuilt channel for installation of cove lights and shall permit quick and easy replacement of cove light without using any tools. Replacement to be carried out within 120 Seconds per meter. Valid UL audit Certificate to be submitted along with the technical bid.

The wall panelling shall be robust & strong enough to sustain the routine loads/minor impacts of typical control room environment. The wall panelling/partition structure shall have UL Audit Certified feature of load bearing capacity of 300 Kgs to hold any display unit on clamp having minimum length of 750mm. Valid UL audit Certificate to be submitted along with the technical bid.

UL Audit Certified feature of Modular wall Panelling tile having secure locking arrangement for equidistant mounting. Locking arrangement enables easy replacement without using any tool within 20 seconds. The feature shall provide easy flexibility of locking all tiles in one column through gravity. Valid UL audit Certificate to be submitted along with the technical bid.

The non-uniform gaps between the designer metal ceiling and the adjacent walls/partition shall be covered with calcium silicate ceiling.

Glass partitions will be made of 12mm toughened glass with 300mm modular metal partition/panelling at the bottom. Modular metal partition/panelling shall have the same material as that of metal panelling/partition. The proper structure shall be made to ensure fixing of glass from RCC slab above the false ceiling and support on partition structure below. Straight & vertical structural members shall not be visible. Glass shall be fitted on anodized extrusion with tool-less technology and having a provision for replacing the glass with perforated sheet/acoustic tile by removing the glass NOTE: - The nature of installation should be replaceable, expandable, and flexible to cater to the future expansion/technical up-gradation.

Metallic Door: - With door hinges and locking arrangements and both way handle. Prepare with rigid thermo fused film metal panels. Specification: 0.6mm thick Metal panel sheets, cavity shall be filled with adequate quantity of honeycomb. Material of the partition and that of metal door will remain the same.

12mm thick frameless tempered clear glass door: - With door spring and locking arrangements and both way handle and patch fittings. Specifications: Tempered glass is formed by heating glass to the softening point in a horizontal tempering stove, and then quickly cooling it. Safety (tempered): when broken, it splits into tiny harmless pieces.

False floor: Top of the flooring shall be similar to the Acoustic Flooring. The acoustic laminate should be made up of twin-layer linoleum built up from 2mm Laminate. The Panel should

a. Have density of 1600KgM³.

- b. Fire resistance DIN EN 1366-6 2005-02.
- c. Core material thickness should be minimum 30mm.

False floor panels shall rest on edge support rigid grid system having Galvanized Iron base plate dimensions as 100mm X 100mm. The stringer should be fixed on pedestal having height adjustment of ± 25 mm.

A prototypical design approach must be adopted for design of control centres & consoles so, it must be prepared in strict compliance to ISO 11064 i.e. Ergonomic Design of control centres. Professional control room interior solution provider to submit an ergonomic study report including control room & desk along with the bid. The study must cover, Lux level reports as per industry acceptable illumination levels, spatial arrangement for efficient & safe movement of operators within the control room during normal and emergency situations, Ideal viewing angles (of operators) to ensure little head movement and minimal eye movement. All these considerations must be shown in the drawings during bid submission and the report must be signed by an ergonomist who has an experience of doing at-least two projects of control room ergonomic study.

The requirements must be elaborated via a smart virtual-reality module with auto-recommendation during design approval stage before commencement of job.

The control desk solution shall conform to high standard of engineering as mentioned in the document; meeting the specified codes, standards and designs. It shall be capable of performing 24X7 operations under the specified environmental condition. The console should be UL Listed & valid certificate to be submitted along with the bid.

Table top: - The material of the working surface shall be 25mm thick MDF. The control room interior solution provider must ensure that the top finish of the worksurface is scratch resistant. Therefore, the top finish shall be of high-pressure ANSI/NEMA LD3 certified scratch-resistant Laminate. The proposed console's life cycle should be assessed (from approved LCA consultant) for environmental impacts associated with all the stages of a product's life for cradle to grave analysis.

The EPD (Environmental product declaration) of control desk must be verified in accordance with ISO 14025 (from UL/Intertek) for Impacts on Environment by Console. Valid certificate to be submitted along with the bid.

Structure: - Made of heavy duty extruded vertical and horizontal Aluminium profiles of 6005 grade. The extrusions shall be duly powder coated with 40+ microns over all surfaces. All sheet metal parts must be finished with a durable, black, electrostatic powder coating. The Control Room Interior Solution Provider must have trademark registration certificate issued by Government of India for the console proposed in this tender. Trademark registration certificate to be submitted along with the bid.

To allow future extension and expansion, a weld free system shall be proposed. Interconnecting joints shall not be visible. The structure shall be rigid enough to withstand BIFMA X5.5: 2014 (Latest Edition) tests. Following tests shall be qualified to ensure the stability of the structure:

- a. Concentrated Functional Load Test (minimum 90 Kgs)
- b. Distributed Functional Load Test (minimum 135 Kgs)
- c. Concentrated Proof Load Test (minimum 135 Kgs)
- d. Distributed Proof Load Test (minimum 200 Kgs)

e. Stability Under Vertical Load Test (minimum 55 Kgs)

Tests must be based on ANSI BIFMA X5.5 -2014 standards applied to the proposed product solution. Valid certificate of BIFMA X5.5 should be submitted along with the bid.

Seismic safety of user & control room equipment is a prime concern area. Control Desk shall be tested and qualified to sustain Seismic vibrations as per design spectrum IS 1893 for zone 4 vibrations with monitor mounted on monitor arms of the console. Seismic test report of bare control desk shall be deemed unacceptable. This test must be carried out by authorised government agency. Test report with images of control desk seismic test should be submitted along with the bid.

Monitor Arm: - The control desk shall feature ergonomic display mounting arms. It shall enable quick & easy replacement of VESA mounts & arm extensions as per the ergonomic requirement defined in ISO 11064. UL audit certified design feature of monitor arm assembly shall have auto lock, push & remove feature for quick release of VESA mounts and modular arm extensions for ease in maintenance and fixing of monitor by one technician within 30 seconds without using any tools. Valid UL audit certificate to be submitted along with the bid.

Cable Trays and Wiring: - The desks must be designed with vertical and horizontal cable trays to allow for continuous cable management between the cabinets. Wire shall be routed into the cabinet through gland plate. Proposed console should be RoHS Certified from UL/Intertek and the valid certificate shall be submitted along with the bid.

- II. Water Supply:** GI pipes of Medium quality conforming to IS: 1239 (Part I) and IS: 1795 for Mild Steel pipes shall be used for all water supply and plumbing works. The PVC storage water storage tank(s) conforming to IS: 12701 shall be provided over the roof of the main control room with adequate capacity to meet requirement, complete with all fitting including float valve, stop cock etc. Required water connection to service the main control room shall be in the scope of the Contractor.
- III. Plumbing And Sanitary:** Sanitary fittings, which includes water closet (EWC/IWC), Wash Basins, Sink, Urinal Fittings including Flushing Tank and necessary plumbing lines shall be provided for Office cum Stores, stores Building , security house.
- IV. Electrification of Building:** Electrification of building shall be carried out by the Contractor as per IS: 732, IS:4648 and other relevant standards. The lighting design of the buildings shall be carried out as per IS 3646. The building shall be provided with adequate quantity of light fittings, 5A/ 15A 1 phase sockets, fans etc., controlled by required ratings of MCBs and MCB, DBs. It is encouraged that Contractor shall use the latest energy efficient equipment for the electrification and illumination.

4.4.1.16 Cable Trenches

In Main Control room, Invertor rooms & Switchyard area cables shall be laid in concrete cable trenches. Cable trenches of suitable dimensions with GI cable trays shall be provided. The trench cover in Main Control room and Invertor rooms shall be of steel grating type. The trench cover in Switchyard area shall be of concrete.

All other cables in the project area shall be buried cables with a provision for culvert/Hume pipe for protection of cables under the motorable roads. The details of buried cables are provided in the Electrical Specifications in this contract and the same shall be followed

4.4.1.17 Switchyard Yard Civil Works

Switchyard civil work includes step up transformer plinth, HT Switchgear kiosk plinth, two pole 4 pole structure foundation, earth pits, metal spreading curb wall in and around switchyard and fencing. The transformer/ HT switchgear kiosk plinth shall be made of brickwork or Random Rubble masonry conforming to relevant standards. The height of transformer /HT Switchgear kiosk plinth shall be decided based on **Inverter Output Voltage/33 KV** ground clearance. Earth pit construction shall be of brickwork covered with RCC (1:2:4) heavy duty pre cast slabs. Cable Trench in Switchyard shall be RCC of M25grade concrete. Switchyard/ double pole area must be surrounded by chain link fencing with pre-cast RCC post/ galvanized MS angle of suitable size with double leaf gate as per CEIG Requirements. Earthing of Fencing shall be done through flexible wire of through GI Plates .Area enclosed within this perimeter must be filled with 100 mm thick gravel.

- a) Switchyard foundations shall be RCC of Minimum M25 grade and structures shall be provided strictly as per CEIG/STU /CTU Norms/ requirements/design as applicable.

Transformer and equipment's foundations shall be designed based on the final geotechnical investigation report. 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. The oil pit shall be filled with granite stones of 40 mm size uniformly graded. The individual oil pits shall be connected to an oil collection pit which shall be sized to accommodate oil volume of the transformer connected to it, without backflow. The oil 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.

Transformer track rails shall confirm to IS:3443. The requirement of fire barrier wall between transformers shall be as per Electricity Rules and IS:1646 recommendations.

4.4.2 DC Systems

4.4.2.1 SOLAR PHOTOVOLTAIC (SPV) MODULES

4.4.2.1.1 SPV Module

- 1) The Solar PV module comprises of PV cells connected in series combination to achieve the required module power output. PV cells directly produces DC power on receipt of solar irradiation. Solar Photovoltaic Module shall be made up of **crystalline silicon cells.**
- 2) **Total DC Capacity of PV Module to be supplied for the (125 MW (50 MW & 75 MW)) (AC) project should be minimum (40 %) higher than the AC rating in MW, which is the cumulative rated capacity of all solar PV modules under supply as per relevant IEC standards under standard temperature condition (STC).**
- 3) **For commissioning of the project, capacity of DC arrays installed shall be considered in multiple of 10MW per unit.**
- 4) The contractor shall guarantee net 110.98 MU for Package-1 and 166.48 MU for Package-2 at delivery point in the first year after **the Operation Acceptance.** The annexure indicating the minimum number of units to be generated in a particular year is mentioned in **Appendix A to Attachment 10.** However, as per the **Attachment 10** of this document, bidder shall quote the Net Guaranteed Million Units to be generated during the contract year but it shall not be less than the MUs provided by the employer. **As per industry practice/norms, the normative losses for Substation Transformer (33/132 kV) range form 0.2% to 0.5% and for 132 kV line it is 0.75%. Bidders may assume suitable loss percentage as per their practice. However, Bidders to demonstrate the net energy quoted at the delivery point irrespective of the loss percentage they considered.**
- 5) Further, the contractor shall make all efforts to add DC Capacity in order to achieve the above generation.

4.4.2.1.2 Rating & Functional Characteristics

- 1) Peak power rating of the individual module shall not be less than **325 Wp.** The allowable tolerance in STC Power rating for each individual module shall be 0 W to +5Wp. No negative tolerance is permitted. The value of positive power tolerance of each module shall not be added/considered in peak power rating of the individual module.
- 2) The cell should have minimum fill factor of 0.72.
- 3) Modules shall be designed for rugged design to with stand tough environmental conditions and Maximum static load, front & maximum static load, back shall be as per IEC-61730-2)
- 4) Electric Cables for photovoltaic systems with a voltage rating of 1.5kV_{DC}.
- 5) Maximum system voltage shall be 1000V DC or higher.
- 6) Power temperature Coefficient for modules shall be greater than (-) 0.43% per °C for better yield.
- 7) Nominal operating cell temperature (NOCT) shall be 45°C ± 2°C.
- 8) The current mismatch of the modules connected to an inverter should be less than 2%.
- 9) SPV module shall have module safety class-II and should be highly reliable and must have minimum operating life of 25 years.

- 10) 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.

4.4.2.1.3 General requirements of Module

- 1) The materials used for manufacturing solar PV module shall have a proven history of reliability and stable operation in external applications. It shall perform satisfactorily in relative humidity up to 95% with ambient temperature between -10°C to +60°C and shall withstand adverse climatic conditions, such as high speed wind, blow with dust, sand particles, saline climatic / soil conditions and for wind 180 km/hr on the surface of the panel.
- 2) **Modules shall consist of 72 cells, connected in series using four (4) or more bus bars. The glass used to make the crystalline silicon modules shall be of toughened low iron glass with minimum thickness of 3.2 mm or more for 72 cell module. The glass used shall have transmittance of above 90% and bending less than 0.3% to meet the specifications**
- 3) The back sheet used in the crystalline silicon based modules shall be of 3 layered structure. Outer layer of fluoropolymer, middle layer of Polyester (PET) based and Inner layer of fluoropolymer or UV resistant polymer. Back sheet with additional layer of Aluminium also will be considered. The thickness of back sheet should be of minimum 300 microns with water vapour transmission rate less than 3g/m²/day. The Back sheet shall have voltage tolerance of minimum 1000 V.
- 4) The module frame shall be made of corrosion resistant materials, preferably having aluminium anodized finish. The anodizing thickness shall be 15 micron or better.
- 5) 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, with sufficient number of grounding installation points. Module frame thickness/Height should be minimum 40 mm, the anodization thickness shall not be less than 15 micron. The adhesion strength with encapsulant shall be greater than 70 N/cm.
- 6) Each module should have two 4 sq.mm stranded UV resistant cables as per of TUV specification **2 Pfg 1169/08.2007/EN 50618** and terminated with connectors adaptive to MC4 type connector directly. MC4 type connector should be **TUV/EN 50618** certified.
- 7) The EVA used for the modules should be of UV resistant in nature. No yellowing with prolonged exposure in the field shall occur. The modules shall be uniformly laminated without any lamination defects.
- 8) The solar cell shall have surface anti-reflective coating to help to absorb more light in all weather conditions.
- 9) 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.
- 10) Each PV module **deployed must use a Radio Frequency Identification (RFID) tag for traceability. RFID shall either be placed behind name plate**

sticker or behind bar code label pasted on the back glass of PV module and must be able to withstand harsh environmental conditions during the module lifetime. One number RFID reader has to be supplied by the bidder which has to be compatible to read the data from the RFID Tag & download the data to Computer. All associated Software & Cables are to be provided along with the RFID reader. The following information must be mentioned in the RFID used on each module :

- i. Name of the manufacturer - PV Module & PV Cells
- ii. Month and year of the manufacture (separately for solar cells and module)
- iii. Country of origin (separately for solar cells and module)
- iv. I-V curve for the module at Standard Test Condition (1000 W/m², AM1.5, 25 deg.C)
- v. Wattage, Im, Vm and FF for the module
- vi. Unique Serial No and Model No of the module
- vii. Date and year of obtaining IEC PV module qualification certificate
- viii. Name of the test lab issuing IEC certificate
- ix. Other relevant information on traceability of solar cells and module as per ISO 9000

Note: Contractor would be required to maintain accessibility to the list of Module IDs along with above parametric data for each module.

- 11) The crystalline silicon based modules supplied should be of Potential Induced Degradation (PID) free modules and the test certificate from third party lab complying with the same shall be provided.
- 12) The modules must qualify to the latest edition of the following IEC PV Module qualification test or equivalent BIS standards as specified in the RfS (Page 99 to 100):-
 - i. IEC 61215 2nd Edition or latest: Design qualification and type approval for Crystalline Si modules).
 - ii. IEC61730 Part 1 &2 : PV module safety qualification testing @ 1000 V DC or higher)
 - iii. IEC 61701: Salt Mist corrosion testing of PV Module for highly corrosive environment, (Severity-6)
 - iv. IEC 62716: Ammonia Resistant certified, if applicable
 - v. IEC 62804 (draft std.) or equivalent TUV Rhineland std.: PID (Potential Induced Degradation) free Module.
 - vi. The PV modules deployed must have valid test certificates as per above specified IEC Standards by one of the NABL Accredited Test Centres in India. In case of module types/ equipment for which such Test facilities may not exist in India at present, test certificates from reputed ILAC Member body accredited Labs abroad will be acceptable.

The contractor shall submit the above compliance certifications for approval of RECPDCL.

- 13) The junction box used in the modules shall have suitable numbers of 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 Box shall comply IP 67 degree of protection or higher protection class. The Junction Box shall consist of semi permeable membrane to allow entry /escape of air in /from the Junction Box, but block the entry of moisture in module. Junction Box shall be weather proof.
- 14) Modules of same rating and manufacturer shall be connected to any single inverter.
- 15) The Contractor shall maintain the list of Module IDs along with performance characteristic data for each module. This data shall be submitted to UPNEDA/IMPLEMENTING AGENCY/MNRE/RECPDCL.
- 16) It is the responsibility of the Contractor to maintain a RFID reader at the site and submit the data stored in RFID to Employer after the work of installation of modules is completed.
- 17) The Contractor shall submit the Data sheet, Drawings, Flash reports and compliance certificates of the offered modules for review/approval of RECPDCL/Implementing Agency/UPNEDA and supply should start thereafter. Also CDF (Construction Data Form) for the SPV Module, approved by any reputed agency shall be submitted as per Engineering Information Schedule.
- 18) **Only valid type tested as per clause no 4.4.2.1.5 crystalline modules with Peak power rating of the individual module not less than 325 Wp** shall be considered for this Project. On this account, the Contractor shall provide full information, to the satisfaction of RECPDCL.
- 19) The Modules must mandatorily meet the requirements laid by UPNEDA/MNRE/IMPLEMENTING AGENCY as mentioned in RFS Document.
- 20) The Contractor has to ensure that all the Solar PV MODULES after their “END of Life” (When they become defective/non-operational/no reparable) are disposed in accordance with the “E-Waste (Management & Handling) Rules, 2011” notified by the Government and as revised and amend from time to time.
- 21) As per the Solar Photovoltaics, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, PV Modules used in the grid connected solar power projects shall be registered with BIS and bear the Standard Mark as notified by the Bureau of Indian Standards.
- 22) Transportation, handling, storage and installation of modules shall be in accordance with the manufacturer manual so as not to breach warranty conditions. The Standard Operating Procedure (SOP) for the same shall be shared by the Contractor prior to dispatch for review.
- 23) The Employer shall perform material inspection at the Manufacturer’s factory before the start of proposed manufacturing schedule. Proof of procurement of components

as per the approved BOM mentioning manufacturer name, manufacturing date and relevant test certificate shall be submitted during material inspection for verification.

4.4.2.1.4 Routine Testing & Inspection

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer.

The Employer reserves the right to inspect the modules at the manufacturer's site prior to dispatch.

4.4.2.1.5 Type Test:

SPV modules supplied must be of type tested design and certified by any of the accredited certifying agencies according to International standards mentioned at Clause No. 4.4.2.1.3 (12) above and the type test reports shall be submitted to the Employer for approval.

Further, Bidder shall submit the following:

i) Third Party verified PAN files for any one module, if bidder is offering three wattage bins or less. In case the bidder is offering more than three wattage bins, additional wattage bin need to be submitted.

ii) Self-certified Electro-Luminescence (EL) Test Report of all the Crystalline Silicon based PV modules being offered to RECPDCL.

4.4.2.1.6 Warranty for Modules

- a) Performance Warranty:** Power output at STC for modules shall not be less than 97% rated power output at STC during the first year after year of completion.
- b) PV modules must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years from the date of successful completion of COD.**
- c) Product Warranty:** The modules shall be warranted for at least 10 years for failures due to material and workmanship.

4.4.2.1.7 Insurance for Warranty/Guarantee/Performance of PV Modules

Contractor shall submit Third Party Insurance towards Warranty for Modules before the dispatch of first lot of PV Modules. This insurance shall cover the PV module warranty in case of insolvency or bankruptcy of the PV module manufacturer. The Premium Charges, recurring charges, any expenditure for the Insurance shall be in the scope of Contractor.

4.4.2.2 MODULE MOUNTING STRUCTURES (MMS)

4.4.2.2.1 Module Mounting Structures (MMS)

The PV modules shall be mounted on metallic structures called Module Mounting Structures (MMS) having adequate strength and appropriate design, which can withstand the load of the modules and design wind pressure. Modules shall be mounted on non-corrosive support structures.

The Contractor shall provide the following type of mounting arrangement:

Fixed Tilt Mounting Arrangement

4.4.2.2.2 Technical Requirements

1. The MMS Structure and foundation shall be designed considering total project life of at least 25 years. The structure design shall be appropriate and innovative. It must follow the existing land profile. The foundation system for MMS shall be designed as per geo technical investigation report.
2. The structure shall be designed to allow easy replacement of any modules and easy access for safe and trouble free operation & maintenance of the plant.
3. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels at the same time.
4. The design calculations shall be as the codes & standards as mentioned in relevant sections in this document. The Contractor shall submit to the employer the detailed foundation & structural design drawings along with calculations and bases/ standard, Bill of Materials, entire specifications, STAAD PRO Analysis Report, Shadow analysis report showing the effect of shadow of various structures and buildings on the energy output of PV Array as per the Engineering Information Schedule.
5. The structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation & tilt, absorb and transfer the mechanical loads to the ground properly.
6. Design shall be in such a manner that, there are minimum requirements of child parts/sub-parts. Further, all the sub-parts used in the Module Mounting Structure like purlins, rafters, bracings, C-clits etc. shall be designed to ensure easy replacement. The contractor shall ensure that, the design of the mounting holes of MMS structure is in accordance with the dimensions of the SPV Module to be used in the project.
7. The thickness of the members shall be arrived by structural analysis after considering combination of all possible loads.
8. The primary loads and load combinations for design of MMS structure shall be as specified as under:

i.

Primary Loads:

- Dead Load (DL)
- Live Load (LL)

- Wind Load (WL) – Both along X&Z directions
- Seismic Load (EL)- Both along X&Z directions

ii. **Wind Load (WL) for MMS design**

9. Load due to fair (positive pressure) wind direction on design tilt angles of MMS members.
10. Load due to adverse (negative pressure) wind direction on design tilt angles of MMS members.
11. Load due to wind on side face of MMS members.
12. In case, String Combiner Box (SCB) is mounted on the Module Mounting structures, the contractor shall take into consideration the load of SCB during design of MMS. Further suitable supporting members for mounting the SCB on the MMS shall also be in the scope of the Contractor. Separate structure for the mounting of SCB can also be proposed.
13. The contractor shall design the structure height considering highest flood level at the site. The minimum clearance between the lower edge of the module and the ground shall be the higher of (i) highest flood level at the site + 100 mm and (ii) 500 mm.
14. The support structure design & foundation shall be designed with reference to the existing soil conditions in order to withstand wind speed applicable for the zone (Site Location), whichever is higher, using relevant Indian wind load codes. The structures and foundations shall also conform to the seismic conditions pertaining to the zone using relevant Standards and codes.
15. Modules shall be mounted on a non-corrosive support structures. Mounting structures shall be designed to withstand the extreme weather conditions in the area. The terrain factor K2 and topography factor K3 shall be as per IS 875 (Part 3).
16. MMS frames, post, base plate, assembly of the array structures, etc. shall conform to IS-Standards mentioned in this document. The MMS structure shall be made of hot dipped galvanized steel with minimum GSM 610 kg/sqm and/or minimum coating thickness of 80 microns. It is to be ensured that galvanization process is done as per relevant standards. Galvanization shall conform to IS-2629, 4759 & 4736 as applicable. The galvanization shall be done after fabrication of members and cutting of holes to ensure galvanization of all cut/exposed edges. Purity of Zinc to be used for galvanizing shall be 99.5% as per the IS: 209. Before the galvanizing the steel section shall be thoroughly cleaned of any paint, grease, rust, scale, acid or alkali or other foreign matters. The galvanized steel member shall withstand minimum four (4) dips of one (1) minute duration each in copper sulphate solution as per IS: 2633.
17. All fasteners (nuts, bolts and washers) shall be of Stainless steel of grade SS316 and must sustain the adverse climatic conditions. If stainless steel (SS304) fasteners are used they must have protective coating to insure the life of 25 years. All bolts shall be tighten with designed torque mechanically.

18. Welding of the structure at site shall not be allowed and only bolted connections shall be used.
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.
20. Cable should pass from Pipes and Cable-ties shall be used to hold and guide the Pipes (cables/wires) from the modules to inverters or junction boxes. All the cables were aesthetically tied to module mounting structure.
21. **The Structure must be designed considering 1.5 times factor of safety.**
22. Modules shall be clamped/bolted with the structure properly. The material of construction shall be AL/S.S. Clamps/Bolts with or without EPDM rubber shall be designed in such a way so as not to cast any shadow on the active part of a Modules.
23. Cutting, welding, drilling etc. at site is not allowed for MMS. Contractor shall carry out all correction in structure (if required) at his works.
24. Contractor must submit all the quality test documents and test certificates complying with requirement of the structure.
25. **Mounting of PV Modules:** -PV Modules will be supplied in the pallets each arranged with colour coding to minimize module mismatch losses. Contractor should select the modules from a single pallet for mount them in the same array so as to minimize module mismatch loss.

