:: TENDER DOCUMENT::

Tender No: 16/JREDA/CANALTOP/22-23.

TENDER FOR DESIGN, ENGINEERING, PROCUREMENT & SUPPLY, CONSTRUCTION, COMMISSIONING & COMPREHENSIVE OPERATION AND MAINTENANCE FOR TEN (10) YEARS OF 2 MW (AC) GRID-CONNECTED CANAL-TOP SOLAR PHOTOVOLTAIC POWER PLANT AT SIKIDIRI CANAL, VILLAGE: SIKIDIRI, DISTRICT: RANCHI, STATE: JHARKHAND

Issued by:

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building, Kusai Colony, Doranda
Ranchi-834 002, JH
Phone: +91 651-2491 161
Email: info@jreda.com
Web: www.jreda.com

Jharkhand Renewable Energy Development Agency (JREDA)
(3rd Floor, SLDC Building, Kusai Colony, Doranda, Ranchi)
Website: - www.jreda.com

TENDER

FOR

DESIGN, ENGINEERING, PROCUREMENT & SUPPLY, CONSTRUCTION, COMISSIONING AND COMPREHENSIVE OPERATION & MAINTENANCE FOR TEN (10) YEARS OF 2 MW GRID-CONNECTED Canal-TOP SOLAR PHOTOVOLTAIC POWER PLANT AT SIKIDIRI CANAL, VILLAGE: SIKIDIRI, DISTRICT: RANCHI, STATE: JHARKHAND

ISSUED BY:

DIRECTOR,
JHARKHAND RENEWABLE ENERGY DEVELOPMENT AGENCY (JREDA)

Govt. of Jharkhand

Energy Department

Jharkhand Renewable Energy Development Agency (JREDA)
3rd Floor, S.L.D.C. Building, Kusai Colony, Doranda, Ranchi-834002.
Ph.: 0651-2491161, Fax: 0651-2491165,
E-mail: info@jreda.com; Website: www.jreda.com

e-Procurement Notice

Tender Reference No. : 16/JREDA/CANALTOP/22-23 **Dated: 07.09.2022**

1	Name of the work	**Design, Engineering, Procurement & Supply, Construction, Commissioning and Comprehensive Operation & Maintenance for Ten (10) Years of 2 MW Grid-Connected Canal-Top Solar Photovoltaic Power Plant at Sikidiri Canal, Village: Sikidiri, District: Ranchi, State: Jharkhand**
2	Estimated Cost	**Rs. 17.10 Crores + GST extra as applicable**
3	Time of completion	**06 (Six) Months**
4	Date of publication of NIT on website: http:// jharkhandtenders.gov.in	**09.09.2022 (Friday)**
5	Date & time of Pre-bid meeting	**19.09.2022 (Monday)** at 1.00 P.M.
6	Last date & time for receipt of online bids	**06.10.2022 (Thursday)** upto 05:00 PM
7	Submission of original copies of Bid fee & EMD (Offline)	**06.10.2022** and **07.10.2022** up to 5.00 P.M.
8	Technical Bid Opening Date	**10.10.2022 (Monday)** at 03:00 PM
9	Name & address of office inviting tender	Director, Jharkhand Renewable Energy Development Agency(JREDA) 3rd Floor, SLDC Building, Kusai, Doranda, Ranchi- 834002 (Jharkhand)
10	Contact no. of procurement officer	0651-2491167/68/61/7004806449
11	Helpline no. of e-procurement	0651-2491167/68/61

Any corrigendum/addendum can be seen on website: http://jharkhandtenders.gov.in & www.jreda.com. Further details can be seen on website: http://jharkhandtenders.gov.in & www.jreda.com

Sd/-
Director,
JREDA, Ranchi

NOTICE INVITING e-Tender

SUB: "TENDER FOR DESIGN, ENGINEERING, PROCUREMENT & SUPPLY, CONSTRUCTION, COMISSIONING AND COMPREHENSIVE OPERATION & MAINTENANCE FOR TEN (10) YEARS OF 2 MW GRID-CONNECTED CANAL-TOP SOLAR PHOTOVOLTAIC POWER PLANT AT SIKIDIRI CANAL, RANCHI, JHARKHAND"

NIB No. 16/JREDA/CANALTOP/22-23

This e-Tender in two parts are invited on behalf of Jharkhand Renewable Energy Development Agency (JREDA), Ranchi from eligible parties for the work as under:

Jharkhand Renewable Energy Development Agency (JREDA) invites interested parties to participate in this **"Tender"** for bidding and selection process for the appointment of Contractor for "Design, Engineering, Procurement & Supply, Construction, Commissioning and Comprehensive Operation and Maintenance for Ten (10) years of 2 MW Grid Connected Canal-Top Solar Photovoltaic Power Plant using PV technology at Sikdiri Canal, Village- Sikidiri, Ranchi in the State of Jharkhand" (the **"Project"**). The 2 MW grid-connected canal- top solar PV Project is to be developed at Sikidiri Canal located near Sikidiri village of Jharkhand state. Proposed site is located in close vicinity of Getalsud Dam being operated by Jharkhand Urja Utpadan Nigam Limited (JUUNL) at Village: Sikidiri, Block: Angara; District:Ranchi; State: Jharkhand. The site is located approximately 40 km from Ranchi, Jharkhand where a capacity of 2 MW Canal-top Solar PV power plant can be installed.

Tender Documents may be downloaded from Website **http://jharkhandtenders.gov.in & www.jreda.com**. For view download and any other updates regarding this Tender, kindly check **www.jreda.com**. Tender Fee & EMD shall be paid along with online submission of Tender Documents shall be submitted before the due date along with the original documents. All the relevant documents of the Tender shall also be submitted physically by Registered Post A.D. or Speed Post or in Person only which shall be addressed to: Director**, Jharkhand RenewableEnergy Development Agency (JREDA)**, 3rd Fl**oor, SLDC Building, Kusai Colony, Doranda, Ranchi-834 002, Jharkhand** super scribing the envelope with Tender No. and Description. The bidder can submit the Tender in person to the office of Tender Issuing Authority before stipulated timeline.

List of Important dates & details of Bids

NIB No. 16/JREDA/CANALTOP/22-23

TABLE A: IMPORTANT DATES

Sr.	Event		Date (and Time)
i.	Date of upload of this Tender	:	**09.09.2022 (Friday)**
ii.	Last date and time for receipt of questions/ queries/ clarifications	:	**19.09.2022 (Monday)** up to 5.00 P.M.
iii.	Site visit guided by JREDA	:	**15.09.2022 (Thursday)**
iv.	Pre-Bid Meeting	:	**19.09.2022 (Monday)** at 1.00 P.M.
v.	Last date and time of On-line (e-tendering) tender/offer submission (the "Bid Submission Deadline") **{This is mandatory}**	:	**06.10.2022 (Thursday)** upto 05:00 PM
vi.	Submission of original copies of Bid fee & EMD (Offline) **{This is mandatory}**	:	**06.10.2022** and **07.10.2022** up to 5.00 P.M.
vii.	Bid Validity	:	One Hundred and Eighty (180) days from the date of opening of the Price Bid of this Tender
viii.	Opening of Technical Bid	:	**10.10.2022 (Monday)** at 03:00 PM
ix.	Tentative date of opening of online Financial Bid	:	Shall be intimated later.
x.	Target date for Commissioning of Project	:	180 days from Letter of Intent
xi.	Tentative Date for Operational Acceptance Test	:	210 days from Letter of Intent

xii.	Security Deposit Testing Period	:	Security Deposit (PG) Test Period shall start as under: *A)* If the Contractor successfully completes Operational Acceptance Test (OAT) in first attempt within 30 days from date of commissioning, then PG Test Period and O&M Period will start from the date when the OAT was successfully Completed. *(OR)* B) In case the Contractor fails the OAT in the first attempt, the Contractor shall be allowed maximum 30 days for corrective actions and further next OAT shall start on completion of 30 days period or earlier as desired by the Contractor. The PG Test and the O&M period shall start from the date when of second OAT period is started. In case the Contractor fails in the second attempt as well, a penalty will be imposed at 1% of EPC Contract Price. In this case, irrespective of the result (whether pass or fail) of the OAT, the PG Test and O&M Period shall start at the beginning of the second OAT. The start of O&M and first year operation shall be considered after successful completion of operational acceptance test or 60 days from date of commissioning of 2 MW (AC) whichever is earlier. Further all the

			guarantees related to NEEGG / Incentive shall also be applicable. *(OR)* C) However, in case of failure of the second OAT, if the Contractor needs more time to further take corrective action at its own discretion, then the same may be allowed by JREDA without imposing any further penalty on the Contractor towards such subsequent (i.e. 3rd or 4th attempt) OATs. However, if the Contractor is successful in third attempt, then the penalty deducted at the time of unsuccessful 2nd attempt of OAT shall be returned but if the Contractor fails in third attempt of OAT then penalty charged at the time of second unsuccessful attempt of OAT shall not be returned to the Contractor.
xiii.	Operation and Maintenance Period	:	Upon start of PG Test Period as per Clause No. xii above for a period of ten (10) years.
xiv.	EMD Validity	:	12 (Twelve) months from the last date of receipt of bids.
xv.	Bank Guarantee for shortfall at the time of PG Test (if applicable)	:	For 9 (nine) Years from the completion of PG Test.
xvi.	Bank Guarantee Against PV Module Warranty (if applicable) as per Clause no. 6.39.10.	:	90 days beyond the 25 Years from the date of O&M Period start.

Note: The abovementioned dates are subject to amendment, in which case the amendments shall be intimated.

TABLE B: IMPORTANT AMOUNTS

Sr.	Head		Amount (and Validity)
i.	**Tender Fees (non-refundable)**	:	Rupees Twenty Five Thousand Only (Rs. 25,000/-) including GST/Nil for MSME of Jharkhand
ii.	**Earnest Money Deposit (EMD) in Bank Guarantee (Refundable/adjustable)**	:	Rupees Thirty-Nine Lakhs Only (Rs.39,00,000/-) with a validity as per Clause No. xiv of Table A (Important Dates) above. / Nil for MSME of Jharkhand.
iii.	**Security Deposit (SD)**	:	The Contractor shall furnish Security Deposit (SD) equivalent to 10% of the EPC Contract Price, to be submitted within fifteen (15) days from the date of issue of Letter of Intent (LoI), initially valid for a period of twenty four (24) months from the date of issue of LoI or till the date of successful completion of PG test whichever is later;, and if required same will have to be extended up to 3 months beyond the due date for successful completion of PG test.
iv.	**O&M Bank Guarantee (O&M BG)**	:	10% of the EPC Contract Price, to be submitted upon initiation of O&M period of the Project as mentioned in NIT; Table A: IMPORTANT DATES; POINT No.(xiii), valid up to an aggregate period of ten (10) years from the initiation of O&M period. This O&M BG shall cover the risk against warrantee for equipment up to

			O&M Period and recovery towards shortfall in NEEGG during O&M Period. The O&M Bank Guarantee shall be valid 90 days beyond the O&M Period.
v.	**Bank Guarantee for shortfall at the time of PG Test (To whomsoever it is applicable)**	:	₹ 30 per kWh (For shortfall unit)
vi.	**Insurance or Performance Bank Guarantee (SD) Against PV Module Warranty**	:	Rs. 10 Lacs per MW of PV Module (DC Capacity) valid for 25 years from the date of O&M Period Start.

IMPORTANT NOTE TO BIDDERS:

Timely Submission of offer to JREDA: In addition to bid submitted online**,** all the relevant documents as per requirement of the Tender shall also be submitted physically along with the Demand Draft towards Tender Fee and BG towards EMD in sealed cover so that the same is received in this office on or before the due date and time. Hardcopy of all such documents shall be submitted via RPAD/ Speed Post/ in Person in sealed cover only. Otherwise, the offer will not be considered and no any further communication in the matter will be entertained. **Please note that Price Bid is not to be submitted in physical form**.

No Tender shall be accepted in any case after due date and time of receipt of the Tender, irrespective of delay due to postal services or any other reasons and JREDA does not assume any responsibility for late receipt of the Tender.

1. All interested parties are requested to understand this Tender in detail in order to comply with JREDA's requirements including but not limited to the fees and deadlines,selection criteria, selection methodology, scope of work, and minimum technicalstandards. They shall be strictly abiding by ALL terms prescribed in this Tender and provide accurate information to the best of their knowledge without misleading the Company to be considered for participation in this Project.

2. It is **mandatory** for all the bidders to submit their Financial Bid ONLINE only via e-tendering portal.

3. **Technical Bid (techno-commercial Bid)**: It is **mandatory** for all the bidders to submit their Technical Bid (Techno-commercial Bid) documents in both forms i.e., online (e-tendering) only.

4. **Technical bid (Techno-commercial bid)** envelope shall be super scribed as: "Tender No. 13/JREDA/CANALTOP/22-23 Solar PV" Technical Bid (Techno-commercial bid) for "Design, Engineering, Procurement & Supply, Construction, Commissioning and Comprehensive Operation & Maintenance for ten (10) years of 2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal at Ranchi, Jharkhand due for opening on 13/09/2019".

5. All the envelopes should be addressed to: *Director, Jharkhand Renewable Energy Development Agency (JREDA), 3rd Floor, SLDC Building, Kusai Colony, Doranda, Ranchi-834 002, Jharkhand*. Complete postal address of the bidder should appear on all the envelopes for identification of the Bidder without opening the envelope.

6. DD towards Tender Fee and BG towards EMD shall be submitted in **Original.**

7. It is mandatory for all bidders to submit their PRICE-BID (APPENDIX 13) only through online (e-tendering). Price bid submitted in physical form will not be considered for its opening and only online submitted price bid will be considered for evaluation. Bidders to note that Price Bid (APPENDIX 13) of those bidders shall be opened (Online/e-tendering) who is found technically qualified and is found reasonably responsive to JREDA's tender terms and conditions and Scope of Works.

8. All the Bidders shall fulfil the pre-qualification criteria as stipulated in Clause No. 3.2.
9. Any technical/commercial query pertaining to this Tender should be referred to:

   Director,

   Jharkhand Renewable Energy Development Agency (JREDA)
   3rd Floor, SLDC Building, Kusai Colony
   Doranda, Ranchi-834 002, Jharkhand
   Ph: 0651- 2491 161
   Email: info@jreda.com
   Website: www.jreda.com

<u>Alternate Contact Details:</u>

Shri. Mukesh Prasad (EEE), JREDA - +91 7004806449

10. JREDA reserve the rights to accept/reject any or all tenders without assigning any reasons thereof. Bidders are requested to be in touch with above-mentioned websites till opening of the price bid to know the latest status.

--- End of Section ---

Document Checklist

[Note: Document Checklist shall be attached with Appendix 1: Format for Covering Letter]

Sr.	Document	Complied/ Attached? (Yes/ No)	For Official Use
1.	Complete sets of Bid (Original and Copies)		
2.	Signed Tender Documents in Cover-I		
3.	D.D of Tender Fees		
4.	B.G. of EMD		
5.	Enclosures of the Bid including the Covering Letter as per the format prescribed in Cover-II.		
6.	Copy of GST Registration and PAN Card of Bidder.		
7.	Attested Certificate of Commencement of Business issued by the Registrar of Companies for the Bidder.		
8.	Attested copy of Provident Fund Code of Bidder.		
9.	Appendix 2		
10.	Appendix 3		
11.	Appendix 4		
12.	Appendix 5		
13.	Appendix 6		
14.	Appendix 7		
15.	Appendix 8		
16.	Appendix 9		
17.	Appendix 10		
18.	Appendix 11		
19.	Appendix 12		
20.	Appendix 13		
21.	Appendix 14		
22.	Documents as per Clause No. 3.2		
23.	Bill of Quantities with specifications/ make etc. as per the Tender/		

--- End of Section ---

Table of Contents

1 Definitions, Interpretation and Brief Introduction on JREDA

1.1 Definitions

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

1.1.1 "**Actual Energy Delivered**" means the net energy in kilo-watt hour (kWh) from 2 MW Canal-top solar PV plant as measured at the Metering Point.

1.1.2 "**Adjudicator**" means the person, who shall be an engineer or a firm of engineers who is appointed by JREDA to act as the adjudicator to make a decision on or to settle any dispute or difference between JREDA and the Contractor referred to it by the parties pursuant to Tender (Adjudicator) hereof.

1.1.3 "**Applicable Law**" means any statute, law, regulation, ordinance, notification, rule, regulation 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.

1.1.4 "**Base NEEGG**" for a year is calculated by using the Net Electrical Energy Generation Guarantee (NEEGG) quoted in the Bid offer by the Contractor adjusted with a correction factor to take into account the actual average global solar radiation measured by the calibrated pyranometer for that year.

1.1.5 "**Bid**" shall mean the bid submitted by the Bidder in response to this "Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand" Ref. No. 13/JREDA/CANALTOP/22-23 issued by JREDA.

1.1.6 "**Bidder**"- Any reference to the Bidder includes Bidding Company including its successors, executors and permitted assignee, severally, as the context may require;

1.1.7 "**Capacity Utilization Factor** (**CUF**)" shall have the same meaning as provided in CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009 as amended from time to time.

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

1.1.9 "**Commissioning**" means the satisfactory, continuous and uninterrupted operation of the equipment/system as specified after all necessary statutory approvals, initial tests, checks and adjustments for a period of at least 3 days to the satisfaction of JREDA and necessary certificates are issued by the all concerned agencies appointed by JUVNL/JBVNL/JUUNL.

1.1.10 "**Company**" means JREDA, the same definition applies as per Clause 1.1.30.

1.1.11 "**Completion of the Facilities**" means that the Facilities (or a specific part thereof where specific parts are specified in the Scope of Work) have been completed operationally and structurally and put in a tight and clean condition and that all work in respect of Commissioning of the Facilities or such specific part thereof has been completed as per the Scope of Work.

1.1.12 "**Consultant**" shall mean any consultant hired by JREDA or the company for the purpose of this project.

1.1.13 "**Contract**" or "**Contract Agreement**" means the Contract signed between JREDA and the Contractor to execute the entire Scope of Work.

1.1.14 "**Contractor**" means the Successful Bidder with whom contract is signed by JREDA includes the legal successors or permitted assignee of the Contractor.

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

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

1.1.17 "**Delivery Point**" shall be the interconnection point at which solar power developer (SPD) shall deliver the power to the JREDA's Plant Substation end.. The metering shall be done at this point of interconnection.

1.1.18 "**Defect Liability Period**" means the period of validity of the warranties given by the Contractor, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in Clause No. 6.13 hereof.

1.1.19 "**Effective Date**" for this Contract shall mean the date of issuance of Letter of Intent by JREDA.

1.1.20 "**Engineer-in-Charge**" shall mean the engineer appointed at Project site by JREDA.

1.1.21 "**Facilities**" means the Plant and Equipment to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract for enabling the installation, construction, testing and commissioning of the Solar Power System(s).

1.1.22 "**Financial Bid**" or "**Financial Proposal**" means the proposal submitted by the Bidder online and by post (unpriced) as a part of the Bid including the EPC Contract Price, O&M Contract Price and Guaranteed Generation as per format prescribed in Appendix 13: .

1.1.23 **"Government Authority"** means Government of India, any state government or any governmental department, commission, board, body, bureau, agency, authority, undertaking, or administrative body or any sub-division or instrumentality thereof, central, state, or local, having jurisdiction over the Contractor, the Facility, or the performance of all or any of the services, obligations or covenants of Contractor under or pursuant to this Contract or any portion thereof.

1.1.24 "**Guaranteed CUF**" means the CUF calculated as per Clause No. 1.1.7 considering NEEGG quoted by the Bidder in the Tender document at the time of submission of Bid.

1.1.25 "**Guarantee Test(s)**" means the Performance & Guarantee Test(s) specified in this Tender to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees.

1.1.26 "**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, inspection, expediting, Site preparation works (including the provision and use of Contractor's Equipment and the supply of all civil, structural and construction materials required), installation, Commissioning, carrying out guarantee tests, operations, maintenance, the provision of operations and maintenance manuals, training of JREDA's personnel etc.

1.1.27 "**JBVNL**" shall mean Jharkhand Bijli Vitran Nigam Limited

1.1.28 "**JNNSM**" means the Jawaharlal Nehru National Solar Mission.

1.1.29 "**JREDA**" shall mean Jharkhand Renewable Energy Development Agency.

1.1.30 "**JSERC**" shall mean Jharkhand State Electricity Regulatory Commission constituted under section 82 of Electricity Act 2003 or its successors.

1.1.31 "**JUSNL**" shall mean Jharkhand Urja Sancharan Nigam Limited

1.1.32 "**JUUNL**" means Jharkhand Urja Utpadan Nigam Limited.

1.1.33 "**JUVNL**" shall mean Jharkhand Urja Vikas Nigam Limited

1.1.34 "**Metering Point**" for purposes of recording of Delivered Energy will be the Delivery Point.

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

1.1.36 "**MNRE**" means Ministry of New and Renewable Energy, Government of India.

1.1.37 "**Price Bid**" means the same as per Clause No. 1.1.22.

1.1.38 "**O&M**" means Operations and Maintenance.

1.1.39 "**Owner(s)**" means JREDA and includes the legal successors or permitted assigns.

1.1.40 "**Party**" or "**Parties**" means individually any one of the Bidder, Contractor or JREDA; or collectively any or all of the Bidder, Contractor or JREDA; respectively.

1.1.41 "**Plant**" means the 2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant proposed at Sikidiri Canal, Ranchi State: Jharkhand as per the provisions in this Tender.

1.1.42 "**Plant Capacity**" is defined as the function of cumulative rated DC capacity of all solar PV modules under STC conditions as defined and measured in adhering to the guidelines of latest version of applicable IEC standard for crystalline silicon PV module technologies as well as cumulative rated AC capacity of the grid connected inverters, utility interface, performance measurement and safety norms in accordance the relevant guidelines of MNRE/ JBVNL / any other Jharkhand State Agencies guidelines as well as the requirements stipulated by JREDA.

1.1.43 "**Project**" means the 2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant proposed at Sikidiri Canal, Ranchi, Jharkhand as per the provisions in this Tender including but not limited to its design, engineering, procurement & supply, construction, commissioning, compressive operation and maintenance.

1.1.44 "**Project Manager**" means the person appointed by JREDA in the manner provided in the Tender. The Project Manager hereof and named to perform the duties delegated by JREDA.

1.1.45 "**Prudent Utility Practices**" means those practices, methods, techniques and standards, that are generally accepted for use in electric utility industries taking into account conditions in India, and commonly used in prudent electric utility engineering and operations to design, engineer, construct, test, operate and maintain equipment lawfully, safely, efficiently and economically as applicable to power stations of the size, service and type of the Project, and that generally conform to the manufacturer's operation and maintenance guidelines.

1.1.46 "**Power Purchase**" means whosoever with whom JREDA has signed a Power Purchase Agreement (PPA) for offtake of power from the 2 MW Canal-top solar PV Plant.

1.1.47 "**SECI**" means Solar Energy Corporation of India.

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

1.1.49 "**Solar Power System(s)**" means the solar photovoltaic grid connected power system(s) to be established at the site specified in the Tender.

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

1.1.51 "**Successful Bidder**" means the Bidder who is financially and technically eligible and qualified, and evaluated as the Lowest Evaluated Bidder as per the provisions in this Tender and to whom the contract is awarded.

1.1.52 "**Tender**" or "**Tender Document(s)**" shall mean this "Tender for Design, Engineering, Procurement & Supply, Construction, Testing, Commissioning And Comprehensive Operation & Maintenance For Five (5) Years Extendable for Another Five (5) Years for Three Projects of Cumulative 2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand", Ref. No. 13/JREDA/CANALTOP/22-23 issued by JREDA including its annexures, appendices, attachments, amendments and any other documents as added or modified by JREDA as per the provisions in this Tender.

1.1.53 "**Tender Issuing Authority**" means the office of Director, Jharkhand Renewable Energy Development Agency (JREDA).

1.1.54 "**Time for Completion**" shall be the date on or before which Completion of the Facility has to be achieved to the satisfaction of JREDA and such date is specified in NIT

1.2 Interpretations

1.2.1 **Language**: Unless otherwise agreed by the parties in writing, the parties shall use the English language and the Contract and the other Bid documents, all correspondence and communications to be given, and all other documentation to be prepared and

supplied under the Contract shall be written in English, and the Contract shall be construed and interpreted in accordance with that language. If any of the Contract Documents, correspondence or communications are prepared in any language other than English, the English translation of such documents, correspondence or communications shall prevail in matters of interpretation.

1.2.2 **References**: All Clauses, Sections, Chapters, Appendices, Annexure or any other objects mentioned in this Tender shall refer to the same in this Tender unless specified otherwise.

1.2.3 **Singular and Plural**: The singular shall include the plural and the plural the singular, except where the context otherwise requires.

1.2.4 **Headings**: The headings and marginal notes in the General Conditions of Contract are included for ease of reference, and shall neither constitute a part of the Contract nor affect its interpretation.

1.2.5 **Persons**: Words importing persons or parties shall include firms, corporations and government entities.

1.2.6 **Men**: The word 'Men' in this Tender shall mean all genders i.e. male, female and others.

1.2.7 **Entire Agreement**: The Contract constitutes the entire agreement between JREDA and Contractor with respect to the subject matter of Contract and supersedes all communications, negotiations and agreements (whether written or oral) of parties with respect thereto made prior to the date of Contract. The various documents forming the Contract are to be taken as mutually explanatory. Should there be any discrepancy, inconsistency, error or omission in the Contract documents, the matter may be referred to the Adjudicator and the Contractor shall carry out work in accordance with the decision of the Adjudicator.

1.2.8 **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.

1.2.9 **Time**: Any time, unless mentioned otherwise, shall be as per Indian Standard Time (IST).

1.2.10 **Currency**: All amounts mentioned as Rupees, Rs. or INR shall be interpreted as Indian Rupees.

1.2.11 **Independent Contractor**: Subject to the provisions of the Contract, the Contractor shall be solely responsible for the manner in which the Contract is performed.

a. All employees, representatives or subcontractors engaged by the Contractor in connection with the performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of JREDA and nothing contained in the Contract or in any sub-contract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives or Subcontractors and JREDA.

b. Not in any case the sub-contractor shall claim or shall put any binding to JREDA and the sub-contractor must be handled by the Contractor and JREDA shall not be responsible for any claims at any time by the Contractor in relation to the sub-contractor.

1.2.12 Non-Waiver:

a. Subject to Clause1.2.12 (b) 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.

b. 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.

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

1.2.14 **Country of Origin**: "Origin" means the place where the materials, equipment and other supplies for the facilities are mined, grown, produced or manufactured, as the case may be, and from which the services are provided. This shall be according to MNRE/JREDA/ JUVNL/ JBVNL/ JUUNL guidelines as well as in accordance to the relevant provisions of Jharkhand State Solar Policy 2015 and subsequent amendments.

1.3 About JREDA

The Jharkhand Renewable Energy Development Agency (JREDA) is incorporated as a society act in year 2001 under the administrative control of the Department of Energy, Govt. of Jharkhand for promoting use of renewable energy sources in the state. Being a nodal agency, JREDA is working for implementation of fiscal and financial incentives made available by the Ministry of New and Renewable Energy (MNRE), Govt. of India and Indian Renewable Energy Development Agency (IREDA).

It is at present implementing agency for various central and state government sponsored schemes/ projects in the area of renewable energy in the State.

JREDA's Mission:

- To create awareness about the uses of Solar, Wind, Biogas and Biomass based various technologies among the public.
- To promote the policies and programmes necessary for popularizing the applications of various new and renewable energy technologies in the State
- To promote the installation of power plants based on renewable energy sources for Energy Security
- To promote the energy conservation measures for efficient use of energy resources.
- To promote green building design for efficient use of energy in housing, commercial and industrial sector.

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--- End of Section ---

2 Information regarding payment of Tender Document, EMD Fee & Online Bidding

Detailed instructions & documents to be furnished for online bidding

2.1. The guidelines to submit bid online can be downloaded from website http://.Jharkhandtenders.gov.in

2.2. The interested bidders can download the bid from the website "http://Jharkhandtenders.gov.in".

2.3. To participate in bidding process, bidders have to get 'Digital Signature Certificate (DSC)' as per Information Technology Act-2000 to participate in online bidding. This certificate will be required for digitally signing the bid. Bidders can get above mention digital signature certificate from any approved vendors (CCA). Bidders, who already possess valid Digital Certificates, need not to procure new Digital Certificate.

2.4. The bidders have to submit their bids online in electronic format with digital Signature. The bids without digital signature will not be accepted. No proposal will be accepted in physical form.

2.5. Bids will be opened online as per time schedule mentioned in section 1

2.6. Bidders should get ready with the scanned copies of cost of documents & EMD as specified in the tender document. Before submission of online bids, bidders must ensure that scanned copy of all the necessary documents have been attached with bid.

2.7. Bidder have to produce the original D.D. towards tender fee & EMD in approved form to the authority "Director, Jharkhand Renewable Energy Development Agency, Ranchi" on the date & time as mentioned in the NIT failing which bidder will be disqualified. The details of cost of documents, EMD specified in the tender documents should be the same as submitted online (scanned copies) otherwise tender will summarily be rejected.

2.8. Uploaded documents of valid successful bidders will be verified with the original before signing the agreement. The valid successful bidder has to provide the originals to the concerned authority.

2.9. The department will not be responsible for delay in online submission due to any reason.

2.10. All the required information for bid must be filled and submitted online. If the bid is not found to be uploaded online in the website (http://Jharkhandtenders.gov.in), bid

shall be rejected even though the bidder/s have submitted Bid fee & EMD. No hard copy is required to be submitted in the office of JREDA except original Bid fee & EMD.

2.11. Other details can be seen in the bidding documents.

--- End of Section ---

3 Instructions to Bidders

3.1 General Instructions

3.1.1 The current document is the Tender, which is issued to all the potential Bidders, requesting a Bid for implementation of the Project on a fixed price basis. A Contractor would be selected through competitive bidding process for execution of the Project.

3.1.2 Any information regarding Tender can be obtained from the office of Director at (info@jreda.com) on any working day prior to last date of submission of Tenders. The payment of Tender Document Fee can be made through Demand Draft. The payment of Earnest Money can be made by the bidders through Bank Guarantee.

3.1.3 Before submitting Tenders, the instructions may be read carefully regarding submission of Tender. If any bidder finds discrepancies or omissions in the Tender documents or is in doubt as to the true meaning of any part, he shall clarify same from the Tender issuing office in writing before the due date of submission of the queries.

3.1.4 Unless exempted specifically, Tenders not accompanied with the prescribed EMD and Tender Fees shall be rejected. EMD / Tender Fees shall be in the prescribed mode of payment as asked in the NIT otherwise the Tender shall be liable to be rejected.

3.1.5 The validity of the EMD shall be for valid up to 12 (Twelve) months from the last date of receipt of Bids.

3.1.6 The details of NIT along with Tender Documents can be seen and downloaded from the portal http://Jharkhandtenders.gov.in as well as JREDA website www.jreda.com

3.1.7 The committee nominated by JREDA shall evaluate all the Bids received against NIT on the parameter indicated under heading Pre-Qualifying Requirement (PQRs)/ Eligibility conditions in Clause 3.2 and other relevant clause of the Tender. The decision of the committee shall be final.

3.1.8 Issuance of Tender Documents to any party shall not construe that such party is considered to be qualified.

3.1.9 In case due dates of sale / receipt /opening of the Tender happens to be holiday in JREDA, the needful will be done on next working day.

3.1.10 The Bidders / Contractors shall observe the highest standards of ethics during the submission of Tender, procurement and execution of the Contract. In case of evidence of cartel formation by the Bidder(s) EMD is liable to be forfeited.

3.1.11 The Bidder shall bear all costs including bank charges if any, associated with the preparation and submission of this Bid and the purchaser will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

3.1.12 Tender Issuing Authority reserves the right to cancel the NIT/Tender or to change qualifying requirement or to reject any or all the tenders so received without assigning any reason.

3.1.13 The Site for the work is either available or it shall be made available in the parts in a manner so as not to hamper the progress of work.

3.1.14 The Bidder whose Bid is accepted will be required to furnish by way of Performance Bank Guarantee the amount as prescribed in the NIT/Tender for the due fulfilment of this Contract.

3.1.15 Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the Bidders who resort to canvassing will be liable to rejection straight way.

3.1.16 All rates shall be quoted on the proper form i.e. price bid supplied as part of the Tender documents on e-tender portal by the Department.

3.1.17 On acceptance of the Tender, the name of the authorized representative(s) of the Successful Bidder, who would be responsible for taking instructions from the Engineer-in-Charge and shall be communicated to the Engineer-in-Charge immediately after the allotment / start of work.

3.1.18 The JREDA does not bind itself to accept the lowest bid and reserves to itself the right to accept the whole or any part of the Tender and the Bidder shall be bound to perform the same at the rate quoted in this Tender.

3.1.19 No Bidder is permitted to Tender for the works if any of his near relatives is posted to deal with the Project activities and who is working in any capacity requiring him to give instructions / advice and in particular any office / official of the Company including the member of the Board. Any breach of this condition by any one shall render him liable to be removed from the list of the contractors for the JREDA and the work entrusted to him may be terminated.

***Note:**

1. By the terms near relatives meant wife/ husband, parents and grandparents, children and grandchildren, brothers and sisters, uncles and cousins and their corresponding in-laws.
2. The Bidder shall attach the list of officers and employees of JREDA related to him with this Tender.

3.2 Pre-Qualifying Requirements (PQRs)/ Eligibility Conditions

3.2.1 GENERAL

i. The Bidder shall be a body incorporated in India under the Companies Act, 1956 or 2013 including any amendment thereto. A copy of certificate of incorporation shall be furnished along with the Bid in support of above.

3.2.2 TECHNICAL

Experience of having successfully completed similar works during last 7 years ending last day of month previous to the one in which applications are invited should be either of the following: -

Three similar completed works costing not less than the amount equal to 40% of the estimated cost.

or

Two similar completed works costing not less than the amount equal to 50% of the estimated cost.

or

One similar completed work costing not less than the amount equal to 80% of the estimated cost.

Definition of Similar Work: -

- Design, Engineering, Supply, Installation, Testing & Commissioning of Grid Connected/ Off-Grid Solar Power Plant Project.
- Each Work Order along with successful completion certificate will be considered as one "Similar completed work"

i. The Bidder shall also submit documentary proof of achievement of performance generation guarantee of at least one solar PV power plant which shall be certified from the Developer of that particular solar PV power plant.

3.2.3 FINANCIAL

i. Average Annual Turnover of the Bidder for last three (3) financial years ending on 2020-21 shall be minimum 30% of the estimated project cost.

ii. The Net Worth of the Bidder during last Financial Year shall be positive, wherein the Net Worth shall be calculated as follows:

Net Worth = (Equity + Reserves) – (Revaluation reserves+ intangible assets + miscellaneous expenses to the extent not written off + carried forward losses).

The Bidder shall provide a copy each of audited annual report to ascertain their turnover & net-worth.

iii. The Bidder shall submit audited annual report of FYs 2018-19, 2019-20, 2020-21 with ITR.

3.2.4 OTHER

i. The Tender of only those bidders will be considered who will produce documentary proofs, self-attested to meet the following requirements: The Bidders to have valid Proof of Permanent EPF account no., ESI registration no. and Good and Service Tax no.

ii. The agency should have valid license under Contract Labour Regulation and Abolition Act-1970 from Labour Department, Jharkhand or should give an undertaking that he will get himself registered within one (01) month if work is allotted to him.

iii. The bidder who is blacklisted or banned or debarred or whose agreement has been terminated on account of non-performance within five (5) years preceding the date of bid opening by any State Government / Central Government / Public Sector Undertaking in India, will not be eligible for participating in this bidding. A self-attested certificate from the Bidder to the effect that the Bidder is not blacklisted from any Public Sector undertakings of Central Govt. / State Govt. /SEBs / Corporations/ JREDA/ any other reputed Thermal/ Hydel Plant etc. has to be submitted by the bidder.

3.3 Local Conditions

3.3.1 The Bidder is advised to visit and examine the site conditions, traffic, location, surroundings, climate, availability of power, water and other utilities for construction, access to site, handling and storage of materials, weather data, applicable laws and regulations, and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into the Contract Agreement. The costs of visiting the Site shall be at Bidder's own expense.

3.3.2 The Bidder and any of its personnel or agents shall be granted permission by JREDA to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the Bidder, its personnel or agents, shall release and indemnify JREDA and its personnel and agents from and against all liability in respect thereof and shall be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused, which, but for the exercise of such permission would not have arisen.

3.3.3 Failure to visit the Site or failure to study the Tender Document shall in no way relieve the Successful Bidder from furnishing any material or performing any work in accordance with the Tender Document.

3.3.4 In no case, the Target Date for Completion of Project shall be extended, due to the failure of the Bidder to visit the site. The Bidder must conduct its own inspection of the Project Site, access to the Project Site and surroundings at its own cost in order to make a proper estimate of the works to be performed under consideration of site-specific constraints. This applies in particular to the transportation of equipment to the Project site and the scope of site works. The Bidder shall also inspect the site and the access to

site from the point of manufacture to make sure that its equipment is suitable for the available access and the site terrain.

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

a. made a complete and careful examination of the Tender Document;
b. received all relevant information requested from JREDA;
c. acknowledged and accepted the risk of inadequacy, error or mistake in the information provided in the Tender Documents or furnished by or on behalf of JREDA relating to any of the matters referred to in this Tender;
d. satisfied itself, about all matters, things and information including matters referred to in the Tender Document, necessary and required for submitting an informed Bid, execution of the Project in accordance with the Tender Document and performance of all of its obligations there under;
e. acknowledged and agreed that inadequacy, lack of completeness or incorrectness of information provided in the Tender Document or ignorance of any of the matters referred to in the Tender herein shall not be a basis for any claim for compensation, damages, extension of time for performance of its obligations, loss of profits etc. from the JREDA, or a ground for termination of the Contract Agreement; and
f. agreed to be bound by the undertakings provided by it under and in terms hereof.

3.3.6 JREDA shall not be liable for any omission, mistake or error on the part of the Bidder in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to the Tender Document or the Bidding Process, including any error or mistake therein or in any information or data given by JREDA.

3.4 Local Regulatory Frame Work

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

3.4.2 It is the responsibility of the Bidder that such factors have properly been investigated and considered while submitting the Bid proposals and that no claim whatsoever including those for financial adjustment to the Contract awarded under this Tender shall

be entertained by JREDA and that neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by JREDA.

3.5 Clarifications to Tender Document

3.5.1 A Bidder requiring any clarification of the Tender documents may inform JREDA in writing or by e-mail to JREDA's contact:

The Director,
Jharkhand Renewable Energy Development Agency (JREDA),
3rd Floor, SLDC Building, Kusai Colony
Ranchi -834 002, Jharkhand
Email: info@jreda.com
Website: www.jreda.com

3.6 Amendments to Tender Document

3.6.1 JREDA may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective Bidder, modify the Tender Documents.

3.6.2 The amendments will be notified on website as mentioned in Notice Inviting e-Tender of this Tender.

3.6.3 In order to allow the prospective Bidder(s), reasonable time in which to take the amendment into account in preparing their Bids, JREDA at its discretion, may extend the deadline for the submission of Bids.

3.7 Acceptance of Bids

3.7.1 JREDA neither bind itself to accept the lowest or any nor to assign any reason for the rejection of any Bid. It is also not binding on JREDA to disclose any analysis report.

3.8 Withdrawal of Invitation to Bid

3.8.1 While JREDA has floated this Tender, and has requested Bidders to submit their proposals, JREDA shall always be at the liberty to withdraw this invitation to Bid at any time before the acceptance of bid offer.

3.9 Representative/ Agent of Bidder

3.9.1 All the Bidders are requested to mention the name of their authorized representative/ agent, if any, with full address in the Bid. In case the representative is changed during the bidding process such changes shall be notified by the Bidder, failing which, JREDA shall not accept any responsibility.

3.10 Financial Proposal and Currencies

3.10.1 The Bidders shall quote the prices exclusive GST & inclusive of all other taxes, while also providing the breakup of taxes as mentioned in Appendix 13: , the similar format will be present in the e-tender for online submission. The Bidder shall indicate the price in Financial Proposal in Indian National Rupee only.

3.11 Bank Guarantees & EMD

3.11.1 EMD should be in the form of Bank Guarantee/DD.

3.11.2 The validity of EMD shall be as per mentioned in NIT.

3.11.3 The EMD shall specifically bind the Bidder to keep its Bid valid for acceptance and to abide by all the conditions of the Tender Documents in the event of JREDA desiring to award the work to the said Bidder. JREDA shall have an unqualified discretion to forfeit the EMD in the event: (i) Bidder fails to keep the Bid valid up to the date specified/ required; or (ii) refuses to unconditionally accept Letter of Intent and carry it out the work in accordance with the Bid in the event such Bidder is chosen as the Successful Bidder.

3.11.4 The EMD shall be released in the following manner:

- The EMD of the Successful Bidder may be converted to Security Deposit (SD).
- The Company shall, however, arrange to release the EMD in respect of unsuccessful Bidders, without any interest, only after issue of LOI to the Successful Bidder and their acknowledgement of the same.

3.11.5 The EMD in respect of the Successful Bidder may be converted into the Security Deposit which will be valid up to faithful execution of work including O&M period.

3.11.6 The EMD shall be forfeited and appropriated by JREDA as per the discretion of JREDA as genuine, pre-estimated compensation and damages payable to JREDA for, inter alia, time, cost and effort of JREDA without prejudice to any other right or remedy that may be available to JREDA hereunder or otherwise, under the following conditions:

a. If a Bidder engages in a corrupt practice, fraudulent practice, coercive practice, or restrictive practice;

b. In the case of Successful Bidder, if it fails (i) to furnish the Security Deposit (SD) within the two weeks from date of LOI(s). or (ii) to sign the Contract Agreement within 30 days from the issue of LoI(s).

c. In case the Successful Bidder, having signed the Contract Agreement, commits any breach thereof prior to furnishing the Performance Bank Guarantee.

d. If at any stage it is found that bidder has submitted false/fake document in the bid;

3.11.7 The Successful Bidder shall furnish the following Bank Guarantees:

i) **Security Deposit** (SD) as per the format given in Appendix 17: Format of Bank Guarantee for Security Deposit/ Performance Bank Guarantee, shall be furnished in favour of the Director, Jharkhand Renewable Energy Development Agency, Ranchi, Jharkhand. The Successful Bidder shall submit Security Deposit (SD) of 10% of the EPC Contract Price, within fifteen (15) days from the date of issue of Letter of Intent (LoI), initially valid for a period of twenty four (24) months from the date of issue of LoI or till the date of successful completion of PG test whichever is later;. if required, the SD shall have to be extended for further 3 months beyond the due date of successful completion of PG test. However, in case Bidder fails to submit SD within two weeks after issue of date of LOI, JREDA reserves the right to cancel LOI and to recover all cost and liability thereof from Bidder. The period for Security Deposit Test shall begin from the date mentioned in NIT of this Tender and shall continue till next one (1) year. SDshall be returned only after successful Security Deposit Test/ Final Acceptance Test.

ii) **O&M Bank Guarantee**: The Contractor shall undertake comprehensive operation and maintenance (O&M) activities for a period of ten (10) years from the date mentioned in NIT of this Tender. The Contractor shall submit the O&M Bank Guarantee to JREDA

within 30 days from the date of start of O&M period as specified in the NIT of this Tender in favour of the Director, Jharkhand Renewable Energy Development Agency, Ranchi, Jharkhand. The format of the O&M Bank Guarantee is given in Appendix 18: Format of O&M Bank Guarantee.

(iii) Bank Guarantee against PV Module Warranty: The Successful Bidder who is not able to provide insurance of PV modules as specified in the Tender. (a) shall submit a Bank Guarantee of Rs. 10 Lakh per megawatt of PV modules (i.e. DC capacity), which shall be valid for a period of Fifteen (15) years and 90 days before releasing of PBG & O&M BG. The minimum validity of the Bank guarantee shall be five (5) years and shall be renewed subsequently every five (5) years prior to thirty (30) days of its expiry. In case the PV module fails to provide power output as per its performance warranty, and if the Contractor fails to rectify, replace or repair the PV module, then the Owner shall carry out the necessary rectification, repair or replacement at its own discretion at the risk and cost of the Contractor. The cost of such rectification, repair or replacement shall be encashed from the Bank Guarantee against PV Module Warranty. The same shall be replenished by the Contractor within thirty (30) day, failing which the entire Bank Guarantee amount shall be encashed and all pending payment shall be withheld by the Owner till such amount is replenished by the Contractor. In another instance, if the Contractor becomes bankrupt or insolvent, then the JREDA shall immediately encash the entire amount of the Bank Guarantee against PV Module Warranty. In case the contractor fails to renew BG every 5 year, the contractor shall be blacklisted.

iv) Bank Guarantee for shortfall at the time of PG Test: In case the Contractor fails toachieve the NEEGG at the PG test then the Contractor shall, within a period of thirty (30) days, provide a Bank Guarantee of the amount equal to "Rs 30 x No. of shortfall units" valid for a period of 9 (nine) years. In case the Contractor achieves the NEEGG in the 10th year then then Bank Guarantee shall be returned to the Contractor at the end of 10th year of O&M Period. However, if the Contractor fails to achieve the NEEGG during the 10th year then Rs. 30/ kWh shall be charged for the shortfall that has occurred in the 10th year with a maximum amount limited to the Bank Guarantee value. For example, during the PG Test, if the Contractor has a shortfall of 100 kWh, then the Contractor shall submit a Bank Guarantee of Rs. 3,000/- valid for 9 (nine) years.

Further, at the end of 10th year, if the shortfall is of 100 kWh then maximum penalty of Rs. 3000 shall be encashed from this Bank Guarantee. However, if the shortfall is of

80 kWh then Rs. 2,400 (i.e. Rs. 30.00 x 80 kWh) shall be encashed from the Bank Guarantee and the remaining amount of the Bank Guarantee shall be released to the Contractor. It is further clarified that the year-on-year shortfalls in achieving the NEEGG during the 1st to 10th year of O&M Period shall be charged as per Clause No 6.11.5 of this Tender Document, which shall be over and above the provision of this current Clause.

3.11.8 Due to an extended nature of the O&M Bank Guarantee, the Contractor is allowed to provide O&M Bank Guarantees of not less than one (1) year and renew the same each year. However, the Contractor shall renew the O&M Bank Guarantee at least one month before the expiry of the validity failing which JREDA will be at liberty to encash the same. In case the O&M Bank Guarantee is encashed due to any penalty then the Contractor has to replenish within 20 days the O&M Bank Guarantee for the remaining period.