4.4.2.2.3 Standards & Codes

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards. In the event of other standards being applicable they will be compared for specific requirement and specifically approved during detailed engineering for the purpose:

| Standards | Description |
|-------------------|--|
| IS 800: 2007 | Code of Practice for use of structural steel in general building construction of steel |
| IS 875:Part 1 & 2 | Code of Practice for Design Loads for Buildings and Structure. |
| IS 875: Part 3 | Code of Practice for the Design Loads for Building and Structures –Wind Loads |
| IS 1893: 2002 | Criteria for earthquake resistant design of structures -General provisions and buildings |
| IS 513: 1994 | Cold-rolled low carbon steel sheets and strips |
| IS 814 | Covered electrodes for manual metal arc welding |
| IS 3043 - 1987 | Grounding of mounting structures |
| IS 4759 | Hot Dip Zinc coating on Structural Steel and other allied products |
| IS 4736 | Hot Dip Zinc coating on mild steel tubes |
| 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 Purpose |
| IS 4923 | Hollow Steel Sections for Steel Structural use |

4.4.2.2.4 Routine Testing & Inspection

All the acceptance tests and Routine Tests, inspection at manufacturers works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the MMS at the manufacturer's site prior to dispatch.

4.4.2.3 STRING COMBINER BOX (SCB)

4.4.2.3.1 String Combiner Box (SCB)

String Combiner Box (SCB) is used in multi-string photovoltaic systems to combine the individual strings electrically and connect them to the Inverters. It shall be equipped with appropriate functionality, safety (including fuses, grounding, contacts etc), protection and String Monitoring Unit (SMU). The SMU shall be capable to monitor each input current, string voltage and total current of all the strings connected to SMU. PV array showing the location of each SMU shall be displayed as a screen shot on the SCADA screen so that operator can identify the faulty SMU and the string from the SCADA screen

4.4.2.3.2 General Requirement

1. SCB shall be corrosive resistant and should not be sensitive to the salty/ foggy weather condition.
2. The maximum voltage of the PV Plant is in open circuit and the lowest ambient temperature of the PV modules. SCB shall support minimum 1000 V DC /as per system requirement in open circuit without deterioration.
3. The maximum input current is in short circuit condition and the highest sun irradiance. Regardless the number of inputs, each input shall be rated accordingly during the highest irradiance conditions. The reverse-current resistance of the PV modules must be taken into account for solar PV rated fuse sizing.
4. The rating of all component of SCB's shall be suitable with adequate factor of safety to inter connect the Solar PV array. There shall be suitable space for workability and natural cooling.
5. 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.
6. Cable connectors to be used for connecting Solar PV Modules and SCB shall be in accordance with DIN EN 50521. Connectors shall be of Plug in socket design to be plugged together by hand but can be separated again using a tool only.

4.4.2.3.3 SCB Enclosure

1. The junction boxes shall be dust, vermin, and waterproof and made of polycarbonate or equivalent material, which should be sunlight/ UV resistive , fire retardant & must have minimum protection to IP65 (Outdoor) and Protection Class II. The enclosure shall be fire retardant with self-extinguishing property and free from Halogen. The enclosure shall be UV protected.
2. Degree of protection for enclosure shall be at least IP 65. The mechanical impact resistance of enclosure shall be IK 07 or better.
3. SCB shall have terminals blocks rated for minimum 1000 V DC and rated continuously to carry maximum expected current.
4. The size of the enclosure shall be designed in such a way that the temperature rise of the enclosure should not more than 30 deg C above the ambient temp of 50 deg C. The components mounted inside the SMU shall have higher temperature withstand capability and shall continuously operate under such conditions.
5. 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.

6. In each SMU, 5% spare terminals (along with cable glands) rounded off to next higher integer shall be provided to connect the PV strings.
7. Cables used in SCB shall be suitable for system voltage-1500V DC. All internal wiring shall be securely supported, neatly arranged readily accessible and connected to component terminals and terminal blocks. Wire terminations shall be made with solder less crimping type of tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on wires shall not fall off when the wire is disconnected from terminal blocks.
8. All PV inputs shall be protected with fuses and both polarities shall be protected. The fuses shall be gPV type and dedicated to solar applications and confirm to IEC 60269-6 or UL-2579 standards. String fuses should be so designed that it should protect the modules from reverse current overload.
9. Each SCB shall be provided with properly rated surge protection device (SPD). SPD shall be provided with Metal Oxide Varistors (MOV) type surge arrestors, which shall be connected from positive and negative bus to the earth. The discharge capability of the SPD shall be at least as per IEC 61643-12. During Earth fault and failure of MOV, the SPD shall safely disconnect the healthy system. SPD shall have thermal disconnecter to interrupt the surge current arising from internal and external faults. In order to avoid the fire hazard due to possible DC arcing in the SPD due to operation of thermal disconnecter, the SPD shall be able to extinguish the arc.
10. Resistance Temperature Detector (RTD) type or semiconductor type temperature sensor shall be provided to monitor the cabinet temperature.
11. MC4 connector conforming to IEC 62852 or EN 50521 shall be provided at each SCB input. Cable gland (double compression metallic) of suitable size for DC cables shall be provided at the SCB output.
12. Provision shall be made for disconnection for each of the groups/incomers. A test point shall be provided for each-sub group for quick fault location and to provide group array isolation.
13. At outgoing side DC Disconnecter switches Switch of suitable capacity shall be provided.
14. Two (2) pole ON LOAD disconnecter switches (s) shall be installed at the output of the SCB to secure any intervention in the SCB or in the field as per IEC60947-3.
15. Short-circuit Withstand capacity of the PV-SPD has to be properly selected with respect to the total String current at Combiner Box (SCB) output plus the reverse (back) current from the Inverter side.
16. Overvoltage protection shall be ensured in DC and AC circuits using type II surge arrester.

4.4.2.3.4 String Monitoring Unit (SMU)

1. SMU shall communicate over RS485 or any other compatible networking system. The protocol and speed of the communication line shall allow the Monitoring system of the plant to collect all data. Shunt Characteristic shall be employed for sensing current & voltage of string.
2. At least following parameters shall be available at SCADA for monitoring the health of SCB:
 - a. String(s) Current
 - b. Voltage of SMU
 - c. Total Current of SMU
 - d. Total Power of SMU
 - e. Status of Disconnecter Switches
 - f. Cabinet Temperature
 - g. SPD operating status

4.4.2.3.5 Standards and Codes

Connectors, Junction Boxes, Surge Protection Devices, etc. must also conform to the relevant international/ national Standards. The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards

| Standard | Description |
|-----------------------|---|
| IEC/EN 62262 | Degrees of protection provided by enclosures for electrical equipment against external mechanical |
| IEC/EN61439- 1 & 2 | Low-voltage switchgear and control gear |
| IEC/EN 60529/IS 2147 | Enclosure protection |
| UL-94V | Fire Resistant/Flammability |
| UL-746C | UV Resistant |
| EN50539-IEC 61643-12 | Surge protection |
| IEC 60269- 6/UL- 2579 | Solar PV application string fuses |
| IEC 62208 | Enclosure for Low Voltage Switchgear and Controlgear assemblies |
| IEC 60695-2-11 | Fire Hazard Testing |

4.4.2.3.6 Routine Testing & Inspection

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the SCBs at the manufacturer's site prior to dispatch.

4.4.2.4 POWER CONDITIONING UNIT (PCU)

4.4.2.4.1 Power Conditioning Units (PCU)

Power Conditioning Unit (PCU) shall consist of an electronic inverter along with associated control, protection and data logging devices. The system shall incorporate a uni-directional inverter designed to supply the AC power to the grid at load without any disturbance. The power-conditioning unit shall automatically adjust the voltage & frequency levels to suit the Grid. All three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency. The model offered should have operating capability to operate under the existing environmental conditions in India. Only indoor/**Outdoor** type PCU shall be accepted.

4.4.2.4.2 General Requirements

1. PCU shall confirm to IEC 61000 or equivalent international standard for compliance to requirements for Electromagnetic compatibility and to IEC60068-2 or equivalent international standard for requirement of environmental testing. The rating of PCU/Inverter shall not be less than 1 MW. Block wise installation should have to be adopted.
2. The inverter supplied shall have minimum of **40%** additional DC input Capacity. (E.g. Inverter is supplied with rated capacity of 1000 kW (AC) shall accept at least **1400 kW** of DC power). Contractor shall also submit maximum overloading capacity of the PCU at ambient temperature of 50 deg C along with the PCU data sheet. In case, the rated capacity is mentioned in KVA, the certificate of OEM declaring the power factor of the Inverter/PCU at 50 deg Cel has to be submitted and the power factor shall be multiplied by the KVA rating to achieve the rated capacity of the Inverter in KW.
3. PCU shall also confirm to IEC 62109 or IEC 62103 or equivalent international standard for compliance to requirement for the design and manufacture of PCU for protection against electric shock, energy, fire, mechanical and other hazards.
4. Only those PCU's/Inverters models/capacity which are supplied and installed (as on the original date of submission of Bid) for more than 50 MW capacity Solar PV projects in India shall be considered for this project. The Contractor must provide all the relevant data sufficing the above requirement to the Employer.
5. All the PCUs shall consist of associated control, protection and data logging devices and remote monitoring hardware and compatible with software used for string level monitoring.
6. The rated power /name plate capacity of Inverter shall be AC Output of the Inverter at 50°C ambient temperature. Hence, the maximum AC Power Output at 50°C ambient temperature should not be less than the rated capacity of the Inverter.
7. **Grid Connectivity:** Relevant CERC regulations and grid code as amended and revised from time to time shall be complied. The system shall incorporate a uni - directional 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. 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 by the feedback control loop of the inverter and the inverter shall always remain synchronized with the grid

8. PCU must have provision to be isolated from grid through Circuit Breakers, which shall be inbuilt with the inverter or located in separate standalone panel. In case of grid failure, the PCU shall be re-synchronized with grid after revival of power supply. Vendor to furnish the time taken by PCU to be re-synchronized after restoration of grid supply during detailed engineering. PCU and its components shall be designed accordingly and parallel operation equipped with advanced/dynamic grid support & monitoring features. Suitable synchronizing methodology shall be provided for synchronizing the AC output from the inverters.
9. 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. The PCU shall be capable of controlling the power factor dynamically.
10. The minimum euro efficiency of the PCU as per IEC 61683 shall be 98% at 100 % load. The Contractor shall specify the conversion efficiency at following load conditions i.e. 25%, 50%, 75% and 100% during detail engineering, which shall be confirmed by type test reports.
11. The PCU shall have protection against any sustained fault in the feeder line and against lightning discharge in the feeder line. PCU should be equipped with space heater in each cabinet to control through hygrostat and thermostat.
12. The PCU shall also have the adequate protection against earth leakage faults. The incoming DC feeder of PCU shall have suitably rated isolators to allow safe start up and shut down of the system and its terminals should be shrouded. The DC feeder shall terminate in the fuse box through a suitable fuse rating. The PCU fuse box shall have one spare terminal with fuse and holder for the future use. The connection between the fuse box and inverter shall be through copper bus bars or copper cable.
13. Internal Surge Protection Device (SPD) shall be provided in the PCU on DC and AC side. It shall consist of Metal Oxide Varistor (MOV) type arrestors. The discharge capability of the SPD shall be as per IEC 61643-12. During earth fault and failure of MOV, the SPD shall safely disconnect the healthy system. SPD shall have thermal disconnecter to interrupt the surge current arising from internal and external faults. In order to avoid the fire hazard due to possible DC arcing in the SPD due to operation of thermal disconnecter, the SPD shall extinguish the arc.
14. The PCU inverter shall be Transformer-less. However, adequate grounding for the DC side shall be provided.
15. Each solid state electronic device shall have to be protected to ensure long life as well as smooth functioning of the inverter.
16. The PCU shall have anti-islanding protection as per IEC 62116 or equivalent international standard.
17. The PCU shall have required protection arrangements against reverse polarity of DC connection and remains in standby mode.
18. 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.
19. 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.

20. It should have local display with keypad for system control including start & stop, monitoring instantaneous system data, event logs, data logs with date & time and configuration settings. Control and readout should be provided on an indicating panel integral to the inverter.
21. **Display:** The PCU shall have local LCD (Liquid crystal display) and keypad for system control, monitoring instantaneous system data, event logs, data logs and changing set points. PCU front panel shall be provided with display (LCD or equivalent) to monitor the following Instantaneous DC power input
 - a. DC input voltage
 - b. DC Current
 - c. Instantaneous active AC power output
 - d. Instantaneous reactive AC power output
 - e. AC voltage (all the 3 phases and line
 - f. AC current (all the 3 phases and line)
 - g. Power Factor
 - h. KWh produced during entire day
 - i. Total kWh produced during its life time
 - j. Thermal loading (percentage)
22. 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.
23. All the cables from the array strings to the solar grid inverters shall be connected/terminated in the DC Distribution Box with suitable rated GPV type fuse conforming to IEC 60269-6 or UL- 2579 Standards.
24. In case external auxiliary power supply is required, Standalone UPS shall be used to meet auxiliary power requirement of PCU, it shall have a backup storage capacity of at least 120 minutes.
25. To prevent the maximum permissible temperature in the inverter room from being exceeded because of internal heat emission of inverters and other auxiliaries in the inverter room, the inverter room in the PV station shall be adequately ventilated. The Ventilation plant capacity and air quality of inverter room shall be as per inverter and other auxiliaries manufacturer's recommendations. Filter banks at the air inlet of the inverter room shall be provided to prevent dust ingress.
26. The Contractor shall ensure by carrying out all necessary studies that the PCU will not excite any resonant conditions in the system that may result in the islanded operation of PV plant and loss of generation. In case there is excitation of any resonant condition in the system during PV plant operation that may result in the islanding/tripping of the PV plant and affect the power transfer, it shall be the

responsibility of contractor to rectify the design and carryout required modification in the equipment of his supply.

4.4.2.4.3 Maximum Power Point Tracker (MPPT)

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 contractor shall submit the details of working mechanism of MPPT during detail engineering. The operating range of PCU and the MPPT shall be large enough such that it satisfactorily operates for PV Modules exposed to the maximum ambient temperature of 50°C. The MPPT Unit shall conform to IEC 62093 for design qualification.

- a)**Low Power Mode (Auto):** The system shall automatically 'wake up' in the morning and begin to export power provided there is sufficient solar irradiation and the grid voltage and frequency are in range.
- b)**Standby 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 in datasheet.
- c)**Basic System Operation (Full Auto Mode) :** When solar radiation increases further, the PCU shall adjust the voltage of SPV array to maximize solar energy fed into the grid. When the solar radiation falls below threshold level, the PCU shall enter in low power mode/standby mode.
- d)The PCU control shall prevent excessive cycling of shut down during insufficient solar radiance
- e)**Sleep Mode:** Automatic 'sleep' mode shall be provided so that unnecessary losses are minimized at night. The PCU must also automatically re-enter standby mode when threshold of standby mode reached.

4.4.2.4.4 Other Technical Features

| | |
|---------------------------------|--|
| PCU Mounting | As per Design |
| Wave Form | Pure Sine wave |
| MPPT Voltage (Max. & Min.) | As per standard manufacturing norms |
| Minimum Efficiency at 100% load | > 98%, measured as per IEC 61683 |
| No load loss | <1% of rated power maximum loss in sleep mode shall be less than 0.05% |
| Output frequency | 50 Hz |
| Power Factor Control Range | >=0.95 lead or lag |
| Maximum Input voltage | 1000 V or 1500V as per application |
| THD | Less than 3 % of rated power |
| Ambient temperature | 0 to (+) 55°C |
| Humidity | 95 % non- condensing or more |

| | |
|---------------------|---|
| Enclosure (type) | Minimum IP 21 (Indoor rated) & Minimum IP 54 (Outdoor rated) |
| Maximum noise level | 75 dBA |
| DC injection | Less than 0.5% of nominal load current |
| Maximum Noise Level | 75 dB |
| Flicker | As per IEC 61000 |

The inverter /PCU shall meet the following requirements.

1. Inverter shall be equipped with Voltage Ride-Through (VRT) capabilities to stay online during grid disturbance as per IEC 61727 or equivalent standard. Inverter shall be able to support low and high frequency ride through and reactive power compensation as response to abnormally low or high grid voltage.
2. Sinusoidal current modulation with excellent dynamic response.
3. Unit wise & integrated Data logging.
4. Dedicated open protocol modbus / RS 485 or any other compatible networking
5. The Inverter/PCU shall have protection against various faults including but not limited to
 - a) AC/DC Over current
 - b) Sync loss
 - c) Over temp.
 - d) line to ground fault
 - e) short circuit
 - f) surge voltage induced at output due to external source
 - g) AC/ DC bus over/under voltage
 - h) Cooling System failure
 - i) Anti-islanding
 - j) Unbalance Protection
 - k) A under & over frequency
 - l) AC & DC Short Circuit
 - m) Over load Protection
 - n) AC & DC Lightning/surge Protection
6. Power regulation in the event of thermal overloading
7. Set point pre-selection for VAR control
8. Remote control via telephone modem or mini web server & SCADA
9. Insulation monitoring of the PV array with sequential fault location
10. Ground fault detector to sense discharge current with respect to ground

11. Inverters shall offer the possibility to set a constant reactive power mode to absorb or inject reactive power during night time.
12. Overvoltage voltage against atmospheric lighting discharge to the PV Array
13. Inverter shall offer provision for both local and remote emergency stop
14. **Earthing of Inverter:** DC side of each inverter shall be earthed to distinct earth pit through adequate size conductor as per IS 3043-1987. The size of conductor shall be as per the maximum fault current of DC
15. The contractor shall submit to the Employer the Drawings, design calculations, 'the temperature versus output characteristics' of the Inverter Operation & Maintenance manual and other information as per Engineering Information schedule during detailed engineering
16. The Inverters/PCUs installed in the solar power plant must have a warranty for 5 years

4.4.2.4.5 Standards and Codes:

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards. In the event of other standards being applicable they will be compared for specific requirement and specifically approved during detailed engineering for the purpose *(The Inverters of the SPV Power Plant must confirm to latest edition of IEC/equivalent BIS standards as specified at page no. 100 of the RfS document also)*:

| Standard | Description |
|---|---|
| IEC 61727 or Equivalent Standard. | Photovoltaic(PV) System – Characteristics of utility interface |
| IEC 61683 | Photovoltaic systems – Power conditioners – Procedure for measuring efficiency |
| EN 50530 | MPPT efficiency of grid connected photovoltaic inverters |
| IEC 60068-2/IEC 62093 | Environmental testing |
| IEC 61000-6-2, IEC 61000-6-4 | Electromagnetic compatibility (EMC) |
| IEC62109-1&2/IEC 62103 or equivalent standard. | Electrical Safety of power converters for use in photovoltaic power systems – Particular requirements for inverters |
| IEEE Standard 929-2000 or equivalent | Recommended practice for PV Utility Interconnections |
| IEEE 1547/UL1741/IEC 62116 or equivalent EN/BIS Standards | Protection against islanding of Grid |
| Grid Connectivity | Relevant CERC/CEA regulations (including LVRT Compliance) and grid code as amended from time to time |

| Standard | Description |
|--|---|
| BDEW 2008 or Latest | Technical guidelines for generating plant connected to medium voltage network |
| IEEE 519 | Recommended practices and requirements for harmonic control in electrical power system. |
| IEC 62093 | Reliability test standards |
| As per the Solar Photovoltaics, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, Inverters used in the grid connected solar power projects shall be registered with BIS and bear the Standard Mark as notified by the Bureau of Indian Standards. | |

4.4.2.4.6 Routine Testing & Inspection at Work

All the Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per the Final Quality Assurance Plan and reports shall be submitted to Employer. All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer reserves the right to inspect the modules at the manufacturer's site prior to dispatch.

4.4.2.4.7 Type Test:

PCU supplied must be of type tested design and certified by any of the accredited certifying agencies in accordance with relevant standards /codes and the type test reports shall be submitted to Employer for approval. If the type tests are not done previously, then they shall be conducted without any additional cost to the Employer and the type test report shall be submitted before supply of PCUs.

4.4.2.5 Solar & DC CABLES

4.4.2.5.1 Solar Cables

The Solar Cables in a solar PV plant shall be used in the following areas

- i. Interconnecting SPV modules
- ii. From SPV Modules up to String Combiner Box (SCB)

4.4.2.5.2 DC Cables

- i. From SCB up to the Inverter.

4.4.2.5.3 Solar Cables

- a) All cables and connectors for use in installation of solar field must be of solar grade which can withstand harsh environment conditions for 25 years and shall conform to the requirements of **TUV specification 2 Pfg 1169/08.2007/EN 50618** for DC cable for photovoltaic system.
Note: IEC Standard for DC cables for PV systems is under development. It is recommended that in the interim, the Cables of 600-1800 Volts DC for outdoor installations should comply with the EN50618/TUV 2pfg 1169/08/07 / EN 50618 equivalent IS for service life expectancy of 25 years.
- b) These cables shall meet the fire resistance requirement as per **TUV specification 2 Pfg 1169/08.2007 / EN 50618** and shall be electron beam cured. In case higher system voltage (>1000 V) are used, the Module Interconnecting wires shall be as per 2 Pfg 1190/05.12.
- c) The Cables used for (+) ve and (-) ve shall have distinct colour identification on outer sheath of the cable.
- d) DC Plug in connectors used for connecting SPV Modules and SCBs shall be in accordance with DIN EN 50521. Connector shall be of plug and socket design to be plugged together by hand but can be separated again using tool only.
Cable used for module interconnection shall also be referred as Solar Cables.

4.4.2.5.4 DC Cables

Cables used between SCB's and Inverters shall be of min. 1.5 kV (DC Grade). In case Contractor offers 1500V DC system, 3.3 kV (E) grade cables shall be provided. These Power cables shall have compacted Aluminium/copper conductor, XLPE insulated, PVC inner-sheathed (as applicable), Armoured/Unarmoured, FRLS PVC outer sheathed conforming to IS: 7098 (Part-I/II/Latest). These cables shall conform to the requirements of the standards & codes specified in 4.4.3.4 i.e. Cabling system of Technical specifications

4.4.2.5.5 DC Cables Sizing Criteria

The Maximum voltage drop of DC Cables (SPV Modules to Inverters) shall be limited to 2% and shall submit the same for the Employer's review & reference.

4.4.2.5.6 Drawings

The Contractor shall submit all the drawings and documents in respect of cabling system such as DC Cable layout drawing, DC cable trench, and other relevant drawings during the time of detailed engineering for employer's review as per the Engineering information Schedule.

4.4.2.5.7 Routine Testing & Inspection at Works

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to

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

4.4.2.5.8 Type Test Reports

DC Cables must be tested and certified by any of the accredited certifying agencies according to **TUV specification 2 Pfg 1169/08.2007/EN 50618** and the type test reports shall be submitted to Employer for approval. If the type tests are not done previously, then they shall be conducted without any additional cost to the Employer and the type test report shall be submitted before supply of DC Cables.

4.4.2.5.9 Cable Installation

- a. Cable installation shall be as per IS 1255.
- b. Solar cables shall be provided with UV resistant printed ferrules and DC cables shall be provided with punched/ embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.
- c. Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles.
- d. A.C and D.C cables shall be kept in separate trenches. The horizontal and vertical clearances between power and communication cable shall not be less than 300mm.
- e. Solar cables shall be aesthetically tied to Module Mounting Structure using UV resistant cable-ties suitable for outdoor application.

4.4.3 AC Systems

4.4.3.1 Transformers

4.4.3.1.1 Power Transformers

The Contractor shall provide the complete EPC Design, supply, erection, testing and commissioning of transformers along with all necessary items such as bushings, undercarriage, current transformers, instrumentation, valves, piping, mounting plates, hardware, fittings, cable trays, marshalling box accessories etc. and Stage I 33 KV transformer interconnecting station to the output of the Inverter as per the design requirement at detailed engineering stage, where the power is collected at the common location and where it is stepped up to Stage II (132 kV) Voltage level as per the STU/CTU requirements.

4.4.3.1.2 Rating and Functional Characteristics – Power Transformers

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

Power Transformers and associated switchgear of approved make should be utilized. Power Transformer(s) to be installed in Stage II switchyard have to be designed in accordance with the Interconnection point voltage level as per the requirements of SPIA.