3.11.9 Any lapse in the timely renewal of the O&M Bank Guarantee shall entitle JREDA to encash it without assigning any further reason thereof.

3.11.10 The O& M Bank Guarantee for 1st year should be valid up to 45 days beyond the due date of completion of 1st O&M year. For subsequent O&M years, the Bank Guarantee should be extended/renewed in such a manner that the same remains valid up to 45 days beyond the date of completion of each subsequent O&M year.

3.12 Project Management Consultant and Third-Party Inspection Agency

3.12.1 A Project Management Consultancy (PMC) or Third-Party Inspection agency (TPI) may be appointed by JREDA, at its sole discretion, to conduct any kind of inspection regarding procurement, fabrication, installation, hook-up, quality, execution, commissioning, operation and maintenance during the span of the Project. The Contractor shall provide necessary access and coordination to conduct such inspections. The Contractor shall provide all necessary access and cooperation for inspection by National or State agency.

3.13 Right to Accept or Reject any or all Bids

3.13.1 Notwithstanding anything contained in this Tender, JREDA reserves the right to accept or reject any Bid and to annul the bidding process and reject all Bids at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons thereof.

3.13.2 JREDA reserves the right to reject any Bid and appropriate the EMD if:

a. after reviewing the Bid there is doubt that the offered works, materials or equipment are not state of the art and/ or not suitable for the site operating conditions;
b. at any time, a material misrepresentation is made or uncovered, or
c. the Bidder does not provide, within the time specified by the JREDA, the supplemental information sought by JREDA for evaluation of the Bid.

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

a. select the next Bidder with the Lowest Evaluated Bid Value as the Successful Bidder;

<or >

b. take any such measure as may be deemed fit in the sole discretion of JREDA, including annulment of the bidding process.

3.13.4 In case it is found during the evaluation or at any time before signing of the Contract or after its execution and during the period of subsistence thereof, that one or more of the pre-qualification conditions have not been met by the Bidder or the Bidder has made material misrepresentation or has given any materially incorrect or false information, the Bidder shall be disqualified forthwith, if not yet appointed as the Contractor either by issue of the LoI or entering into of the Contract Agreement, and if the Successful Bidder has already been issued the LoI or has entered into the Contract Agreement, as the case may be, the same shall, notwithstanding anything to the contrary contained therein or in this Tender, be liable to be terminated, by a communication in writing by JREDA to the Contractor, without JREDA being liable in any manner whatsoever to the Bidder or Contractor, as the case may be. In such an event, JREDA shall forfeit and

appropriate the bank guarantees without prejudice to any other right or remedy that may be available to JREDA.

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

3.14 Net Electrical Energy Generation Guarantee (NEEGG)

3.14.1 The Bidder shall be required to quote the Net Electrical Energy Generation Guarantee (NEEGG) for Ten (10) years period. The Bidder shall give NEEGG per annum after considering proposed configuration and all local conditions, solar insolation, wind speed and direction, air temperature & relative humidity, barometric pressure, rainfall, sunshine duration, grid availability and grid related all other factors and losses due to near shading, incidence angle modifier, irradiance level, temperature loss, array loss, module quality loss, module array mismatch loss, soiling loss and various inverter losses etc. To assess/ verify feasibility of quoted NEEGG, Bidders are required to provide computation documents along with considered factors based on which NEEGG has been computed.

3.14.2 Bidders are expected to undertake their own study of solar profile and other related parameters of the area and make sound commercial judgment about power output i.e. Net Electrical Energy Guaranteed Generation. The Site information and solar data provided in this Tender except the reference radiation for the twelve (12) months is only for preliminary information purpose. No claim or compensation shall be entertained on account of this information. It shall be the responsibility of the Bidder to access the corresponding solar insolation values and related factors of solar plant along with expected grid availability. The Bidder should access all related factors about the selected Site for the Project and then quote the NEEGG for the proposed Project.

3.14.3 The Contractor shall be responsible for achieving NEEGG. For any shortfall in NEEGG corresponding to the offer, the compensation shall be recovered from the Contractor as per Clause No. 6.11.5 and Clause No. 6.12. The Contractor shall maintain the Plant equipment including its repair, replacement, overhauling, etc., so as to give the agreed

NEEGG per year, for which JREDA shall pay the agreed O&M Contract Price and the applicable taxes.

3.14.4 The Bids with NEEGG of less than or equal to 31,53,600 kWh (Thirty One Lakhs Fifty Three Thousand and Six Hundred kilo-watt hours only) for the first year shall be summarily rejected.

3.14.5 The NEEGG quoted for each consecutive year should have maximum 1% annual degradation factor in NEEGG. If the bidder anticipates any degradation of the modules during the first year, it shall be taken care of to provide additional capacity of solar PV modules to meet guaranteed generation at the end of first year to avoid liquidated damages/compensation on account of Security Deposited Generation. The NEEGG of consecutive year should not be more than the previous year's NEEGG. Bids not following these conditions shall be summarily rejected.

3.14.6 This NEEGG shall be used for the evaluation of the Bids as specified in Appendix 13:

--- End of Section ---

4 Submission of Bid

4.1 General Terms

4.1.1 A Bidder is eligible to submit only one Bid for the Project. Any form of Consortium is not allowed.

4.1.2 Along with electronic submission of Bid as mentioned in Chapter-2 , the bid has to be also submitted in post as indicated in tender forTechnical Bid and Price Bid (unpriced).

4.1.3 Notwithstanding anything to the contrary contained in this Tender, the detailed terms specified in the draft Contract Agreement shall have overriding effect; provided, however, that any conditions or obligations imposed on the Bidder hereunder shall continue to have effect in addition to its obligations under the Contract Agreement.

4.1.4 The Bid should be furnished in the formats mentioned in the Tender Document, which shall be duly signed by the Bidder's authorized signatory, provided that the Financial Proposal (unpriced) will be submitted in separate envelope.

4.1.5 The Bidder should submit a power of attorney as per the format given in Appendix 10:

4.1.6 Any condition or qualification or any other stipulation contained in the Bid other than those already existing in the Tender Document shall render the Bid liable to rejection as a non-responsive Bid. The complete Bid shall be without alterations, interlineations or erasures, except those to accord with instructions issued by JREDA, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialled by the person or persons signing the Bid.

4.1.7 The Tender Documents, Bid Documents and all attached documents are and shall remain the property of JREDA and are transmitted to the Bidders solely for the purpose of preparation and the submission of a Bid in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Bid. JREDA will not return any Bid or any information provided along therewith.

4.1.8 Bidder shall note that Price Bid of only those Bidders shall be opened who are found technically qualified and responsive to JREDA's Tender terms and conditions including but not limited to the Scope of Work.

4.2 Format and Signing of Bid

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

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

4.3 Bid Due Date

4.3.1 Bids should be submitted before the Deadline for Submission of Bid as specified in NIT.

4.3.2 JREDA may, in its sole discretion, extend the Bid due date by issuing an Amendment/ Addendum in accordance with Clause No. 3.6 uniformly for all Bidders.

4.4 Late Bids

4.4.1 Bids received by JREDA after the specified time on the Bid due date shall not be eligible for consideration and shall be summarily rejected. In case it happens to be holiday on the prescribed closing/ opening day of the Bid, the next working day shall be treated as the scheduled prescribed day of closing/ opening of the Bid.

4.5 Confidentiality

4.5.1 Information relating to the examination, clarification, evaluation and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor/ consultant advising JREDA in relation to or matters arising out of, or concerning the bidding process. JREDA will treat all information, submitted as part of the Bid, in confidence and will require all those who have access to such material to treat the same in confidence. JREDA may

not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or JREDA.

4.6 Correspondence with the Bidder

4.6.1 JREDA shall not entertain any correspondence with any Bidder in relation to acceptance or rejection of any Bid.

4.7 Bid Opening and Evaluation

4.7.1 JREDA shall open, examine and evaluate the Bids in accordance with the provisions set out in this Tender.

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

4.7.3 After the receipt of Bids, JREDA may at its discretion send a team of engineers and other staff if necessary to inspect the engineering facilities, to ensure suitability and satisfactory working conditions at the Bidder's work(s)/ yard(s) and equipment listed to be used by the Bidder for the work. The Bidder shall ensure that the aforesaid team shall at all the times have access to visit and inspect works, equipment etc.

4.8 Tests of Responsiveness

4.8.1 Prior to evaluation of Bids, JREDA shall determine whether each Bid is responsive to the requirements of the Tender. A Bid shall be considered responsive only if:

a. it is received by the Bid due date including any extension thereof;
b. it is received in the manner prescribed in this Tender;
c. it is accompanied by the requisite Tender Fee and EMD;
d. it is received with all the Enclosures of the Bid as prescribed in tender;
e. its Enclosures are received as per the formats specified in Appendices as well as the Tender;
f. it contains all the information (complete in all respects) as requested in this Tender (in the same formats as specified);

g. it complies with all the terms, conditions and provisions specified in this Tender; and

h. it does not contain any conditions or deviations;

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

4.9 Modification and Withdrawal of Bids

4.9.1 In case any clarifications are sought by JREDA after opening of 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 Financial Proposal) after opening of Bid without specific reference by JREDA, shall render the Bid liable to be rejected without notice and without further reference to the Bidder and its EMD shall be forfeited.

4.9.2 Withdrawal or unsolicited modification of a Bid during this interval shall result in the Bidder's forfeiture of its EMD.

4.10 Evaluation of Bid and selection of Bidder

4.10.1 JREDA will examine the Bid to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bid is generally in order.

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

4.10.3 If the Bid is not substantially responsive, it will be rejected by JREDA and may not subsequently be made responsive by the Bidder by correction of the nonconformity.

4.10.4 JREDA will evaluate and compare Bids which have been determined to be substantially responsive.

4.10.5 Following factors shall be required for evaluation of Bid:

a. The Evaluated Bid Value (EBV) shall be calculated using the following parameters and as mentioned in Appendix 14:

i. Engineering Procurement Commissioning (EPC) Contract Price;
ii. Net Present Value (NPV) of O&M Price of Ten (10) years;
iii. Net Electrical Energy Generation Guarantee; and
iv. Constant parameters as indicated in the Tender.

b. The Bid with the Lowest Evaluated Bid Value shall be considered as L-1 and the Successful Bidder. The Bid with next highest value shall be considered as L-2 and so on for more understanding please refer Appendix 14: Bid Evaluation Criteria (BEC). An example has also been done for Bidder's comprehension.

4.10.6 In no case, a Bidder shall have the right to claim to be the Successful Bidder for its Bid.

4.11 Contacts during Bid Evaluation

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

4.12 Employment of Officials/ Ex-Official of JREDA

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

4.13 Declaration on Bidder's Relation to Directors

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

4.14 Letter of Intent ("LOI") and Notification to Proceed

4.14.1 After selection of the Successful Bidder, a Letter of Intent (the "LoI") shall be issued, in duplicate, to the Successful Bidder. The Successful Bidder shall not be entitled to seek any deviation from the Contract, as may have been amended by JREDA prior to the bid submission date.

4.14.2 On issue of the LoI by the Company, Authorized representative of the Successful Bidder shall sign the Contract Agreement within 15 (Fifteen) days and submit the Bank Guarantee within the stipulated time, i.e., 7 days from issue of LoI. The authorized representative of the Successful Bidder shall sign the Contract Agreement.

4.15 Security Deposit

4.15.1 Security Deposit (SD) as per the format given in Appendix 17: Format of Bank Guarantee for Security Deposit/ Performance Bank Guarantee shall be furnished in favour of Director, Jharkhand Renewable Energy Development Agency (JREDA). The Successful Bidder shall submit Security Deposit (SD) of 10% of the EPC Contract Price, within two weeks after issue of date of LOI, initially validity period of SD should be for a total period up to twenty Four (24) months from the date of LOI. However, in case of delay in demonstration of the PG test, the same will have to be extended upto 3 months beyond the due date for completion of PG test. The period for Security Deposit Test shall begin from the date mentioned in NIT of this Tender and shall continue till next one (1) year. SD shall be returned only after successful Security Deposit Test/ Final Acceptance Test. No interest is payable on SD amount.

4.15.2 The Bank Guarantee by the Contractor will be given from bank specified in Appendix 16: List of Banks (for Bank Guarantee) only. BG of any other Bank will not be treated as valid BG.

4.15.3 The SDs shall be liable to be encashed wholly or partly at the sole discretion of the Owner, should the Contractor either fail to execute the work within the stipulated period or fail to fulfil the contractual obligations or fail to settle in full his dues to the Owner. In case of premature termination of the contract, the SD will be encashed and the Owner will be at liberty to recover the loss suffered by it from the Contractor.

4.15.4 The Owner is empowered to recover from the SD through invocation of SD for any sum due and for any other sum that may be fixed by the Owner as being the amount or loss or losses or damages suffered by it due to delay in Performance and/or non-performance and / or partial performance of any of the conditions of the contract and / or non-performance of guarantee obligations.

4.16 Fraudulent Practices

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

4.16.2 Any effort by a Bidder to influence JREDA on the Bid evaluation, Bid comparison or Contract award decision may result in the rejection of the Bidder's Bid.

4.17 Negotiation with Bidders

4.17.1 The price discovery for the Contract shall be done based on the procedure described in Appendix 14: Bid Evaluation Criteria (BEC). L1 shall be selected based on the Evaluated Bid Value (EBV). Generally, the negotiations, if any, will be held with the L1 Bidder. However, the negotiations can be held up to L_3 Bidder, if the difference between the L_1 EBV and the EBV of L_2 and L_3 is within 5% of the L_1 EBV. In cases where the L_1 Bidder refuses to further reduce his offered price and the L_2 or L_3 Bidders come forward to offer a price which is better than the price offered by L_1 Bidder, the Bidder whose price is accepted becomes the L_1 Bidder (as per the procedure of EBV calculation). However, in such a situation, the original L_1 bidder shall be given one more opportunity to match the discovered price. In case of acceptance, he would be treated as the L_1 bidder.

4.17.2 The merit order of L1, L2, L3 bidder will be decided as described in Appendix 14: Bid Evaluation Criteria (BEC).

4.17.3 The work as a whole will be allotted in a single part to the bidder who is evaluated as L1 on the basis of criteria mentioned in Appendix 14: Bid Evaluation Criteria (BEC).

--- End of Section ---

5 Scope of Work

5.1 GENERAL SCOPE OF WORK

The bids are invited for cumulative capacity of 2 MW Canal-top Solar PV project is now being set up at Sikidiri Canal, Sikidiri, Ranchi, which comprises of minimum 2 MW DC equivalent to cumulative capacity of all solar PV modules under Standard Test Conditions (STC) as per IEC 61215. The Contractor shall comply that the maximum AC capacity whichshall not exceed 2 MW AC, maximum lower limit shall be -10%, measured at metering point.Wherever 2 MW capacity mentioned is to be considered as a 2 MW AC capacity. CUF shall be considered with AC capacity of 2 MW. Power to be evacuated on 33kV voltage level. A metering point shall be considered at Solar Plant Substation end. The scope of work also includes development of 33 kV switchyard capacity of minimum 2 MW solar evacuation at generation substation. Transmission line from Solar Plant Switchyard to Pooling Substation tobe developed by JBVNL. The general scope of work for the 2 MW solar PV power plant involves Engineering, Procurement & Supply and Construction (EPC) of the grid-connected solar photovoltaic power plant, testing and commissioning, comprehensive operation & maintenance and evacuation of power upto the evacuation point of 33 kV Solar plant substation..

5.1.1 General Scope

The general scope of work for the 2 MW Canal-top solar PV power plant involves Design, Engineering, Procurement & Supply and Construction (EPC) of the grid-connected canal-top solar photovoltaic power plant, testing, commissioning and evacuation of power upto the evacuation point of 33 kV solar plant substation corresponding to the guaranteed plant performance in the form of guaranteed energy output..

5.1.2 Evacuation of Power & Metering Point:

For this project, the evacuation voltage shall be at 33 kV AC (three phase) wherein evacuating point cum metering point shall be installed at 33 kV Solar Plant Substation end. ABT Meter to measure net power evacuation shall be installed at 33 kV Solar Plant Substation at generating end. At 2 MW Solar Plant Substation end and JBVNL's Sikidri Power Substation, ABT meters procurement, supply, testing, installation charges shall be borne by successful bidder.

5.1.3 Operation and Maintenance (O&M):

The scope of work includes Operation and Maintenance (O&M) of the plant for ten (10) years, wherein the plant shall generate at least equivalent to the guaranteed Performance of Plant. The Bidder shall submit in the Bid a comprehensive project execution schedule as well as Operation and Maintenance (O&M) schedule with resource planning in the form of Gantt chart and shall be liable for abiding by the schedule. It is the responsibility of the Contractor to perform the necessary maintenance/ timely replacement of all Civil /Mechanical or Electrical components of the project during this O&M period such that the guaranteed performance of the plant is not compromised. Any damage to CIVIL/ ELECTRICAL/ MECHANICAL components of the plant and the developed transmission line is to be reworked/ replaced/ supplied without any extra cost and time by the Contractor during complete O&M period. The Operation and Maintenance shall be comprehensive. The maintenance service provided shall ensure project functioning of the Solar PV system as a whole and Power Evacuation System to the extent covered in the Contract. All preventive/ routine maintenance and breakdown/ corrective maintenance required for ensuring maximum uptime shall have to be provided. Accordingly, the Comprehensive Operation and Maintenance shall have two distinct components as described below:

a. Preventive / Routine Maintenance: This shall be done by the Contractor regularly and shall include activities such as cleaning and checking the health of the Plant and the developed transmission line, cleaning of module surface, tightening of all electrical connections, and any other activity that may be required for proper functioning of the Plant as a whole. Necessary maintenance activities, preventive and routine for Transformers and associated switchgears also shall be included.

b. Breakdown/ Corrective Maintenance: Whenever a fault has occurred, the Contractor has to attend to rectify the fault, the fault must be rectified within 24 hrs time from the time of occurrence of fault failing which the Contractor will be penalized as per terms and conditions of this Tender.

c. The date of Comprehensive Operation and Maintenance Contract period of the Plant shall begin on the date as defined in the NIT of this Tender. Detailed scope of comprehensive operation & maintenance has been described in Chapter 5 of this document. However, operation of the Power Plant means operation of system as per

bidding schedule and workmanship in order to keep the project trouble free covering the guarantee period.

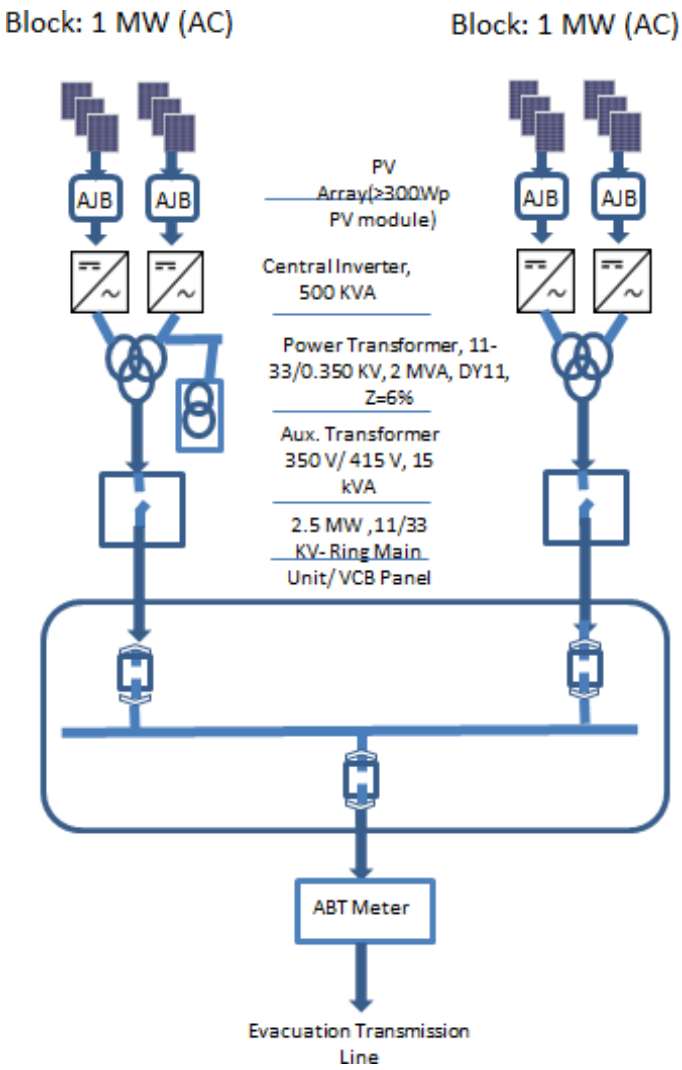


Figure 5-1: Schematic of Proposed 2 MW Solar Project

5.1.4 Electrical Work:

Consisting of installation of solar PV modules, junction boxes, grid-tied inverters, isolation transformers, meters, control panel, 33 kV switchgear for evacuation. interconnection through wires, cables, bus bars, etc.; plant lighting system, automatic weather station, SCADA and remote web-based communication & monitoring hardware, software etc.; plant and human safety and protection equipment including danger signs etc. Refer Schematic – 1 for 2 MW

Project. Anything not mentioned in the list but still required to finish the EPC contract to be considered for the Bid.

5.1.5 Civil and Other Non-Electrical Work:

i. Module Mounting Structures (MMS): The Contractor shall design, fabricate, supply and install module mounting structures with all required accessories like clamps, nuts, bolts, cable ties etc., The structures of simply supported, cantilever or any other are acceptable..

ii. Foundations: The Contractor shall design and construct appropriate civil foundations for MMS, pre-fabricated/engineered structures/RCC, transformers, switchyard equipment, feeder bay etc.

iii. The following pre-fabricated/engineered /RCC structures are to be planned and constructed by the Contractor at the project site of the 2 MW Canal-top Solar PV project:-

- Pre-fabricated/engineered / RCC Inverter rooms
- RCC Control room, Conference room cum SCADA monitoring room, Toilet and Pantry
- Or RCC for combined Control and inverter room with Conference room cum SCADA monitoring room , toilet and pantry
- Pre-fabricated/engineered Watchman's cabin - 01 Nos.
- Security Cabin – 04 Nos"

iv. Solar PV Module Cleaning System: The Contractor shall plan for washing of all solar PV modules depending upon the dust level basis but maximum limit of this interval shall not exceed 15 days. For this, the Contractor shall construct and operate 10,000 litre capacity RCC/Sintex water storage tank. The Contractor also has to drill a bore and construct pipeline for carrying water to storage tank, provide electric panel and pump for bore and total water cleaning system. For module cleaning, the contractor shall provide a pipeline network with valves. However, contractor is also free to provide automatic robot based cleaning system.

i. Chain-Link Fencing and Boundary Wall: The Contractor shall provide chain-link fencing of the entire plant boundary for plant sites as detailed into the Clause No.5.3.

ii. Roads and Pathways: The Contractor shall provide road and pathways of asphalt type for plant site.

iii. Cable Trenches: Construction of RCC cable trenches with cable trays and covers in inverter and control rooms, earthen excavated cable trench with alternate layers of sand and brick as per relevant IS from PV arrays to inverter room to control room to switchyard shall be provided by the Contractor.

iv. Main Gate: The Contractor shall provide main gate of structural steel material of appropriate design at front and rear side. Arrangement of front and rear gate is required to provide access to canal maintenance team through the plant area.

v. Site levelling: The Contractor shall level the site, wherever required cutting or filling, compaction by vibro- roller is to be carried out, so as to compact the plant in minimum possible area and also minimize shading losses because of solar PV module structures. Removal of debris and bush-cutting is mandatory.

vi. Communication: The Contractor shall provide complete plant SCADA with SCADA server having string level monitoring capabilities over remote server. Contractor shall lay the cable in appropriate cable trench, connect with suitable connectors and terminate to the SCADA server inside control room. The Contractor shall also provide necessary internet connection through GPRS enabled modem along with LAN connectivity for data communication over remote server and shall bear the cost of the same during the Contract period including O&M. The Contractor shall provide necessary provision of RTU for communication with SLDC. The Contractor shall submit the below mentioned Technical Data Sheet for String RTU, TCP String, Central RTU in the prescribed format. Internet connection shall be in the name of JREDA. However, all the charges to be paid by the Contractor during the O&M period including the initial one time cost. Plant monitoring shall be done through SCADA place in the control rooms of each plot, JREDA shall decide to designate one control room as a master control room for monitoring/ controlling and access of all other plants.

Type Code
Power Entry Characteristics
AC input voltage range ($V_{ac, min}$ $V_{ac, max}$)

Nominal AC input voltage ($V_{ac,n}$)
Rated frequency (f_r)
DC Input Voltage Range ($V_{dc,min}$..$V_{dc,max}$)
Nominal DC input voltage ($V_{dc,n}$)
RS485 Section
Serial interface type
Baud rate
Protocol
Number of devices
Line biasing resistor (wherever necessary)
Termination resistor
RS485 MODBUS section
Serial interface type
Baud rate
Protocol
Number of devices
Line biasing resistor (wherever necessary)
Termination resistor
Physical and Environmental
Environmental protection rating
Ambien temperature range
Relative humidity
Compliance
Isolation
Marking
Safety and EMC standard

Essential list of I/O and equipment is given herewith, but scope is not limited to the Essential List, contractor is fully responsible to provide complete SCADA System which can be extensible / communicable with add additional / future solar plant.

Sr.	Equipment to be monitored	Data to Be Monitor (Real Time)	Type of IO
1	String Monitoring / Array Monitoring	Each PV string needs to be monitored	Through Communication with SJB PLC/Card
2	String Junction Box / Array Junction Box (SJB = AJB)	SJB internal temperature and SJB Bus Voltage and Current	Through Communication with SJB PLC/Card
3	Inverter	All Electrical Parameters of Inverter along with Scanning, Records & Error communication	Through Communication with SJB PLC/Card
4	Inverter Transformer	Oil and Winding Temp Monitoring	Analog Input
5	33KV RMU	ON/OFF and Trip position of Each RMU	Through Communication with SJB PLC/Card
6	33 KV Breakers	ON/OFF and Trip Position of Each Breaker and Energy Meter communication	DI and Communication
7	Weather Monitoring Station	Two no. of Class I Pyranometer (one for GHI, one at PV plane collector angle), Two numbersof contact type temperature sensors one at module front and the other at backside of the module. Ambient temperature sensor, Wind velocity and speedsensor.	Through Communication
8	33 KV VCB panel	ON/OFF and Trip Position of CB	Analog and Digital
9	Main and Check Meter	All electrical parameters recorded by energy meter	Through RS-485/MODDBUS communication

5.1.6 Plant Safety Equipment:

The Contractor shall provide appropriate numbers of foam type fire extinguishers / CO_2 extinguishers, sand buckets and transformer discharge rod at Invertor Rooms, Control Room, Security Cabin and Switchyard/Substation. Further, all high voltage places to be provided with danger sign boards with appropriate size and material to last for 25 years.

5.1.7 Statutory Requirements:

All construction, operation and maintenance procedures shall be carried out through appropriate relevant standards, regulations laid by JREDA / JUVNL / JUUNL / JBVNL / MNRE and / or any other agency as and when applicable. Further, this shall comply with the applicable labor laws. The Bidder shall make himself aware of such requirements and shall not solely depend on the Company to avail full information.

5.1.8 Planning and Designing:

i. The Contractor shall plan and design for the structural/electrical / mechanical / civil requirements including but not limited to plant configuration, space optimization, distance between rows of modules, sufficient passage for vehicle and man-power movement in the plant, mounting structures, location of inverter room, cable routing, selection of equipment and items, procurement plan etc. to enhance plant output.

ii. The Contractor has to carry out the complete soil investigation of the site, through Government/NABL approved laboratory suggested by Owner/Client/Engineer-in-Charge before designing various civil structures. The design of all civil foundations, R.C.C structures, buildings etc. will be carried out considering appropriate seismic zone and wind zone of the area. All appropriate loads, wind velocity, seismic factors etc. will be considered as per the relevant IS Specifications while designing any civil structure. Also, the environmental conditions, soil characteristics, atmospheric effect, ground water table level, rain water data, land profile, HFL of canal, Free board of canal water level, Full supply depth of canal etc. must be considered as per the site actual condition and accordingly appropriate precautions and preventive measures will be taken while designing the structures. RCC structures will be adopted considering surrounding weather and soil conditions of site and as per the relevant IS codes. The concrete mix

design for all type of concrete structure shall be done by minimum M25 grade with minimum 350 kilograms of cement(Sulphur resistant cement) shall be carried out in Govt. certified laboratory or NABL accredited laboratory. Mix design shall be submitted 1 week prior to starting of concrete work.

iii. The Contractor shall take into consideration all parameters like wind speed, seismic zone, safety factor and safe Soil Bearing Capacity (SBC) etc. for the purpose design and construction of civil foundations for all civil work as per relevant IS codes.

iv. The Contractor shall carryout Shadow Analysis at the site and accordingly design strings and arrays layout considering optimal usage of space, material and labour.

v. All designs & drawings have to be developed based on the governing standards and requirements of the project and also keeping in mind basic design specifications. JREDA may approve minor deviations or suggest required modifications in the same which are meant for increasing plant performance without sacrificing quality / workmanship norms.

vi. All designs, specifications, reports, etc. submitted or used by the Contractor at any point in time shall first be approved by the JREDA and revised by JREDA, if required, prior to execution.

vii. The technology offered shall be commercially established technology and at least one Project based on this technology shall be satisfactorily operational for at least Three year in India. Details of the Project with location and the successful operational period of the Project utilizing this technology shall also be mentioned before the submission of first set of drawings for approvals.

viii. The Contractor has to arrange the facility for testing bulk material at site such as elcometer for testing the galvanization, cube-testing machine for testing the strength of cube samples, apparatus for sieve analysis, flakiness and elongation measuring apparatus, Pyconometer etc. If it is not made available on site by contractor, then contractor has to make arrangement for testing in NABL/Govt, lab and also make transportation arrangement for Client/Consultant for witnessing the such type of test.

ix. The Contractor at their own cost has to send samples of the material to Govt. accredited / NABL accredited laboratory for testing as when required/instructed by EIC of the Company.

x. JREDA reserves the right to modify the specifications at any stage as per local site conditions/ requirements and EPC contractor shall comply with modification without any extra cost and time.

5.1.9 Approval of Designs / Drawings

i. The following procedure has to be followed for assessment and approval of designs, specifications and drawings during the course of the project: The Contractor shall submit to the Company the documents in hard copy and soft copy to both with proper reference and drawing numbers. The respective documents for selection, supply, installation, erection, commissioning of equipment/ structures have to besubmitted at least 15 days in advance to the planned start of the activity as per Contractor's project schedule. The Contractor shall submit documents as required for this project according to his design and specifications. JREDA (on behalfof the Company) will assess and approve the documents within 10 days of submissionof documents; and only after the approval the Contractor shall release the documents on site for execution. The documents shall be revised by the Contractor as perinstructions /comments given by JREDA (on behalf of the Company) if required, prior to execution. Subsequent revisions and the final version of the documents shall also be submitted in hard and soft copy to the Company. The Contractor has to take into account the above mentioned process of revisions (if required) and adjust the preparation and delivery of the documents such that the overall planned project schedule is not affected.

ii. The Contractor has to submit all drawings, which are related to plant for approval and the Contractor, shall not claim any drawing as their intellectual property. Drawing which is developed for project will be the intellectual property of the Company.

iii. The Contractor shall submit a comprehensive project management schedule in the form of a Gantt chart/CPM/PERT chart and shall be liable for abiding by the schedule.

iv. The Contractor shall submit a comprehensive maintenance schedule for operation and maintenance of the photovoltaic power plant along with checklists before commencement of work on site and shall be liable for abiding by the schedule. All construction, operation and maintenance procedures shall be carried out through appropriate relevant standards, regulations and labour laws.

v. The Bidder shall submit in the Bid, all basic engineering drawings of all civil work required to complete the project, including but not limited to, layout of the power plant indicating rows of photovoltaic modules, layout of different buildings, basic MMS design, civil foundations and anchoring design / details, electrical SLD, shadinganalysis and generation estimation report etc.

vi. The Bidder shall submit in the Bid technical specifications / drawings / designs and datasheets for all electrical work including but not limited to electrical component of the power plant including photovoltaic modules, cables, connectors, junction boxes, inverters, transformers, monitoring and auxiliary systems, etc. for the 2MW Canal-top Solar PV project.

5.1.10 Final Commissioning

The commissioning procedure shall be as per JREDA/ JUVNL/ JBVNL/ Chief Electrical Inspector to Government (CEIG) requirements. The Contractor shall also ensure the following:

i. Obtaining written certificate of commissioning of the facility and permission to connect to the grid from the office of the Chief Electrical Inspector of the state and any other authorized representative from Government of India (GoI)/ GoJ/ JUVNL.
ii. Inspection and successful electrical commissioning certificate from the Company.
iii. Obtaining all certificates required by JBVNL from agency appointed by them.
iv. Satisfactory completion certificate towards completion of all other contractual obligations by the Contractor as stipulated from the Company.

5.1.11 Comprehensive Operation and Maintenance Contract

The Bidder shall separately quote in Appendix 14 for Operation and Maintenance of the power plant for Ten (10) Years, wherein the plant should perform at a minimum annual NEEGG derated every year by not more than 1% referring to the installed DC capacity of the plant indicated by the Bidder. Any damage to CIVIL/ELECTRICAL/MECHANICAL components of the plant is to be reworked/replaced/supplied without any extra cost and time by the Contractor during maintenance period. This means after completion of O & M period every component of the plant should be in good and working condition.

Disclaimer: Any civil / electrical / other work, which is not mentioned or included in this Tender document but necessary for the construction and O&M of 2 MW Canal-top Solar PV plant at Sikidiri Canal, Ranchi, Jharkhand shall be borne by the Contractor. The Contractor shall, unless specifically excluded in the Contract, perform all such works and /or supply all such items and materials not specifically mentioned in the Contract/ Tender Document but can be reasonably inferred from the Contract as being required for attaining completion, commissioning and performance of the facilities, delivering NEEGG and maintaining the plant & achieving NEEGG during O&M period of 2 MW Canal-top Solar PV Power Plant at Sikidiri Canal, Ranchi, Jharkhand as if such work and / or items and materials were expressly mention in the Contract without any extra cost implication and liability to JREDA. All specifications mentioned in this Tender indicates minimum technical requirement. The Contractor may propose alternate specifications or design though the final acceptance of the same is subject to the Company's discretion.

5.2 DETAILED ELECTRICAL WORK

5.2.1 Photovoltaic modules

i. The Contractor shall employ solar PV module of Crystalline-Si (Poly / Multi or Mono / Single) solar technology only. The Contractor shall provide detail Technical Data Sheets, Certifications of Standard Testing Conditions (STC: defined as Standard Testing Condition with air mass AM1.5, irradiance 1000W/m2, and cell temperature 25°C) as per the latest edition of IEC 61215 and as tested by IEC / MNRE recognized test laboratory. The Bidder shall also specify the minimum guaranteed energy output of solar PV module as per the Site Condition in the Bid.

ii. The PV modules to be employed shall be of minimum 72 cell configuration with rated power of module ≥300 Wp as certified for solar PV module power performance test as prescribed by latest edition of IEC 61215 and as tested by IEC / MNRE recognized test laboratory. The maximum tolerance in the rated power of solar PV module shall have maximum tolerance of +3%. No negative tolerance in the rated capacity of solar PV module is allowed.

iii. All modules shall be certified IEC 61215 2nd Ed. (Design qualification and type approval for Crystalline Si modules), IEC 61730 (PV module safety qualification testing @ 1000 V DC or higher).

iv. Minimum certified module efficiency shall be 16% with minimum fill factor of 0.75 for crystalline modules. The temperature co-efficient of the module shall be -0.43% / °C or better.

v. All photovoltaic modules should carry a performance warranty of >90% during the first 10 years, and >80% during the next 15 years. Further, module shall have performance warranty of > 97.5% during the first year of installation and degradation of PV module shall not be more than 1% in any particular year.

vi. The module mismatch losses for modules connected to an inverter should be less than 0.5%.

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

viii. The SPV module shall be made up of high transmittivity glass & front surface shall give high encapsulation gain and the module shall consists of impact resistance, low iron and high transmission toughened glass. The module frame shall be made of corrosion resistant material, which shall be electrically compatible with the structural material used for mounting the modules.

ix. The SPV modules shall have suitable encapsulation and sealing arrangements to protect the silicon cells from environment. The encapsulation arrangement shall ensure complete moisture proofing for the entire life of solar modules.

x. The module frame should have been made of Aluminum or corrosion resistantmaterial, which shall be electrolytically compatible with the structural material used formounting the modules with sufficient no. of grounding/installation.

xi. All 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 85% with temperature between -40°C to +85°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.

xii. Modules only with the same rating and manufacturer shall be connected to any single inverter. Modules shall compulsorily bear following information in the form of ID encapsulated with solar cell in the manner so as not to cast shadow on the active area and to be clearly visible from the top. The ID encapsulation is meant for RFID tags.

xiii. The Bidder shall provide to the Company in the Bid, power performance test data sheets of all modules. The exact power of the module shall be indicated if the data sheet consists of a range of modules with varying output power.

xiv. Only those crystalline modules which are supplied for a capacity more than 20 MW in other projects across the world and is successfully operational for at least one year shall be considered for this Project. On this account, the Contractor shall provide full information, to the satisfaction of JREDA, before placing final order for the modules. The Contractor shall also submit the proof of original purchase.

xv. JREDA or its authorized representative reserves the right to inspect the modules at the manufacturer's site prior to dispatch. JREDA shall only bear the cost of travel for their own employee/authorized representative/consultants. Contractor has to bear travelling cost for their personnel. However, all the cost related to testing facilities shall be borne by the Contractor.

xvi. The Bidder is advised to check and ensure the availability of modules prior to submitting the Tender Document.

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

Table 5-1 Information to be displayed on solar PV module

Sr.	Particulars
1	Name of the manufacturer of the PV module and RFID code
2	Name of the manufacturer of solar cells
3	Month & year of the manufacture (separate for solar cells and modules)
4	Country of origin (separately for solar cells and module)
5	I-V curve for the module at standard test condition (1000 w/m^2 , AM 1.5, 25°C
6	Wattage, Imp, Vmp, Isc, Voc, temperature co-efficient of power and FF for the module
7	Unique Serial No. and Model No. of the module
8	Date and year of obtaining IEC PV module qualification certificate
9	Name of the test lab issuing IEC certificate
10	Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001

5.2.2 Junction Box / Combiner Box

i. The Contractor shall provide sufficient no. of Array Junction Boxes / PV combiner boxes / DCDBs.

ii. All switch boards shall be provided with adequately rated copper bus-bar, incoming control, outgoing control etc. as a separate compartment inside the panel to meet the requirements of the Chief Electrical Inspector of Government (CEIG). All live terminals and bus bars shall be shrouded. The outgoing terminals shall be suitable to receive suitable runs and size of cables required for the Inverter/Transformer rating.

iii. The degree of protection for following equipment shall be IP 65 or better.

iv. All junction/ combiner boxes including the module junction box, string junction box, array junction box and main junction box should be equipped with appropriate functionality, safety (including fuses, grounding, etc.), string monitoring capabilities, and protection.

v. 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 cable ferrules will be fitted at the cable termination points for identification.

vi. The Array Junction Box shall also have suitable surge protection device. In addition, over voltage protection shall be provided between positive and negative conductor and earth ground such as Surge Protection Device (SPD) or on-load DC disconnectors with shoes. All incoming & outgoing cables must be terminated with Brass Gland for Cu Cables & Steel Gland for Al Cables. All Glands must be of Double Compression type for Outdoor duty & Single Compression type for Indoor duty. The rating of the Junction Boxes shall be suitable with adequate safety factor to inter connect the Solar PV array. String cable can be terminated through polymide glands or panel receptacles. The Junction Boxes shall have suitable arrangement for the followings

- Combine groups of modules into independent charging sub-arrays that will be wired into the controller.
- Provide arrangement for disconnection for each of the groups.
- Provide a test point for each sub-group for quick fault location.
- Provide group array isolation

vii. The rating of the Junction Boxes shall be suitable with adequate safety factor to inter connect the Solar PV array.

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

ix. 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.

x. The current carrying rating of the Junction Boxes shall be rated with standard safety factor to interconnect the Solar PV array.

xi. Suitable markings shall be provided on the bus-bars for easy identification and cable ferrules will be fitted at the cable termination points for identification.

xii. Adequate capacity solar DC fuses & isolating miniature circuit breakers / MCCB should be provided if required. The Junction Box must have space for the maintenance and 10% Spare Install Capacity for future integration.

xiii. Detailed junction box specifications and data sheet shall be provided in the Technical Bid document.

xiv. Other Sub systems and components used in the SPV power plants (Cables, connectors, Junction Boxes, Surge Protection devices, etc.) must also confirm to the relevant international /national standards for electrical safety besides that for quality required for ensuring expected service life and weather resistance. It is recommended that the interim, the cables of 600-1800 Volts Dc for outdoor installations should comply with the draft EN 50618 for service life expectancy of 25 years.

5.2.3 Inverter and Power Conditioning Unit (PCU)

i. Only those PCUs/ Inverters which are commissioned for more than 5 MW capacity in other solar PV projects till date shall be considered for this project. The Contractor has to provide sufficient information to the satisfaction of JREDA before placing the final order for PCUs/Inverters. Power Conditioning Unit (PCU) shall consist of an electronic inverter with latest technology available in the market along with associated control, protection and data logging devices and must be fully communicable to SCADA with OPEN Communication Protocol. If any software required for the communication & SCADA, the same to be made available within the EPC package by the Contractor.

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

iii. Dimension and weight of the PCU shall be indicated by the Bidder in the Bid.

iv. Capacity of single unit of inverter shall be min. 50 kW. This plant shall be divided into multiple identical Solar PV arrays "sections", wherein the capacity of each section varies depending upon supplier's product capacity. No. of inverters to be supplied shall be worked out by the Contractor based on DC rating of inverter.

v. The Bidder shall guarantee average annual power loss due to non-threshold condition to be less than 0.1% and shall support the claim with necessary document / data / graphs in the Bid.

vi. DC Injection into the grid: This shall be avoided by using a step-up transformer at the output of the inverter. DC injection shall be limited to 1% of the rated current of the inverter as per IEC 61727.

vii. Inverters shall be capable of operating at varying power factor preferably in between 0.85 lag to 0.85 lead and shall be able to inject or absorb reactive power.

viii. Inverters shall operate at ambient temperature of 50°C without deration.

ix. The up-time of Inverters should be of 99% in a year, in case of failing to achieve this due to failure of any component of inverter the Contractor shall either replace the inverter or the components at his own cost.

x. All inverters shall be tested for IEEE 519 &IEC 62116 standard

xi. DC input terminals must be in enough numbers so as each terminal is connected to dedicated single input. Two DC inputs cannot be connected on the single input DC terminal of the inverter. If adequate number of input are not available in the selected inverter by the Contractor then a DC junction box with protection devices such as fuse DC disconnects may be incorporated in to design. The Bidder has to indicate the selected parameters in the Bid.

xii. The minimum European efficiency of the inverter shall be not less than 98% above measured at 100% load as per IEC 61683 standards for measuring efficiency. The Bidder shall specify the conversion efficiency of different loads i.e. 25%, 50%, 75% and 100% in the Bid. The Bidder should specify the overload inverter capacity in the Bid.

xiii. 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.

xiv. The inverters shall have minimum protection to IP 65(Outdoor)/ IP 21(indoor) and Protection Class II.

xv. Nuts & bolts and the PCU enclosure shall have to be adequately protected taking into consideration the atmosphere and weather prevailing in the area.

xvi. (Grid Connectivity) Relevant CERC/JSERC 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.

xvii. All three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency.

xviii. The inverter output shall always follow the grid in terms of voltage and frequency. This shall be achieved by sensing the grid voltage and phase and feeding this information to the feedback loop of the inverter. Thus control variable then controls the output voltage and frequency of the inverter, so that inverter is always synchronized with the grid. The inverter shall be self-commutated with Pulse width modulation technology.

xix. This should be capable of synchronize maximum within 1 Minutes.

xx. The PCU shall be capable of controlling power factor dynamically.

xxi. Maximum power point tracker (MPPT) shall be integrated in the power conditioner unit to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor based to minimize power losses. The details of working mechanism and make of MPPT shall be mentioned by the Bidder in the Bid. The MPPT must have provision for constant voltage operation. The MPPT unit shall confirm to IEC 62093 for design qualification.

xxii. The system shall automatically "wake up" in the morning and begin to export power provided there is sufficient solar energy and the grid voltage and frequency is in range.

xxiii. Sleep Mode: Automatic sleep mode shall be provided so that unnecessary losses are minimized at night. The power conditioner must also automatically re-enter standby mode when threshold of standby mode reached.

xxiv. Stand – By Mode: The control system shall continuously monitor the output of the solar power plant until pre-set value is exceeded & that value to be indicated.

xxv. Basic System Operation (Full Auto Mode): The control system shall continuously monitor the output of the solar power plant until pre-set value is exceeded & that value to be indicated.

xxvi. The PCU shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU's safe operating range due to internal or external causes. The self-protective features shall not allow signals from the PCU front panel to cause the PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices. In addition, it shall have following minimum protection against various possible faults.

a. Earth Leakage Faults: The PCU shall have the required protection arrangements against earth leakage faults and –Ve DC directional protection.

b. Over Voltage & Current: In addition, over voltage protection shall be provided between positive and negative conductor and earth ground such as Surge Protection Devices (SPD).

c. 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.

d. Galvanic Isolation: The PCU inverter shall have provision for galvanic isolation. Each solid state electronic device shall have to be protected to ensure long life of the inverter as well as smooth functioning of the inverter.

e. Anti-islanding (Protection against Islanding of grid): The PCU shall have anti islanding protection. (IEEE 1547/UL 1741/ equivalent BIS standard).

f. Unequal Phases: The system shall tend to balance unequal phase voltage.

g. Heat Transfer / Cooling / Built in Ventilation Systems must be provided with 20% Spare capacity. Bidders to Submit Heat Rejection / Transfer calculation for Air Conditioning of Inverter Room.

h. Inverter must be provided with –Ve earthing for protection of PV modules against possible "Potential Induced Degradation".

xxvii. Reactive Power: The output power factor of the PCU should be of suitable range to supply or sink reactive power. The PCU shall have internal protection arrangement against any sustained fault in the feeder line and against lightning in the feeder line.

xxviii. Isolation: The PCU shall have provision for input & output isolation. Each solid-state electronic device shall have to be protected to ensure long life as well as smooth functioning of the PCU.