All the transformers shall be suitable for outdoor installation with 3 phase 50 Hz 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%. Bidder can adopt any of the following criteria or better for EHV power transformers:

1. 2x50% + 1 spare of 50% equivalent capacity

All the transformers shall be provided with the statutory requirement such as oil pits, fire barrier wall etc. as applicable as per applicable standards.

| Sr No | Parameters | Requirements |
|--------------|--|---------------------------|
| 1 | No. of phases | Three Phase |
| 2 | Installation | Outdoor |
| 3 | Rated VA and Qty | As per system requirement |
| 4 | Voltage Ratio | As per system requirement |
| 5 | Minimum % Impedance at , Rated MVA and Rated frequency | As per IS 2026 |
| 6 | Type of cooling | ONAN |
| 7 | Type of conservator | As per Manufacturer |

| Sr No | Parameters | Requirements |
|--------------|--|-----------------------------|
| 8 | Max. flux density at rated voltage and frequency | Not to exceed 1.9 Tesla |
| 9 | Connection of Transformer | |
| (a) | - HV winding | As per system requirement |
| (b) | - LV winding | |
| (c) | Vector group | As per system requirement |
| 10 | Tap Changer | As per system requirement |
| 11 | Type of bushing | |
| (a) | - HV terminal | Oil/Air bushing |
| (b) | - LV terminal | Oil/Air bushing |
| (c) | - Neutral terminal | |
| 12 | Rated frequency, Fr | 50 Hz |
| 13 | Voltage ratio | As per system requirement |
| 14 | Rated voltage, Ur | |
| (a) | - H.V. winding | As per system requirement |
| (b) | - L.V. winding | |
| 15 | Highest voltage, Um | |
| (a) | - H.V. winding | As per relevant IEC/IS std. |
| (b) | - L.V. winding | |
| 16 | Power frequency withstand voltage | |
| (a) | - H.V. winding / Bushing | As per relevant IEC/IS std. |
| (b) | - L.V. winding / Bushing | |
| (c) | - H.V. neutral / Bushing (minimum) | |
| (d) | - L.V. neutral / Bushing (minimum) | |
| 17 | Lightning impulse withstand voltage | |
| (a) | - H.V. winding / Bushing | As per relevant IEC/IS std. |
| (b) | - L.V. winding / Bushing | As per relevant IEC/IS std. |
| (c) | - H.V. neutral / Bushing (minimum) | As per relevant IEC/IS std. |
| 18 | Switching impulse withstand voltage of H.V Winding and Bushing | N/A |
| 19 | Minimum creepage distance in air | |

| Sr No | Parameters | Requirements |
|-------|--|-------------------------------|
| (a) | - H.V. bushing | As per relevant IEC/IS std. |
| (b) | - L.V. bushing | As per relevant IEC/IS std. |
| 20 | Short circuit current for 1 sec. on HV side | As per Table-2 of IEC 60076-5 |
| 21 | Short circuit apparent power | As per Table-2 of IEC 60076-5 |
| 22 | Maximum temperature rise with a reference maximum ambient temperature of 50 °C | |
| (a) | -Top oil (Measured by thermometer) | 50°C |
| (b) | - Winding (Measured by resistance method) | 55°C |
| 23 | Insulation | |
| 24 | Voltage withstand capacity during sudden | As per relevant IEC/IS std. |
| 25 | Noise level | As per NEMA TR- 1 |
| 26 | H.V. Line Bushing CT | |
| (a) | CT ratio | As per system design |
| (b) | No. of CT cores for each phase of transformer | As per system design |
| 27 | H.V. Neutral Bushing CT | |
| (a) | CT ratio | As per system design |
| (b) | No. of CT cores for each phase of transformer | As per system design |
| 28 | L.V. Neutral Bushing CT | |
| (a) | CT ratio | As per system design |
| (b) | No. of CT cores for each phase of transformer | As per system design |

4.4.3.1.3

Inverter Transformers & Auxiliary Transformer

The Contractor shall provide Inverter Transformers as per system requirement, complete with cubicles and all necessary accessories such as bushings, off-circuit tap changer, CTs, instrumentation, fittings etc. They shall be compatible with offered model of grid connected PCU inverters.

The total kVA capacity of Inverter transformer shall not be less than cumulative kVA capacity of PCU connected to all the LV windings of Inverter Transformer. The overall cumulative capacity of Inverter Transformer(s) shall **not be less than total rated kVA capacity of respective Inverters**. The overall number of the Inverter transformers depends on the plant layout design.

Auxiliary Transformer (s) shall be connected **Low voltage side of the Inverter Transformer** through XLPE cable. A suitable Oil / Air bushing at HV end of the transformer shall be provided. LV side shall be connected to AC distribution board(s) through suitable size cables.

The Contractor shall provide suitable capacity of Auxiliary Transformer(s) complete with cubicles and all necessary accessories such as bushings, off-circuit tap changer, CT's, instrumentation, fittings etc. The Contractor shall make detailed calculations based on the actual power consumption of the connected equipment to check the adequacy of capacity and submit these data to the Employer's review & reference. In case actual power consumption comes out to be more, the Contractor shall have to supply the transformer(s) as per actual requirement.

The Inverter Transformers and Auxiliary Transformers shall be of proven design for intended duty specified to ensure a high reliability and availability. The transformers shall be suitable and design shall be capable to withstand frequent start and stop sequence.

4.4.3.1.4 Rating and Functional Characteristics – Inverter Transformers & Auxiliary Transformer

| Sl. No. | Parameter | Inverter Transformer | Auxiliary Transformer |
|----------------|---|---|------------------------------|
| 1 | kVA Rating | As per system requirement | |
| 2 | Quantity | As per system requirement | |
| 3 | Voltage Ratio (KV) | As per System Requirement | |
| 4 | No. of Winding | As per system requirement | 2 (Two)/3 (Three) Nos. |
| 5 | Frequency | 50 Hz | 50 Hz |
| 6 | Service & Duty | Continuous Solar Application and Converter Duty (Outdoor) | Outdoor/Indoor & Continuous |
| 7 | Nos. of Phase | THREE | THREE |
| 8 | Vector Group & Neutral earthing | As per system requirement | |
| 9 | Cooling | ONAN | ONAN/AN |
| 10 | Tap Changer | As per System Requirement | |
| 11 | Impedance at 75 degree C a) Principal Tap b) Other Taps | AS PER IS 2026 and system requirement | AS PER IS 2026 |

| | | |
|----|--|---|
| 12 | Permissible Temperature rise over an ambient of 50 deg C (irrespective of tap) a) Top Oil b) Winding | 50 deg.C 55 deg.C |
| 13 | SC withstand time | 2 sec. |
| 14 | Fault Level & Bushing CT | As per system requirement |
| 15 | Termination | As per system requirement |
| 16 | Bushing rating, Insulation class | As per relevant IS/IEC |
| 17 | Noise level | AS PER NEMA TR-1 |
| 18 | Loading Capability | Continuous operation at rated KVA on any tap with voltage variation of +/- 10%, also transformer shall be capable of being loaded in accordance with IS:6600/ IEC60076-7. |
| 19 | Flux density | Not to exceed 1.9 Wb/sq.m. at any tap position with +/- 10% voltage variation from voltage corresponding to the tap. Transformer shall also withstand following overfluxing 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% |
| 20 | Air Clearance | As per CBIP |

4.4.3.1.5 General Requirement (Applicable to Power Transformers, Inverter Transformers & Aux. Transformer)

Adequate set of rails with all related embedment and hardware for handling and installation of all the above transformers in switchyard shall be provided by the Contractor.

Adequate set of piping required for oil water separator and soak pit shall be provided by the Contractor.

Coordination and provision of necessary contacts and/or ports for integration with plant SCADA system.

The power/inverter transformers shall be suitable and design shall be capable to withstand frequent start and stop sequence as per system requirement.

Inverter Transformer shall be designed for at least 5% total harmonic distortion (THD) to withstand distortion generated by the inverter as well as possible outside harmonics from the network.

The transformer shall be suitable for continuous operation with a frequency variation of $\pm 2.5\%$ from nominal frequency of 50 Hz without exceeding the specified temperature rise.

All the control and instrumentation panels / devices shall be so arranged that these are easily visible and conveniently and safely accessible from the front.

Normal operation shall be defined as operation with operating parameters within the following ranges:

| Sl. No. | Grid Parameter | Normal Range |
|---------|------------------------|------------------------------|
| 1 | HV and LV side voltage | 90 % to 110 % of rated value |
| 2 | Frequency | 47.5 Hz to 52.5 Hz |
| 3 | Power factor | 0.9 (lag and lead) |

Core: The cores shall be constructed from high grade Cold Rolled Non Ageing super Grain Oriented Silicon Steel Laminations equivalent to M4 grade steels or better. Adequate lifting lugs shall be provided to enable the core and windings to be lifted. Core insulation level shall be 2 kV (RMS) for 1 minute in air.

Windings:

- The winding shall be designed to withstand the highest system voltage continuously and shall have uniform insulation.
- The conductor shall be of electrolytic grade copper free from scales and burrs.
- The coil clamping arrangement and the finished dimensions of any oil ducts shall be such that, it will not impede the free circulation of oil through the ducts. The edges of copper conductor shall be smooth so as to ensure that the vibrations do not damage the paper wrapped leading to a fault.
- Tappings shall be so arranged as to preserve the magnetic balance of the transformers at all voltage ratios.
- The Transformer shall be oil insulated type and class of insulation should be "A".

Bushings: All the HV, LV & Neutral bushing shall be supplied as per system requirement. A stress shield shall be considered as an integral part of bushing assembly.

Termination arrangement: The Contractor shall be responsible for the termination arrangement /interface arrangement for the transformers.

Tank:

- a) he transformer tank and cover shall be fabricated from good commercial grade low carbon steel. The tank construction shall be welded type and the cover shall be bolted to the tank. Stiffeners of structural steel for general rigidity shall reinforce the tank.
- b) he transformer tank shall be equipped with all necessary valves of appropriate size with standard screw connections for external piping for reliable operation and maintenance of transformer.
- c) suitable inspection holes with welded flange and bolted covers shall be provided on the tank cover. The inspection holes shall be of sufficient size to afford easy access to the lower ends of the Bushings, terminals etc.
- d) ll bolted connections to the tank shall be fitted with suitable oil tight gaskets.
- e) he transformer tank, fittings and all accessories shall be designed to withstand seismic acceleration.
- f) ll bolts and nuts used in connection with the tank and fittings shall be hot dip galvanized /electro-galvanized.

Conservator vessel, oil gauge and breather

- a) conservator tank will have adequate capacity to meet Oil preservation system and volumetric expansion of total transformer oil during operation of transformer. The conservator shall have sufficient strength to withstand, without permanent distortion, during filling under vacuum.
- b) he conservator shall have two filter valves one at the bottom at one end and other at the top on the opposite end. One number Magnetic Oil Gauge (MOG) with low-level alarm contacts shall be provided.
- c) ach conservator vessel shall be fitted with indicating type silica gel breather. Silica gel shall be isolated from atmosphere by an oil seal.

Gas and oil actuated relay (Buchholz relay): Each transformer shall be fitted with gas and oil actuated Buchholz relay having alarm and trip contacts.

Current transformer: Bushing or turret mounted current transformers shall be provided. It shall be possible to remove the CTs from the transformer tank without removing the transformer cover. CT secondary leads shall be brought out to a

weather-proof terminal box near the bushings and the wiring from terminal box to marshalling box shall be done.

Neutral formation: Neutral Earthing shall be done as per system requirement .In case of Solidly earthed neutral of Transformers, it shall be brought through Insulated Support from Tank to the Ground level at a convenient point with two numbers copper flat strips, for connection to ground network (as applicable).

Valves: All valves shall be heavy duty Gate type made of stainless steel material. Means shall be provided for pad-locking the critical valves in the open and close positions.

Pressure relief device: The pressure relief device, specifically designed for transformer protection, shall be provided for protection from internal overpressure. The no. of devices shall be worked out according to the volume of oil. The discharge of PRD shall be properly taken through pipes and directed away from the transformer / other equipment

Transformers shall have Oil Temperature Indicator (OTI) and Winding Temperature Indicator (WTI) with accuracy class of ± 2 deg C

Marshalling box: Marshalling Box shall be of Sheet steel, vermin proof, weather and dust proof provided with proper lighting and thermostatically controlled space heaters. The degree of protection shall be IP65. The Marshalling Box shall be capable of accommodating various Instruments (OTI,WTI , Relays, Selector switches etc), Electrical Wiring, Terminals, CT Connections ,TBs and other equipments as per system design. Sufficient spare Terminals shall be provided with each Marshalling Box. Wiring scheme shall be engraved in a stainless steel plate with viewable font size and same shall be fixed inside the Marshalling Box door. Marshalling Box of all transformers shall be preferably Tank Mounted and shall be at sufficient height above the ground level for safe operation.

Control wiring: All controls, alarms, indicating and relaying devices and secondary terminals of CTs provided with the transformer shall be wired up to the terminal blocks inside the marshalling box. The wiring shall be from PVC insulated copper cable of 1100V grade. All the control wiring shall be properly routed through perforated & covered cable tray fixed on the tank

Joints and gaskets: All gaskets used for making oil tight joint shall be of proven material such as granulated cork, bonded with synthetic rubber. The gasket used shall be of neoprene rubber.

Insulating oil

The oil supplied with Transformers shall be new and previously unused and must confirm to the relevant IS Standards while tested at Supplier's premises. The oil shall be free from moisture and have uniform quality throughout. The parameters of new oil at the time of dispatch of oil from refinery/manufacturer works shall confirm to IS 335-1994, IEC 60296-2003 wherever applicable, considering stringent values in case of overlapping standard/ references. No inhibitor shall be used in oil.

Internal Earthing arrangement:

- a)
earthing of core clamping structure: The top & bottom of main core clamping structure shall be connected to the tank body adopting standard practice.
- b)
earthing of magnetic circuit: The magnetic circuit shall be earthed to the clamping structure at one point only, through a link placed in an accessible position beneath an inspection opening in the tank cover. The connection to the link shall be on the same side of the core as the main earth connection. The connections are to be brought out through a bushing for the convenience of measurements
- c)
earthing terminal: Two earthing terminals capable of carrying the short circuit current of the transformer shall be provided.
- d)
earthing of coil clamping rings: Where coil-clamping rings are of metal at earth potential, each ring shall be connected to the adjacent core clamping structure on the same side of transformer as the main earth connections.

Locking arrangement: The Contractor shall ensure that all valves, ladder and other devices shall be suitable for safety of installation. Locking with the help of nuts, bolts and other hardware shall be provided for authorized operation of devices.

Guaranteed losses: The no load loss in kilowatts at rated voltage and rated frequency, load losses and total loss in kilowatts at rated output, rated voltage and rated frequency shall be guaranteed. The contractor shall submit the detailed losses calculation of the transformer for the Employer's review at the time of detailed engineering.

Termination arrangement: The Contractor shall be responsible for proper termination/interface arrangement for transformers.

Transformer movements: The transformers shall be provided with Bi-directional Wheel/Skids, jacking pads, lifting lugs, towing holes, core and winding lifting lugs and other necessary fittings so as to allow complete transformer to be lifted and permit movement of the transformer along its longitudinal or transverse axis on

standard broad gauge tracks and allow trouble free operation and maintenance of the transformers.

The Contractor shall submit to the Employer for review the Drawings, design calculations and other relevant information as per Engineering Information Schedule during detailed Engineering.

All external surface of the transformer shall be painted with two coats of epoxy-based paint of colour shade RAL 7032. Internal surface of cable boxes and marshalling box shall be painted with epoxy enamel white paint.

4.4.3.1.6 Codes & Standards:

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards:

| Sl. No | Standard | Description |
|--------|---|--|
| 1 | IEC 60076, IS 2026 | Power/Inverter transformers |
| 2 | IEC 60137, IS 2099 | Insulated bushings for alternating voltages above 1000 V |
| 3 | IEC 60296, IS 335 | Specification for unused mineral insulating oils for transformer and Switchgear. |
| 4 | IS 3639 | Fittings and accessories for Power/Inverter Transformers |
| 5 | IS 2544 | Porcelain insulators for system above 1000 V |
| 6 | IS 5350 | Part-III Post Insulators for system greater than 1000 V |
| 7 | IS 5621 | Hollow Insulators for use in electrical equipment |
| 8 | IS 5556 | Serrated lock washers-specification |
| 9 | IEC 60354, IS 6600 | Loading guide for oil immersed power/Inverter transformers |
| 10 | IEC 60185, IS:2705, | Bushing CTs |
| 11 | Indian Electricity Act, CEA Notifications | |

4.4.3.1.7 Routine Testing & Inspection at Works

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer reserves the right to inspect the Equipment at the manufacturer's site prior to dispatch.

The Contractor shall carry out the following Routine Tests but not limited to the following:

Routine Tests

All the routine test shall be done in accordance with IEC 60076.

- i. Measurement of Voltage Ratio and Phase displacement. (as per IEC 60076-1)
- ii. Measurement of winding resistance on all taps. (as per IEC 60076-1)
- iii. Vector Group and Polarity Check(as per IEC 60076-1)Magnetic Balance and
- iv. Magnetizing Current Test
- v. Measurement of no load current with 415 V, 50 Hz AC Supply.
- vi. Measurement of no load losses and current at 90%, 100% & 110% of rated voltage
- vii. R Measurement Test(as per IEC 60076-1)
- viii. Measurement of Capacitance & tan delta to determine a capacitance between winding & earth
- ix. R Measurement on wiring of Marshalling Box.
- x. Induced over voltage withstand test
- xi. Separate Source voltage withstand test
- xii. Breakdown voltage test on transformer oil as per IS 335
- xiii. Measurement of short circuit impedance and load loss

Installation & Commissioning

Mainly following activities are required to be carried out before the commissioning of Power/Inverter Transformers:-

Assembling of Power/Inverter Transformers accessories and testing activities including the following

- i. Ratio Test
- ii. Megger Value
- iii. Magnetic Balance
- iv. Check of vector group
- v. Oil BDV
- vi. Earth Resistance
- vii. Bucholz relay checking
- viii. WTI/OTI/MOLG(OIL level) checking
- ix. Checking of points of leakage of oil from Transformer body/Radiator Valve

- x. Setting of relays in the panel
- xi. **DGA of Oil before charging and also after charging.**

4.4.3.1.8 Type Test

Transformers supplied must be of type tested design and certified by any of the accredited certifying agencies in accordance with relevant standards /codes and the type test reports shall be submitted for employer's review. If the type tests are not done previously, then they shall be conducted by the Contractor without any additional cost to the Employer and the type test report shall be submitted before supply of Transformers.

Type Test Reports to be submitted by the Contractor shall be including but not limited to the following:

- i. Temperature Rise test at a tap corresponding to maximum losses as per IEC 60076.
- ii. Measurement of harmonics of no load current.
- iii. Measurement of acoustic noise level as per NEMA TR-1.
- iv. Tank Vacuum & Pressure Test (as per CBIP Norms)

4.4.3.2 HIGH VOLTAGE (HV) SWITCHGEAR

4.4.3.2.1 The Contractor shall select the voltage level of HV Switchgear as per the system requirement. The indoor switchgear system shall include Requisite nos. incoming panels from field units, and outgoing panels to Power/Inverter transformers or the outgoing lines depending on the evacuation voltage & system requirement, panels for **HV/415 V** Auxiliary Transformer, Bus couplers breakers and associated equipment.

4.4.3.2.2 The HV switchgear panels located indoor shall be complete with cubicles, protection, metering, bus-bar system, cabling, wiring and other accessories, comprising of HV Vacuum/SF6 circuit breaker, AC bus bars (including N-bus bar), Current transformers, Potential transformers, Multifunction meters and other necessary equipment as per system requirements. The quantities shall be finalized during detail engineering based on the proposed configuration.

4.4.3.2.3 Rating and Functional Characteristics

| Sl. No. | System | Description |
|---------|---|----------------------------------|
| 1 | Nominal System Voltage | As per system requirement |
| 2 | Highest System Voltage | As per IEC/IS Standards |
| 3 | Rated Frequency | 50 Hz |
| 4 | No. of Phases/poles | Three (3) |
| 5 | System Neutral Earthing | Solidly earthed |
| 6 | One minute power frequency withstand voltage -for Type Tests | As per relevant IEC/IS standards |

| Sl. No. | System | Description |
|----------------------------|---|--|
| 7 | 1.2/50 microsecond Impulse withstand voltage | As per Fault Level calculation/system requirement |
| 8 | Minimum system fault level | As per requirement |
| 9 | Short time rating for Bus Bars, circuit breakers, transformers and switchgear assembly | As per system requirement |
| 10 | Dynamic Withstand Rating | As per system requirement |
| 11 | Control Supply Voltage | As per system requirement |
| 12 | Maximum Ambient air temperature | 50 deg. C |
| 13. Bus Bars | | |
| i | Continuous current rating at 50 deg.C at ambient | As per system requirement |
| ii | Temperature rise allowed above ambient | As per system requirement |
| 14. Circuit Breaker | | |
| i | Type | Vacuum /SF6 |
| ii | Description | Three phase equipped with group control mechanism |
| iii | Rated normal current, A | As per system requirement |
| iv | No. of interrupter unit per pole | 1 |
| v | Short Circuit breaker current | As per system requirement |
| vi | Short Circuit Making Current | As per system requirement |
| vii | Total break Time | As per system requirement |
| viii | Total Make Time | As per system requirement |
| ix | Rated operating sequence | As per system requirement |
| x | Normal voltage for operating mechanism i.e., charging motor (DC) | As per system requirement |
| xi | Reclosing | As per Manufacturer |
| xii | Auxiliary Contacts | As per Manufacturer |

| Sl. No. | System | Description |
|----------------------------------|--|--|
| xiii | Noise Level Maximum of Circuit Breaker | As per Manufacturer |
| 15. Current Transformer | | |
| i | Secondary Current | As per system requirement |
| ii | Class of Insulation | Class E or better |
| iii | Current Ratio | As per system Requirement |
| iv | Accuracy class | |
| iv.(a) | Protection | Class PS for Differential & REF and core balance CTs (CBCT); 5P20 for other protection CTs |
| iv(b) | Metering | 0.2S |
| v | Number of CTs. | As per the requirement of STU/CTU/UPNEDA/State Transmission Authority. |
| vi | Number of Cores | As per the requirement of STU/CTU/UPNEDA/State Transmission Authority. |
| vii | Partial discharge level | As per system requirement |
| viii | Rated VA Burden | As per system requirement |
| ix | Installation | Outdoor(IP 65) |
| x | Temperature Rise | As per IEC 60044 |
| xi | Minimum primary earth fault current to be detected by CBCT | As per system requirement |
| xii | Instrument Security Factor for Measurement CTs | As per system requirement |
| 16. Potential Transformer | | |
| i | Rated Voltage Factor | As per system requirement |
| ii | Class of Insulation | Class E or better |
| iii | Transformation ratio | As per system requirement |
| iv | Accuracy Class | |
| a) | Relaying | 3P |
| | Metering | 0.2 |
| v | Rated Total Thermal | As per system requirement |
| vi | Partial Discharge | As per system requirement |
| vii | Number of Cores | As per the requirement of STU/CTU/UPNEDA/State Transmission Authority. |
| viii | Number of CTs. | As per the requirement of STU/CTU/UPNEDA/State Transmission Authority. |

4.4.3.2.4 Standards & Codes

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable IS/IEC standards. In the event of other standards

being applicable they will be compared for specific requirement and specifically approved during detailed engineering for the purpose:

| Sl. No. | Standards | Description |
|---------|----------------------|--|
| 1 | IEC 60529/ IS-13947 | Degrees of protection provided by enclosures (IP Code) |
| 2 | IEC 60044-1/ IS-2705 | Instrument transformers – Part 1 : Current transformers |
| 3 | IEC 60044-2/ IS-3156 | Instrument transformers – Part 2 : Inductive voltage transformers |
| 4 | IEC 60044-6 | Instrument transformers – Part 6 : Requirements for protective current transformers for transient performance |
| 5 | IEC 62271-100 | High-voltage switchgear and control gear – Part 100: High-voltage alternating-current circuit-breakers |
| 6 | IEC 62271-200 | High-voltage switchgear and control gear – Part 200: A.C. metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV |
| 7 | IEC 60694 | Common specifications for high-voltage switchgear and control gear standards |
| 8 | IS: 8130 –1984 | Conductors for Insulated Cables |
| 9. | IEC 60255 | Measuring relays and protection equipment |
| 10. | IS 3231 | Electrical relays for power systems protection |
| 11. | IS 9431 | Indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to and including 300 kV |
| 12. | IEC 60099-4 | Surge arresters - Part 4: Metal-oxide surge arresters without gaps for A.C. systems |
| 13. | IEC 62053 | Electricity metering equipment (A.C.) - Particular requirements |
| 14. | IS 9385 | High voltage fuses |

4.4.3.2.5 General requirement

1. The Indoor HV Switchgear shall be of the steel enclosed type vermin proof, dust, Moisture protected and shall comply with the requirements of latest edition of IEC/IS. The switchgear boards shall have a single front, single tier, fully compartmentalized, metal enclosed construction complying with IEC 62271-

200. Each circuit shall have a separate vertical panel with distinct compartments for circuit breaker truck, cable termination, main bus bars and auxiliary control devices. The adjacent panels shall be completely separated by steel / Aluzinc sheets except in bus bar compartments where insulated barriers shall be provided to segregate adjacent panels. The Service Class Continuity of Switchgears shall be LSC 2B-PM (as per IS/ IEC 622771-200). However, manufacturer's standard switchgear designs without inter panel barriers in bus bar compartment may also be considered.