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

a. Sinusoidal current modulation with excellent dynamic response.
b. Compact and weather proof housing.
c. Direct use in the outdoors with outdoor housing.
d. Comprehensive network management functions (including the LVRT and capability to inject reactive power to the grid).

e. No load loss < 1% of rated power and maximum loss in sleep mode shall be less than 0.05%.

f. Unit wise & integrated Data logging

g. Dedicated Prefab compartment required for Ethernet for networking.

h. PCU shall have protection against over current, sync loss, over temperature, DC bus over voltage, cooling fan failure (if provided), short circuit, lightening, earth fault, surge voltage induced at output due to external source, power regulation in the event of thermal overloading,

xxx. It shall have bus communication via interface for integration, remote control via telephone model or mini web server, integrated protection in the DC and three phase system, insulation monitoring of PV array with sequential fault location.

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

xxxii. The power conditioner must be entirely self-managing and stable in operation. A self-diagnostic system check should occur on start up. Functions should include a test of key parameters on start up.

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

xxxiv. The power conditioner must be entirely self-managing and stable in operation. A self-diagnostic system check should occur on start up. Functions should include a test of key parameters on start up.

xxxv. The Contractor has to specify three models of inverters. Out of which any one will supplied in case of awarded work.

xxxvi. <u>Standards and Compliances:</u>

The Bidder also has to confirm the PCU specifications in the Bid.

Table 5-2 Detailed Specifications of PCU

Sr.	Particulars	Details
1	PCU Mounting	As per the design
2	Nominal AC Output Power	≥ 50 kW
3	Nominal AC Output Voltage	415 Volts +15%/-10% AC / 270 V / As per design
4	Maximum Input Voltage	800 V DC Extendable up to 1500 V

5	Wave Form	Pure Sine wave
6	DC voltagerange,	450 to 800 volts DC MPPT
7	Minimum Efficiency at 100% load The rated European efficiency (Euro Eta Efficiency) and peak efficiency	> 98% as IEC-61683(Efficiency) > 98%, measured as per IEC 61683 standard for measuring efficiency. * Inverter No Load / Full Load Loss Calculation must be submitted by the Bidder.
8	Output frequency	50 Hz +3% to - 5% Hz
9	Power Factor	0.8 lag- 0.8 lead
10	Max. THD at ratedpower	Less than 3 %
11	Ambient dry bulb temperature range	0 to 50˚ deg C
12	Humidity	15% to 95 % non- condensing
13	Enclosure	IP 21 / IP 65 (Indoor/ Outdoorrated) IEC-60068-2 (environmental)
14	Protection rating (asper IEC-60721-3-3)	Classification of chemicallyactive substances: 3C2 Classification of chemicallyactive substances: 3S2
15	Grid Specifications	IEC 61727, VDE 0126
16	Nominal Voltage & Frequency	415 Volts & 50 Hz
17	Voltage Tolerance	+ 10% and -10%

a. PCU shall confirm to IEC 60068-2 standards for Environmental Testing.

b. All inverters shall be IEC 61000 compliant for electromagnetic compatibility, harmonics, etc.

c. All inverters shall be safety rated as per IEC 62109 (1 &2), EN 50178 or equivalent DIN or UL standard.

d. Each PCU shall be compliant with IEEE standard 929 – 200 or equivalent. The Bidder should select the inverter (Central / String) as per its own system design so as to optimize the power output.

xxxiii. Display

a. 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. Control and read-out should be provided on an indicating panel integral to the Inverter. Display should be simple, self-explanatory and should show all the relevant parameter relating to PCU operational data and fault condition in form of front panel meters/ LEDs or two line LCD Display.

b. PCU front panel shall be provided with display (LCD or equivalent) to monitor the following

- Instantaneous DC power input
- DC input voltage
- DC Current
- Instantaneous active AC power output
- Instantaneous reactive AC power output
- AC voltage (all the 3 phases and line)
- AC current (all the 3 phases and line)
- Power Factor
- kWh Produced during entire day
- Total kWh produced during its life time
- Thermal loading (percentage)

PCU must be provided with display and also the same has to be made available at the SCADA monitoring & controlling desk installed in Main Control Room through Universal Open Protocol of Communication.

xxxiv. Documentary Requirements & Inspection.

a. The bill of materials associated with PCUs should be clearly indicated while delivering the equipment.

b. The Contractor shall provide to JREDA data sheet containing detailed technical specifications of all the inverters and PCUs. Operation & Maintenance manual should be furnished by the Bidder before dispatch of PCUs.

<u>Note:</u> The Company or its authorized representative reserves the right to inspect the PCUs/ Inverters at the manufacturer's site prior to dispatch.

5.2.4 Cables and Wires

i. All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions for 25 years and voltages as per latest IEC standards. (Note: IEC standards for DC cables for PV systems is under development, the cables of 1000- 1800 volts DC. DC cables for outdoor installations should comply with the EN50618 / TUV 2PfG 1169/09.07 or equivalent IS for service life expectancy of 25 years.

ii. Wires with sufficient ampacity and parameters shall be designed and used so that maximum voltage-drop at full power from the PV modules to inverter should be less than 1.5% (including diode voltage drop). PV Modules should be connected with USE-2/RHW-2 cables array to junction box conductors and junction box to photovoltaic disconnector with the THHN/THWN-2 sunlight resistant with 90ºC wet rated insulation cable. Due consideration shall be made for the de-rating of the cables with respect to the laying pattern in buried trenches / on cable trays, while sizing the cables. The Contractor shall provide voltage drop calculations in excel sheet.

iii. All cables shall be supplied in the single largest length to restrict the straight-through joints to the minimum number. Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. All wires used on the LT side shall conform to IS and should be of appropriate voltage grade. Copper conductor wires of reputed make shall be used. Armoured Aluminium cable connecting SMB and Inverter and also for lT applications are allowed.

iv. All cables shall be armored except Solar Cables. Solar cable shall be laid through MMS / DWC Conduits.

v. OFC cable shall be laid in DWC conduits.

vi. Ethernet cables shall be CAT-6.

vii. All wires used for connecting the modules and array should conform to the NEC standards. Modules should be connected with USE-2/RHW-2 cables array to junction box conductors and junction box to photovoltaic disconnector with the THHN/THWN-2 sunlight resistant with 90ºC wet rated insulation cable.

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

ix. Irrespective of utilization voltage and current rating all type of power cables shall be minimum of 1100 V grade PVC insulated conforming to IS 1554 / IS 694 for working

voltage less than 150 V control cable shall be of minimum 500 V grade, the control and power cable has to be laid separately. All LT XLPE cables shall confirm to IS: 7098 Part I. All HT XLPE Cables (33kV) Shall confirm IS: 7098 PART-2 & IEC -60287, IEC-60332 and the Contractor to submit technical data sheet, Voltage drop calculation, Power Loss Calculation and type test report for the approval of client.

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

Table 5-3 Relevant Codes & Standards for Cable

Sr.	Item	Relevant IS	Relevant IEC
1	Conductors of Insulated Cables	IS: 8130 - 1984	**IEC: 228**
2	Impulse tests on cables and their accessories		**IEC: 230**
3	Extruded solid dielectric-insulated power cables for rated voltage from 1 KV upto 30 KV.		**IEC: 502**
4	Test methods for insulations and sheaths of electric cables and chords.		**IEC: 540**
5	Test on cable over a sheath which has special protective functions and are applied by extrusion.		**IEC: 229**
6	Calculations of continuous current rating of cables (100% load factor).		**IEC: 287**
7	Cross-linked polyethylene insulated PVC sheathed cable for voltage from 3.3 KV upto 33 KV.	IS: 7098 (Part II)	
8	PVC insulation & sheath of electrical cables.	IS: 5831 - 1984	
9	Mild steel wires, formed wires and tapes for armouring of cables.	IS: 3975	
10	Electrical test methods for electric cables partial discharge test.		**IEC: 885(2) - 1987 (Part II)**
11	Methods of test for cables.	IS: 10810	

12	Common test methods for insulating and sheathing materials of electric cables.	**IEC: 811**
13	Impulse test on cables & other accessories	**IEC: 230**
14	Cable termination for gas insulated switchgear.	**IEC: 859**

5.2.5 TECHNICAL SPECIFICATION OF LT XLPE CABLES

General Constructional Features

The medium voltage cables shall be supplied, laid, connected, tested, and commissioned in accordance with the drawings, specifications, relevant Indian Standards specifications, manufacturer's instructions. The cables shall be delivered at site in original drums with manufacturer's name, size, and type, clearly written on the drums.

A. Material:

Medium voltage cable shall be XLPE insulated. PVC sheathed, aluminum or copper conductor, armoured conforming to IS: 7098 Part I.

B. Type:

The cables shall be circular, multi core, annealed copper or aluminium conductor, XLPE insulated, and PVC sheathed, armoured.

C. Conductor:

Uncoated, annealed copper, of high conductivity upto 4 mm size, the conductor shall be solid and above 4 mm, conductors shall be concentrically stranded as per IEC: 228.

D. Insulation:

XLPE rated 90° C. extruded insulation.

E. Core Identification:

Two core	:	Red and Black
Three core	:	Red, Yellow and Blue
Four core	:	Red, Yellow, Blue and Black
Single core	:	Green cable with Yellow strips for earthing

Black shall always be used for neutral.

F. Assembly:

Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.

G. Armour:

Galvanised steel flat strip / round wires applied helically in single layers complete with covering the assembly of cores.

- For cable size upto 25 Sq. mm. : Armour of 1.4 mm dia G.I. round wire
- For cable size above 25 Sq. mm. Armour of 4 mm wide 0.8 mm thick G.I strip

H. Sheath:

The cable shall be rated extruded for XLPE 90 deg.c. Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables.

Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp 50 deg. C and operating temperature of cables. The sheath shall be resistant to water, ultraviolet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black. Sequential length marking required at every 1.0 meter interval on outer sheath shall be available. The contractor has to furnish resistance / reactance / capacitances of the cable in the technical datasheet.

I. Rating:

1100 Volts or higher.

5.2.6 TECHNICAL SPECIFICATION OF HT XLPE CABLES

General Constructional Features

A. Conductors:

The conductor shall be of circular stranded Aluminium confirming to IS: 8130 & IEC: 228. It shall be clean, reasonably uniform in size & shape smooth & free from harmful defects. Any other form of conductor may also be accepted if in line with modern trends.

B. Semi-Conductor Barrier Tape/Tapes:

The semi-conducting barrier tape/tapes shall be provided over the conductors.

C. Conductor Screen:

The conductor screen shall consist of an extruded layer of thermosetting semi-conducting compound which shall be extruded simultaneously with the core insulation.

D. Insulation:

The insulation shall be super clean XLPE compound applied by extrusion and vulcanized to form a compact homogenous body.

E. Insulation Screen:

a. Each insulation have an insulation screen in two parts consisting of:

b. A water barrier tape/Non-metallic semi-conducting swellable tape part and a metallic screen part.

c. The non-metallic part shall be directly applied upon the insulation of each core and may consist of an impregnated but nylon/PVC tape or a similar approved material or, an extruded semi-conducting material extruded simultaneously with the conductor screen and insulation (triple extrusion).

d. The semi-conductor shall be readily strippable and must not be bonded in such a manner that it has to be shaved or scraped to remove.

e. The metallic part shall consist of a copper tape helical applied with a 30% overlap over the water barrier tape/blocking tape. A binder tape of copper shall be applied over the copper wire metallic screen.

F. Laying Up:

a. The cores shall be identified on the non-metallic part of the insulation screen by legible printing on the length of each conductor or, by the inclusion of a marker tape.

b. The cores shall be laid up with a right hand direction of lay.

c. Binder tape/Moisture barrier:

During layup, a suitable open spiral binder may be applied, at the manufacturer's discretion, before the application of an extruded inner covering.

G. Fillers:

Fillers shall be polypropylene.

H. Inner Covering/Sheath:

The inner covering shall be extruded over the laid-up cores to form compact and circular bedding for the metallic layer.

I. Metallic Layer:

The metallic layer shall be galvanized steel wire.

J. Outer Sheath:

The tough outer sheath, black coloured best resisting PVC polyethylene compound type ST-2 as per IS: 5831 for the operating temperature of the cable shall be provided over the armour as specified in relevant standards by extrusion process.

K. Cable Marking:

a. Embossing on outer sheath:

The following particulars shall be properly legible embossed on the cable sheath at the intervals of not exceeding one meter throughout the length of the cable. The cables with poor and illegible embossing shall be liable for rejection.

- JREDA Solar
- Voltage grade
- Year of manufacture
- Manufactures name
- Successive Length
- Size of cable
- ISI mark

xi. Packing and marking shall be as per clause No. 18 of IS 7098 (part I)/1988 amended up to date.

xii. Cables inside the control room and in the switchyard shall be laid in Galvanized Cable Trays mounted on mild steel supports duly painted, in constructed trenches with RCC raft and brick sidewalls and provided with removable RCC covers.

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

xiv. All cable/wires shall be provided with Punched Aluminium tags only. The marking on tags shall be done with good quality letter and number ferrules of proper sizes so that the cables can be identified easily.

xv. The wiring for modules interconnection shall be in the GI pipe /HD Pipe of approved make.

xvi. Data sheets of individual cable sizes (HT & LT) shall be submitted for approval by the Company. Drum numbers and drum length details shall be submitted with each consignment.

xvii. Cable end terminations and joint kits shall comply with the latest version of the relevant IS standard.

xviii. The cable ends shall be terminated with adequate size copper lugs and sockets etc, single/double compression cable glands. Cable glands shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. The metallic glands shall be earthed at two locations. Suitable lock type crimping lugs shall be used for cable end terminations. Where cables are raising from ground, suitable PVC pipe guarding shall be provided for cable raising with sealing of the guarding PVC pipe including a suitable clamp.

xix. HT cable termination kits and straight through joints shall be selected as per the cable specifications. Installation shall be as per the instructions given in the manufacturer's manual. Heat shrinkable type kits only shall be used for HT and LT cables.

xx. Data sheets of the joints and kits shall be submitted for approval by JREDA.

5.2.7 Clamps and Connectors

i. The bus-support clamps, spacers, T-connectors and various equipment connectors shall be supplied as per the enclosed drawings. The material to be used for these items shall be generally as per the technical specification of mentioned in NIB.

ii. The materials shall be of the best workmanship, and all the sharp edges and corners shall be rounded off. The thickness of tinning, wherever applicable, shall be not less than 10 microns. The minimum thickness of pads made of copper shall be 10 mm and those made out of Aluminium/Aluminium Alloy, shall be 12 mm, unless otherwise indicated in the specifications.

iii. All the clamps and connectors shall be designed to carry a continuous current not less than 125% of the rated current of the conductor (twin/single as the case may be)/equipment terminal to which these are to be connected. Temperature rise of the connector under the above condition shall not be more than 50% of the temperature of the main conductor/equipment terminal.

Table 5-4 Clamps & Connectors

Sr.	Application	Material
1.	Bolted type connection	

2.	For connection to ACSR/AAAC/ Aluminum terminal	Aluminum Alloy conforming to designate A6 as per IS 617
3.	For connection to copper terminals, with crimping facility to connect ACSR/AAAC jumper	Electrolytic grade copper, forged and tinned
4.	Crimping type connection	
5.	For connection to ACSR/AAAC jumper	Electrolytic grade aluminum

iv. All the fasteners (i.e. nut-bolts, washers, check-nuts, etc.) used in the clamps and connectors shall be of non-magnetic stainless steel. The straight bolts shall be fully threaded, and the U-bolts shall be threaded up to 30 mm from the ends. For connectors made out of Aluminium/Aluminium Alloy, the bolts shall be of 12 mm diameter, and for copper connectors the bolts shall be of 10 mm diameter.

v. The clamps and connectors meant for ACSR and AAAC (525 sq.mm) shall have the same crimping dimensions. It shall be possible to use the same clamp/connector for ACSR or AAAC, as would be required, without any modification/change at site.

vi. The length of bolt shall be chosen such that after fully tightening the nut and check-nut, minimum 5 (five) threads of the bolt shall project outside the nut/check-nut.

vii. As an alternative to the various types of clamps and connectors detailed under 2.0 above, the Contractors may offer connectors of Power Fired Wedge Pressure Technology (PFWPT). However, the same needs to be specified in the Bid.

viii. Connectors of PFWPT type shall meet the general requirements for various connections/joints as indicated in the relevant drawings.

ix. PFWPT type connectors shall comprise of:

a. Tapered `C' - shaped spring member

b. Wedge for connecting solid/stranded conductor, along with handle, suitable for connection between:

- Aluminium & Aluminium
- Copper & Copper

- Aluminium & Copper
- Aluminium & Al. Alloy
- Copper & Al. Alloy
- Al. Alloy & Al. Alloy

i. Components of the PFWPT type connectors shall be made of Aluminium Alloy suitably heat-treated to ensure that the required Mechanical & Electrical parameters are in line with ANS 1 specification no. C 119.4-1991. The connectors shall have `self-cleaning' capability during application. The connector shall ensure stable and low contact resistance under varying load conditions and the thermal cycling effects.

ii. The special tools and tackles required for installation of the PFWPT type connectors shall be identified in the offer. One set of these bolts and tackles shall be included in the scope of supply.

iii. The Contractor shall furnish the following information in their bill of material:

a. Availability of the PGWT connectors indigenously.
b. Unit rate of each item
c. Not-withstanding anything stated above, the final decision regarding acceptance of the type of clamps and connectors (conventional/PFWPT type) shall rest with JREDA

5.2.8 Structural Steel Work

i. The structural steelwork required for termination incoming 33 kV line/ Cable, equipment supports, lighting masts and for shielding towers together with all foundation bolts shall be included by the Bidder in its scope of work. The steel work shall be fabricated from galvanized structural sections. The height of structures for incoming line shall be as per the design developed by the Bidder and drawings submitted.

ii. The incoming line gantry shall be designed on the basis of ACSR conductor/Cable considered in the design and also considering that TRANSCO/ DISCOM terminal tower will be located at a distance of not more than 100 meters from the incoming gantry at SPV power station switchyard. The Bidder shall take into account wind load,

temperature variation etc. while designing the gantry structure. The column shall be provided with step bolts and anti-climbing devices.

iii. The entire structural steel work shall conform to IS: 802. The Bidder shall furnish design calculations for approval by Owner before procuring the material.

iv. The design of the switchyard towers, gantries and equipment structures shall also be designed in conformity with the standards followed by the Owner. Approval from the Owner also shall be obtained by the Bidder if required.

5.2.9 Hardware

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

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

iii. All drop-forged parts shall be free-from flaws, cracks, or other defects and shall be smooth, close-grained and of true forms and dimensions. all machined surfaces shall be true, smooth and well-finished. The thickness of all structural steel of Switchyard shall be minimum 80 microns measured at all points of the structure member when measured. No averaging is allowed. The gap between base plate of structural membersand concrete top of foundation shall be filled with GP-2 grouting material of reputed make. The material of all J-bolts shall be of 8.8 Class.

iv. All ferrous parts of hardware shall be galvanized in accordance with IS 2629. The galvanization shall withstand four dips of 1-minute duration each in copper-sulphate solution as per the test procedure laid down in the relevant ISS.

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

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

a. Danger Plates

vii. Size of each Danger Notice plates shall be 200 mm x 150 mm made of mild steel sheet and at least 2 mm thick, and vitreous enameled white on both sides and with inscription in signal red colors on front side as required. The inscriptions shall be in Hindi and English.

viii. Fire Extinguishing System.

ix. The installation shall meet all applicable statutory requirements, safety regulations in terms of fire protection.

x. 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. Bidder shall provide portable fire extinguisher as given below:

DCP Type (ABC type) (10 kg Cap)	CO_2 Type Hand 9 kg	Foam Type Hand 9 kg
1	1	1

xi. The minimum 1 no. of fire extinguishers shall be required for each inverter rooms and as per CEA and safety guidelines required numbers of fire extinguisher shall be kept at switchyard and control room. For outdoor installations type AB fire extinguishers can be used and for all indoor applications type ABC fire extinguishers shall be used.

xii. Sand bucket should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546.

5.2.10 Lightening Protection for PV Array

i. The source of over voltage can be lightning or other atmospheric disturbance. Main aim of over voltage protection is to reduce the over voltage to a tolerable level before it reaches the PV or other sub-system components as per IEC 62305, IS: 2309 – 1989 (Reaffirmed – 2005), Edition 3.1 (2006-01).

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

iii. The lightning conductor shall be earthed through flats and connected to the earth mats as per applicable Indian Standards with earth pits. Two earth pits shall be provided for each lightening arrestor. Each lightning conductor shall be fitted with individual earth pit as per required Standards including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, watering pipe using charcoal or coke and salt as required as per provisions of IS & Earth Resistance of Lightening System must be less than one (1) Ohm.

   a. If necessary more numbers of lightning conductors may be provided. The Contractor is also free to provide franklin rod / Early Streamer type of lightning arrestors on the MMS structure designed in such a way not to cast shadow on the next raw of solar PV modules. The Contractor to submit necessary calculations based upon rolling sphere method for the Lightening protection system.

The Contractor shall submit the drawings and detailed specifications of the PV array lightning protection equipment to JREDA for approval before installation of system.

5.2.11 AC Network

i. AC converted by the inverter is transmitted through the appropriate cables from the Inverter to appropriately sized Inverter transformer. In case of more than one Inverter transformer in a block, RMU shall be provided. Each individual block shall be connected to HT panel at MCR through AC cable. RMU panel should consist of adequate size indoor AC bus/ cable, which can handle the current and the voltage safely as per the relevant, IS standards. RMU panel should be equipped with adequate

protection relays, fuses, annunciations and remote operating and controlling facility from the Main Control Room. Relevant national & international codes to be follows :-

Table 5-5 Relevant National & International Code

Sr.	Item	Relevant IS	Relevant IEC
1	Power transformer	IS 2026	**IEC 76**
2	Fittings & Accessories	IS 3639	
3	Climate Proofing	IS 3202	**IEC 354**
4	Loading of Transformer	IS 6600	**IEC 296**
5	Oil	IS 335	**IEC 137**
6	Bushings	IS 20650	**IEC 144**
7	Degree of Protection	IS 2147	**IEC 76**
8	Testing, Tolerances on guaranteed Particulars	IS 2026	**IEC 76**
9	Buchholz Relay	IS 3637	
10	Electrical Insulation	IS 1271	**IEC 85**

ii. VCB/RMU panel shall be provided in Inverter room. It shall have circuit breaker of suitable rating for connection and disconnection of PCU from grid. The busbar shall connect the AC distribution board to the transformer. It shall have provision to measure bus voltage, current and power of the transformer.

iii. Bus-bars shall be of high conductivity Aluminium alloy or Copper of adequate size. The bus-bars shall be adequately supported by non-hygroscopic, non-combustible track resistant and high strength type polyester fibre glass moulded insulators. Separate supports shall be provided for each phase and neutral busbar. The bus-bars joints shall be provided with high tensile steel bolts, bellevelle washers and nuts, so as to ensure good contacts at the joints. The bus-bars shall be colour coded as per IS 375.

iv. The Bidder shall submit the detailed specifications of the AC bus and panel in the Bid.

v. The VCB/RMU panel with thermal over current and earth fault releases. The incomer shall be selected one size higher than the required rating as per Type 2 selection chart.

vi. Removable gland plates with gaskets shall be provided in the cable alleys for glanding the power and control cables. The distance between the gland plate and the incomer terminals shall not be less than 450 mm.

vii. The Contractor should submit theoretical design calculations and detailed explanations along with drawings shall be provided and approved by the Company.

33kV SUBSTATION BLOCK:

5.2.12 Step-Up Transformer

i. The Contractor shall provide the complete turnkey design, supply, erection, testing and commissioning of transformers and transformer substation to first step-up the output of the inverter to 33 kV at the location of the inverter. Project to have 33kV Indoor/Outdoor Metering Block. Each Step up Inverter Transformer must be connected with HV VCB/RMU Panel and cumulative of all the Step up Inverter Transformer must be connected with HV VCB/RMU panel for Metering. Provision of ABT meter to be provided at 33kV Four-pole structure near evacuation point.

ii. 3 phase, Oil Filled, 33 kV, 50 Hz, Power Transformers with min power rating 1.20 times of the selected inverter rating and associated Switchgear of approved make should be utilized. 33 KV transformers can be off-load tap change type. The transformers shall be suitable for outdoor installation with 3 phase 50 Hz 33 KV system and they should be suitable for service under fluctuations in supply voltage up to plus 10% to minus 15%. Maximum Three Winding transformer acceptable based upon Guaranteed Technical Parameter and Installation of the same must be minimum 5 Year old. For all category of transformers, similar rating of type test report is compulsory.

iii. Cumulative loss shall be as per IGBC guidelines. All electrical equipment and installation shall confirm to the latest Indian Electricity Rules as regards safety, earthing and other essential provisions specified for installation and operation of electrical plants.

iv. Relevant national and international standards in this connection are mentioned in Table 5 – 6.

v. All working parts, insofar as possible, are to be arranged for convenience of operation, inspection, lubrication and ease of replacement with minimum downtime. All parts of equipment or of duplicate equipment offered shall be interchangeable.

vi. The quality of materials of construction and the workmanship of the finished products/ components shall be in accordance with the highest standard and practices adopted for the equipment covered by the specification.

Table 5-6 General Standards for Transformers

IS: 2026 (Part 1 to 4)	Specifications for Power Transformer
IS: 2099	Bushings for alternating voltage above 1000 V
IS: 3639	Fittings and accessories for power transformer
IEC: 60076 (Part 1 to 5)	Specifications for Power Transformer
IS: 9921 Part 1 to 5	Alternating currents disconnectors (isolators) and earthing switches rating, design, construction, tests etc.
IS: 2705 Part 1 to 4 & IEC: 185	Current transformer
IS: 3156 Part 1 to 4	Potential Transformer
IS: 3070 part 1 to 3	Lightning arrestors
IS: 2544	Porcelain insulators for system above 1000 V
IS: 5350	Part III – post insulator units for systems greater than1000 V
IS: 5621	Hollow Insulators for use in electrical equipment
IS: 5556	Serrated lock washers – specification
IEC: 186	Potential Transformer

vii. All items of equipment and materials shall be thoroughly cleaned and painted in accordance with relevant Indian Standards. The finish paint shall be done with two coats of epoxy based final paint of colour Shade RAL 7032 of IS:5 for indoor equipment

viii. Any fitting or accessories which may not have been specifically mentioned in the specification but which are usual or necessary in the equipment of similar plant or for efficient working of the plant shall be deemed to be included in the contract and shall be provided by the Contractor without extra charges. All plant and apparatus shall be complete in all details whether such details are mentioned in the specifications or not.

ix. All equipment shall be designed for operation in tropical humid climate at the required capacity in an ambient air temperature of 50°C. Equipment shall be suitable for an ambient temperature of 50°C. Maximum relative humidity of 100% shall also be taken into consideration for design of equipment.

x. The reference ambient temperatures for which the transformers are to be designed are as mentioned in Table 5 – 7 .

xi. The rating and electrical characteristics of the MV / 33 kV Outdoor type transformer (typical) shall be as mentioned in Table 5 – 8 .

Table 5-7 Reference Weather Conditions for Transformer Design

Sr.	Particulars	Specifications
1.	Maximum ambient temperature	50 degree C
2.	Maximum daily average ambient temp	40 degree C
3.	Maximum yearly weighted average ambient temp	40 degree C
4.	Minimum ambient air temperature: (Cooling medium shall be Air)	Minus 5 degree C
5.	CLIMATIC CONDITIONS :	
5.1	Maximum relative humidity	51.6%
5.2	Yearly average number of thunder storms	Varies from 30 to 50
5.3	Average no. of rainy days per annum	60 days
5.4	Fog	The atmosphere is subject to fog for two month in winter
5.5	Number of months during which tropical monsoon conditions prevail	3 months
5.6	Dust storms	occur at frequent intervals
5.7	Average annual rainfall	140 cms
5.8	Maximum wind speed	180 kmph

Table 5-8 Rating and electrical characteristics of 33kV Power Transformer

Sr.	Particulars	Inverter Transformer (Outdoor type)
1	Continuous kVA ratings	As per design
2	Type	Oil immersed
3	Frequency	50 Hz
4	Type of cooling	Oil Natural Air Natural
5	No. of phases	Three
6	Rating voltage H.V. side	33 kV
7	Highest System voltage on H.V. side	36 kV
8	Rated voltage on L.V. side	Output of solar inverter
9	Vector Group	Dyn5/ Dyn11/As per recommendation of DisCom
10	Connections a) H.V. Winding b) L.V. winding	Delta Star
11	On load taps on H.V. Side (for H.V. Variation)	+ 5 to – 10.0 % (in steps of 2.5%)
12	Impedance voltage (%)as per IS 2026	4%
13	Minimum Creepage distance	31mm/ kV
14	Transformer connections	LV side – Bus Duct/ Busbar with weather proof enclosure, HV Side –Bushing with enclosure

5.2.13 Instrument Transformer

i. The instrument transformers i.e. current and Potential Transformers shall be single phase transformer units and shall be supplied with a common marshalling box for a set of three single phase units. The tank as well as top metallic shall be hot dip galvanized or painted Grey color as per RAL 9002.

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

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

iv. Current Transformer, Voltage Transformer, Circuit Breaker and Relays should match –Local distribution JREDA requirements.

5.2.14 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.

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

Type and Rating

a. The current transformer should be of outdoor/ indoor type, single phase, oil immersed, self-cooled and suitable for operation in 3 phase solidly grounded system.
b. Each current transformer should have the following particulars under the site conditions for the system under design (typical values for 33 kV systems are given).
c. General Parameters: 11/33kV CT.
d. Each current transformer should have the following particulars under the site conditions for the system under design (typical values for 11/33kV system are given).

Table 5-9 General parameters for 33 kV CT

Sr.	Particulars	Details
1	Highest System Voltage (Um)	36 kV rms
2	Rated frequency	50 Hz
3	System Neutral Earthing	Effective earthed
4	Installation	Outdoor/indoor(IP 65)
5	Rated short time thermal current	25 kA for 1 sec or appropriate thermal current as per design calculations
6	Rated dynamic current	63 kA (Peak) appropriate dynamic current as per design calculations
7	Rated min power frequency withstand voltage (rms value)	28/70 kV
8	Rated lightning impulse withstand voltage (peak value)	70/170 kV
9		
10	Minimum Creepage distance	25 mm/kV
11	Temperature rise	As per -IS 2705/1992
12	Type of insulation	Class A
13	Number of cores	Two (2) with One (1) protection core and one (1) metering core of accuracy 0.5 class
14	CT secondary current	Protection cores – 1 Amp. Metering Core – 1 Amp (With Highest Accuracy Class)
15	Number of terminals in marshalling box	All terminals of control circuits wired up to marshalling box plus 20 terminals spare
16	CT ratio & Rated VA Burden, short time thermal rating ,class of accuracy	Minimum burden required : 1. Metering core – 40 VA 2. Protection core – 10 VA

5.2.15 General Parameters of 33 kV PT

The Bidder has to furnish the specifications of 33kV PT with the Bid.

Table 5-10 General parameters for 33 kV PT

Sr.	Particulars	Details
1	Highest system voltage (Um)	36 kV
2	System neutral earthing	effective earthed
3	Installation	Outdoor (IP 65)
4	System fault level	Appropriate
5	Rated min power frequency withstand voltage (rms value)	28/70 kV
6	Rated lightning impulse withstand voltage (peak value)	70/170 kV
7	Standard reference range of frequencies for which the accuracy are valid	96% to 102% for protection and 99% to 101% for measurement
8	Rated voltage factor	1.2 continuous & 1.9 for 30 sec
9	Class of Accuracy	0.5 / 3P, IS3156/1992
10	Minimum Creepage distance	25 mm/kV
11	Stray capacitance and stray conductance of LV terminal over entire carrier frequency range	As per IEC:358
12	One Minute Power frequency Withstand voltage for secondary winding	3 kV rms
13	Temp. rise over an ambient temp. of 50 deg. C	As per IS 3156/1992
14	Number of terminals in control spare.	All terminals of control circuits wired Cabinet up to marshalling box plus 10 terminals
15	Rated total thermal burden	350 VA
16	Number of cores	2 (two) – 1 for protection and one for metering with 0.5 class accuracy.
17	Rated Output, insulation level, transformation ratio, rated voltage factor	Should be provided by the Contractor.

5.2.16 Circuit Breaker

i. The circuit breakers shall be capable of rapid and smooth interruption of currents under all conditions completely suppressing all undesirable phenomena even under the most

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

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

iii. Appropriate & adequate Capacity 415V AC indoor air Circuit Breaker as per the IEC 60898 / IEC 62271 – 100 or equivalent Indian Standards along with control circuit and protection relay circuit, fuses, annunciations and remote operating and controlling facility from the Main Control Room.

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

v. The circuit breaker shall be capable for breaking the steady & transient magnetizing current corresponding to 11/33 kV transformers. It shall also be capable of breaking line charging currents as per IEC- 62271-100 with a voltage factor of 1.4.

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

vii. The Bidder shall indicate in the Bid, the noise level of breaker at distance of 50 to 150 m from base of the breaker.

viii. The Bidder may note that total break time of the breaker shall not be exceeded under any duty conditions specified such as with the combined variation of the trip coil

voltage, pneumatic pressure etc. While furnishing the proof of the total break time of complete circuit breaker, the Bidder 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.

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

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

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

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

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

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

xv. Mounting and supporting structure for Circuit Breaker. The circuit breakers should be self-supporting type. However, if necessary for the purpose of minimum ground clearance the circuit breakers should be mounted on raised steel structures which should be included in the scope of supply of circuit breaker.

xvi. Following information and data for design of foundations from the supplier of the circuit breaker be obtained.

a. Dead weight per pole for complete circuit breaker
b. Static bending moments above the feet of each pole and for complete circuit breaker.
c. Static shear force at the foot of each pole and for complete circuit breaker
d. Maximum height of the steel supporting structure
e. Maximum diameter of the pole
f. Maximum horizontal force acting at upper terminal of each pole due to impact of closing/opening of the circuit breaker
g. Max. Impact loading in terms of equivalent static load both compression and upward due to opening/closing of the breakers. It shall be clearly stated whether these forces shall act simultaneously or at different timing.
h. No. of steel supporting columns provided for mounting the equipment.
i. The above data should represent static reactions for the worst windage or operation conditions. Circuit breakers whether of self-supporting type or on raised steel structure should ensure minimum sectional clearance (say 3500 mm for 33 kV).
j. Necessary connecting materials such as clamps, bolts, nuts, washers etc. and fixing bolts for mounting the equipment on the supporting structures wherever required should be obtained from the circuit breaker supplier.

xvii. **Applicable Standards:** The materials shall conform in all respects to the relevant Indian Standard Specifications/ IEC Standards, with latest amendments indicated below in Table 5 – 11.

Table 5-11 Applicable Standards for Circuit Breakers

Indian Standard	Title	International & Internationally recognized standard

ISS-13118/1991	General requirements for Circuit breakers for voltage above 1000 V	IEC 62271-100-1/2001
ISS-2705/1992	Current Transformers	
ISS-2099/1986	Bushings for alternating voltages above 1000 V	
ISS-2633/1964	Methods of testing uniformity of coating of zinc coated articles	
ISS-3231/1986	Electrical relays for power system protection	
ISS-1248/1983	Specification for Ammeters & Voltmeters	
ISS-335/1983	New insulating oils Electrical Clearances	IEC 71 (For oils in CTs)
ISS-2147/1962	Degree of protection provided by enclosures for low voltage switchgear & control gear	

xviii. **General Parameters of Circuit Breaker:** General parameters: Outdoor/ Indoor Vacuum type Circuit Breaker.

Table 5-12 General Parameters for Vacuum Type Circuit Breakers

Sr.	Particulars	Details
1	Type of circuit breaker	Vacuum type
2	Highest System Voltage	36 kV
3	Rated operating voltage	33 kV
4	Rated frequency	50 Hz (+3% to -5%)
5	Number of poles	Three (3)
6	Rated/minimum power frequency Withstand voltage	70 kV
7	Rated lightning impulse Withstand voltage	170 kV
8	Minimum Creepage distance	25mm/ kV
9	Rated operating duty cycle	0 - 0.3 sec. - CO – 3 min. – CO
10	Rated line charging breaking	As per IEC
11	Reclosing	Single and three phase high speed auto reclosing
12	Maximum fault level	25 kA (rms) for 1 sec.
13	Auxiliary contacts	As required plus 6NO and 6NC contacts per pole as spare.

14	Noise level	Maximum 140dB at 50m distance from base of circuit breaker
15	Seismic acceleration	g horizontal

xix. General Parameters of SF6 Insulated Ring Main Unit (RMU):

Table 5-13 General Parameters for SF6 Type RMU

Sr.	Particulars	Details
1	Type of Ring Main Unit	Metal enclosed, compact module, panel type, IEC 62271-200
2	Highest System Voltage	36 kV
3	Rated operating voltage	33kV
4	Rated frequency	50 Hz (+3% to -5%)
5	Number of poles	Three (3)
6	Rated/minimum power frequency Withstand voltage	70 kV
7	Rated lightning impulse Withstand voltage	170 kV
8	Rated Current Busbar	630A
9.	Insulation Gas	SF_6
10	Minimum Creepage distance	25mm/ kV
11	Rated operating duty cycle	0 - 0.3 sec. - CO – 3 min. – CO
12	Rated line charging breaking	As per IEC
13	Reclosing	Single and three phase high speed auto reclosing
14	Maximum fault level	21 kA (rms) for 1 sec. Or appropriate as per design
15	Rated Making Capacity	52 kA
16	Rated Breaking Capacity	21 kA
17	Auxiliary contacts	As required plus 6NO and 6NC contacts per pole as spare.
18	Noise level	Maximum 140dB at 50m distance from base of circuit breaker

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

xxi. Circuit Breaker protection against

- Over Current
- Earth fault
- Under voltage & over voltage protection
- Under frequency & over frequency
- SF6 gas pressure low (where applicable)
- DC supply failure

5.2.17 Protective Relays

i. The Solar PV system and the associated power evacuation system interconnections should be protected as per IEC 61727 Ed.2, norms. Over current relays, reverse power relays and earth fault relays have to be essentially provided as per technical requirements.. All relay should be numerical type & should be remote operating and controlling facility from the control room.

ii. The numerical relays shall have RS 485 port for communication.

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

iv. Detailed Design calculations shall be provided on fault power computations and the philosophy of protective relaying with respect to short circuit kA calculations. Design, drawing and model of protection relay shall be approved by the Company/Electricity Authority.

5.2.18 Earthing for PV Array

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

ii. The earthing system shall be designed with consideration of the earth resistivity of the project area. The earth resistivity values shall be measured prior to designing the

earthing system. Unless otherwise specified, earthing system shall be in accordance with IS: 3043 and IEEE 80, Indian Electricity Rules, Codes of practice and regulations existing in the location where the system is being installed.

iii. The permissible system fault power level at 33 kV also shall be kept in consideration while designing the earthing system. Each array structure of the PV yard, LT power system, earthing grid for switchyard ,all electrical equipment ,control room ,PCU, All junction boxes, ACDB& DCDB ,all motors and pumps etc .shall be grounded properly as per IS 3043 - 1987. All metal casing / shielding of the plant shall be thoroughly grounded in accordance with Indian electricity act / IE Rules.

iv. The earthing for array and LT power system shall be made of 3.0 m long 40 mm diameter perforated Cu/GI/ chemical compound filled, double walled earthing electrodes including accessories, and providing masonry enclosure with cast iron cover plate having pad-locking arrangement, chemical compound mix as required as per provisions of IS: 3043.

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

vi. Each string/ array and MMS of the plant shall be grounded properly. 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.

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

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

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

x. The Contractor should submit the earthing system design calculations along with the system layout for the Company's approval prior to the installation of the system

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

xii. Earthing Mesh is to prepared and installed in entire power plant.

5.2.19 Lightening Protection for PV Plant & Earthing

i. The source of over voltage can be lightning or other atmospheric disturbance. Main aim of over voltage protection is to reduce the over voltage to a tolerable level before it reaches the PV or other sub-system components as per IEC 60099 / IS: 2309 – 1989 (Reaffirmed – 2005), Edition 3.1 (2006-01). Lightening Protection System required for Solar PV Plant, Inverter Room, and Substation Structure & Control Room within the EPC scope of work. The intent of specification can be conventional as per IS : 2309 or can be Early Streamer Emission Type depending upon Area, Protected Equipment & Technical feasibility. Necessary concrete foundation for holding the lightning conductor in position to be made after giving due consideration to shadow on PV array, maximum wind speed and maintenance requirement at site in future. We recommended going with Early Stream Emission Air Terminal Technology as per NFC 17-102 / IEC 62305-2. Level of Protection must be defining as per Rolling Sphere Method LPL-I, LPL-II, LPL-III & LPL-IV where the radius shall be of 20mtr, 30mtr, 45mtr & 60mtr respectively.

ii. Rp(h) : Protection radius at a given height (h) Rp(h) = √ 2rh - h2 + Δ(2r + Δ) (for h ≥ 5 m) For h < 5 m, refer to the table below h : Height of the OPR tip above the surface(s) to be protected r(m) : Standardized striking distance Δ(m) = 106 .ΔT (OPR efficiency)

OPR radius of protection

Protection level	I (r = 20 m)			II (r = 30 m)			III (r = 45 m)			IV (r = 60 m)		
OPR	OPR 30	OPR 45	OPR 60	OPR 30	OPR 45	OPR 60	OPR 30	OPR 45	OPR 60	OPR 30	OPR 45	OPR 60
h (m)	Radius of protection Rp (m)											
2	19	25	31	22	29	36	25	32	39	28	36	43
3	29	38	47	33	42	52	38	48	58	43	57	64
4	38	51	63	44	57	69	51	65	78	57	72	86
5	**48**	**63**	**79**	**55**	**71**	**86**	**63**	**81**	**97**	**71**	**89**	**107**
6	48	63	79	55	71	87	64	81	97	73	90	107
8	49	64	79	56	72	87	66	82	98	73	91	108
10	49	64	79	57	72	88	66	83	99	75	92	109
15	50	65	80	58	73	89	69	85	101	78	95	111
20	50	65	80	59	74	89	71	86	102	81	97	113
45	43	65	78	58	75	89	75	90	105	89	104	119
50	40	65	74	57	75	88	75	90	105	89	104	120
55	36	65	72	56	75	88	74	90	105	90	106	120
60	30	65	69	52	75	85	73	90	104	90	106	120

ii. The lightning conductor shall be earthed through flats and connected to the earth mats as per applicable Indian Standards with earth pits. Each lightning conductor shall be fitted with individual earth pit as per required Standards including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, chemical compound as per provisions of IS.

iii. If necessary more numbers of lightning conductors may be provided as per design calculation

iv. The Contractor shall submit the drawings and detailed specifications of the PV array lightning protection equipment.

v. The design, manufacture, inspection, testing and performance of Lightning Arrester shall comply with all currently applicable statutes, safety codes, provision of latest Indian Electricity Act, Indian Electricity Rules and Regulations of Statutory Authorities.

vi. Contractor shall provide dedicated two earth pits for Lightening Arrestor as per relevant IS standard.

5.2.20 Isolators cum Earthing Switches, Contacts, Insulators, Busbars

i. This specification covers design, manufacture, testing and supply of. Manually operated 33 KV, 800 Amps Upright mounting type with manually operated with earth switch Isolators. The Isolators and Isolator-cum-Earthing Switched shall comply with the requirements of the IS: 9921 and IEC: 129 (latest edition) except specified herein. The Insulators shall comply with the requirements of IS : 2544 and IEC : 168-1988 (latest edition) for 33 kV pole mounted structure wherever required. 33kV polemounted structure would be supplied, installed and commissioned by the Contractor wherever required.

ii. The isolator shall be of the manual operated type with earthing switches and shall complete with all parts and accessories including insulator operating rods, mounting attachments, necessary for their efficient operation. The equipment shall confirm in all respect to high standards of engineering Equipment shall capable of performing in continuous commercial operation up to the suppliers guarantee in a manner acceptable

to the client, The equipment offered shall be complete with all components necessary for its effective and trouble free operation along with associated equipment's, interlock, protection schemes, etc. Such components shall be deemed to be within the scope of the Contractor's supply irrespective of whether those are specifically brought out in this specification or not. All similar parts particularly removable ones shall be interchangeable.

iii. Each pole shall have three Pedestal type of Insulator's stacks. Necessary arrangements shall be provided for proper alignment of the contacts. Gange operated links shall be so designed that all phases shall make and break simultaneously. The design of Isolators and Isolator-cum-Earthing Switches shall be provided for positive control of blades in all positions with minimum mechanical stress on the Insulators. Fixed guides shall be so provided that proper setting of contacts shall be obtained, when a blade is out of alignment even by 25mm in either direction. All movable parts which may be in current path shall be shunted by flexible copper conductor of adequate cross-section and capacity, which shall be furnished under bill of material.

Service Condition:

The 33 kV triple pole air break isolators are intended to be used primarily for sectionalizing 33 kV UG cable portion of the line with 33 kV overhead portion of the line.

Isolator shall confirm IS: 9921(Part 1 to 4) & IEC 600 - 129 "alternating current disconnects (Isolators) and earthing switches", and IS 9921 (Part-I to IV) "Specification for alternating current disconnects (isolators) and earthing switches for voltages above 1000V"

a. The moving & fixed contacts shall be made of hard drawn electrolytic grade copper strips and shall be heavy duty self- aligning & high pressure type preferably which applies pressure to the contact surfaces after the blades are fully closed and release the pressure before they start to open. High pressure type contacts shall wipe the contact surfaces, while opening and closing. The contacts shall be so designed that wiping, action shall not cause securing or abrasion on the contact surfaces. The wiping action shall be sufficient to remove oxide film, formed during the operation of the switches. The pressure shall be developed by rotation of the entire blade.