2. The circuit breakers and bus VTs shall be mounted on with drawable trucks which shall roll out horizontally from service position to isolated position. For complete withdrawal from the panel, the truck shall rollout on the floor or shall roll out on telescopic rails. In case the later arrangement is offered, suitable trolley shall be provided by the Contractor for withdrawal and insertion of the truck from and into the panel. Testing of the breaker shall be possible in isolated position by keeping the control plug connected.
3. Switchgear assembly shall be with the truck in any position SERVICE, ISOLATED or removed, and all doors and covers closed. All doors, removable covers and glass windows shall have gaskets all round with synthetic rubber or neoprene gaskets.
4. The doors and covers shall be constructed from cold rolled steel sheets of 2.0 mm or higher thickness .The gland plate thickness shall be minimum 3.00 mm for hot/cold rolled sheet steel. Gland plates shall be 2.5 mm thick made out of hot rolled or cold rolled steel sheets and for non-magnetic material it shall be 3.0 mm. Switchboards shall have a degree of protection of IP: 5X for outdoor and IP4X for indoor as per IS/IEC:60947.
5. All the sheet steel work shall be pre-treated in accordance with IS: 6005. The gaskets shall be of good quality EPDM/Neoprene.
6. The indicating lamps be with multiple LEDs shall be installed in the panel.
7. The bus bars shall be of Copper conductors conforming to IEC/IS. The bus bar system shall be insulated with PVC sleeves and shall be complaint with UL 224.
8. Circuit breaker shall be according to IEC/IS and shall be complete with the proper interlocking.
9. The current transformer shall be of inductive type. It shall be mounted within the cubicles and shall comply with the requirements of relevant IEC/IS. It shall be used for protection and metering.
10. The potential transformer shall be of inductive type. It shall be mounted within the cubicles on a withdrawable trolley independent of the trolley for the circuit breaker and shall comply with the requirements of relevant IEC/IS. The potential transformer at bus bar shall have requisite number of cores for protection and metering as per the system requirement.
11. Insulating mats of appropriate size confirming to relevant standards are to be provided in front of all the HV switchgear panels for the safety of personnel.
12. Necessary provision/potential free contacts shall be made available

for control, status, alarm and indication of faults/status at Main Control Room.

13. In the Service position, the truck shall be so secured that it is not displaced by short circuit forces. Bus bars, jumpers and other components of the switchgear shall also be properly supported to withstand all possible short circuit forces corresponding to the short circuit rating specified.
14. The switchgear construction shall be such that the operating personnel are not endangered by breaker operation and internal explosions, and the front of the panels shall be specially designed to withstand these. Pressure relief device shall be provided in each high voltage compartment of a panel, so that in case of a fault in a compartment, the gases produced are safely vented out, thereby minimizing the possibility of its spreading to other compartments and panels. The pressure relief device shall not however reduce the degree of protection of panels under normal working conditions.
15. To represent the single line diagram, a mimic diagram shall also be made available on the panel. The circuit breaker cubicle shall be provided with space heater and door operated illumination lamp.
16. Suitable lifting hooks shall be provided for each panel.
17. Restricted Earth fault relay for HV side Power transformer shall be provided. The system shall be compatible with station SCADA, regarding input and output needed for operation, control and monitoring of HV switchgear system.
18. All the auxiliary wiring shall be carried out with calculated design voltage grade, single core cable conductor, colour coded, and PVC insulated wires. Conductor size shall be 1.5 mm² (min) for control wiring and 2.5 mm² (min) for CT and space heater circuits.
19. Each switchgear panel shall be provided with thermostatically controlled space heaters, separately for breaker, cable and bus bar compartments, to prevent condensation within the compartment.
20. The Contractor shall submit to the Employer the layout arrangement ,equipment Drawings, design calculations for short circuit withstand capability , load calculation for bus bar rating selection etc. and other relevant information as per Engineering Information Schedule during detailed Engineering.

4.4.3.2.6 Routine Testing & Inspection

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the modules at the manufacturer's site prior to dispatch.

The contractor shall perform the routine tests conforming IS/IEC 60044-1:2003 for the Instrument Transformers (CT & PT) including but not limited to following:-

- a. Verification of terminal markings
- b. Power-frequency withstand test on primary winding
- c. Partial discharge measurement
- d. Power-frequency withstand test on secondary windings
- e. Power-frequency withstand tests, between sections
- f. Inter-turn overvoltage test

4.4.3.2.7 Type Test

HT Switchgear supplied must be of type tested design and certified by any of the accredited certifying agencies in accordance with relevant standards /codes and the type test reports shall be submitted for employer's review. If the type tests are not done previously, then they shall be conducted by the Contractor without any additional cost to the Employer and the type test report shall be submitted before supply of Transformers.

4.4.3.2.8 The contractor shall perform the routine tests conforming IS/IEC 60044-1:2003 for the Instrument Transformers (CT & PT) including but not limited to following:-

- a) Short-time current tests
- b) Temperature rise test
- c) Lightning impulse test
- d) Switching impulse test
- e) Wet test for outdoor type transformers
- f) Determination of errors
- g) Radio interference voltage measurement (RIV)

4.4.3.3 LT SWITCHGEAR

4.4.3.3.1 LT Switchgear

3-phase, 50 HZ, 415 V switchgear system shall consist of various LT metal enclosed Switchgear boards complete with suitably rated equipment including, Draw out type incoming air circuit breaker, required no. of MCCBs, Current transformers, of Potential transformers, of Multifunction meters, Energy meters, AC bus bars (including N-Bus bar), Local control switches, Indicators (LED Type) as per requirement, all necessary auxiliaries for control and supervisory circuits, and other necessary associated equipment

4.4.3.3.2 General Requirement

The switchgear system shall be solidly grounded, 3 phases, 4-wire TNS, according to IEC Publication 60364-3. The 415 V Switchgear shall be metal enclosed indoor cubicles free floor standing type and of uniform height not exceeding 2450 mm.

EPDM/Neoprene gasket shall be provided between the panel sections to avoid ingress of dust into panels.

All switches, push buttons etc. shall be operated front and shall be flush/semi-flush mounted

Necessary shrouding arrangement shall be provided for this purpose. Wherever two breaker compartments are provided in the same vertical section insulating barriers and shrouds shall be provided in the rear cable compartment to avoid accidental touch with the live parts of one circuit when working on the other circuit.

Each switchboard shall be provided with undrilled, removable type gland plate having thickness of 3.0 mm for hot / cold-rolled sheet steel and 4.0 mm for non-magnetic material.

Cable entries shall be from bottom. The opening of cable entry shall be covered by 3mm thick gland plates with proper sealing to avoid water and rodent entry.

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

All switchboards shall be of dust-proof and vermin-proof construction and shall be provided with a degree of protection of IP-5X for outdoor LT panels and IP-4X for indoor panels as per IS/IEC60947.

The minimum clearance in air between phases and between phases and earth for the entire run of horizontal and vertical bus bars and bus-link connections at circuit-breaker shall be 25mm.

All auxiliary wiring shall be carried out with voltage grade as per system design single core stranded copper conductor, colour coded, PVC insulated wires. Conductor size shall be 1.5mm² (min.) for control circuit wiring and 2.5 mm² (min) for CT and space heater circuits.

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

All Switchboards shall be provided with three phase & neutral bus bar. Bus bar conductors shall be made of copper of adequate size with PVC sleeves conforming to UL 224.

Copper/Aluminium earth bus shall be provided at the bottom of each panel and shall extend throughout the length of each switchboard with proper earthing arrangements.

Control switches and instruments shall be mounted on the circuit breaker compartment doors/front side of the panel.

The air circuit breakers shall be designed in accordance with the recommendations of IEC Publications 60947-1 and 60947-2.

The MCCBs shall be designed in accordance with the IEC Publications 60947.1 and 60947-2.

All fuses shall be of HRC cartridge fuse link type of suitable rating.

The current transformer shall be single-phase single core inductive type and shall comply with the requirements of relevant IEC 60044-1.

Required no. of potential transformers with fuses in all the phases shall be provided for metering and interlock.

The Contractor shall submit to the Employer the layout arrangement ,equipment Drawings, design calculations for short circuit withstand capability , load calculation for bus bar rating selection etc. and other relevant information as per Engineering Information Schedule during detailed Engineering.

4.4.3.3.3 Standards & Codes

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards. In the event of other standards being applicable they will be compared for specific requirement and specifically approved during detailed engineering for the purpose.

4.4.3.3.4 R

| Standards | Description |
|------------------|--|
| IEC 60529 | Degrees of protection provided by enclosures (IP Code) |
| IEC 60439 | Low-voltage switchgear and control gear assemblies |
| IEC 60364 | Electrical installations of buildings |
| IEC 60947 | Low-voltage switchgear and control gear |

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e Testing & Inspection at Works

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the modules at the manufacturer's site prior to dispatch

4.4.3.4 CABLING SYSTEM

4.4.3.4.1 Cabling System shall include the following:

- i.
T Power & Control Cable
- ii.
T Power cable
- iii.
able Installation Methodology

4.4.3.4.2 LT Power & Control Cable

LT Power & control cables shall be of minimum 1100 volts grade XLPE / PVC insulated conforming to IS 1554 for utilization voltages less than equal to 415 V. The cables shall be suitable for laying on racks, in ducts, trenches, conduits and underground (buried) installation with chances of flooding by water.

4.4.3.4.3 General Requirements

1.
All cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses developed under steady state and transient operating conditions. If Cables are to be laid Underground, laying shall be as per relevant IS Code.
2.
Copper/Aluminium conductor used in power cables shall have tensile strength as per relevant standards. Conductors shall be stranded.
3.
XLPE insulation shall be suitable for a continuous conductor temperature of 90 deg. C and short circuit conductor temperature of 250 deg C. PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C.
4.
The minimum conductor cross-section for control cable shall be 1.5 sq.mm. KV Grade.
5.
Control Cables shall have stranded copper conductor and shall be multicore PVC insulated, PVC inner sheathed, armoured / unarmoured, FRLS PVC outer sheathed conforming to IS: 1554. (Part-I)
6.
All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath as per IS : 5831.
7.
For single core armoured cables, armouring shall be of aluminium wires/formed wires. For multi core armoured cables armouring shall be of galvanized steel of suitable size and type of armour. The aluminium used for armouring shall be of H4 grade as per IS: 8130.
8.
The aluminium used for armouring shall be of H4 grade as per IS: 8130 with maximum resistivity of 0.028264 ohm mm² per meter at 20 deg C.
- 9.

uter sheath shall be of PVC as per IS: 5831. In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following FRLS properties.

- i.
xygen index of min. 29 (as per IS 10810 Part-58).
 - ii.
cid gas emission of max. 20% (as per IEC-754-I).
 - iii.
moke density rating shall not be more than 60 % (as per ASTMD- 2843)
10.
ll cables shall meet the fire resistance requirement as per Category-B of IEC 332 Part-3.
 11.
llowable tolerances on the overall diameter of the cable shall be +/- 2 mm maximum over the declared value in the technical data sheet
 12.
n plant repairs of the cable shall not be accepted. Pimples, fish eye, blow hole etc are not acceptable.
 13.
able shall be supplied with Wooden drums which shall comply with IS: 10418.

4.4.3.4.4 HT Power Cable

All cables shall meet the fire resistance requirement as per IEEE - 383 with cable installations made in accordance with 'Flammability Test' and as per Category-B of IEC 332 Part -3.

4.4.3.4.5 Cable Selection and Sizing (Applicable for LT & HT Cables)

HT & LT Power Cables shall be sized based on the following considerations:

- a)
ated current of the equipment
- b)
he Maximum voltage drop
 - i.
T Power Cable:- The maximum voltage drop in the cables Inverter to Inverter Transformer shall be limited to 0.5 % of the rated voltage. For other LT cables, Maximum Voltage drop shall be limited to 3% of rated voltage.
 - ii.
T Power Cable-The Maximum voltage drop in the cables (Inverter Transformer to HT Panels shall be limited to 3 % of the rated voltage (excluding motor starting conditions)

4.4.3.4.6 Derating Factors (Applicable for LT & HT Cables)

Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes:

- a)
ariation in ambient temperature for cables laid in air

b)

grouping of cables

Variation in ground temperature and soil resistivity for buried cables

4.4.3.4.7 Codes and Standards (Applicable for LT Power & Control & HT Cables)

All the cables shall conform to the requirements of the following standards and codes:-

| Standards | Description |
|--------------------|--|
| IS :1554 - I | PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V. |
| IS : 3961 | Recommended current ratings for cables |
| IS : 3975 | Low carbon galvanized steel wires, formed wires and tapes for armouring of cables. |
| IS : 5831 | PVC insulation and sheath of electrical cables. |
| IS:7098 (Part -I) | Cross linked polyethylene insulated PVC sheathed cables for working voltages up to and including 1100V. |
| IS:7098 (Part -II) | Cross linked polyethylene insulated PVC sheathed cables for working voltages from 3.3 KV up to and including 33 KV. |
| IS : 8130 | Conductors for insulated electrical cables and flexible cords. |
| IS : 10418 | Specification for drums for electric cables. |
| IS : 10810 | Methods of tests for cables. |
| ASTM-D -2843 | Standard test method for density of smoke from the burning or decomposition of plastics. |
| IEC-754 (Part-I) | Tests on gases evolved during combustion of electric cables. |
| IEEE-383 | Standards for Type Tests of Class IE Electric Cables |
| IEC-332 | Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B). |
| IS- 1255 | Code of practice for installation and Maintenance of power cables including and up to 33 KV rating. |
| IS-3043 | Code of practice for earthing |
| IS:9537 | Conduits for electrical installation |
| IS:13573 | Joints and terminations for polymeric cables for working voltages from 6.6 KV upto and including 33 KV performance requirements and type tests |
| DIN 46329 | Cable lugs for compression connections, ring type for Aluminium conductors |
| VDE 0278 | Tests on cable terminations and straight through joints. |

| Standards | Description |
|--------------------|--|
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| VDE 0278 | Tests on cable terminations and straight through joints. |

4.4.3.4.8 Cable Ends

a)

able end terminations and joint kits shall comply with the latest version of the relevant IS Codes

b)

he Cable end shall be terminated with adequate size copper lugs, Aluminium lugs,

sockets, single/double compression cable glands. Cable glands shall have adequate earthing provision. Suitable lock type crimping lug shall be used for cable end terminations.

c)

T Cable termination kits and straight through joints shall be selected as per the cable specifications. Heat shrinkable type kits only shall be used for HT & LT Cables

4.4.3.4.9 Inter Plant Cabling: Interplant cabling for main routes shall be laid in Cable trenches/cable trays/buried/duct banks

4.4.3.4.10 Trenches: PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps

4.4.3.4.11 Cable Trays, Fittings & Accessories: Cable trays shall be ladder/perforated type as specified complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable trays shall have standard width of 150 mm, 300 mm & 600 mm and standard lengths of 2.5 metre

4.4.3.4.12 Terminations & Straight through Joints: Termination and jointing kits for **Inverter Output Voltage/33Kv** and 1.1/1.5kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be pre-moulded type, taped type or heat shrinkable type. **Inverter Output Voltage Kv, 33 kV and 1.1/1.5kV grade joints and terminations** shall be type tested as per IS:13573. 3.3kV grade joints and terminations shall be type tested as per VDE0278

4.4.3.4.13 Cable glands: Cable shall be terminated using double compression type cable glands. Cable glands shall conform to BS:6121. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron .

4.4.3.4.14 Cable lugs/ferrules: Cable lugs/ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipment. Cable lugs and ferrule shall conform to relevant standard.

4.4.3.4.15 Installation Cable tray and Support System Installation

Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.

The Contractor shall design, erect & install the complete plant cabling system including HT, LT Power & Control cabling, trenches, cable trays, fittings and accessories with proper support system for cable trays, junction boxes, arrangement of proper termination as per system requirements, cable glands, lugs/ferrules, trefoil clamps, cable clamps and straps, receptacles including galvanizing and welding as per the relevant IS/IEC standards, necessary for reliable and satisfactory operation of the plant.

The Contractor shall submit a Cable Schedule for complete plant- to the Employer.

Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures. The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in

the floor/roof/wall cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.

Junction boxes with minimum IP 55 degree of protection shall be mounted at an adequate height above floor level or as specified in the drawings and shall be adequately supported/mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.

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

The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings etc.

At least 300mm clearance shall be provided between

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

4.4.3.4.16 Routine Testing & Inspection at Works

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the modules at the manufacturer's site prior to dispatch.

4.4.3.4.17 Type Test

The cables supplied must be of type tested design and certified by any of the accredited certifying agencies in accordance with relevant standards /codes and the type test reports shall be submitted for employer's review. If the type tests are not done previously, then they shall be conducted by the Contractor without any additional cost to the Employer and the type test report shall be submitted before supply of Cables.

| SI No | TYPE TEST | REMARKS |
|--------------------------------------|---------------------------|-----------------------------------|
| Conductor | | |
| 1 | Resistance test | |
| 2 | Tensile test | For circular non – compacted only |
| 3 | Wrapping test | For circular non – compacted only |
| For Armour wires/Formed wires | | |
| 4 | Measurement of Dimensions | |
| 5 | Tensile test | |
| 6 | Elongation test | |
| 7 | Torsion test | For round wires only |
| 8 | Wrapping test | For aluminium wires/ Formed wires |
| 9 | Resistance test | |

| | | |
|-------|---|--------------------------------|
| 10(a) | Mass & uniformity of Zinc Coating tests | For GS formed wires/wires only |
| 10(b) | Adhesion test | For GS formed wires/wires only |
| 11 | Adhesion test | For GS formed wires/wires only |

For PVC /XLPE insulation & PVC sheath

| | | |
|----|---|------------------------------------|
| 12 | Test for thickness | |
| 13 | Tensile strength and elongation test before aging | |
| 14 | Ageing in air oven | |
| 15 | Loss of mass test | For PVC insulation and sheath only |
| 16 | Hot deformation test | For PVC insulation and sheath only |
| 17 | Heat deformation test | For PVC insulation and sheath only |
| 18 | Shrinkage test | |
| 19 | Thermal stability test | For PVC insulation and sheath only |
| 20 | Hot set test | For XLPE insulation only |
| 21 | Water Absorption test | For XLPE insulation only |
| 22 | Oxygen index test | For outer sheath only |
| 23 | Smoke density test | For outer sheath only |
| 24 | Acid gas emission test | For outer sheath only |

The reports for following type tests shall be furnished for each type (voltage grade) & size of the cable

S1 No Type Test for all cables

| | |
|--|---|
| 1 | Insulation Resistance test(Volume Resistivity method) |
| 2 | High voltage test |
| For cables of 11 kV and above Grade only | |
| 3 | Sheath Test |
| 4 | DC High Voltage Test |
| 5 | Dielectric power factor test |
| | a) As a function of voltage |
| | b) As a function of temperature |
| 6 | Impulse withstand test |

4.4.3.5 PROTECTION SYSTEM

4.4.3.5.1 The Contractor shall provide suitable protection systems for the complete Solar PV Plant and the associated Power Evacuation System covering Inverters, DC System, Power/Inverter transformers, Auxiliary Transformer, HT Switchgear, LT Switchgear, Switchyard & associated Power Evacuation System, Battery Bank & Charger and other equipment and systems as per system design as required for safe, efficient and trouble free operation of the Solar PV Plant.

4.4.3.5.2 The Solar PV Plant and the associated Power Evacuation System shall be protected as per applicable IS/ IEC standards. Over Current Protection, Reverse Power Protection, Differential protection, Earth Fault protection/REF, Under voltage Protection, Over flux Protection, Bus Bar Protection, Breaker Failure Protection, Buchholz, Winding Temperature, Oil Temperature, PRV and other protection for Transformers and other equipment/ systems installed in the Solar PV Plant shall essentially be provided whichever and wherever applicable as per manufacturer's recommendation, standard practice and system design considering the fault current under most severe fault conditions.

4.4.3.5.3 General Requirement

Protection system shall be complete in all respect. Protection shall be provided through relays, which shall be Numeric type protection relays with RS 485 port or any other compatible port for communication with PC/Laptop for configuration and data download as well as communication with Numeric protection for Power/Inverter transformer shall be provided with 100% redundancy of relays.

The Solar PV System and the associated Power Evacuation system interconnections should be protected as per IEC 61727 Ed-2 norms.

All relays shall be rated for control supply voltage and shall be capable of satisfactory continuous operation between 80-120 % of the rated voltage, making, carrying and breaking current ratings of their contacts shall be adequate for the circuits in which they are used.

All communications of protection system with the control system shall be based on universally accepted protocol as per IEC 60870-5-10.

The numerical relay shall have RS-232/RS-485/RJ-45/USB ports on front side for local communication with PC and on rear side for remote communication to SCADA system.

All circuit breaker feeders shall be provided with communicable numerical relays (IED, i.e. Intelligent Electronic Device, complying with IEC 61850, having protection, control, measurement and monitoring features.

All major numerical relays shall have in built disturbance recorder (DR) and event recorder with adequate number of Digital & Analog channels and storage Capacity for enabling smooth fault analysis. All relays, disturbance recorders, event recorders etc. shall be time synchronised through universal time synchronisation system as described in "Section -Control and Monitoring (SCADA) System".

The control/ relay compartments shall have degree of protection not less than IP 5X in accordance with IS/IEC 60947.

One minute power frequency withstand test voltage for all numerical relays shall at least be 2kV (rms) for 1 min or 2.5 kV for 1 sec.

The alarm/status of each individual protection function and trip operation shall be communicated to Switchgear SCADA.

The design of relay shall be immune to any kind of electromagnetic interference.

All CT terminals on the relays shall be fixed type suitable for connection of ring type lugs to avoid any hazard due to loose connection leading to open circuit.

Relay shall have self-diagnostic features with continuous self-check for power failure, program routines, memory and main CPU failures and a separate output contact for indication of failure.

The relays and associated hardware shall be suitable for continuous operation in harsh environmental conditions, high temperature, humidity, dust etc.

The protection scheme shall also be coordinated with the fire protection system for step-up transformers & other areas. The detailed scope of supply given in relevant clause is indicative only. However, all protection as per relevant IEC standards shall be provided.

All the relays shall be of reputed make with proven performance. . If the protection system mentioned in the awarded contract become obsolete at the time of supply, the contractor shall offer a latest model without any extra cost.

The Contractor shall submit to the Employer the protection scheme / diagram, relay setting details/ chart and other relevant information as per Engineering Information Schedule during detailed Engineering.

4.4.3.5.4 Protections

The Incomer, Bus Coupler & Tie feeder protection relay shall be suitable for providing the following protections:

- a. Three Phase Over current and Earth Fault protection (50 & 50N) with instantaneous, definite time, and IDMT features.
- b. The over current element should have the minimum setting adjustable between 250- 2000% of CT secondary rated current. The earth fault element should be suitable for residually connected CT input. The relay shall be suitable for detection of earth fault currents in the range of 5% to 10% of the CT rated current.
- c. The following protections shall be covered:

A. Step up Transformer & Transformer bay Protection as applicable as per standards

Contractor shall have to provide the protections for the Transformers as per system design including but not limited to following:

- i. 87 Differential Protection
- ii. 49 Winding Temperature Alarm and trip protection
- iii. 26 Oil Temperature alarm and trip protection

- iv. 71 Oil Level alarm and trip protection
 - v. Buchholz Protection and alarm
 - vi. PRV Protection
 - vii. 50/51N Instantaneous and time delay over current and earth fault protection On HV as well as LV Side
 - viii. 64 R Restricted earth fault protection
 - ix. 59 F Over fluxing protection
 - x. 50 Z Local Breaker Failure protection
 - xi. 27 Under Voltage Protection
- B. Auxiliary Transformer Protection**
- Contractor shall have to provide the protections for the Transformers as per system design including but not limited to following:
- i. Transformer winding temperature alarm and trip protection
 - ii. 50/51N Instantaneous and time delay over current and earth fault protection On HV as well as LV Side
 - iii. 64 R Restricted earth fault protection
 - iv. 26 Oil Temperature alarm and trip protection
 - v. 71 Oil level alarm and trip protection
- C. Bus BAR Protection for complete system**
- Contractor shall have to provide the following protections but not limited to following
- i. 87 Differential Protection of all Buses
 - ii. 95 BB CT Wire supervision relay
- D. Other provisions**
- i. Protection of Solar Inverters, Solar Power/Inverter Transformers
 - ii. Protection of 415 V Switchgear
 - iii. Protection of all Cables
 - iv. Necessary ICTs, Relay panels, marshalling boxes, isolating and shorting links etc.
 - v. Protection of all Line bay. Further, the contractor shall also have to co-ordinate in order to integrate the protection of Switchyard protection systems with State Authority Transmission Authority & Other systems so as to complete the protection of the entire system.
 - vi. Provision of necessary contacts and /or ports for integration with plant SCADA System for Alarm, tripping and status signal as per requirements.
 - vii. Trip circuit supervision shall be provided for all feeders to monitor the circuit breaker trip circuit.
 - viii. The numerical processor shall be capable of measuring and storing values of a wide range of quantities, all events, faults and disturbance recordings with a time stampings using the internal real time clock. Battery backup for real time clock in the event of power supply

failure shall also be provided. Sequence of events shall have at least 1 ms resolution at device level.