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

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

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

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

INSULATORS: The isolator shall be provided with solid core insulators.

i. These shall be of stacking type to be used. The dimensions and other parameters unless otherwise specified shall generally conform to IS - 5350-Part-11 & IEC 273.

ii. The cylindrical type post insulators shall be of solid core type. Insulators of similar type shall be interchangeable. The mechanical strength class for outdoor cylindrical post insulators shall be of strength class 6, corresponding mechanical strength in tension, compression and torsional shall be as per IS: 53550 Part - II. When operated at maximum system voltage, there shall be no electrical discharge. Shielding rings, if necessary shall be provided.

iii. The parameters of the insulators required shall conform to IS: 0350 - Part - II - 1973 or IEC 273.

iv. The cylindrical post insulators shall consist of single unit only.

v. The insulator shall be provided with a completely galvanized steel base designed for mounting on the support. The base and mounting arrangement shall be such that the

insulator shall be rigid and self-supporting and no guying or cross bracing between phase shall be necessary.

vi. **Porcelain of the insulator**:

a. The porcelain used for the manufacture of the insulators shall be homogenous, free from laminations and other flaws or imperfections that might effect the mechanical or dielectric quality and shall be thorough vitrified, tough and impervious to moisture. The glazing of the porcelain shall be uniform brown colour, with a smooth surface arranged to shade away rain water and free from blisters, burns and other similar defects. Insulators shall be inter-changeable.

b. The porcelain and metal parts shall be assembled in such a manner and with such materials that any differential thermal expansion between the metal and porcelain parts throughout the operating temperature range will not loosen the parts or electrical strength or rigidity. The assembly shall not have excessive concentration of electrical stress in any section or across leakage surfaces. The cement used shall not give rise to chemical reaction with metal fittings. The insulator shall be suitable for water washing by rains or artificial means in service conditions. Further the insulators to be supplied shall be of high- quality and should not result in mismatch and misalignment of stacks during erection and operation.

c. Each cap shall be of a high grade cast iron or malleable steel casting or steel forging. Cap and base insulators shall be interchangeable with each other. The insulator shall conform to the requirement of the latest edition of IS: 2544,or any other equivalent standard. The Bidder should furnish the characteristics of insulators in the Bid.

Busbars

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

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

iii. The ACSR bus bars are an underground system of wires strung between two supporting structures and supported by strain type insulators. The stringing tension may be limited to 500-900 kg. depending upon the size of the conductor used. These types of bus bars are suitable for earthquake prone areas.

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

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

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

vii. The isolator shall be provided with padlocking device to permit locking of the isolator in both fully open and fully closed positions.

5.2.21 Control & Relay Panel Specifications

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

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

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

- Metering, Indications & Controls
- Ammeter – 0..... A
- Ammeter selector switch
- Voltmeter – 0 – 12/36 kV
- Voltmeter selector switch

- Load manager to display the following parameters : MW, MVA, MVArh, MVAr Cos Ø, Hz,
- Indication lamps for R, Y, B phases, Breaker 'ON' (R), Breaker 'OFF' (G), Breaker 'TRIP' (A), Spring charged (W), Trip Circuit Healthy (B)
- TNC switch, spring return to neutral position shall be provided for circuit breaker operation.
- Local / Remote selection switch for circuit breaker operation
- Semaphore indicators (LED type) for CB and Isolator 'Open' & 'Close' positions
- Mimic diagram for the 33 kV systems with aluminum strips and 'ON' 'OFF' indications for isolators

5.2.22 Low Voltage Switchgear

i. This specification is for the 415V TP&N Power Control Centre (PCC).
ii. The PCC shall be rated for the maximum output of the supply transformer feeding the system.
iii. The short circuit withstand rating (1 sec) at rated voltage of the switchgear shall be minimum of 20 kA (rms) and corresponding dynamic rating shall be 50 kA (peak).
iv. The configuration of the PCCs shall be as per the Single Line Diagram of the system.

5.2.23 Execution

i. Single front / compartmentalized, modular design, degree of protection IP52 with provision of extension on both sides.
ii. Incomer feeders: mains incomer - Electrically operated draw out type Air Circuit Breakers (ACBs).
iii. Outgoing feeders : Electrically operated draw out type Air Circuit Breakers (ACBs) / Moulded Case Circuit Breakers (MCCBs)
iv. The color finish shade of switchgear enclosure for interior shall be glossy white & for exterior it shall be light grey, semi glossy shade 631 of IS: 5. If a different exterior shade is desired by the PURCHASER, the same shall be intimated to the supplier.
v. The PCC shall be fabricated out of CRGO sheet steel; 2 mm thick for the outer shall all-round. The internal walls and separators shall be of 1.6 mm thick CRGO sheet steel.

vi. The gland plates shall be 3 mm thick.

5.2.24 Control & Relay Panel Specifications for 415 V TP&N Power Control Centre (PCC)

i. This specification is for the 415V TP&N Power Control Centre (PCC).
ii. The PCC shall be rated for the maximum output of the supply transformer feeding the system. The short circuit withstand rating (1 sec) at rated voltage of the switchgear shall be minimum of 20 kA (rms) and corresponding dynamic rating shall be 50 kA (peak)
iii. The configuration of the PCCs shall be as per the Single Line Diagram of the system.

Execution

Power Control Centres (Construction)

a. Single front / compartmentalized, modular design, degree of protection IP52 with provision of extension on both sides.
b. Incomer feeders: mains incomer - Electrically operated draw out type Air Circuit Breakers (ACBs).
c. Outgoing feeders : Electrically operated draw out type Air Circuit Breakers (ACBs) / Moulded Case Circuit Breakers (MCCBs)
d. The colour finish shade of switchgear enclosure for interior shall be glossy white & for exterior it shall be light grey, RAL 7032 of IS: 5. If a different exterior shade is desired by the PURCHASER, the same shall be intimated to the supplier.
e. The PCC shall be fabricated out of CRGO sheet steel; 2 mm thick for the outer shall all-round. The internal walls and separators shall be of 1.6 mm thick CRGO sheet steel
f. The gland plates shall be 3 mm thick

Control Circuit

a. Control supply for breaker closing / tripping - 110V DC
b. Air Circuit Breaker spring charge motor – 240 V AC, 1 phase
c. Moulded Case Circuit Breakers – 240 V AC, 1 phase
d. Indications, annunciation – 110V DC

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

Busbar and Cable Cavity

a. The material for main bus bars and tap off bus bars shall be electrolytic grade aluminum with HR PVC sleeved insulation
b. Bus bars shall be suitable for short circuit rating and current suitable for all connected load.
c. Bottom cable entry for incoming and outgoing cables
d. A suitable gland plate shall be supplied for termination of power, control and instrumentation cables.
e. Whenever feeders are housed in multi-tier configuration, these tiers shall be segregated by sheet metal barriers

5.2.25 Control Room Electrical Wiring

i. Electrification of building shall be carried out as per IS 732-1989, IS 46481968 and other relevant standards. Suitable AC Distribution Board should be designed to Supply AC power in Control room.
ii. Control room AC distribution Board theoretical design, calculations and detailed explanations along with drawing shall be provided and approved by JREDA.

5.2.26 Auxiliary Power Supply

i. The Contractor shall install a separate 33 kV / 415 V step down transformer to supply power for internal equipment such as power for control equipment, area lighting, water pumps, and conference room fixtures, control room lighting and air-condition, etc.
ii. This auxiliary power should be utilized directly from the internal connection before the metering point of the solar PV Plant. A separate meter can be installed for auxiliary consumption just for internal accounting purpose.

5.2.27 DC Battery & Charger

i. Adequate capacity DC battery Bank should be provided for emergency control supply of inverters, control / protection system & emergency lighting. A

appropriate capacity battery charger with relevant IS/IEC standards & protection and automatic change over system should be provided to charge the battery bank along with relay circuit, fuses, annunciations and remote operating and controlling facility from the Main Control Room.

ii. A DC power supply Distribution panel/board should be supplied along with the Charger as per relevant IS standards. Control room DC Battery Bank & DC supply system theoretical design, calculations and detailed explanations along with drawing shall be provided and approved by JREDA.

iii. DC Batteries the batteries shall have the following specifications

a.	Type	:	Sealed LA type, storage battery
b.	Rating	:	110 V D.C., Minimum 80 Ah at 8 Hour rate of discharge
c.	Standard	:	IS 1651 – 1979 ; performance as per IS 8702
d.	Container	:	Plastic Resin, ABS or PP
e.	Terminal Post	:	Designed suitably to accommodate external bolted connections

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

v. The data sheet for the battery shall be submitted along with the Bid for evaluation.

5.2.28 Earthing

i. Earthing bus bar shall be terminated at both ends of the switchgear to suit the connections to outside earthing conductor. All components inside the module are required to be earthed individually and are to be looped and connected to the horizontal earth bus.

Terminals

a. CT circuit - Isolating link type terminals with shorting facility

b. PT circuit – clip on type terminals

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

Specific Requirements

1. All ACBs shall be 4 pole, electrically operated, draw-out type, with closing coil, spring charge motor, trip coil, TNC switch for close and trip, manual closing and tripping push buttons, door I/L, test and service position micro switches, emergency P.B., safety shutters, etc. The circuit breaker shall be provided with anti-pumping feature.
2. ACBs shall be complete with microprocessor release and shall be provided with over current, short circuit and earth fault protections.
3. Minimum10% spare feeders of each rating shall be provided in the switchgear.
4. All current transformers shall have 5/1A secondary and all meters shall be suitable for 5/1 A operation.
5. All indicating lamps shall be of LED cluster type. ACB feeders shall be provided with ON, OFF, AUTOTRIP, SPRING CHARGED, TEST, SERVICE, TRIP CIRCUIT HEALTHY indications
6. All indicating instruments shall be flush mounting, Digital, 96 sq.mm size.
7. Window annunciator with hooter and accept, test, reset button shall be provided. Necessary auxiliary relays for contact multiplication shall be provided in the panel.
8. The maximum temperature of the bus bars, droppers and contacts at continuous current rating under site reference ambient temperature of 50º C shall not exceed 105º C.

   Instrumentation: Switchgear instrumentation shall be provided as follows:

   a. Mains Incomer – Voltmeter with selector switch
   b. Ammeter with selector switch
   c. Power Factor meter
   d. Frequency meter
   e. TVM + MD meter
   f. Potential indicating lamps
   g. Outgoing Feeders
   h. Ammeter with selector switch on all feeders

5.2.29 General Technical Specifications of Control Panel

i. The panel shall be self-supporting, free standing, floor mounted, modular type with construction having degree of protection of IP 54 as per IS 2147.

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

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

iv. Stiffeners shall be provided at corners & between modules to make panel rugged. The stiffeners will necessarily be required for relay compartments or doors where heavy components are mounted.

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

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

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

viii. Panel shall be provided with fl. lamp of 20 w capacity operated by door operated limit switch. Panel shall also have space heaters and thermostat arrangement.

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

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

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

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

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

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

xv. Panel shall have provision of drawing pocket.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

xxxiv. All routine tests shall be carried out on the panel in presence of the Company / its representative. These tests shall include following:

a. Verification of components ratings and operation.
b. High voltage measurement test.
c. Insulation Resistance measurement.

xxxv. Control testing.

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

a. General arrangement drawing.
b. Wiring Diagram.

xxxvii. Detail bill of material.

5.2.30 Metering System

i. ABT energy meter shall be approved by JBVNL to measure the delivered quantum of energy to the grid for sale. The responsibility of arranging for the meter, its inspection/calibration/testing charges etc. rests with the Contractor. All charges incurred on Meter testing, shall be borne by the Contractor. ABT energy metering system is to be approved by JBVNL.

ii. Meter must be provided with the necessary data cables.

iii. Separate metering system has to be provided by contractor for measurements of auxiliary consumption.

iv. The Bidder shall provide ABT compliant meters at the interface points. Interface metering shall conform to the Central Electricity Authority (Installation and Operation Meters) Regulation 2006 and amendment thereof Commercial settlement of solar Photovoltaic Grid Interactive based power project shall be in accordance with the JREDA order.

v. Meter shall be suitable for interfacing for synchronizing the built-in clock of the meter by GPS time synchronization equipment existing at the station either through a

synchronization pulse received from the time synchronization equipment or through a remote PC synchronized to GPS clock shall also be in the scope of Bidder.

vi. All charges for testing and passing of the meter with relevant government agency shall be borne by Bidder, JREDA will assist Bidder for necessary document as and when required.

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

viii. Shall be microprocessor-based conforming to IEC 60687 / IEC 62052-11/ IEC 62053-22 / IS 14697

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

x. 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, and shall be connected to Class 0.2 CT cores and Class 0.2 PT windings.

xi. The active and reactive energy shall be directly computed in CT & PT primary ratings.

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

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

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

xv. The data shall be stored before being over-written for the following parameters or as per latest guidelines:

Table 5-14

Sr.	Parameters	Details	Min No of Days.
1	Net MWh	15 min Block	90 days in meter
2	Average Frequency	15 min Block	90 days in meter
3	Net MVARh for > 103 %	15 min Block	90 days in meter
4	Cumulative Net MWh	At every Mid-night	30 days in meter / 90 days in PC
5	Cumulative Net MVARh for v > 103 %	At every Mid-night	30 days in meter / 90 days in PC
6	Date and time blocks of PT failure on any phase		

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

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

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

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

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

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

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

xxiii. The meter shall have a unique identification code provided by the Company and shall be permanently marked on the front of the meter and stored in the non-volatile memory of the meter.

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

5.2.31 SCADA and Remote Monitoring System

i. The plant shall be automatically operated and shall be controlled by microprocessor based control system SCADA. There shall be simultaneous data logging, recording and display system for continuous monitoring of data for different parameters of different sub systems, power supply of the power plant at DC side and AC side.

Minimum Requirements of SCADA System for I/O Consideration

Sr. No.	Equipment Details	Location	SCADA Requirements			
			Monitoring / Status	Control / Operation	Data Logging	Specific Remarks
1	ABT Meter	33kv Metering yard	Yes		Yes	
2	Isolators	33kv Metering yard	Yes			
3	C & R	33kv Switchyard	Yes	Yes	Yes	Relay Log
4	Power Transformer	33kv Metering yard	Yes		Yes	Marshalling Box
5	Breakers	33kv Metering yard	Yes	Yes		
6	33kV VCB Panel	MCR	Yes	Yes	Yes	MFM Meters with RS485
7	DC Battery Charger	MCR	Yes			Battery Back Up Status
8	UPS	MCR / LCR	Yes			UPS Data Log
9	Aux. Transformer	33kv Metering yard	Yes			Marshalling Box
10	Fire Alarm Panel	MCR / LCR	Yes	Yes		
11	Inverter	LCR	Yes	Yes	Yes	Inverter Data Log

12	33kV VCB/RMU Panel	LCR	Yes	Yes	Yes	MFM Meters with RS485
13	Weather Monitoring Status	MCR	Yes		Yes	
14	Plant & Switchyard Lighting	Plant & 33kv Metering yard	Yes	Yes		Feedback through ACDB & Light ON/OFF Programming
15	CCTV	LCR / MCR / Plant / Switchyard	Yes		Yes	NVR based recording & data transmission
16	String Junction Box	Plant	Yes		Yes	Each String Monitoring

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

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

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

v. The data acquisition system shall measure and continuously record electrical parameters at inverter output, 33 kV ABT meter at evacuation point, ambient temperature near array field, control room temperature, AC and DC side electrical parameters of each inverter, power characteristics of the HT side.

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

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

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

ix. SCADA shall provide following data at a 5 -15 minute interval.

a. Power at 33 kV ABT meter at switchyard
b. Ambient temperature near array field.
c. Wind Speed
d. AC and DC side Power of each inverter
e. Solar irradiation/isolation
f. Voltage of the HT Side

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

xi. SCADA shall provide 15 minute daily, monthly and annual average of following parameters:

- Exported Energy to grid at 33 kV
- Energy of each inverter
- Solar Radiation
- Temperature

xii. The SCADA server PC shall be of Industrial type, rugged & robust in nature to operate in a hostile environment. The Industrial PC shall have minimum Intel Core i5 processor having 2 X 2 TB HDD with 8 GB RAM. The PC shall also have 42" TFT Color monitor, DVD Drive with Writer, USB drive, Scroll Mouse and UPS for 4 hours Power back up.

xiii. The printer shall be of industrial type, rugged & robust in nature and of reputed make. The printer shall be equipped for printing, scanning, copying and fax for A4 & Legal paper size

xiv. <u>String Monitoring System</u>: String Monitoring System designed exclusively for parallel connection of the photovoltaic field strings, allowing for protection in the case of breakdown & monitoring the entire photovoltaic field, by means of the following checks.

- Reading the string currents (10 channels available)
- Reading the total voltage of the field
- Checking the fuses positioned in the system, to protect the photovoltaic panels.
- Checking the state of the internal protection against over-voltages.
- Should be very low power consumption.

a. Monitoring of various parameters at string level should be made possible in the main control room at site by installing the suitable string monitoring system any fault at string level could be recognizable by that system.
b. A provision should be present for remote monitoring of the power plant at string detail over the web.
c. The Contractor shall provide to JREDA the detailed specifications, and all administrative rights/ privileges/ passwords to the string monitoring system.

xv. Weather Station and Data logger

a. Contractor shall provide the data over remote web-server with rights to control or modify the same through appropriate arrangements.
b. Contractor shall provide necessary licensed software and hardware solution to offer monitoring of electrical parameters of grid and solar generator monitored at individual string level over remote web server. The Contractor shall provide all necessary accessories like power supply, connection cords, sensors, active SIM card with appropriate data plan etc. so as to make the system complete in all respect.
c. The cost of data plan during the project and O&M shall be borne by the Contractor. At the end of the O&M, the same shall be transferred to JREDA at no extra cost.
d. It shall also have local data logging and communication through Bluetooth / Wi Fi and Ethernet port. Hardwire connection with Ethernet port is also acceptable.
e. The Remote Monitoring System shall be capable of sustaining maximum – minimum temperature, rainfall, wind gusts and UV radiation. The enclosure shall be IP65 for outdoor installation.
f. The Remote Monitoring System shall have capability to log and send data from weather sensors.
g. The data shall be available for every minimum 15 minutes interval.
h. The system shall have sufficient internal memory storage to retain data for one complete year and shall have provision of expanding memory through external memory card / USB drive.
i. The system shall be able to communicate wirelessly in a close proximity
j. The Contractor shall provide to the Company the detailed specifications, and all administrative rights/ privileges / passwords to the string monitoring system.

k. The Contractor shall provide following measuring instruments with all necessary software & hardware compatible with the Data logging and web based monitoring system. Reliable sensors for solar insolation, temperature & other weather & electrical parameters are to be supplied with data logger unit.

i. **Pyranometer**: The Contractor shall provide two no. of pyranometers for measuring incident global solar radiation, one each on the horizontal surface and in the same orientation (inclination and azimuth) as the photovoltaic modules. The pyranometers shall have following specifications mentioned in **tender.**

Table 5-15 Specification of Pyranometers

Sr.	Particulars	Specification
1	Class	II
2	Spectral Response	0.31 to 2.8 micron
3	Sensitivity	Approx. 9 micro - volt/w/m2
4	Time response (95%)	Max 15 sec.
5	Non-linearity	±0.5%
6	Temperature Response	±2%
7	Temperature Response	Max ±2%
8	Tilt error	±0.5%.
9	Zero offset thermal radiation	±7 w/m2
10	Zero offset temperature change	±2 w/m2
11	Operating temperature range	- 40 deg. to +80 deg.
12	Uncertainty (95% confidence Level)	Hourly- Max-3%
13	Daily-	Max -2%
14	Non-stability	Max ±0.8%
15	Resolution	Min + / - 1 W/m2
16	Input Power for Instrument & Peripherals	230 VAC (If required)
17	Output Signal	Analogue form which is compatible with the data

ii. Temperature Sensor: The Contractor shall provide suitable nos. of RTD type temperature sensors with required weather shield as per Indian Standards, so as to individually and simultaneously measure both, ambient temperature, and module temperature. To measure module temperature, the temperature sensors shall be located on the back of representative modules and on front glass surface. Care must be taken to ensure that the temperature of the cell in front of the sensor is not substantially altered due to the presence of the sensor. Instrument shall have a range of -5°C to 60°C.

iii. Anemometer and Wind Vane: The Contractor shall provide double cup anemometer on tubular type made up of hot dipped Galvanized Iron. Velocity range upto 65 m/s, accuracy limit of 0.1 m/s. the anemometer shall have valid calibration certificates which should be produced during one month of the installation.

iv. Each instrument shall be supplied with necessary cables. Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. The signal cable length shall not exceed 20m. Bidder shall provide Instrument manual in hard and soft form.

v. The data acquisition system shall measure, continuously record power at PV module ambient temperature near array field, cell temperature, wind velocity, AC and DC (string level) side power of each inverter, power characteristics of the HT side, fault messages, alarms etc. in Indian Standard Time.

vi. All data shall be recorded chronologically date wise. The data file should be MS Excel compatible. The data logger shall have internal reliable battery backup and data storage capacity to record all sorts of data simultaneously round the clock. All data shall be stored in a common work sheet chronologically. Representation of monitored data in graphics mode or in tabulation form. All instantaneous data can be shown in the Computer Screen.

vii. Provision should be available for Remote Monitoring and Data Retrieval over web server. Moreover, Successful Bidder shall also provide one no. of PC with required hardware and licensed copies of software to make it fully functional for normal operation and data logging through Bluetooth / Wi Fi / RS port from the site.

viii. The Bill of Materials associated with the equipment must clearly indicate especially the details about the PC and other accessories.

ix. The Data Acquisition System should be housed in appropriate enclosure to sustain outdoor environment as per generation design guidelines laid for enclosures. The same shall have provision of locking the same to prevent unauthorized operation. Remote Monitoring System (RMS) shall provide following data at a 15 minute interval.

- Power, Current and Voltage at individual solar PV strings (Instantaneous)
- Ambient temperature near array field, cell temperature measured at module front and back surface
- Wind Speed
- Cumulative AC and DC side Power of each inverter
- Cumulative AC and DC energy of each inverter
- Solar irradiation/isolation over horizontal and in-plane of the module
- Voltage, frequency and other important electrical parameters etc. in the local grid.
- Any other parameter considered necessary by supplier based on current prudent practice

x. All data shall be recorded chronologically date wise. The data file should be MS Excel compatible. The data logger shall have internal reliable battery backup and data storage capacity to record all sorts of data simultaneously round the clock. All data shall be stored in a common work sheet chronologically. Representation of monitored data should be in graphics mode or in tabulation form. All instantaneous data should be shown in the Computer Screen.

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

xii. RMS shall be provided with independent solar PV based power supply along with maintenance free battery having 3 days autonomy.

xiii. The RMS shall be compatible to the requirements for measuring and reporting the performance-ratio of the power plant.

xiv. The contractor shall provide all administrative rights/ privileges/ passwords of the RMS system to JREDA.

xv. The Bidder shall submit the data sheet with technical specifications of the RMS system in the Bid.

5.2.32 Testing Instruments for Electrical & Electronic:

The Contractor shall also provide required set of onsite testing instruments/equipment viz. earth resistance tester, rheostats, insulation tester, millimetres, clamp meters, CRO, Function Generator, Transformer oil BDV kit, Relay testing kit, infra-red thermal imaging hand held temperature meter, inverter testing kit etc.

5.2.33 Electronic LED Display Board:

The Contractor shall provide an electronic LED Display board that can display the Solar PV plant parameters like total generation till date, daily generation, instantaneous generation, instantaneous frequency, etc. The LED display board has to be erected at a height of 8 feet above ground level and should be large enough to be read from a distance. The LED display board is to be placed between the Control Room and the main gate, the exact location of which will be provided by the Company after award of the project.