4.4.3.5.5 Routine Testing & Inspection at Works

All the acceptance tests and Routine Tests, inspection at manufacturer's works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the modules at the manufacturer's site prior to dispatch.

4.4.3.6 SWITCHYARD

4.4.3.6.1 Switchyard/Switchgear Equipment

- i. Inter connecting Power Transformer station shall be designed in accordance with the design of Inverter Transformers and then the output power from the Inverter Transformer is stepped up to **132 KV** by using the Power Transformer as per the UPNEDA/IMPLEMENTING AGENCY/STU/CTU requirements. The design shall strictly adhere to the requirements of UPNEDA/IMPLEMENTING AGENCY/STU/CTU.
- ii. The Contractor shall provide suitable number of incoming bays and Outgoing bays as per system requirement comprising of circuit breakers, current transformers, isolators, Earth Switches, Surge Arresters, Wave trap and voltage transformers and other equipment necessary for satisfactory operation of switchyard
- iii. The switchyard/**Switchgear** must have all the main equipment and auxiliaries and contractor is responsible for supply of all these items i.e. Conductor, galvanized gantry structures and supporting structures, insulators, hardware fittings, fasteners, lightning masts, earthing risers for equipment and gantry structures, earth wire, Marshalling Kiosks, secondary wiring, terminal blocks, labelling and nameplates, sockets etc. for reliable and satisfactory operation of the Solar PV Plant.
- iv. All sundry equipment, fittings, unit assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections, and all other items which are useful and necessary for efficient assembly and installation of equipment and components of the work shall be deemed to have been included in the scope of contractor irrespective of the fact whether such items are specifically mentioned in the specifications or not.

4.4.3.6.2 Rating and Functional Characteristics

The ratings of the Switchyard Equipment shall be based on Voltage level, which shall be updated based on project specific information. The contractor shall be provided the following details:

| System Parameter | Description |
|-----------------------------|---------------------------|
| Installation | Outdoor |
| Type of bus bar arrangement | As per system requirement |

| System Parameter | Description |
|---|---|
| Total No. of bays | As per system requirement |
| Rated voltage, kV, r.m.s | As per system requirement |
| Highest System Voltage | As per system requirement and relevant IS/IEC Standards |
| Rated frequency, Hz | 50 |
| Rated continuous current, A, r.m.s | As per the system requirement |
| Rated short time withstand current (rms) for 1 sec. | As per system requirement and relevant IS/IEC Standards |
| Rated Peak withstand current, k A | |
| Rated duration of short circuit | |
| Rated /minimum power frequency withstand voltage | |
| Rated lightning impulse with stand voltage (peak) | |
| Minimum Creepage distance , mm | |
| Rated control voltage DC, V | |
| Auxiliary AC supply, 3 phase, V | |
| Partial discharge of switchgear assembly at highest voltage for equipment, pc | |
| Circuit Breaker | |
| Type | Vacuum/SF6 Type |

| System Parameter | Description |
|--|---|
| Number of poles | Three (03) |
| Rated short circuit breaking current & making current kA (r.m.s) | As per IEC/IS Standards As per IEC/IS Standards |
| Rated line charging breaking current capacity, A | As per IEC |
| Auto Reclosing | Three Phase high speed auto reclosing |
| Closing time | As per system requirement |
| Maximum Fault Level | As per system requirement |
| Rated operating duty cycle | O-0.3Sec-CO-3 min-CO |
| Auxiliary Contacts | 4 NO and 4 NC contacts per pole as spare |
| Noise Level | As per system requirement |
| Seismic Acceleration | As per system requirement |
| IP Protection | IP 65 |
| Isolators | |
| Type | 3 Phase double Break |
| Operation | Motorized/ manual as per system requirement |
| Rated short time current of Isolator & Earth switch | As per system requirement & relevant IS/IEC Standards |

| System Parameter | Description |
|---|--|
| Rated dynamic short time withstand current of isolator and earth switch | As per system requirement & relevant IS/IEC Standards |
| Temperature Rise | As per table IV of IS:9921 |
| Line Charging breaking capacity | As per system requirement & relevant IS/IEC Standards |
| Rated Mechanical Terminal Load | As per 62271-102 |
| IP Protection | IP 65 |
| Current Transformers | |
| Current ratio | As per system Requirement |
| Line bay | As per system requirement |
| Power Tr. Bay(incoming) | |
| Accuracy | |
| For protection | Class PS for Differential & REF and core balance CTs (CBCT); 5P20 for other protection CTs |
| For metering | 0.2S |
| System Neutral Earthing | Effectively Earthed. |
| Rated dynamic current | As per system Requirement |
| Partial Discharge Level | As per system Requirement |
| Temperature Rise | As per system Requirement |

| System Parameter | Description |
|--|--|
| Insulation Level | As per system Requirement |
| Number of CTs. | As per the requirement of STU/CTU/UPNEDA/State Transmission Authority. |
| No. of Cores | As per the requirement of STU/CTU/UPNEDA/State Transmission Authority. |
| CT Secondary Current | As per system requirement |
| Rated Burden | As per system requirement |
| No. of terminals in Marshaling Box | As per system requirement |
| IP Protection | IP 65 |
| Surge Arrestors | |
| Class | As per system requirement |
| Rated arrestor voltage | As per system requirement |
| Rated nominal discharge Current (8/20 micro second wave) | As per system requirement |
| Maximum Residual Voltage | As per design |
| Minimum discharge capability | As per system requirement |
| Maximum Continuous operating voltage (MCOV) | As per system requirement |
| Partial Discharge at highest voltage | As per design |
| Max residual voltage at (1 KA) | As per system requirement |

| System Parameter | Description |
|--|------------------------------------|
| Max switching impulse residual voltage at -1000 A Peak | As per system requirement |
| Max steep current residual | As per system requirement |
| High current short duration test value current (4/10 micro sec wave | As per system requirement |
| Current for pressure relief test | As per system requirement |
| Radio interference voltage at 156 | As per system requirement |
| IP Protection | IP 65 |
| Capacitive Voltage Transformers for HV Bus | |
| IP Protection | IP 65 |
| Voltage ratio | As per system requirement |
| Accuracy class for Metering & Protection | As per system requirement |
| Number of cores in secondary side | As per system requirement |
| Partial Discharge at highest Voltage | Less than 10pc |
| Insulation Class | A |
| Rated Burden | As per system requirement |
| Number of cores in secondary side | As per system requirement |
| System Neutral Earthing | Effectively Earthed. |
| System Fault Level | As per system requirement |
| Stray capacitance and stray conductance of LV Terminal over entire carrier frequency | As per IEC :358 |
| Temperature rise over an ambient temperature of 50 deg C | As per IEC 60044. |
| Rated Voltage Factor | 1.2 continuous and 1.5 for 30 sec. |
| Partial Discharge at highest Voltage | As per Standards (IS/IEC) |
| Insulation Class | A |
| Minimum Creepage distance | As per system requirement |
| Accuracy class for Metering & Protection | 0.2 & 3P respectively respectively |

4.4.3.6.3 General Requirements

Circuit Breaker:

The Circuit Breaker shall be of outdoor type, comprising three identical single pole units, complete in all respects with fittings, wirings etc and shall conform to IEC

62271-100 or equivalent Indian Standards. The circuit breakers shall have all the necessary operation equipment and provisions for reliable and satisfactory protection of the system. 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 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 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 rated transient recovery voltage for terminal fault and short line faults shall be as per IEC: 62271-100. The circuit breaker shall be capable of breaking the steady & transient magnetizing current corresponding to transformers. It shall also be capable of breaking line charging currents as per IEC-62271-100. The 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 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. While furnishing particulars regarding the DC 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. The critical current, which gives the longest arc duration at the lock pressure of extinguishing medium and arc duration, shall be indicated.

- i. Breaker shall be C2/MI class under all duty conditions and shall be capable of performing their duties without opening resistor. The circuit breaker shall be capable for breaking the steady & transient magnetizing current. It shall also be capable of breaking line charging currents as per IEC- 62271-100 with a voltage factor of 1.4
- ii. The rated transient recovery voltage for terminal fault and short line faults shall be as per IEC: 62271-100
- iii. **Operating Mechanism of Circuit breakers**
 - a) Circuit shall be vacuum type and equipped with electrically spring charged mechanism.
 - b) The operating mechanism shall be anti-pumping and trip free (as per IEC definition) electrically under every method of closing.
 - c) Provision shall also be made for local electrical control. 'Local / remote' selector switch and close & trip push buttons shall be provided in the breaker central control cabinet. Remote located push buttons and indicating lamps shall also be provided. The VCB coil DC supply through appropriately rated battery bank and charger to be supplied by the Contractor.
 - d) There shall be "SERVICE", "TEST" and "FULLY WITHDRAWN" positions for the breakers.

- e) Suitable mechanical indications shall be provided on all circuit breakers to show "OPEN", "CLOSE", "SERVICE ", "TEST" AND "SPRING CHARGED" positions.
- f) During closing, main poles shall not rebound objectionably and mechanism shall not require adjustments. Necessary dampers shall be provided to withstand the impact at the end of opening stroke.
- g) Mechanical indicators shall be provided on the breaker trucks to indicate OPEN / CLOSED conditions of the circuit breaker, and CHARGED / DISCHARGED conditions of the closing spring.

iv. Routine Tests

Contractor shall submit the routine test report of SF6 Circuit Breaker comprising of tests but not limited to following:

- a) Circuit Breaker Timing Measurement,
- b) Contact Resistance Measurement ,
- c) IR Test,
- d) HV Test etc.

Isolator-cum-Earthing Switches:

The isolator-cum-Earthing Switches shall have all the necessary operation equipment and provisions for reliable and satisfactory protection of the system. They shall comply with the requirements of IS -9921 and IEC-129 (latest edition) and shall conform in general to IEC 62271-102 (or equivalent Indian standard). The insulators shall comply with the requirements of IS-2544 and IEC-168-1988 (latest edition). Isolator shall be double break, outdoor, gang operated for main blades and earth switches. The operation of the three poles shall be well synchronized and interlocked. The design of linkages and gears shall be such so as to allow one man to operate the handle with ease for isolator and earth switch. The design 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 25 mm 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. They shall be constructed such that they do not open under influence of short circuit current and wind pressure together. The earth switches wherever provided shall be constructional interlocked so that the earth switches can be operated only when the isolator is open and vice-versa. 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 150 mm for muffing.

Routine Tests of Isolators

Contractor shall submit the routine test report of Isolators comprising of tests but not limited to following:

- a) IR Test,

- b) HV Test
- c) CRM(Contact Resistance Measurement)

Contacts:

The moving & fixed contacts shall be made of hard drawn electrolytic grade copper strips and shall be heavy duty self-aligning & high pressure type preferably which applies pressure to the contact surfaces after the blades are fully closed and release the pressure before they start to open. High-pressure type contacts shall wipe the contact surfaces, while opening and closing. The contacts shall be so designed that wiring, action shall not cause securing or abrasion on the contact surfaces. The wiping action shall be sufficient to remove oxide film, formed during operation of switches. The pressure shall be developed by rotation of the entire blade. The temperature-rise of contacts due to flow of rated short circuit current for a period of 3-seconds shall not cause any annealing or welding of contacts. The moving contacts, if provided, shall close first and open last so that no damage is caused due to arcing whatever to the main contacts. The Contractor shall give full details of such contacts with necessary drawings. The arcing contacts, if provided shall close first and open last so that no damage is caused due to arcing whatever to the main contacts. The tender shall give full details of such contacts with necessary drawings. The female contact and its tensioning by spring shall be such that there will, always, be a positive contact with adequate pressure to give enough contact surface for the passing of current. The springs provided should not go out of alignment or get entangled with the male contact during operation. The details of springs shall be furnished on the G.A. drawing.

Earthing Blades: The Isolators controlling the transmission line (underground transmission cables) shall be equipped with earthing blades. The Earthing blades shall be counter balanced to ensure easy operation. Line earth switch shall consist of three Earthing links per Isolator which will normally rest against the frames, when the connected Isolator is in closed position. The Earthing links of all three phases shall be suitable for fitting on either side of the Isolator. Short time current withstand capacity of earthing blades of Isolator Earthing Switch shall be same as that of the main blades of Isolator. The material of the earthing Isolator, Each earthing blade shall be provide with flexible copper connections of adequate length of not less than 60mm² are for connection between the operating shall and the base frame. The rated making capacity of earthing switches specified in the applicable standard of isolators.

Instrument Transformers:

Instrument transformers shall be completely encapsulated cast resin type, suitable for continuous operation at the ambient temperature prevailing inside the switchgear enclosure, when the switchgear is operating at its rated load and the outside ambient temperature is 50°C. The instrument transformer i.e. current and voltage transformers shall have all the necessary operation equipment and provisions for reliable and satisfactory protection of the system. The instrument 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 metallics shall be hot dip galvanized or painted Grey colour. The instrument

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

a)

Current Transformer:

i.

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. The insulation of the CT, lower part as well as upper part shall be properly secured to avoid any risk of damage due to transportation stresses. Current Ratings, design, temperature rise, etc should be in accordance with IS 2705(Part I to IV). The type tests and routine tests shall be carried out conforming to IS/IEC 60044-1:2003

ii. Routine Tests of Current Transformers

Contractor shall submit the routine test report of CT comprising of tests but not limited to following:

- a) IR Test,
- b) HV Test
- c) Ratio Test(Primary injection)

b)

Voltage Transformer:

i.

Voltage transformers shall be single phase oil immersed self -cooled type suitable for outdoor. They 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. The secondaries shall be protected by HRC cartridge type fuses for all windings. In addition fuses shall also be provided for protection and metering windings for connection to fuse monitoring scheme. The core should be of high grade non -ageing electrical silicon laminated steel of high permeability. The VTs should be hermetically sealed to eliminate breathing and prevent air and moisture entering the tank. The type tests and routine tests shall be carried out conforming to IS/IEC 60044-2:2003

ii.

Routine Tests of Voltage Transformers

Contractor shall submit the routine test report of PT comprising of tests but not limited to following:

- a) IR Test,

- b) HV Test
- c) Ratio Test(Primary injection)

c)

Surge Arrestors:

i.

Surge Arrestors shall have all the necessary operation equipment and provisions for reliable and satisfactory protection of the system. 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. The surge arrestors shall conform to IEC-60099-4. The Surge Arrestors shall be of heavy duty station class and gapless Metal Oxide type without any series or shunt gaps and shall be capable of discharging over voltages occurring during switching of unloaded transformers and long lines. The Surge Arrestors shall be complete with insulating base for mounting on structure. Suitably enclosed for outdoor use. The type tests and routine tests shall be carried out conforming to IS/IEC 60099-4.

ii.

Routine Tests of Surge Arrestors

Contractor shall submit the routine test report of LA comprising of tests but not limited to following:

- a) IR Test,
- b) HV Test

d)

Insulator:

Insulator shall have all the necessary operation equipment and provisions for reliable and satisfactory protection of the system. 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. 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. Insulator shall also meet requirement of IEC – 60815.

Bus Bars:

The Bus Bars shall have all the necessary operation equipment and provisions for reliable and satisfactory protection of the system. The outdoor bus-bars and equipment connections shall be with ACSR conductor suitably sized as per design requirement. All bus bars shall be adequately supported by non-hygroscopic, non-combustible, track-resistant and high strength sheet moulded compound or equivalent type polyester fibre glass moulded insulator.

Entire bus bar system shall be insulated with PVC sleeves. Bus bar sleeves shall be compliant to UL224 (Extruded insulating tubing), CE/UL certified, having fire retardant properties and working temperature of 105 deg C.

The Contractor shall submit to the Employer the layout arrangement ,equipment Drawings, design calculations for short circuit withstand capability , load calculation for bus bar rating selection etc and other relevant information as per Engineering Information Schedule during detailed Engineering.

4.4.3.6.4 Standards & Codes

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards.

| Standard | Description |
|------------------|--|
| IS-13118/1991 | General Requirements for Circuit Breakers for voltage above 1000 V |
| IEC 60694 | Common specifications for high-voltage switchgear and control gear standards |
| IEC-60186 | Voltage transformers |
| IEC-60099-4 | Metal-oxide surge arresters without gaps for AC systems |
| IEC-62271 Parts) | “High voltage switchgear and control gear”, |
| IEC 60044-1 | Instrument transformers - Part 1 : Current transformers |
| IEC 60044-2 | Instrument transformers - Part 2 : Inductive voltage transformers |
| IEC 60044-6 | Instrument transformers - Part 6 : Requirements for protective current transformers for transient performance |
| IEC 62271-100 | High-voltage switchgear and control gear – Part 100: High-voltage alternating-current circuit breakers. |
| IEC 62271-200 | High-voltage switchgear and control gear – Part 200: A.C. metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV |
| IS 802 | Code for use of Structural Steel in Overhead Transmission Line Towers |
| IS 875 | Code of Practice for Design Loads (other than Earthquake) For Buildings and Structures |

4.4.3.6.5

Routine Testing & Inspection All the acceptance tests and Routine Tests, inspection at manufacturer’s works as well as at site shall be carried out strictly as per specifications, relevant standards and in accordance with the Final Quality Assurance Plan and reports shall be submitted to Employer. The Employer or its authorized representative reserves the right to inspect the modules at the manufacturer’s site prior to dispatch.

4.4.3.6.6 Type Test

Switchyard equipments supplied shall be of type tested design and certified by any of the accredited certifying agencies in accordance with relevant standards /codes and the

type test reports shall be submitted for employer's review. If the type tests are not done previously, then the Contractor shall conduct them without any additional cost to the Employer and the type test report shall be submitted before supply of Switchyard equipment

4.4.3.7 ENERGY METERING SYSTEM

4.4.3.7.1 Metering System

ABT Energy Meter shall be provided as approved by the State Transmission Authority to measure the delivered quantum of energy to the grid for the sale. The responsibility of arranging for the meter, its inspection/calibration/testing charges, maintenance, renewal, and repair of meter etc. rests with the Contractor. Energy metering system is to be approved by State Transmission Authority and comply with Implementing Agency, UPNEDA & IMPLEMENTING AGENCY requirements. Necessary MRI, Modem etc. scheme shall be provided by Contractor as per the requirement for all meter as applicable as per SLDC, State Transmission Authority, CTU, Implementing Agency, UPNEDA.

The Contractor shall supply ABT Meters (Main & Check as well as Stand-by meter (s)) at the plant take off point as well as at the substation as per system requirement and as per UPNEDA & Implementing Agency requirements with all necessary metering rated CTs and PTs at the plant take off point as well as at the substation. These Energy meters of 0.2s accuracy class suitable for ABT requirement conforming to respective RLDC/State power Utilities/CTU requirement, shall be provided at each of the export feeders as per the requirement of the project. These energy meters shall be provided in a separate outdoor metering cubicle with padlock arrangement. For measurement of Auxiliary power consumption, the Contractors shall provide MFM in ACDB incomer.

4.4.3.7.2 General Requirements

Meters shall be microprocessor-based conforming to IEC 60687/ IS-14697/IEC 62052-11/IEC 62053-22/IEC 62056/IS 15959 for category B.

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

Shall have an accuracy of energy measurement of at least Class 0.2S for active energy and at least Class 0.5 for reactive energy according to IEC 60687. The active and reactive energy shall be directly computed in CT & VT primary ratings

The reactive energy shall be recorded for each metering interval in four different registers as MVARh (lag) when active export, MVARh (Lag) when active import, MVARh (lead) when active export, MVARh (Lead) when active import.

Interface metering shall conform to the Central Electricity Authority (Installation and Operation Meters) Regulation 2006 and amendment thereof.

Shall compute the net MWh and MVARh during each successive 15- minute block metering interval 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 plus/minus sign, date and time; and instantaneous current and voltage on each phases.

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 through Optical Port /RS232/RS485 Port.

Meters shall have a built in clock and calendar. Date/time shall be displayed on demand. The clock shall be synchronized by GPS time synchronization equipment

All the hardware required for interconnection, synchronization, commissioning shall be in scope of Contractor. All type tests reports should comply with IEC 62052-11/62053-22 and must be compliant with State Transmission Authority

The meter shall be suitable to operate with power drawn from the VT supplies. The burden of the meters shall be as per relevant standard. The power supply to the meter shall be healthy even with a single- phase VT supply. Automatic back-up in the event of non-availability of Voltage in all the phases shall be provided by built in long life battery.

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

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

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

4.4.3.7.3 Type Test

Meters supplied shall be of type tested design and certified by any of the accredited certifying agencies in accordance with relevant standards /codes and as per requirement of the STU/CTU/Implementing Agency/UPNEDA and the type test reports shall be

submitted for employer's review. If the type tests are not done previously, then they shall be conducted by the Contractor without any additional cost to the Employer and the type test report shall be submitted before supply of Meters.

4.4.3.8 EARTHING & LIGHTNING PROTECTION SYSTEM

4.4.3.8.1 AC Earthing System

Earthing system shall be in strict accordance with IS: 3043, IEE80-2000, Indian Electricity Rules/Acts, Codes of practice and regulations existing in the location where the system is being installed.. The Solar PV Modules, BOS and other components of power plant requires adequate earthing for protecting against any serious fault as guided by IEC 60364. Contractor shall obtain all necessary statutory approvals for the system. The permissible fault level at **(Inverter Output Voltage), 33 kV & (132 Kv)** shall be kept in consideration while designing the earthing system.

For outdoor switchyard, Earthing system network/earth mat shall be interconnected mesh of mild steel rods buried in ground. For other areas in the solar plant such as transformer yard, switchgear room the earthing system shall consist of minimum two parallel conductors interconnected together. All non-current carrying metal parts, metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system in compliance to Rule 11 and 61 Indian Electricity Rule 1956 (as amended upto date), IS3043 and IEE80-2000 . All the other structures such as Crane rails, tracks, metal pipes conduits Steel RCC structures, etc shall also be effectively earthed. Separate electronic earthing shall be provided each for PCU, SCB and SCADA system.

Inverter transformer neutral shall be floating, not to be earthed. However, recommendation of inverter manufacturer shall also be taken into account.

Inverter transformer shield shall be earthed separately using minimum two no. of earth electrodes. Earthing conductor between shield bushing and earth electrodes shall be copper flat of suitable size not less than 25 x 6 mm.

Neutral and body of the auxiliary transformer shall be earthed.

The earth conductors shall be free from pitting, laminations, rust, scale and other electrical, mechanical defects.

The material of the earthing conductors shall be as follows Conductors above ground level and in built up trenches -Galvanized steel

Conductors buried in earth - Mild steel

Earth electrodes - Mild steel rod

Neutral connections and metallic conduits/pipes shall not be used for the equipment earthing. Lightning protection system down conductors shall not be connected to other earthing conductors above the ground level.

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

conductor shall be buried at least 2000 mm outside the fence of electrical installations.

Earth pit shall be constructed as per IS:3043. Earth pits shall be treated with salt and charcoal if required. However Based on the soil resistivity data of the site, in case, the earthing resistance requirements as per applicable standard is not met, Contractor may have to provide special earthing arrangement like chemical earthing etc. in order to meet the earthing resistance requirements.

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

4.4.3.8.2 Solar Array Earthing

Equipment and structure in Solar Array System shall be earthed in compliance to the IS: 3043 (Code of Practice for Earthing) and Indian Electricity Rules/Acts.

Each Module mounting structure (MMS), SPV Module frames, mounting arrangement for String Monitoring Boxes, Metallic Junction Boxes, Metal frames/Panel, Metallic Pipes of the solar array shall be effectively earthed. 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. Equipment and structure in the solar PV Plant shall be earthed in compliance to the IS: 3043 (Code of Practice for Earthing) and Indian Electricity Rules/Acts.

Each PV Module frame shall be earthed in accordance with module manufacturer guidelines. In case module frame earthing is to be separately provided, it shall be earthed with minimum 2.5 SQMM flexible copper cable with lug at suitable location of module frame.

Earth pit shall be constructed as per IS:3043. Electrodes shall be embedded below permanent moisture level. Earth pits shall be treated with salt and charcoal if required.

4.4.3.8.3 Lightning Protection General

Lightning protection system shall be in strict accordance with IS:2309 .

Lightning conductor shall be of 25x6mm GS strip when used above ground level and shall be connected through test link with earth electrode/earthing system

Lightning system shall comprise of air terminations, down conductors, test links, earth electrode etc. as per approved drawings

Down conductors shall be as short and straight as practicable and shall follow a direct path to earth electrode.

4.4.3.8.4 Lightning Protection System For Solar Array

Complete Solar Array with associated structure shall be protected from Direct Lightning Stroke.

Lightning protection system for solar array:

i) **Codes & Standards IS/IEC 62305: Protection Against Lightning**

ii) **NF C 17-102: Lightning Protection with early Streamer Air Termination Rod.**

Necessary concrete foundation or any other arrangement for holding the lightning conductor in position is to be made after giving due consideration to shadow on PV array, maximum wind speed and maintenance requirement at site in future. The Contractor shall submit to the Employer the design calculations for the Earthing System and other relevant information as per Engineering Information Schedule during detailed Engineering.

4.4.3.8.5 The Contractor shall submit to the Employer the design calculations for the Earthing System and other relevant information including Earthing Resistance Test Values of each of the Pits on DC side & AC side as per Engineering Information Schedule during detailed Engineering.

4.4.3.9 BATTERY SYSTEM

4.4.3.9.1 Battery System

Adequate capacity DC battery Bank (s) shall be provided at suitable locations as per system requirements for emergency control supply of inverters, control & protection system, Fire Detection/ Alarm Panel, SCADA System, Operation of Equipment, emergency lighting, CCTV, and other requirements.

Adequate capacity battery charger(Float Cum Boost Charger-FCBC) with relevant IS/IEC standards & protection and automatic change over system shall be provided to charge the battery bank(s) along with relay circuit, fuses, annunciations.

DC power supply Distribution panel/board shall be supplied along with the Charger (FCBC) as per relevant IS standards. Control Room DC Battery Bank & DC supply system design, calculations and detailed explanations along with drawing shall be provided to the Employer for review.

4.4.3.9.2 General requirements

DC Batteries the batteries shall have the following specifications :-

- | | |
|------|---|
| i. | Type: VRLA batteries. |
| ii. | Rating: As per system Requirement. |
| iii. | Standard – IS: 1651-1979; performance as per IS8702 |
| iv. | Container: Plastic Resin, ABS or PP |
| v. | Terminal Posts: Designed suitably to accommodate external bolted connections. |

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

The battery system shall be designed by the contractor considering sufficient back up time as per system requirement and in accordance with the prevailing practice for reliable and satisfactory operation of the solar PV Plant.

The Contractor shall ensure an adequate battery storage room with all necessary battery equipment and accessories

4.4.3.9.3 Codes & Standards

The system and equipment shall be designed, built, tested and installed to the latest revisions of the following applicable standards.

| Sl. No. | Standard | Description |
|---------|--------------|--|
| 1 | IEEE Std 485 | IEEE recommended practice for sizing VRLA batteries for stationary applications. |
| 2 | IEC 60146 | Semiconductor converters. |
| 3. | IEC 60439 | Low Voltage Switchgear and control assemblies |
| 4. | IEC 62040 | Uninterruptible Power Systems (UPS) |

4.4.3.10 PLANT ILLUMINATION SYSTEM

4.4.3.10.1 Plant Illumination System

1. comprehensive illumination system shall be provided in the entire Plant Area. Each building shall be provided with adequate light fittings, 6A/16A socket, fans, etc. Exhaust fans shall also be provided in toilets, battery room and Pantry etc.
2. his specification covers design of Array yard and sub-station, street light using min. 15 W LED luminaires, 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.
3. ormal indoor and outdoor lighting system for Main Control Room, Inverter Rooms, switchyard and Security Room(s) etc. in plant shall be through 415 V AC systems, comprising Lighting cabinets, All energy efficient LED type lighting system for indoor, including the light fittings, lighting facia/panels, warning/direction sign boards, Push-buttons or switches and other accessories.
4. utdoor lighting for plant array yard, approach roads, boundary wall / fencing of plant, street lights, S/yard etc. shall be through energy efficient LED type. All lighting fixtures and control gears including lighting panels shall be powder coated, weather proof and of IP 55 deg of protection.

4.4.3.10.2 Emergency lighting system

Emergency lighting system shall be provided for indoor applications such as Main control room, Inverter Rooms, Security Room(s) etc.

4.4.3.10.3 General Requirement

1. ormal AC Lighting System of 415V, 3Phase, 4wire, will be fed from Lighting Distribution Boards (LDBs), which in turn will be fed from the 415V, Main AC Distribution Board.
2. ontrol rooms, offices, facilities, utilities, Inverter Rooms shall be equipped with

power outlet circuits with necessary breakers/switches, protective and indicating devices shall be provided for each socket/cubicle.

3.

adequate no. of switchboards (with 3-pin sockets), portable socket cubicles, distribution boards, lighting accessories, lighting poles for street lights etc., shall be provided by the Contractor.

4.

the illumination system shall be properly wired, earthed and connected with suitable grade cables, as applicable.

4.4.3.10.4 Lux levels and quality of direct glare limitation

LED Lamps with at least 15-20 W (at 240 V) shall be provided in control room, Battery Room, Inverter Room, Office space, SACDA Room etc as per requirement.

The nominal illumination level for lighting, measured at the height of a worktable (0.9 m) shall have an average lux value as mentioned below:-

| Sl. No. | Location | Average Lux Level |
|---------|--------------------------------------|-------------------|
| 1 | Main Control Room | 300 |
| 2 | Inverter Room(s) | 100 |
| 3 | Street lighting – roads, Array Yard | 20 |
| 4 | Switchyard , Security room(s) | 50 |
| 5 | Other areas including periphery wall | 20 |

4.4.3.10.5 The Contractor shall submit to the Employer general arrangement and layout plan for illumination system, Cable and conduit routing diagram, Wiring and termination drawings and other information in accordance to the Engineering information Schedule.

4.4.3.11 SCADA AND COMMUNICATION CABLES

A. SCADA

I. General Requirements

- i. The Contractor shall provide complete SCADA system with all accessories, auxiliaries and associated equipment and cables for the safe, efficient and reliable operation and monitoring of entire solar plant and its auxiliary systems.
- ii. The Contractor shall provide all the components including, but not limited to, Hardware, Software, Panels, Power Supply, HMI, Laser Printer, Gateway, Networking equipment and associated Cables, firewall etc. needed for the completeness.
- iii. SCADA System shall have the provision to perform the following features and/or functions:
 - a) Web enabled Operator Dashboards: Showing key information on Generation, Performance and Current Status of various equipment in Single Line Diagram (SLD) format with capability to monitor PV

array string level parameters.

- b) Real time Data Logging with Integrated Analytics & Reporting: Logging of all parameters - AC, DC, Weather, System Run Hours, Equipment Status and Alarms as well as derived/ calculated/ integrated values. The SCADA User interface shall be customizable and enable Report Generation and Graphical Analysis.
- c) Fault and System Diagnostics with time stamped event logging.
- d) Support for O&M Activities: SCADA shall provide a Data Analysis and Decision Support for smooth and efficient Plant Operations.
- e) Generate, store and retrieve user configurable Sequence of Event (SOE) Reports
- f) Interface with different field equipment in the plant and work seamlessly with field equipment supplied by different companies
- g) Transfer of plant data reliably, to Cloud on any kind of remote network including low bandwidth and wireless links such as 2G/3G/VSAT.

(Note: Telecom Lease line connection, if required for transferring data from Plant over internet shall be taken by Contractor in the name of Employer for O&M period)

- h) The Control system shall be designed to operate in non-air-conditioned area. However, the Contractor shall provide a Package/ Split AC of suitable capacity decided by heat load requirement in SCADA room at Main Control Room.
- i) **The plant SCADA should be Open Platform Communications (OPC) compliant with standard DNP3 and mod bus control interfaces over TCP/ IP having the provision to add protocol converters to implement custom and secure communications protocol standard for providing real time online data (including but not limited to irradiance, plant generation (instantaneous/ daily/ monthly/ yearly), Daily Peak Generation, temperature, wind speed etc.) to UPPCL/UPNEDA.**
- j) **Fibre Optic Ethernet Ring network (Managed type Ethernet switches in each Control Room) should be provided between MCR & Inverter Control Rooms.**
- k) **Web-based monitoring should be available, which should not be machine dependent. The web-based monitoring should provide the same screens as available in the plant. Also, it should be possible to download reports from a remote web-client in PDF or Excel format**

II. Architecture

- i. The SCADA System shall be built over Industrial IoT architecture with integrated Analytics, secure web access, enterprise software and Database.

- ii. Data acquisition shall be distributed across MCR and LCRs while plant level data aggregation shall be done in the server.
- iii. Analog and Digital IO modules shall have integrated processor for distributed IO processing and control.
- iv. Data communication system shall be built over fibre optic cables/ wireless network with high bandwidth TCP/IP communication (Fast Ethernet or 802.11a/b/g/n) across all Inverter and Control Rooms with Internet/Intranet access at Main Control Room. Firewall shall be provided for network security.
- v. Plant SCADA Server shall have Industrial Grade Server Hardware running SCADA & Monitoring Software with data storage (complete plant data) space for 2 years.
- vi. Plant data for monitoring and control operations should be accessible without dependence on external network.
- vii. A virtual/cloud server running SCADA & Monitoring Software shall be configured in parallel with Plant Server to enable easy access to plant data from outside the plant without having to login to plant server. Effectively, the plant data shall be replicated to provide data redundancy for critical plant data.
- viii. Operator Workstation/PC shall be of Industrial Grade for browser-based access to plant data from Plant. Plant control & SLDC/Utility related operations shall only be initiated through browser-based interface requiring no client software or database to be installed on the Workstation. All critical software shall be installed/stored on local server and Plant Data shall be installed/stored on local as well as cloud servers with user access control for protecting the software and data assets from accidental deletion or corruption.
- ix. Internet/Intranet at Plant: Public or private network access shall be provided at the plant through any broadband/VSAT connectivity of 2Mbps or higher bandwidth. In case no broadband/VSAT connectivity can be provided at the plant, a 3G/4G data card from any Internet Service Provider (ISP) may be provided. SCADA system shall be capable of sending all plant data in real time to the Cloud Server.
- x. GPS based Time Synchronization System: The SCADA system shall have a Master/Slave Clock system along with antenna, receiver, cabinet and internal interconnection cables. All SCADA controllers, servers, OWS and communicating equipment shall be synchronized to the GPS clock.

III. Industrial IoT Controllers & Data Acquisition

The Plant SCADA and Monitoring System may use one or more IIoT Controllers at each LCR and MCR for the purpose of data acquisition and data forwarding to the Local and Cloud Servers. SCADA Servers. The IIoT Controllers shall meet the following minimum requirements:

- i. The IIoT Controllers shall be distributed in nature and work independently of other IIoT Controllers or any central controller in the system.
- ii. Shall be capable of supporting wide range of field protocols to communicate with different field equipment (Modbus over RS485/Ethernet, etc.)
- iii. Shall have local storage for a minimum of 2 weeks (in case of network failure).
- iv. Provide web-based interface to configure the controller for various equipment in the field.
- v. IO Functionality: Shall support status monitoring of VCBs & Trip relays on RMU/HT & Transformer panels through distributed DI/AI modules.

- vi. Controls: Shall be capable of Controlling Breakers (ON/OFF). Both ON/OFF and Parameter control of inverters shall be supported.
- vii. Data Communication with Servers: Shall send the data collected, from all the equipment at Inverter Control Room and/or Main Control Room, to the Monitoring & Control Server.
- viii. Controllers shall be capable of sending data over Internet connections, USB data cards
- ix. Shall not require a static public IP address, at the plant for the purpose of remote access.

IV. Functionalities

- i. The SCADA system shall monitor instantaneous and cumulative electrical parameters from all DC & AC Equipment including inverters, string combiner boxes, weather station, MFM, Transformer and Switchgear (LT & HT Panels) at regular intervals not greater than one minute.
- ii. The SCADA system shall monitor Instantaneous and cumulative environment parameters from weather sensors or data loggers at same interval as electrical parameters and provide PR, CUF on the fly.
- iii. The SCADA system shall provide Alarms and Alerts on equipment faults and failure in less than 5 seconds. Alarms on status change of hardwired DI shall also be provided.
- iv. The SCADA system shall provide configurable alerts on any parameter crossing settable thresholds.
- v. The SCADA system shall have user-friendly browser-based User Interface for secure access from anywhere, for minimum ten concurrent connections from the Operator PC or other securely connected laptop/mobile, for plant monitoring, O&M, daily reporting, and analysis. A dashboard providing summary details of total plant generation, day's export, irradiance, Inverter Control Room level generation and performance indicators like PR and CUF
- vi. Reporting: The SCADA system shall provide downloadable reports in Excel/PDF, configurable for equipment parameters across the plant.
- vii. The system shall have Configurable Analysis page for self-configured as well as on demand Analytics charts.
- viii. The SCADA system shall be extensible to include maintenance of O&M schedules and related activities for plant equipment as per the O&M Manual
- ix. Mobile User Interface: summary of plant performance and issues should be accessible in a mobile Native UI or browser UI.
- x. Data Communication to SLDC: SCADA system shall provide required interface to integrate with TRANSCO-SLDC, in compliance with grid code, to send any parameters specified by SLDC

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

- xi. Power Plant Control: SCADA system shall provide required interface to the local SCADA operator to set various power control modes (active/reactive power/frequency/PF) through the inverters over industry standard communication

protocols like Modbus over TCP/IP.

- xii. Forecasting and Scheduling: SCADA shall provide day ahead and week ahead forecasting and scheduling for power generation at the plant as per SLDC/Utility stipulations.
- xiii. All programming functionalities shall be password protected to avoid unauthorized modification
- xiv. The Contractor shall provide software locks and passwords to Employer for all operating & application software. Also, the Contractor shall provide sufficient documentation and program listing so that it is possible for the Employer to carry out modification at a later date.

V. Cable Specifications

RS485 & IO Cables shall meet the following minimum specifications:

- For RS485: 0.5sq.mm ATC multi-strand (class-5), insulated core, twisted pair, overall screened with ATC drainwire, GI wire Armored, PVC sheathed, DIN47100 colour standard, FRLS, 1.1 kV grade
- For IO cabling (between HT/RMU panels and SCADA panel) – 1.0 sq.mm multi- strand, 4/8/12 core screened, armored, FRLS cable, 1.1KV grade.
- For Optical Cabling: 6F, Armored, Single/Multi mode laid through HDPE conduits to minimize cable breaks.

VI. Earthing

- i. Two isolated electronic earth pits near to SCADA panel at every Inverter and Control Room with < 1 Ohm resistance shall be provided. One earth pit shall be used for protective/body earth and the other to be used for Signal Earth
- ii. Apart from providing separate earth pits, manufacturer specified earthing recommendations shall be followed for all communicating equipment connected to SCADA. This includes but is not limited to SMBs, Inverters, WMS and Switchgear panels

VII. Communication Cable Laying

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

VIII. Control Cabinets / Panels

- i. The cabinets shall be IP-22 protection class. The Contractor shall ensure that the temperature rise is well within the safe limits for system components even under the worst condition and specification requirements for remote I/O cabinets.

- ii. The cabinets shall be totally enclosed, free standing type and shall be constructed with minimum 2 mm thick steel plate frame and 1.6 mm thick CRCA steel sheet or as per supplier's standard practice for similar applications.

IX. Software Licenses

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

X. Hardware at Main Control Room

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

Plant Server

| | |
|-------------------------|---|
| Server Hardware | Hex/Octal Core Xeon, 32GB RAM (expandable to 64 GB RAM), 4 X 2TB SATA hard discs in RAID 5 configuration, 2TB external USB hard disc (for backup), dual power supplies, 2 LAN ports, LCD console, keyboard & mouse. The Server hardware shall be housed in a rugged fan-cooled, and rodent-proof Server Rack. |
| Operating System | Operating System and Database shall be of enterprise scale (RedHat Linux or equivalent Linux OS, Oracle/MySQL or equivalent DB), with required AMC for 5 years. |
| Accessories | <ol style="list-style-type: none"> 1. Monitor: Min 22" LED Flat Monitor with non-interfaced refresh rate min. 75 Hz. 2. Keyboard: ASCII type 3 3. Pointing Device: Mouse 4. Intelligent UPS (on line): Minimum 2 hour battery backup. |

Operator Workstation

| | |
|-------------------------|---|
| Hardware | i7 CPU running at 3.0 GHz or faster with 8GB RAM, 500GB hard disk, 25" LED monitor, keyboard and mouse, 4 USB ports, LAN port |
| Operating System | Windows operating system with necessary tools, anti-virus software. |
| Accessories | <ol style="list-style-type: none"> 1. Screen Display Unit: Min 50" LED Flat Monitor with wall mounted arrangement for the display of SCADA screen 2. A4 size monochrome laser printer. 3. UPS of required capacity with 2 hour battery backup. |

- iii. All network components of LAN and Workstations shall be compatible to the LAN, without degrading its performance.

B. COMMUNICATION CABLES

I. Optical Fibre Cables

- a. Optic Fibre cable shall be 4/8/12 core, galvanized corrugated steel taped armoured, fully water blocked with dielectric central member for outdoor/ indoor application so as to prevent any physical damage.
- b. The cable shall have multiple single-mode or multimode fibres on as required basis so as to avoid the usage of any repeaters.
- c. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturing, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.
- d. The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling.
- e. All testing of the optic fibre cable being supplied shall be as per the relevant IEC, EIA and other international standards.
- f. The Contractor shall ensure that minimum 100% cores are kept as spare in all types of optical fibre cables.
- g. Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground buried installation.
- h. Spliced/ Repaired cables are not acceptable. Penetration of water resistance and impact resistance shall be as per IEC standard.

II. Communication Cable (Modbus)

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

4.4.4 GENERAL SYSTEMS

4.5.4.1 WEATHER MONITORING STATION

4.5.4.1.1 Weather Monitoring System

i.

As a part of weather monitoring station (**1 number WMS**), the contractor shall provide following measuring instruments with all necessary software & hardware required to integrate with SCADA so as to enable availability of data in SCADA.

ii.

All the weather sensors shall be supplied with all required certification and shall be proven for Solar Plant Application.

iii.

Location of Sensors and Data Acquisition to SCADA shall be decided during detailed Engineering Stage

4.5.4.1.2 Pyranometer

The Contractor shall provide secondary minimum two (02) number of standard pyranometers (ISO 9060 classification) for measuring incident global solar radiation. One of them shall be placed on horizontal surface and the other on adjustable inclined plane. The specification for pyranometers shall be as follows:

| Sl.No | Details | Values |
|-------|-------------------------------------|--|
| 1. | Spectral Response. | 0.31 to 2.8 micron |
| 2. | Accuracy Class | According to ISO 9060: Secondary Standard. |
| 3. | Sensitivity | Min 7 micro-volt/w/m ² |
| 3. | Time response (95%): | Max 15 s |
| 4. | Non linearity: | ±0.5% |
| 5. | Temperature Response: | ±2% |
| 6. | Tilt error: | < ±0.5%. |
| 7. | Zero offset thermal radiation: | ±7 w/m ² |
| 8. | Zero offset temperature change | ±2 w/m ² |
| 9. | Operating temperature range: | 0 deg to +80 deg. |
| 10. | Uncertainty (95% confidence Level): | Hourly- Max-3%, Daily- Max-2% |
| 11. | Non stability: | Max ±0.8% |
| 12. | Resolution: | Min + / - 1 W/m ² |

4.5.4.1.3 Temperature Sensor

Contractor shall provide minimum six (6) thermometers (one for ambient temperature measurement with shielding case and five (5) for module temperature measurement). The thermometers shall be RTD / semiconductor type measuring instrument. Instrument shall have a range of 0°C to 80°C. The instrument shall have valid calibration certificate

4.5.4.1.4 Anemometer

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

| Sl. No | Details | Values |
|--------|--|--|
| 1. | Velocity range with accuracy limit | ± 0.11 m/s upto 10.1 m/s ± 1.1 % of true when more than 10.1 m/s |
| 2. | Wind direction range with accuracy limit | 0 to 360 deg with accuracy ± 4 deg |
| 3. | Mounting Bracket | Anodized Aluminium bracket to reduce corrosion, all mounting bolts of SS |
| 4. | Protection Class | IP 66 |

4.5.4.1.5 All the above instruments shall have valid calibration certificate. The contractor shall submit all test certificates /Calibration Certificates to RECPDCL as per Engineering Information Schedule. The Contractor shall provide instrument manual in hard and soft form.

Note: Contractor will be required to submit this data to UPNEDA/IMPLEMENTING AGENCY/MNRE on line and/or through a report on regular basis every month for the entire duration of O&M period. The Contractor shall provide access to UPNEDA/IMPLEMENTING AGENCY/MNRE & RECPDCL or their authorized representatives for installing any additional monitoring equipment to facilitate on-line transfer of data.

The plant shall be equipped with measuring and recording following parameters, these will be required to be submitted to UPNEDA/MNRE on line and/or through a report on regular basis every month for the entire duration of PPA:-

- Global Horizontal Irradiation
- Irradiation on Collector Plane
- Module Temperature
- Wind Speed
- Ambient Temperature
- DC Input power to all the Inverters
- AC output power of all the Inverters
- Electrical parameters at outgoing feeders
- The SPD shall maintain the list of Module IDs along with performance characteristic data for each module. The data shall be submitted to UPNEDA/MNRE.

4.5.4.1.6 Data logger and Data Acquisition System

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

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

- i. **Analog Input**

- Adequate nos. for all analog sensors with redundancy
 - Provision for operation in different current and voltage ranges as per connected sensors
 - Accuracy of $\pm 0.1\%$ of FS
- ii. **Digital Inputs**
- a. Adequate no. of Digital inputs and outputs for the application
 - b. Provision for RS232 and RS485 serial outputs
 - c. Built-in battery backup
 - d. Connectivity and Data transmission:
 - Built-in GSM/ GPRS modem for wireless data transmission to SCADA/ cloud server (procurement of GPRS enabled SIM Card and connection subscription to be the responsibility of Contractor). It should be possible to remotely communicate with the device for configuration settings.
 - RS485 MODBUS interface for data collection and storage on SCADA
 - Web interface with provision for user login to enable viewing and downloading of weather data in XLS/ CSV format.
 - Communication protocol should support fast data transmission rates, enable operation in different Frequency bands and have an encryption-based data security layer for secure data transmission
 - e. Display Settings: Graphic LCD screen which should be easily accessible and should display relevant details like all sensor values, battery strength, network strength etc.
 - f. Provision of Time synchronization from telecom time or server time
 - g. Data Storage: Provision for at least 2 MB internal Flash Memory and at least 8 GB Micro SD card (expandable)
 - h. Protection level: IP65

4.5.4.2 FIRE FIGHTING SYSTEM

4.5.4.2.1 The SPV plant shall be equipped with suitable fire protection & firefighting systems (including Portable fire extinguishers, Sand buckets, fire alarm panel and other equipment as required) for protection of entire equipment, switchyard & control room as per CEIG and other statutory requirements. The installation shall meet all applicable statutory requirements, safety regulations in terms of fire protection.

4.5.4.2.2 Fire protection system

Liquefied CO₂ fire extinguisher shall be upright type of capacity 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.

Fire protection for different equipment as per NFPA standard and NBC Norms.

Fire-fighting system for main control room having SCADA room, battery room, Panel room, store room etc.

Firefighting system for switchyard equipment's, Power/Inverter Transformers & Auxiliary Transformer.

Contractor shall provide adequate fire protection system for transformer as per the practises adopted by Solar Park authority or as per statutory requirements/relevant standard for power/inverter transformer.

Firefighting system for inverter rooms having Power Conditioning Units & Inverter Transformers.

Nitrogen based fire protection system shall be provided for power/inverter transformers if required.

Fire detection and alarm system for Main control Room, Switchyard & transformer area, Inverter Rooms etc.

Notification devices such as fire horns/ alarms/ hooters/ bells, light or text display. Manual Call point, Fault Isolation Modules, Control Modules, Digital output or through RS 485/ any other compatible network form the fire detection system shall be integrated with SCADA.

Any other Items not mentioned specifically but necessary for the satisfactory completion of the system.

4.5.4.2.3 General Requirements

The complete fire detecting & fire-fighting system shall be coordinated and established in accordance with latest standards. It shall be sole responsibility of the contractor to ensure proper installation and operation of the system in compliance with the applicable statutory /regulatory requirements.

4.5.4.2.4 Fire Alarm Control Panel Indication

Alarm conditions shall be immediately displayed on the control panel. Alarm LED shall flash on the control panel until the alarm has been acknowledged. Once acknowledged the LED shall remain lit.

During an alarm condition, an alarm tone shall sound within the control panel until the alarm is acknowledged

4.5.4.2.5 Ratings of complete fire-fighting including auxiliary system shall be taken in accordance with prevailing standards & practices. They shall work satisfactorily for the specified conditions.

4.5.4.2.6 The fire fighting should have followings-

1. Main Control room - Fire alarm system
2. Control room :
 - a) DCP Type ABC - 2 No's
 - b) Co2 9 kG capacity - 2 No's
 - c) Foam type 9 kG - 1 Number
 - d) Hand portable co2 9kG Capacity - 1 Number
 - e) Sand bucket -1 Number
2. Inverter station :
 - a) DCP Type ABC - 1 No's
 - b) Co2 9 kG capacity - 1 No's
3. Transformer Yard :

- a) DCP Type ABC - 1 No's
- b) Co2 9 kG capacity - 1 No's
- c) Foam type 9 kG - 1 Number
- d) Sand bucket -1 Number
- 4. Switch yard
- a) DCP Type ABC - 2 No's
- b) Co2 9 kG capacity - 2 No's
- c) Sand bucket -1 Number
- 5) Pantry room
- a) Hand portable co2 9kG Capacity - 2 Number

4.5.4.3 MODULE CLEANING SYSTEM and CLOSED CIRCUIT TELEVISION (CCTV) System

4.5.4.3.1 Module Cleaning System

The Contractor shall provide permanent arrangement for Module cleaning system in the Solar PV Plant after taking into consideration the site conditions. The Module cleaning system shall be complete in all respect and shall conform to the relevant IS Codes standards. This shall include pumps and motors, requisite storage arrangement and laying of HDPE Pipes with sufficient number of isolating valves conforming to IS 4984 and other relevant code and other equipment as required for completion of the system. The contractor shall also install a flow meter for measurement of water consumption. The contractor shall take all necessary approvals required from respective authorities for digging deep bore wells in plant area.

In case of Solar Park if the water supply will be provided by Solar Park developers then contractor shall ensure that the storage arrangement/ Water tank shall have sufficient storage capacity for cleaning of modules and other requirements as per the frequency of water supply.

Design of the Module cleaning system shall be such that complete solar plant shall be cleaned once in 15 days cycle. The water used for cleaning should be of appropriate quality fit for cleaning purpose as per the recommendations of the module manufacturer. The contractor shall also install the water purification/filtration/DM Plant (if necessary) so as to achieve the required quality of water for cleaning of modules as per manufacturer's recommendations. The Contractor shall ensure that each of these tube wells shall provide sufficient yield to meet the water requirement as stipulated above. The Contractor shall also submit the design details of the same to the Employer.

The HDPE Pipe shall be suitably protected against any impact load and shall be protected with higher diameter GI Pipes or other protection system at road crossings and other locations where higher loads are expected. .

Contractor shall furnish calculations based on the head and discharge requirements of the pump rating and the water-line details. Contractor shall provide the single line

diagram of water washing arrangement with location of pump to Employer for approval during detailed engineering

The contractor may propose any advanced cleaning solution like waterless cleaning system, if required, depending upon the site conditions for satisfactory and reliable operation & maintenance of the plant. The Contractor shall provide the Process and Instrumentation Diagrams (P & ID) of Module Cleaning arrangement and other relevant information for review of the Employer during detailed Engineering as per Engineering Information Schedule.

4.5.4.4 CLOSED CIRCUIT TELEVISION SYSTEM

The contractor shall provide CCTV Cameras along with monitoring stations (sufficient numbers) and all other accessories including but not limited to all the power supply (UPS), cables, cable trays, power packs, erection hardware (viz. junction boxes, brackets glands, nut-bolts, conduits etc.) and mounting required for its proper operation.

CCTV Cameras must be installed to have complete coverage of following areas

Switchyard

Main Entry: Covering all the entry/exist 24 Hrs
Plant Solar Array area (PTZ cameras shall be high speed
integrated dome type, 1 no. PTZ type camera at each inverter
room locations)

Control Rooms: Covering Entry/Exit and activities within
Control Rooms

Monitoring Station of all the CCTV Network shall be installed in the Main Control Room
(2nos CCTV Workstation each with 22" monitor at each Unit).

The equipment furnished under this section shall meet the requirements of all the applicable International codes and standards or their latest amendment Codes and Standard.

Contractor has to propose the locations and number of cameras required for the Plant during bidding, however Employer's decision on number of cameras and location shall be final. The exact locations and number of Cameras shall be decided during detailed engineering

The Contractor shall ensure that CCTV Cameras and related equipment must have appropriate rating to work in prevailing site conditions as per the current opportunity. The CCTV Cameras along with all its system components i.e. network switches, storage devices, servers, LAN switches, media converters etc. shall be powered from UPS system.

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

CCTV System shall be provided with all relevant safety standards and network standards.

Camera server shall be provided with sufficient storage space to store recordings of all cameras at 25/30 FPS at 1920X1080 (For HD cameras)for a period of 02 Months or more using necessary compression techniques.

Contractor has to ensure that the data of all the CCTV Cameras shall be compatible for remotely monitoring **(5 numbers concurrent view at each Unit)** at the Employers Corporate office/any other office as desired.

It shall be possible to view, record, search and replay simultaneously without affecting performance of the system.

All the cameras shall capture video stream in colour and be suitable for day and night surveillance (under complete darkness conditions). There will be two types of cameras viz. PTZ & Fixed. PTZ cameras shall be high speed integrated dome type.

4.4.5 QUALITY ASSURANCE PLAN

i.

or all major/critical items, the contractor shall submit Manufacturing and Site/Field Quality Assurance Plans, considering the latest practices being followed in Solar Power Industry/Standard requirements/technical specifications requirements, in the format widely accepted in the Solar Power Industry. The final Quality Assurance Plans shall be mutually agreed upon with the successful bidder during the Pre-Award stage. For any constraints, if occur, the Quality Assurance Plans shall be finalized jointly with the successful bidder within 21 days after placement of Letter of Award. However, inputs are required to be submitted by the bidder for proposed Quality Assurance Plans at the time of Pre- Award stage in any case. This Quality Plan will detail out various tests / inspection to be carried out as per the requirements of the Technical Specifications and standards mentioned therein and Quality Practices and procedures to be followed by Supplier/Contractor's Quality Assurance Department., the relevant reference documents and standards and acceptance norms etc. during all stages of material procurement, manufacture, assembly and final testing/performance testing.

ii.

uring inspection, the Supplier/Contractor shall provide reference documents/plant standards/acceptance norms/test and inspection procedure etc. as referred in Quality Plan. The approved Quality plan shall form a part of the contract. During approval of Quality Plan, RECPDCL jointly with the contractor will identify Customer Hold Points (CHPs) for the major/critical items i.e. testing checks which shall be carried out in the presence of RECPDCL authorized representative. For each Lot of major/critical items/assemblies offered for inspection, RECPDCL's authorized representative will identify 10% (minimum 01 no per lot) quantity except for the Solar PV Modules (to be finalized by the Employer before the finalization of QAP) for testing/inspection in his presence as per approved Quality Plan. These 10% quantity of the major/critical items whose testing/ inspection has been carried out jointly, shall have to be used in the project identified for RECPDCL and should be readily traceable/identifiable.

For the remaining 90% of the major/critical items, testing/inspection will be carried out in house by the Quality Assurance Department of the contractor/supplier as per the approved Quality Plan. The documents of such testing/inspection carried out in house, will be submitted to RECPDCL for review and subsequent issuance of Material Dispatch Clearance Certificate (MDCC). The material/item/assembly for which MDCC has been issued by RECPDCL, shall have to be used in the project identified for RECPDCL and should be readily traceable/identifiable. No material shall be dispatched from the manufacturer's works before the same is accepted, subsequent to pre-dispatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorized representative and duly authorized for dispatch by issuance of Material Dispatch Clearance Certificate (MDCC).

iii.

he site/field quality assurance plans shall detail out the various quality practices, tests and procedures etc. to be followed by the Supplier/Contractor's Site Quality Assurance Dept. during various stages of site activities from receipt of material/equipment at site till final commissioning/acceptance/handover. The site/Field Quality Assurance Plan shall be mutually agreed upon with successful Bidder/Supplier during the Pre-award Stage. For any constraints, if occur, the Quality Assurance Plans shall be finalized jointly with the successful bidder within 21 days after placement of Letter of Award. However, inputs are required to submit for proposed Quality Assurance Plans at the time of Pre- Award stage in any case. However, 30 days Performance Guarantee test shall be conducted at site as described in Clause 4.4.6 .respectively.

iv.

he inspection calls shall be placed at least one month in advance for overseas inspections and 10 days for inspections within India

v.

nly calibrated testing and measuring instruments would be used during manufacturing, testing and commissioning by the Supplier/contractor. Copy of the valid calibration certificates would be provided during inspection to RECPDCL by the Supplier/contractor

vi.

or all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable

vii.

he contractor will provide a compliance certificate regarding confirmation that repair/rectification has been carried out as per the standard procedure to make the job acceptable.

viii.

pproval of the results of the tests and inspection will not, however, prejudice the right of RECPDCL to reject the equipment if it does not comply with the specification in service and the above shall in no way limit the liabilities and responsibilities of the contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets,

drawings etc.

ix.

or item/material/assembly covered in QAP, the Supplier/contractor shall be required to submit copies of the following Quality Assurance documents in original along with the request letter for issuance of MDCC (Material Dispatch Clearance Certificate)

- a. Factory test result for testing required as per applicable codes and standards referred in the Specifications and approved Quality Assurance Plan.
- b. Inspection reports duly signed by authorized representative of RECPDCL and Supplier for the 10% quantity for which inspection has been jointly carried out. For remaining 90% quantity, duly accepted test reports by the authorized representative of the Quality Assurance Dept of the Supplier/Contractor in accordance with the approved Quality Assurance Plan.
- c. The accepted deviation, if any, shall be included with complete technical details
For item/material/assembly not covered in QAP, the Supplier/contractor shall be required to submit copies of the following Quality Assurance documents in original along with the request letter for issuance of MDCC:
 - a. Internal inspection reports/compliance certificate duly signed by authorized representative of Supplier/contractor's Quality Assurance Department.
 - b. The accepted deviation, if any, shall be included with complete technical details.
 - c. Undertaking from the Supplier/contractor that the components requested for MDCC meets the requirements of applicable standards and other relevant requirements of the contract.

x.

(a) Non-conformities observed during manufacturing, handling, packaging, transportation, storage, preservation, erection, testing and commissioning including the corrective action taken by the Supplier/contractor to ensure that the supplied components/items meet the various requirements of the contract will be intimated by the Supplier/contractor for information of RECPDCL promptly.

(b) In case, Supplier/contractor agrees to replace such items/components having non-conformities with new items/components and redo the services having non-conformity, without any additional cost to RECPDCL, the Clause No 4.4.5(a) will not be applicable.

xi.

ny test which is the part of the contract document but not mentioned in the Quality Plan will also be carried out by the Supplier/contractor without any additional cost to RECPDCL.

xii.

he Contractor shall have to submit the Quality Assurance Plans for the following (but not limited to) Equipment/systems.

1. Solar PV Module
2. Power Conditioning Unit (PCU)
3. String Combiner Box (SCB)
4. Cables (DC,LT,HT, Control Cables)
5. Transformers (Power/Inverter Transformer)
6. HT Switchgear, LT Switchgear
7. Switchyard Equipment
8. SCADA

9. Civil Works
10. Erection Works
11. Commissioning of the Plant
12. Plant Performance Tests

4.4.6 PERFORMANCE GUARANTEE

4.4.6.1 Solar PV Power Plant Net Power generation

- i. The Contractor shall guarantee at least 110.98 MU for Package-1 and 166.48 MU for Package-2 Net Annual Guaranteed Generation (NAGGs) at the delivery/interconnection point.
- ii. The minimum year wise Net Annual Guaranteed Generation (NAGGs) to be supplied at the delivery/interconnection point is as per the Appendix A to Attachment 10 of this bid document. However, Contractor shall declare the Net Annual Guaranteed Generation (NAGGs) at Metering Point (CTU/STU end) for the annual basis as per the Attachment 10 of this bid document. The Bid having Declared NAGGs less than Minimum NAGGs provided by the Employer shall be rejected.
- iii. The Contractor shall demonstrate “Actual Net Annual Guaranteed Generation (NAGGs)” at Metering Point (CTU/STU end) as compared to the Declared Net Annual Guaranteed Generation (NAGGs) for every year from the date of starting of O&M period.

4.4.6.2 PERFORMANCE GUARANTEE (PG) TEST

The final acceptance test as to prove the Performance Guarantee shall be conducted at each 110.98 MU for Package-1 and 166.48 MU for Package-2 by the Contractor in presence of the Employer. The PG test shall be conducted on the basis of PG test procedure to be submitted by the contractor and approved by RECPDCL. This test shall be binding on all the parties of the Contract to determine compliance of the equipment with the functional guarantee. Any special equipment, instrumentation tools and tackles and manpower, required for the successful completion of the Performance Guarantee Test shall be provided by the Contractor free of cost. The accuracy class of the instrumentation shall be as per the relevant clause of documents.

The procedure for PG demonstration test shall be as follow:

Any consecutive three months period for the purpose of conducting performance guarantee test shall be chosen on the discretion of RECPDCL.

- 1 Bidder is required to quote the annual target generation in the techno-commercial bid.
- 2 Bidder has also to quote the month wise Target Generation per MWp solar capacity for **Fixed tracking** mode in the techno-commercial bid.
- 3 Based on the actual installed capacity in the mode of generation the month wise generation target for the bidder shall be derived and extrapolating the same to the quoted generation.
- 4 If the plant is not able to achieve the target generation as per the PG procedure during the test period, then contractor shall compensate RECPDCL with an amount equivalent to the loss of generation based on tariff and as per sample calculation in Table-B.

5 The maximum amount of liquidated damages for shortfall in generation during PG Test shall not exceed 20% of the contract value, First & Second Contract.

6 Sample calculation sheet for arriving month wise target generation for an annual quoted generation of 110.98 MU for Package-1 and 166.48 MU for Package-2 from Fixed tracking based system having **175 MWp** DC capacity is shown in Table- A.

| Month | Solar Insolation (kWhr/m ²) | Target Generation (Mwhr) Fixed tracking (1 Mwp) Quoted by Bidder # | Final Monthwise Target generation for Bidder in MWhr |
|-----------|---|--|--|
| | | A* | B**=A X 175 |
| January | 118 | 137 | 23975 |
| February | 135 | 133 | 23275 |
| March | 179 | 144 | 25200 |
| April | 187 | 149 | 26075 |
| May | 202 | 166 | 29050 |
| June | 165 | 138 | 24150 |
| July | 138 | 115 | 20125 |
| August | 135 | 99 | 17325 |
| September | 143 | 128 | 22400 |
| October | 138 | 130 | 22750 |
| November | 114 | 133 | 23275 |
| December | 106 | 129 | 22575 |
| Year | 1760 | | 280175 |

Note:

1. Generation assumed by RECPDCL for illustration purpose.
2. Only the generation arrived in the column 'B' shall be used for arriving LD during PG test procedure as shown in sample calculation.

* Generation assumed by RECPDCL for illustration purpose.

** B=Sum of Final month wise target generation for bidder.

RECPDCL has right to question the rationality of the month wise quoted generation.

7 In addition to the two pyranometers to be supplied under the scope of work, the contractor shall install one more calibrated pyranometers at horizontal plane at locations mutually agreed by Contractor and RECPDCL. The additional pyranometer shall be free of cost on

returnable basis.

- 8 Contractor shall also install data logger to store all the pyranometers data during test period. A valid test reports for the installed pyranometers shall be submitted by the Contractor for approval to RECPDCL. The output of both pyranometers mounted on horizontal plane shall be made available at SCADA during the complete PG test duration i.e. three month period.
- 9 During the PG test period, the module tilt shall be kept as per approved schedule.
- 10 Actual energy exported from the plant shall be noted for three consecutive month period. For this purpose, the net energy exported at the metering point (**As per RFS**) and pyranometers reading shall be noted at agreed frequency on daily basis for entire PG test period.

This measured value of energy shall be compared with “Month wise Target Generation” for the PG test.

Following factors shall be considered for computing the “target Generation” and shortfall (if any)

- a) Effect of any meteorological parameters shall not be considered except of solar radiation.
- b) Variation of Performance Guarantee on account of Generation loss due to grid outage (or power evacuation system which is not in the scope of the Bidder): The measured global solar radiation of the period of the outage of the power evacuation system shall be excluded to calculate the cumulative global Insolation for the month. Under such situation, the radiation corresponding to the warm-up time of inverter as per data sheet shall also be adjusted to arrive at the cumulative global insolation for the month.

If the difference of reading between the two horizontally mounted pyranometers exceeds more than 2%, the test shall be halted and resumed only after rectification of errors which has led to mismatch. The data of that particular day(s) shall be discarded and test period shall be extended by same numbers of day(s).

The test shall be repeated in case of outage of following equipment for more than 7 days.

1. Inverter transformer
2. Power Conditioning Unit
3. SCADA and data logger combined
4. Both pyranometers.

If bidder is not able to demonstrate PG test during these three (03) months he shall be given one more chance to demonstrate the PG test. In that case, the steps for PG test shall be repeated again as above after carrying out necessary modification/replacement.

A sample calculation for shortfall in energy generation for period January to April and LD calculation for the site is given in **Table-B**.

Table-B: A sample calculation for the Solar Plant for Total Short fall in Energy for Design life

| Month | (a) Global Solar Insolation of the month (kWhr/(m ² Xday) | (b) Target Generati on (Mwhr) (Final Target generati on as per Table- A) | (c) No of test days of the month | (d) Refernc e Solar Insolatio n (a) X (c) / (Ndm*) | (e) Modifie d Target Generati on of the month (Mwhr) (b) X (d) / (a) | (f) Measure d Global Horizont al Solar Insolatio n (kWhr/ m ²) | (g) Correcte d Target Generati on (Mwhr) (e) X (f) / (d) | (h) Measure d Generati on at Meterin g Point (Mwhr) | Shortfall in energy for PG Test (g- h)# |
|-------|---|--|--|---|--|---|--|--|--|
| Jan | 118.00 | 14385 | 22 | 83.74 | 10,208.71 | 109 | 13,287.84 | 13,280 | 7.84 |
| Feb | 135.00 | 13965 | 28 | 135.00 | 13,965.00 | 152 | 15,723.56 | 15,639 | 84.56 |
| March | 179.00 | 15120 | 31 | 179.00 | 15,129.00 | 176 | 14,866.59 | 14,897 | -30.41 |
| April | 187.00 | 15645 | 9 | 56.10 | 4,693.50 | 63 | 5,270.78 | 5,246 | 24.78 |
| | | | | | 43,987.21 | | | | 86.76 |

* Ndm= Nos of days in the month

** Test is assumed to start from 10 January till 9th April

-ve value denotes excess generation

| | |
|--|---|
| Total Short fall in Energy for the test period (TP) | $7.84+84.56(-30.41)+24.78=86.76\text{MWhr}$ |
| Modified Target generation for the test period (GTP) | 43,987.31 MWhr |
| Target yearly generation(GY) | 168105 MWhr |
| Yearly shortfall in generation(Y) | $\text{GY} \times \frac{\text{GTP}}{\text{GTP}} = 168105 \times \frac{86.76}{43,987.21} = \mathbf{331.58 \text{ MWhr}}$ |
| Yearly loss of Revenue and applicable LD (INR) | $\text{GY} \times 1000 \times \text{R}$ |
| Applicable LD for complete life of plant (in INR) | $331.58 \times 1000 \times \text{R} \times 10.6454$ |

Where **R** is the applicable **tariff for LD as per clause 4.2.7**

4.4.7 ERECTION CONDITIONS OF CONTRACT (ECC)

I. General Conditions

The following provisions shall supplement the conditions already contained in the other parts of these specifications and documents and shall govern that portion of the work of this contract which is to be performed at site. The erection requirements and procedures not specified in these documents shall be in accordance with the recommendations of the equipment manufacturer, or as mutually agreed to between the Employer and the Contractor prior to commencement of erection work.

II. Electrical Safety Regulations

The contractor shall ensure that entire electrical installation work is executed by adopting applicable statutory safety regulations and best practices in the industry. The Contractor shall employ the necessary number of qualified, full time electricians to maintain his temporary electrical installation.

III. Inspection and Testing Inspection Certificates

The provisions of the clause entitled Inspection and Testing in the Technical Specification, shall also be applicable to the erection portion of the Works. The Employer shall have the right to re-inspect any equipment though previously inspected and approved by him at the Contractor's works, before and after the same are erected at Site. If by the above inspection, the Employer rejects any equipment, the Contractor shall make good for such rejections either by replacement or modification/ repairs as may be necessary to the satisfaction of the Employer. Such replacements will also include the replacements or re-execution of such of those works of other Contractors and/or agencies, which might have got damaged or affected by the replacements or re-work done to the Contractor's work.

IV. Contractor's Field Operation

The Contractor shall keep the Employer informed in advance regarding his field activity plans and schedules for carrying out each part of the works. Any review of such plan or schedule or method of work by the Employer shall not relieve the Contractor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the Employer or any of his representatives and no claim of the Contractor will be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.

The Contractor shall have the complete responsibility for the conditions of the Work-Site including the safety of all persons employed by him or his Sub-Contractor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of the Contract and shall not be limited to normal working hours. The construction review by the Employer is not intended to include review of Contractor's safety measures in, on or near the Work-Site, and their adequacy or otherwise.

V. Protection of Work

The Contractor shall have total responsibility for protecting his works till it is finally taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of any other agency/individual not being under his supervision or control, the Contractor shall make his claim directly with the party concerned. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

VI. Facilities To Be Provided By The Contractor

Contractor's site office Establishment: The Contractor shall establish a site office at the site and keep posted an authorized representative for the purpose of the contract.

Tools, tackles and scaffoldings: The Contractor shall provide all the construction equipments, tools, tackles and scaffoldings required for pre-assembly, installation, testing, commissioning and conducting Guarantee tests of the equipments covered under the Contract. The Contractor shall arrange machinery & equipment such as Dozer, Hydra, Cranes, Trailer, etc. wherever required for the purpose of fabrication, erection and commissioning.

Testing Equipment and Facilities: The contractor shall provide the necessary testing, equipment and facilities

Testing of construction material at the site: Contractor shall make arrangements for the testing of construction material at the site wherever required, under the scope of services of the contract.

First-aid: The Contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen working at the Site. Enough number of Contractor's personnel shall be trained in administering first-aid.

Water: Contractor shall make all arrangements himself for the supply of construction water as well as potable water for labour and other personnel at the worksite.

VII. Security

The Contractor shall have total responsibility for all equipment and materials in his custody stores, loose, semi-assembled and/or erected by him at Site. The Contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and losses.

VIII. Fire Protection

a.

he work procedures that are to be used during the erection shall be those, which

minimize fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the Site regularly. Fuels, oils and volatile or flammable materials shall be stored away from the construction and equipment and materials storage areas in safe containers. Untreated canvas, paper, plastic or other flammable flexible materials shall not at all be used at Site for any other purpose unless otherwise specified. If any such materials are received with the equipment at the Site, the same shall be removed and replaced with acceptable material before moving into the construction or storage area.

b.

ll materials used for storage or for handling of materials shall be of water proof and flame resistant type. All the other materials such as working drawings, plans etc., which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.

c.

ll the Contractor's supervisory personnel and sufficient number of workers shall be trained for fire-fighting and shall be assigned specific fire protection duties. Enough of such trained personnel must be available at the Site during the entire period of the Contract.

d.

he Contractor shall provide suitable quantity & type fire protection equipment for the warehouses, office, temporary structures etc.

IX. Materials Handling and Storage. All the equipment furnished under the Contract and arriving at Site shall be promptly received, unloaded and transported and stored in the storage spaces by the Contractor. Modules, Inverters, Transformers and Other Balance of items etc. must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage. All the materials stored in the open or dusty location must be covered with suitable weather proof and flameproof covering material wherever applicable. The Contractor shall be responsible for any loss or damage during transportation, handling & storage due to improper packing.

X. Construction Management

Contractor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time, the Contractor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the Employer, satisfying that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

XI. Unfavorable Working Conditions

The Contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects during inclement weather conditions, like monsoon, storms, etc. and during other unfavourable construction conditions. No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the Contractor in a proper and

satisfactory manner in the performance of such Works and with the concurrence of the Employer. Such unfavourable construction conditions will in no way relieve the Contractor of his responsibility to perform the Works as per the schedule.

XII. Employment Of Labour

In addition to all local laws and regulations pertaining to the employment of labour to be complied with by the Contractor as mentioned elsewhere in the document, the Contractor will be expected to employ on the work only his regular skilled employees with experience of the particular work. No female labour shall be employed after darkness. No person below the age of eighteen years shall be employed.

The Contractor shall also comply with the Minimum Wages Act and the Payment of Wages Act (both of the Government of India) and the rules made there under in respect of its labour and the labour of its sub-contractors currently employed on or connected with the contract.

The contractor shall be solely responsible for discharge of all obligations relating to retirement /superannuation 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.

All travelling expenses including provisions of all necessary transport to and from Site, lodging allowances and other payments to the Contractor's employees shall be the sole responsibility of the Contractor.

4.4.8 OPERATIONS AND MAINTENANCE (O&M)

I. Scope of Operation & Maintenance (O&M)

Comprehensive O&M of the solar PV plant (s) for a period of **Three (03)** years from the date of operational acceptance is in the scope of the Contractor. The contractor shall be responsible for all the required activities for the successful Operation and Maintenance of the entire Solar PV plant during the O&M period. The contractor shall be responsible for arranging at his own cost all spare parts required for routine repair/replacement for keeping the Solar power plant operational, repairs /replacement of any defective equipment(s) at his own cost as required from time to time, scheduled and preventive maintenance, maintaining log sheets/records of operational details, deployment of competent staff for continuous operation and qualified engineers for supervision of O&M work so as to ensure trouble free operation & healthy condition of the entire system at the designed efficiency/ performance level for the entire period of O&M Contract. Unless otherwise specified in the contract(s), the Employer shall not pay any other amount except the agreed O&M charges.

II. The scope of works shall include (but not limited to) the following: -

Ensuring successful operation of SPV Plant for achieving Declared Net Annual Guaranteed Generation (NAGGs) at Metering Point (CTU/STU end) on the annual basis.

Ensuring Breakdown maintenance, Periodic maintenance, Preventive maintenance, predictive maintenance, overhauls, arranging visit of O&M experts (when required) to maximize the availability of the solar plant.

Daily work of the operators involves logging the voltage, current, power factor, power and energy output of the SPV plant, temperature, logging down individual array output data once a day.

The operator shall record periodic energy output of each array and transformer /Inverter and reports shall be prepared on performance of SPV plant.

Operation procedures such as preparation to start, routine operations with safety precautions, monitoring of Solar Power Plant etc. shall be carried out as per the manufacturer's instructions to have trouble free operation of the complete system.

Contractor shall adhere to the terms & conditions as specified in the RFS document and subsequent clarifications or amendments issued from time to time.

Submission of periodical reports to the Employer on the energy generation & operating conditions of the SPV plant containing the plant performance data as finalised by the employer.

Ensuring Safety and protection of the plant by deputing sufficient security personals.

Monitoring, controlling, troubleshooting, maintaining of records, registers.

Supply of all type of spares, consumables and fixing / application of the same as required. List and quantity to be submitted for which stock will be maintained during O & M period.

Cleaning of the plant including array yard on regular basis and as and when required.

General up keeping of all equipment, buildings, roads, other common facilities in the plant area.

Cleaning of drains, cable trenches, box culverts etc.

Module washing/Cleaning as per as per approved schedule (Preferably, modules cleaning cycle shall be 15 days) Record of washing/Cleaning activities to be submitted periodically as per instruction of the employer.

Herbicide spray and grass cutting on a periodic basis.

Module tilt angle changing/adjustment as per the schedule approved during detailed engineering/as per requirements.

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

The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his employees or his Contractor's employees.

The Contractor shall immediately report the accidents, if any, to the Engineer In charge & to all the concerned authorities as per prevailing laws of the state.

The Contractor shall comply with the provision of all relevant Acts of Central or State Governments including 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, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970 or any modification thereof or any other law relating where to and rules made there under from time to time.

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

Deployment of Plant in Charge, adequate number of technical support staff and other supporting personnel during the O&M period.

Energy estimation and scheduling: The work regarding the Estimation, Scheduling & Forecasting on daily basis in form of day ahead schedule or applicable guidelines shall be in the scope of contractor without any additional cost to Employer during period of O & M Contract. Any financial losses on account of scheduling and forecasting shall be on the account of the contractor. Coordination with concerned Agencies (SLDC/RLDC etc.) for the above shall also be in the scope of the contractor.

Co-ordination with STU/CTU/SLDC/RLDC/ other statutory organizations as per the requirements on behalf on the Employer for JMR recording, furnishing Generation Schedules as per requirement, revising schedules as necessary and complying with grid requirement.

To maintain compliance to the applicable Grid Code requirements and directions, if any, as specified by concerned SLDC/RLDC from time to time.

Contractor shall be responsible to carry out all test and work as required by statutory regulation in effect during O&M period.

Contractor is required to maintain adequate O&M spare during the O&M contract period of the Solar PV plant with the view to maximize availability of the plant.

At the time handing over of the plant by the contractor to the Employer, the contractor shall handover equipment in healthy condition.

III. Operation and Performance Monitoring

Operation part consists of all activities including deputing necessary manpower required to operate the plant at the optimum capacity, including

Monitoring performance of each PCUs & Modules

- i. Monitoring performance of each Distribution Transformer, Substation equipments & Metering Panels.
- ii. The plant would be operated at unity power factor.
- iii. Contractor shall have a proper compatible Bar code reader along with thermal image sensor at the site during the entire O&M period of the plant.

The following points would be taken care of to ensure healthy operation of the plant:

- i. Regular cleaning of the module surfaces at every 15 day cycle.
- ii. Continuous monitoring through SCADA of plant performance and external grid conditions
- iii. Frequent checking and calibration of instruments;
- iv. Monitoring and maintaining performance, operations & maintenance records
- v. Coordinate with various agencies, departments for continuous operations, maximum generation and revenue realization
- vi. Comply with applicable rules, regulations, grid codes, and the specific guidelines for MW solar PV plants set under the MNRE and other schemes
- vii. The system shall include logging the voltage, current, power factor, Active and Reactive Power output of the plant, individual panels/ arrays output data once a day, etc. The system shall also record failures, interruption in supply and tripping of different relays, reason for such tripping, duration of interruption etc. and inform Employer of such interruptions with details on periodic basis. Necessary auto data recording instruments will be

provided.

- viii. The system shall record daily and monthly energy output of each array. Monthly Performance reports indicating array wise energy production, down time, capacity utilization factor, etc. shall be prepared for the plant and furnished in soft mode to Employer in the first week of the following month along with the details of saleable energy as calculated/ arrived at by power utility and /or by contractor.

Maintenance

The contractor shall ensure:

Establish robust preventive maintenance system to maximize up time and to ensure peak generation in peak periods

- i. Careful logging of operation data/historical information from the Data Monitoring Systems, and periodically processing it to determine abnormal or slowly deteriorating conditions.
- ii. alk down checks of the plant.
- ii. areful control and supervision of operating conditions
- iii. Regulate routine maintenance work such as keeping equipment clean, preventive maintenance and checks of delicate ingredients of transformers, circuit breakers, junction boxes, module mismatches, Cleanliness of isolators also to be ensured.
- iv. epairs and replacements to ensure maximum uptime for the plant.

Handing over of the Plant

At the end of the contract period, the contractor shall hand over the plant and equipment back to the Employer in completely safe and healthy condition and without any pending defect.

The items supplied by the Employer on returnable basis, such as spares parts, consumables, tools and plants, documents etc. shall be returned back to the Employer, else, suitable recoveries shall be made from the Contractor's bills.

The contractor shall hand over all technical documents, literature, instruction manuals, lists of spare part & tools & tackles. Contractor shall also hand over all the relevant record/documents, spares and consumable required for **two year's Operation & Maintenance at the time of vacating the project. The spares and Consumables required shall be decided mutually based on the past consumption at no extra cost.**

After O&M period, Employer may at its discretion decide to extend the existing O&M contract on mutually acceptable terms & conditions or undertake the O&M of the SPV Plant on its own.

4.4.9 List of Mandatory Spares

| S. No. | Equipment/Material | Quantity (for each type and rating) |
|--------|--|--|
| 1. | PV Modules | 0.25% of total supply |
| 2. | MC4 connectors (including Y-connector if used) | 1% of total supply |
| 3. | String Monitoring Unit | 1% of total supply |
| 4. | Power Conditioning Unit | |
| | (i) Central Inverter | As per OEM recommendation |
| 5. | Inverter Transformer | |
| | (i) HV bushing with metal parts and gaskets | 2 set |
| | (ii) LV bushing with metal parts and gaskets | 2 set |
| | (iii) WTI with contacts | 2 set |
| | (iv) OTI with contacts | 2 set |
| | (v) Buchholz relay | 2 set |
| | (vi) Magnetic Oil Gauge | 2 set |
| | (vii) Complete set of gaskets 2 set | 2 set |
| 6. | HT Switchgear | |
| | (i) Vacuum pole | 2 Nos. |
| | (ii) Closing coil | 2 Nos. |
| | (iii) Tripping coil | 2 Nos. |
| | (iv) Spring charging motor | 2 Nos. |
| | (v) Relay | 2 Nos. |
| | (vi) Meter | 2 Nos. |
| | (vii) Current Transformer | 2 Nos. |
| | (viii) MCCB | 2 Nos. |
| | (ix) MCB | 2 Nos. |
| | (x) Fuse | 10% of total supply |
| | (xi) Indicating lamp | 10% of total supply |
| | (xii) Rotary switch | 10% of total supply |
| 7. | LT Switchgear | |
| | (i) MCCB | 2 Nos. |
| | (ii) MCB | 2 Nos. |

| S. No. | Equipment/Material | Quantity (for each type and rating) |
|--------|--|--|
| | (iii) Fuse | 10% of total supply |
| | (iv) Relay | 2 Nos.F |
| | (v) Meter | 2 Nos. |
| | (vi) Current Transformer | 2 Nos. |
| | (vii) Voltage Transformer | 2 Nos. |
| | (viii) Indicating lamp | 10% of total supply |
| | (ix) Rotary switch | 10% of total supply |
| 8. | Solar Cable | 1% of total supply |
| 9. | DC Cable | 1% of total supply |
| 10. | AC Cable | 1% of total supply |
| 11. | Communication Cable | 1% of total supply |
| 12. | Fuse | 10% of total supply |
| 13. | Set of Valves for Power transformer | 1 Set |
| 14. | WTI with contacts of Power transformer | 1 Nos. |
| 15. | OTI with contacts of Power transformer | 1 Nos. |
| 16. | Buchholz relay complete of Power transformer | 1 Nos. |
| 17. | Pressure Relief Device of Power Transformer | 1 Nos. |
| 18. | Magnetic Oil Gauge (MOG) of Power Transformer | 1 Nos. |
| 19. | HV and LV Bushing with metal parts and gaskets of Tie Transformer(each type) | 1 Nos. |
| 20. | 33 kV outdoor Current Transformer | 1 no. Of each rating |
| 21. | 33 kV Outdoor Potential Transformer | 1 no. Of each type |
| 22. | 33 kV Outdoor Surge Arrestor | 1 nos. |
| 23. | 33 kV Isolator (one pole) | 1 nos. |
| 24. | Switchyard Spares | |
| 25. | Current Transformer (Protection) | 1 no of each rating |
| 26. | Current Transformer (Metering) | 1 nos. |
| 27. | CVT (For Protection) | 1 nos. |
| 28. | Voltage Transformer (Metering) | 1 nos. |
| 29. | Outdoor Surge Arrestor | 1 nos. |
| 30. | Isolator (one pole) | 1 no of each rating |
| 31. | Circuit Breaker (one pole) | 1 no of each rating |

| S. No. | Equipment/Material | Quantity (for each type and rating) |
|--------|---|--|
| 32 | Swyd Control& Protection-Numerical protection Relay | 1 no of each type |
| 33 | Swyd Control& Protection-Auxilliary Relay | 1 no of each type |
| 34 | Swyd Control& Protection-Bay Control Unit (BCU) | 1 no of each type |
| 35 | Wave trap | 1 nos. |

Remarks:

- a) Components mentioned in mandatory spares list, which are not applicable as per plant design consideration shall not be applicable.
- b). All the mandatory spares may be kept at site with record for use by the Contractor during O&M. Spares, if used, during O&M period shall be replenished by Contractor. All the mandatory spares shall be handed over to Employer in working condition at the end of O&M Period.
- c). Contractor shall furnish the recommended spare list as part of design/drawing approval stage.

4.4.10 Engineering Information Schedule

The Contractor shall submit to the Employer necessary documents, drawings, data, Design and Engineering Information in 3 (three) Hard & Soft copies from time to time as per the Engineering Information Schedule. The Engineering Information Schedule shall be finalized with the Employer.

The list of documents to be submitted by the contractor before the signing of Contract Agreement shall include (but not limited to) the following:-

Documents to be submitted

- 1) Detailed Schedule for various activities including Supply, Erection and Civil Works in the form of PERT Chart for the entire project indicating Start Date and End Date for each activity
- 2) Billing Break up for the Supply, Erection & Civil Works
- 3) Quality Assurance Plan
- 4) Solar Resource Assessment Report containing Solar Insolation data, Generation data etc. using latest software (METEONORM, PVSYST etc.)
- 5) List of Sub Venders for all Bill of Material items supplied under this Contract
- 6) Details of PV Module and PCU as par Clause 4.4.10.2.1 & 4.4.10.2.2 respectively
- 7) PO copy of Modules, Inverters & MMS.

4.4.10.1.1 The Contractor shall also submit following Documents/ Information pertaining to PV Modules **during detailed engineering**

- i. Complete Data Sheet of the offered PV Module indicating all the parameters specified in the detailed Scope of Work.
- ii. Performance Data at STC as well as NOCT.
- iii. IEC Certificates as mentioned in Technical Document of PV Modules

| | |
|--|---|
| A. Minimum Guaranteed Performance Parameters. | Information to be filled by the Contractor |
|--|---|

1. Manufacture
2. Model
3. Type of Technology
4. Total Installed Capacity of Module
5. Quantity of Modules

- 6 Power Rating at STC
- 7 Power Rating at NOCT
- 8 Tolerance in Power Rating
- 9 Module Efficiency at STC
- 10 Temperature Coefficient of Power
(%/°C)
- 11 Permitted Module Temperature under
continuous duty
- 12 Series Fuse Rating

**B. General Electrical Characteristic
under STC**

- 1 Voc (Open Circuit Voltage at STC)
- 2 Isc (Short Circuit Current at STC)
- 3 Vmp(Voltage at maximum power
point at STC)
- 4 Imp(Current at maximum power
point at STC)
- 5 Individual cell voltage, current, power
& efficiency.
- 6 No. of Bus Bar in Module
- 7 Fill Factor

**C. Guaranteed Overall design
specifications**

- 1 General module specification
- 2 Maximum system voltage
- 3 Maximum Reverse current
- 4 Structural Strength for sustaining
wind/snow load
- 5 Permitted Module temperature on
continuous duty
- 6 Front glass
- 7 Module frame material
- 8 Weather module frame is anodized
(YES/NO)
- 9 Encapsulants/sealants

D. Junction Box

- 1 No. of Bypass Diodes
- 2 Diode rating
- 3 IP Protection

E. Module Connecting Cable

- 1 Type of Conductor
- 2 Size of Conductor
- 3 Electrical Rating
- 4 Length

F. Cable Connector

- 1 Type
- 2 Electrical Rating
- 3 Compatibility
- 4 Contact Resistance
- 5 IP Protection

G. Physical Parameter of Module

- 1 Length in mm
- 2 Width in mm
- 3 Depth in mm
- 4 Module area in sq. meter
- 5 Cell size in mm
- 6 No. of cells in Module
- 7 Weight of Module in Kg

H. Commercial

- 1 Material/Product Warranty(Years)
- 2 First year degradation (Max % to be quoted)
- 3 Standard Degradation per year after the first year (%)
- 4 Power Output Warranty (years)

4.4.10.1.2 PCU

The Contractor shall also submit following Documents pertaining to PCU before the signing of Contract Agreement.

- a. Data Sheets of the PCU

- b. Performance Data at STC
- c. Graphs indicating
 - i. Efficiency and AC Output v/s temperature
 - ii. Efficiency and Output curves at various incident radiation
 - iii. Power output AC v/s Power input DC
- d. Efficiency profile v/s Input Power
- e. IEC Certificates

The contractor shall provide the Schedule/Time Line for submission of the following documents (to be finalized in discussion with RECPDCL). The below list is indicative only.

S. No. Documents to be submitted

1. Design Memorandum/Design Basis Report
2. Geotechnical investigation data and Topographical survey report including topographical survey data in digital format (excel file) and Contour plan of the area.
3. Bill of Material shall include item description, type, weight/quantity specification etc. for all equipment/items supplied for the project.
4. List of approvals/clearances required during period of contract
5. List of all the drawings, GA Drawings, Schematic drawings and other Technical documents are detailed out in point 4.4.10.3.1
6. Test reports (for type, acceptance, and routine tests) for all the equipment's supplied under this Tender.
7. Technical Data Sheets, System Design Documents/philosophy for all equipment's supplied under this Tender.
8. Testing Procedure for all equipment's supplied under this Tender.
9. Installation Manual, Erection Manual and Warranty Certificate of equipments supplied under this Tender
10. Operation Manual for all equipment's supplied under this Tender.
11. Detailed Manpower deployment schedule.
12. Any other documents required for the efficient project management of the project not mentioned above.
13. PR Test Procedures
14. Safety Instruction Manual

4.4.10.1.3 List of the Drawings, GA Drawings and other technical documents to be submitted by the Contractor.

The Contractor shall submit all drawings, GA Drawings, technical documents & other documents for the satisfactory completion-of the project to RECPDCL including (but not limited to) the following:

a) Drawings

- i. Civil MMS Foundation Drawing, MMS drawing along with weight
- ii. Stadd Pro Software file soft copy for Civil Foundation and Structure
- iii. Drawing of PV Module indicating detailed Dimensions, location of Junction Box, DC Cable length, details of Mounting Holes etc.
- iv. Plant General Layout of Solar PV Power Plant which includes module yard, LT/HT Transmission system, Switch yard, internal roadways / pathways / landscaped areas, gate, drainage system and water distribution system mentioning all lines and levels, yard earth pits, yard lightings, lightning posts / earth pits, etc
- v. Transmission line drawings and erection plans as per DISCOM/STU guidelines.
- vi. Inverter Room GA Layout and Inverter Room Trench Layout
- vii. String Combiner Box Grouping Layout
- viii. AC side & DC Single line diagram and Switchyard Layout
- ix. General Equipment Layout drawing for Sub Station showing Switchgear room, SCADA room, Office, stores, pantry, toilet, parking and security cabin.
- x. Civil foundation design & drawing for MMS structure, Solar PV module array footings, Pre-Fabricated Building and RCC building, yard equipment such as CT, PT, CB & LAs, Isolators, Power/Inverter Transformers, Watchmen cabin, fencing, gate, etc
- xi. Cable Routing diagram of DC, AC, Control & Communication Cabling
- xii. Trench layout drawing for DC, AC cables.
- xiii. WMB Road Cross Section and Drain Detail Drawing
- xiv. General Layout of earth pits in the yard for lightning protecting and equipment Earthing.
- xv. Perimeter fencing and transformer yard fencing.
- xvi. Fire Protection & Alarm system layout drawing
- xvii. Plant Lighting Layout (Indoor & Outdoor)
- xviii. Design calculation for UPS and battery sizing.
- xix. Weather Monitoring System drawings including pyranometer, anemometer etc.

b) GA DRAWINGS

- i. GA Drawing of PV Module indicating detailed Dimensions, location of Junction Box, DC Cable length, details of Mounting Holes
- ii. GA drawing of string / array / main junction boxes, String Monitoring units and combiner boxes with part details
- iii. GA drawing of PCU with overall dimensions, schematics, Wiring diagram and performance data sheet.
- iv. GA drawing along with schematics of SCADA System
- v. GA drawing along with schematics for lightning protection system for buildings and array

- vi. GA drawing along with schematics for module cleaning system
- vii. GA drawings along with schematics for Switchyard equipment such as CT, PT, CB & LAs, Isolators
- viii. GA drawings along with schematics for all DC Cables, AC Cables & Control Cables along with their cable trays.
- ix. GA drawings along with schematics for Power/Inverter transformer, Marshalling boxes.
- x. GA drawings along with schematics for LT & HT Panels, C&R Panels, Numeric relays.
- xi. GA drawings along with schematics for DC battery, charger, UPS, lighting fixtures.

c) Documents to be submitted at the end of every year

- i. Inventory of spares at project site
- ii. As-Built Drawings – Where ever corrections involved
- iii. Operation log book
- iv. List and description of major maintenance works done on equipment

On completion of complete Operation and Maintenance period, the contractor has to submit Completion Report highlighting all major miles stone events, Spares list with part number, do's and don'ts, special instructions, lessons learnt, etc.

The above list is indicative only. It shall be the responsibility of the contractor to furnish all requisite engineering information in respect of all equipment/systems/spares as required for the successful execution of the contract. The contractor shall be obligated to furnish to the Employer, any other specific information as requested by the Employer

All the documents/drawings shall be submitted in PDF as well as editable format like AutoCAD, Excel, Word etc. as per the requirement of RECPDCL.

4.4.11 Documents to be submitted before the COD

As per the requirements of RFS document, Contractor has to submit the following documents (duly signed and stamped by authorized signatory) well in advance prior to the scheduled commissioning date to RECPDCL. These documents then will be uploaded to UPNEDA/IMPLEMENTING AGENCY-CRM Portal. It is the responsibility of the Contractor to upload these documents on the UPNEDA/IMPLEMENTING AGENCY's-CRM portal.

Note- ***The list of all the documents shall be as per the RFS Opportunity.

4.4.12 LD for shortfall in Generation during O&M

Methodology for calculation of LD on shortfall in stipulated generation shall be as follows:

- i) Quoted Generation by the Bidder **for each year** in Attachment 10= G_1
- ii) Reference Global Horizontal Insolation (Ref clause 4.2.7) = H_1
- iii) Measured Generation during the O&M period= G_2
- iv) Measured Global Horizontal Insolation during the O&M period= H_2
- v) Modified target Generation during the O&M period(G_2')

$$G_2' = (H_2/H_1) \times G_1 \times \text{MCF} \times \text{PGF}$$

where,

MCF=Module correction factor for performance degradation = $(1 - \text{Year of Operation} \times 0.006)$

Thus for 2nd year of operation $\text{MCF} = (1 - 2 \times 0.006) = 0.988$

O&M period after PG shall start after successful completion of PG Test and issuance of Operational acceptance certificate.

PGF=Performance Guarantee Factor which is ratio of achieved generation to modified target generation during the PG Test. It shall be always less than or equal to 1(one), if contractor has not met their guaranteed generation during the PG Test. It's maximum value shall be 1 even if generation achieved during PG Test is more than guaranteed generation.

Therefore, Liquidated Damages for shortfall in Energy shall be applicable, if

$$G = \text{Shortfall in generation} = G_2' - G_2$$

In case $G_2' < \text{or} = G_2$ then no liquidated damages for the corresponding O&M period.

The maximum Liquidated Damages for the shortfall of generation during O&M period shall be limited to an amount equivalent to 10 % of the quoted generation **for each year** by the bidder.

Tariff for computing Liquidity damage for O&M Period as per clause mentioned in clause 4.7.2 .

#In case, the GHI is not available because of instrumentation or SCADA problem, the corresponding insolation and generation shall be excluded from the time block for estimation of loss of generation.

Generation loss due to the grid outage not attributed to the contractor shall also be excluded for arriving loss of generation.

One day shall be equally divided into 96 blocks of 15 minutes each starting from 00:00 Hrs, i.e. 42nd time block shall be from 10:15-10:30 Hrs.

In case of shortfall in generation, recovery of LD shall be first deducted from payment towards O&M contract value up to limiting level of 10% of the Annual Contract Value. The adjustment of LD amount shall be done in the 4th Quarter.

In case the LD recovery amount exceeds above limiting value, balance amount shall be recovered through Bank Guarantee submitted by EPC Contractor against 'Liquidity Damages for shortfall in Generation during Operation and Maintenance period'.

The value of amount encashed from above BG shall have to be replenished by EPC contractor within three months.

Calculation of BG and Proposal for 125 MW (50 MW & 75 MW) Sample Project

- a) Value of the Annual O&M Contract= Say Rs. Y per Year
- b) O&M Charges payable to the contractor on Quarterly basis= Rs. Y / 4 per Quarter
- Maximum LD deductible from O&M contract = 10 % of Annual O&M Contract value in Q4 =Rs. (Y / 4)

The complete LD amount shall be adjusted in the 4th Quarter.

Sample Procedure for determining LD for shortfall in generation during O&M period as follow

- a) O&M Period being considered 2nd Year i.e. MCF=0.988
- b) PGF=0.98 if during the PG Test, the shortfall in generation is 2%.
- c) Quoted Annual Generation by the Bidder(G1 in Million Unit) = 168.19 MU
- d) Reference Global Horizontal Insolation(H1) = 1760 kWh/m²-year (*Actual reference GHI for the site shall be as per Cl 4.2.7*)
- Measured Generation by the Bidder(**G2 in Million Units**) = 166 MU (say)
- Measured Global Horizontal Insolation during the O&M period(H2)=1806 kWh/m²-year (say)
- Modified target Generation during the 2nd year of the O&M period(**G2'**)
=G1 x (H2/H1) x MCF x PGF
=168.19 x (1806/1760) x 0.988 x 0.98=167.10 MU

$$G = G_2' - G_2 = 168.19 - 167.10 \text{ MU} = 1.10 \text{ MU}$$

Since $G_2' > G_2$, LD applicability = Yes

Value of LD in INR = Shortfall in Generation (MU) x Tariff = INR x R

Maximum Value of LD towards shortfall in generation during O&M period = Energy charges for 10% of Quoted generation = $0.1 \times G_1 \times R$ INR

Where R is the applicable tariff for LD. G is the quoted 1st Year Generation by the bidder.

*******END OF SECTION*******