Pixel pitch	**16.0 mm**
Brightness	6,500 nits
LED configuration	DIP / Equivalent
Pixel density	3,906/sqm 363/sqft
Viewing angle	H: 140 degrees V: -45/+15 degrees
Contrast ratio	2,000:1
Lifetime	80,000 hrs
Power consumption	Typical: 220W/sqm; 20W/sqft Max: 480W/sqm; 45W/sqft
Processing	16 bit/color
Refresh rate	4,800 Hz
Operating temperature	-20/+50 degrees Celcius; -4/+122 degrees Fahrenheit
IP rating	IP 65/54
Tile size (WxHxD) in mm	1,024 x 1,024 x 212 mm / 40.3 x 40.3 x 8.3 inches
Serviceability	Front or back
Certifications	CE, UL/ETL, FCC, CB/CEBEC, TUV GS, CCC, RoHs, WEEE

5.2.34 CCTV Camera System

The Contractor shall provide IP Based CCTV Camera for the Monitoring of Control Room, Plant Perimeter, Boundary, Entry & Exit Gates complete in all respect including necessary Camera, NVR, Switch, Active & Passive Components, Software, minimum 32" monitor etc. Minimum 08 Nos. of CCTV Camera of various Indoor / Outdoor with Night Vision Camera to install.

i. <u>Camera Specification (Outdoor) :</u>

1/3" CMOS HD sensor, Out Door Bullet H.264 Compression, 2 mega Pixels CMOS, 3DNR,The highest resolution can be up to 1920 × 1080 Low Lux, DWDR, Spport Voice talk, 1CH Audio in/1CH Audio Out, Mobile P2P Viewing, Support Protocal: TCP, UDP, IP, HTTP, FTP, SMTP, DHCP, DNS ,ARP, ICMP, POP3, NTP and RTSP, Support ONVIF 2.0, Lens : 2.8-12mm Megapixel lens (4-9mm lens optional), IR Distance: 20-30m, POE (802.3af). Support ROI function, Built-in Micro SD/SDHC/SDXC card slot, Ingress Protection level: IP66, Video Bit Rate 32 Kbps –8 Mbps, Audio Compression G.711/G.722.1/G.726/MP2L2,Dual Stream, BLC, ROI STANDARD: ONVIF, PSIA, CGI, ISAPI ,Operating Conditions -30 °C –60 °C (-22 °F –140 °F).

ii. <u>Camera Specification (Indoor) :</u>

1/3" CMOS HD sensor, Indoor Dome fix Lens H.264 Compression, 1.3 mega Pixels CMOS, 3DNR,The highest resolution can be up to 1280×960,Shutter Speed: 1/3 s to 1/100,000s, Min. Illumination:0.01Lux @ (F1.2, AGC ON) ,0 Lux with IR 0.028 Lux @ (F2.0, AGC ON) ,0 Lux with IR, Video Bit Rate 32 Kbps – 8 Mbps, Support Protocal: TCP, UDP, IP, HTTP, FTP, SMTP, DHCP, DNS, ARP, ICMP, POP3, NTP and RTSP, Support ONVIF 2.0, Lens : 3.6mm 1.3Mega Pixel Lens SD, 3DNR, D-WDR, Motion Detection, Privacy Mask, 24pcs LED,20m IR distance, POE(802.3af), Support Dual stream , Impact protection : IK10, operating condition, Support ROI, BLC, Standard : ONVIF, PSIA, CGI, ISAPI, Image Settings: Rotate mode, Saturation, Brightness, Contrast adjustable by client software or web browser , H.264 Type: Baseline Profile / Main Profile.

iii. CCTV Cameras along with monitoring stations (sufficient numbers) and all other accessories required for its proper operation must be installed to have complete coverage of following areas:

a) Main entry: Covering all the entry/exit 24 hrs,

b) Control Rooms: Covering Entry/Exit and activities within Control Rooms.

iv. Contractor has to propose the locations and number of cameras required for the Plant during bidding, however client's decision on number of cameras shall be final and quantity shall be max upto 10 numbers.

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

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

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

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

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

a) Video motion detection

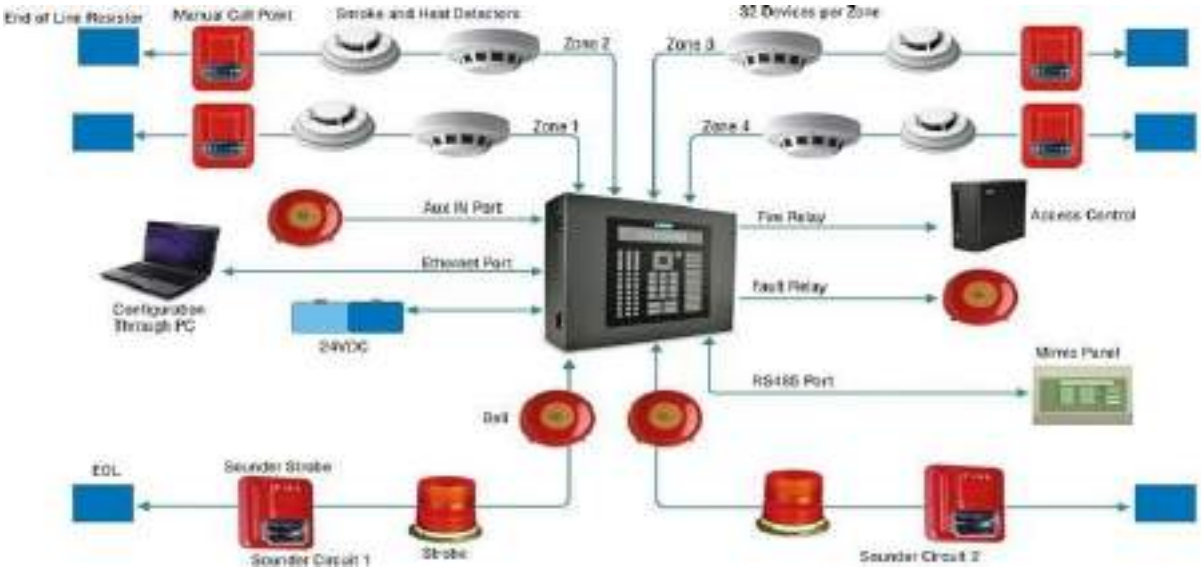
b) Object tracking

c) Object classification

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

5.2.35 Fire Alarm System

The contractor shall provide Fire Alarm System for LCT, MCR & Control Room as per local CFO's guideline.



Fire Alarm Panel : Integrated Fire Detection, Alarm and Control System with Voice Evacuation (EVAC) of UL listed Microprocessor based networkable analogue addressable Main Fire Alarm Control having required loop capacity, each loop having capacity of 159 addressable detectors and 159 addressable devices. Panel capacity can be expanded to additional loops by addition of modules or integrating multiple panels. Panel costs to include power supply, 24VDC power supply automatic battery charger, 24 volts sealed lead acid batteries sufficient for 24 hours normal working and then be capable of operating the system for 2 hours during emergency conditions. The system should be complete with user-friendly programming and configuration tools, front panel operating with a full QWERTY keypad and alphanumeric 640

character LCD display. The Panel as well as detectors and devices shall be UL 9th edition Approved/Listed and in conformance with international standards such as NFPA 72 2010 edition National Fire Alarm and Signalling Code for Human Life Safety. The complete system as a solution must be supplied from the same make/OEM manufacturer components conforming to these standards. The panel shall have the capability to integrate with SCADA on open protocol.

Smoke Detector: Analog Addressable Multi-Criteria Sensing Type Detector or Heat Detector as per application must be with mounting based LED, Address Switch inclusive of detector base and complete as required. All Detectors must be UL Listed & FM Approved.

Sounder : UL Listed Directional Sounders with 20 hz to 20 khz operating frequency with minimum 8 distinct sound patterns to indicate corridors, Exit doors, Move upward, move down ward etc. to direct Occupants for fast & safe Evacuation as specified in NFPA 72 - 2007 edition complete as per all requirements of technical specifications & contracts works.

Manual Call Point / Glass Break Device: UL listed, Flush or surface mounted Manual Call Point in manufacturers prescribed matching red enamel outlet box complete. All components must be of same manufacturing origine.

Monitor, Control Modules & Fault Isolators: UL listed, modules complete with mounting arrangement on North American junction box as per requirements of contract works.

5.3 DETAILED CIVIL AND OTHER NON-ELECTRICAL WORK

All material, installations, fixtures, accessories etc. to be provided shall be as per the relevant IS specifications. These shall be of best quality and of standard manufacturer as approved by the Engineer-In- Charge (EIC) on site, when there are no standard specifications.

The fresh OPC 53 grade cement (Ultratech /Ambuja /Binani /JK Lakshmi) and TMT steel reinforcement bars Fe 500D (TATA /Jindal /RINL /SAIL /Electrotherm) shall be used confirming to relevant IS specifications. In case the material make is not specified, the Contractor has to refer list of the approved manufacturers of the Company. In case there non availability of approved manufactures, Company's approval/consent needs to betaken.

The Contractor has to prepare bar bending schedule and cement consumption for the total project in advance and has to submit to the Company in hard copy and soft copy. The Contractor has to keep the full proof records of purchase and consumption along with original purchase bills of Cement and Steel as per the Company procedures and rules. TheContractor has to provide best workmanship with skilled manpower for all the civil items as per the standard specifications/ best practice as approved by the Engineer In-Charge (EIC) onsite. The booklet of Standard Specifications for Civil Works will be applicable wherever thereis dispute in the items of civil works. The Company will not supply any material for this work.

5.3.1 Topographical Survey:

The Contractor shall do topographical survey of the proposed site at not more than 10 m interval with the help of Total Station or any other suitable standard method of survey The formation levels of the proposed power plant have to be fixed with reference to High Flood Level of the proposed site. The ground level and plinth level of structures shall be fixed taking into consideration the highest flood level and surrounding ground profiles.

5.3.2 Soil Test:

i. Contractor is solely responsible to carry out detailed Geotechnical investigation to ascertain soil parameters of the proposed site for the planning / designing / construction / providing guarantee / warranty of all civil work including but not limited to foundations / piling for module mounting structures, HT lines, 33 kV switchgear equipment etc. The Contractor shall carry out soil investigation through Government approved / NABL certified soil consultant. These reports shall be furnished to the Company prior to commencing work. All RCC worksshall be provided of required grade of concrete as per relevant IS specifications as well as based on soil data considering appropriate earthquake seismic zone, wind velocity, whether effect, soil characteristics etc.

ii. The scope of soil investigation covers execution of complete soil exploration including boring, drilling, collection of undisturbed soil sample where possible, otherwise disturbed soil samples, conducting laboratory test of samples to find out the various parameters mainly related to load bearing capacity, ground water level, settlement, and soil condition and submission of detail reports along with

recommendation regarding suitable type of foundations for each bore hole along with recommendation for soil improvement where necessary. The Contractor shall provide certificate of foundation design and Module Mounting Structure (MMS) design from competent chartered structural engineer in support of the foundation and MMS design proposed by him. The design will be done based on considering the worst result among the bore holes. The Contractor has to carry out also Electrical Resistivity Test.

5.3.3 Foundations:

The foundations should be designed considering the weight and distribution of the structure and assembly, and a maximum wind speed of 180 km per hour. Seismic factors for the site also have to be considered while making the design of the foundation. Epoxy paint/ Bituminous paint to be applied to all open foundations and sulphur resistance cement for pile foundations below ground level that come in contact with excavated soil. All enclosed areas below plinth level have to be aback-filled with sand/ murram that has to be compacted so as to achieve proctor density of 95%. Excavated soil cannot be used for back-filling without being approved for use after testing in Government/ NABL accredited laboratory.

5.3.4 Designing of components:

i. The Contractor shall carry out Shadow Analysis at the site and accordingly design strings and arrays layout considering optimal use of space, material and man-power and submit all the details / design to Company for its review / suggestions / approval.
ii. The Contractor shall obtain and study earthquake and wind velocity data for design of module mounting structure, and considering all parameters related to the weathers conditions like Temperature, humidity, flood, rainfall, ambient air etc.
iii. RCC structures for control room, Pre-fabricated/engineered inverter rooms, Watchman's cabin, Security cabin shall be strictly as per relevant IS standards.

5.3.5 Storage, Construction Power and Water:

The Contractor shall also plan for transport and storage of materials at site and shall arrange for its own construction power and water. However, the contractor can avail construction power connection from DISCOM by applying for temporary connection for which he has to bear the cost. The Company will help with supporting documents. The Contractor can avail construction water by drilling a borehole and extracting required water. Canal water is restricted for construction and Operation and Maintenance purpose. All expenses for the same shall be borne by the Contractor.

5.3.6 Land Development and Cleaning:

From preliminary survey, the site is found to be less undulated. However, the Contractor shall visit the site and do the topographical survey to ensure land development work such that land is perfectly flat. Also, the Contractor shall take reasonable care to ensure that the plant is aesthetically designed. At any place if it required to do the filling than it should be filled by Muroom and compacted by vibro-roller such it is compacted upto 95% proctor density. Wherever filling is required it should be done in layer of 300mm. At any place if cutting is required then excavated earth shall be removed from the site and shall be disposed off as directed by EIC. The Contractor has to ensure that land is levelled and all excavated earth shall be removed from the site at the time of handing over the plant post commissioning. Contractor held responsible for damage to any part of Irrigational canal during construction & Operation and Maintenance Phase.

5.3.7 Watchmen / Security Cabin:

The Contractor shall provide one (1) number of pre-fabricated/engineered watchman's portable cabin near plant gate. The minimum size of watchman's cabin shall be of 3 metre x 3.5 metre and height of 3 metre with toilet unit and appropriate roof at the top. The Bidder shall provide detailed civil, electrical and its fixtures, plumbing and its fixtures, septic tank, soak pit etc. drawings and equipment specifications for the watchmen's cabin. The contractor shall have to provide One (1) table and Two (2) chairs with Light and Fan of reputed make for watchmen's cabin. The Contractor shall provide 6 (six) nos. of pre-fabricated security cabin of size 1.8 mtr. X 1.8 mtr x 2.4 mtr high with appropriate roof at top. Location of the watchman's Cabin and Security Cabin will be as directed by the JREDA.

5.3.8 Area Lighting:

i. Area lighting arrangement shall be made to illuminate the entire site with minimum 10 lux level for night hours or bad light hours. Area lighting arrangement shall have adequate numbers of lights poles (50 mm diameter with 3 mm thick at adequate spacing) on the sides of peripheral roads, etc.).

ii. The connector box shall be made of stainless steel, Dust & Vermin Proof, which is to be recessed at the base of each Yard Lighting system. The connector box shall have suitable brass or copper made connector terminal.

iii. The lighting fixtures with control gear shall be mounted on tubular poles of approved height and mounting arrangement.

iv. All the yard lighting towers and lighting fixtures shall be effectively grounded using adequate size of GI earthing wires / GI earthing strips.

v. The lighting poles shall be welded/bolted with the pole of the fencing to avoid shadow on the panels.

vi. The Area lighting shall be provided throughout the perimeter of the plant boundary (both side of the irrigation canal).

vii. The control gear box (non-integral type) shall be encased in the coping.

viii. Loop in – Loop out power cables shall be brought up to the control gear box through of adequate size for cable protection.

ix. The cables shall be properly glanded to the control gear box gland plate.

x. XLPE / PVC insulated armored Cu/Al cables of adequate size shall be used for interconnection and supply of power to Yard lighting systems.

xi. Cable terminations shall be made with suitable cable lugs & sockets etc, crimped properly and passed through brass compression type cable glands at the entry & exit point of the connector box and at the entry point to MCB distribution Box for controlling the yard lighting system.

xii. The lighting fixture should should be fixed with fencing pole such that it should not cast shadow on Solar PV panel..

5.3.9 Fencing:

The contractor shall provide chain link fencing with barbed wire at top to protect the entire plant premises for restriction the entry of trespasser's. The minimum height of the fencing at any point from ground shall be 1.5 mtr. The chain link of 50mm x 50mm diamond mesh of 10

gauge galvanized steel wire with 12 gauge barbed wires at top (02 numbers) is to be provided. The Contractor's shall be supplying, fabricating and fixing aligning vertical post of 75mm x 75mm x 6mm with cross bracing both side of ISA 45mm x 45mm x 5mm and both bracing shall be fixed by nut bolt assembly at intersecting point. Also line wire at top and bottom of chain link mesh of 8 gauge is to be provided. The chain link fencing shall be fixed in ground by minimum 450mm deep foundation. At bottom of the fencing, 230mm thick brick masonry of 150mm depth shall be provided to avoid entry of any animal from the bottom. The brick masonry shall be rested on 100mm thick of M15 grade Plain cement concrete. The brick masonry shall be covered by 12mm plaster in 1:4 Cement Mortar.

5.3.10 Main Entrance Gate:

An all-weather main gate with width of at least 4 meter and 2 meter height with sliding roller at bottom shall be erected at the entrance of the plant site. The gate shall be designed such that it should have aesthetic view by creating Arch type structure above the gate in which the Company's name shall be embossed. Same size of gate shall be provided on the rear end of the plant for providing access to Operation and maintenance team of Canal.

5.3.10 (I) Roads:

All internal roads shall be of Asphalt type. The Contractor has to design as per relevant IS, submit and take approval from the Company for Asphalt Road. The asphalt road should be constructed on One side of canal only. The Asphalt Road shall connect Control Room, Switchyard, all Invertor rooms and main gate. The asphalt road shall have sufficient courses like a subgrade, subbase, base courses, and surface course as per MORTH specifications. The width of asphalt road shall be of 3.75 metres plus 0.5 metres shoulders on both sides and with sufficient thickness for access of heavy equipment like transformers/ Inverters/ Switchyard equipment during construction as well as subsequent maintenance. Topof the road shall be 150mm above the Natural ground level.

5.3.11 Landscaping:

Landscaping of half (0.5) meter width on both sides of the road after shoulder from main gate till the Control Room is to be provided by the Contractor. It is recommended to use aesthetically pleasing plants and shrubs suitable to the local soil and climatic conditions.

5.3.12 Underground RCC / Sintex water tank:

The Contractor shall design the tank as per relevant IS codes, submit and take approval from Company and construct 10,000 litre. The underground RCC/ Sintex water tank shall have sufficient valves, plumbing fixtures and cleaning arrangement for tank from inside.If RCC tank is preferred then, design of RCC water tank shall be such that it shall resist Earthpressure and Water pressure and satisfy all IS codes.

5.3.13 Water supply:

The contractor shall have to drill one (1) number of bore holes for water supply including pipeline for carrying water from bore hole to storage tank, 1 numbers of electric panel for bore holes and total water cleaning system. The contractor shall have to liaze and take necessary approvals for drilling bore holes from concern authority. The cleaning system shall consist of

a. Pipe line network with valves. Pipe line network shall be design in such way that the sufficient water pressure shall be available at outlet/nozzle points. Pipe line shall be rested on proper reinforced foundation which should be minimum 300mm above ground and minimum 450mm below ground. Contractor shall have to provide Water softener plant if required. All necessary arrangement for cleaning of the solar panels shall be in the scope of the Contractor.

5.3.14 Prefabricated/engineered Inverter Room and RCC Control Room cum Conference Room:

i. All prefabricated structures shall strictly adhere to relevant IS standards towards construction, design, workmanship, materials and ergonomics. At the same time, it shall take into account the convenience and user needs.

ii. The Contractor shall provide to the Company detailed civil, electrical, plumbing, etc. drawings and equipment specifications for the inverter/ control room and take approval from the Company. The drawings of panels with the make of components should be approved from the Company.

iii. Pre-fabricated/ Reinforced Cement Concrete (RCC) Invertor Rooms: The Contractor has the option to construct either Pre-fabricated/engineered or RCC based Inverter Rooms. The details of each are as below:

Pre-fab Inverter Room shall be of adequate size and should of be of standard manufacturer with sufficient lighting points and RCC cable trenches with oil painted edge angle and checker plate covers and shall have exhaust chimney and also sufficient ventilation. It shall be designed for wind speed of 180 kmph. All prefab inverter room shall be laid on RCC plinth with sufficient foundation and 100mm reinforced grade slab with finished Kotah /Vitrified /Ceramic tile flooring and 100 mm skirting of same tiles. The plinth shall be minimum 450 mm high from formation level of the plant. Plinth protection shall be given throughout perimeter of width 1.2m for Inverter rooms . Sufficient steps at the entry of the room with finished Kotah on its top and ramp shall be provided for shifting the equipment in the rooms for all Inverter rooms, . Rooms shall be designed such that structural components shall not be visible from inside or outside after wall cladding work is completed. Rainwater pipe at various locations with gutter at the top shall be provided to discharge rainwater.

iv. RCC frame structure for Inverter Rooms shall have adequate size of footing, pedestal columns, plinth beam, grade slab with reinforcement as per relevant IS specifications considering seismic zone, wind and soil detail etc. The RCC Inverter Rooms shall have RCC cable trenches with oil painted edge angle and checker plate covers and shall have exhaust chimney and also sufficient ventilation. Flooring of Inverter Rooms shall be provided with finished Kotah /Vitrified /Ceramic tile flooring and 100 mm skirting of same tiles. Interior part of walls shall be applied with 12mm plaster above which two (2) coats of putty and distemper paint have to be applied. The exterior part of walls of Inverter Rooms shall be provided with 20mm plaster above which three (3) layers of weatherproof paint shall be applied. The plinth of the Inverter rooms shall be minimum 450mm high from the formation level of the plant. Plinth protection shall be given throughout the perimeter of width 1.2 m with rough kotah on its top. Also, Termite proofing is required before preparation of grade slab. Terrace water proofing treatment with china mosaic/bitumen layer is to be provided. The Inverter Rooms should have a terrace that is accessible through proper painted MS ladders. If pre-fabricated/engineered superstructure is adapted then Design of super-structure i.e. Steel

Structure like purlin, rafter, columns, truss etc. for fixing the PUF Panels conforming to relevant IS codes and of Jindal/ Tata/ RINL make. It shall include all necessary fitting like nuts, bolts, washers etc. of good quality. All structural steel shall be treated with two coats of red oxide and three coats of Oil paint (Asian Paints, Berger, Durex). The gap between base plate of structural members and concrete top of foundation shall be filled with GP-2 grouting material of reputed make. The material of all J-bolts shall be of minimum 8.8 Class.

The Insulated panels should be of required size for roof and walls. The insulated wall and roof panels shall be sandwich type. The panels shall be made out with 0.35mm thick pre coated steel sheet on both side of Poly Urethane Foam (PUF) for both wall and roof. The density of PUF shall be 40±2 kg/m3 and thermal conductivity shall be within range of 0.019-0.021 W/m˚K at 10°C. The total thickness of the panels for walls shall be 60mm and for roof is 40mm. The panels shall be joined together by tongue and groove method. The joints of the panels shall be filled with silicon or equivalent filling material. Panels shall be cuts such that the exposure of PUF and patch work is avoided. The fixing of the panels shall be such that there should not be any gaps at joints like wall and roof, wall to wall, etc. from which air and water particle can pass (Air and Water tight). Roof panel shall be extended 300mm from the eaves wall and 150mm from Gable walls. Rain water gutter shall be provided throughout the periphery with rain water pipes (CPVC pipes) with proper clamping at regular interval. Provision of future installation of Solar panels on the top of the roof shall be done by I or C section with Small base plate assembly

v. RCC Control Room cum Conference Room: It shall be of adequate size for fixing the panels, battery banks etc. with a) Conference room with conference table and chairs; b) SCADA Room with Work station with Desktop and Chairs; c) Store Room with Wardrobes; d) Pantry unit of sufficient size with sandwich type of platform with plumbing fixture and exhaust fan; e) Seperate Toilet units for Gents and Ladies; f) RCC cable trenches with covers and cable trays and all openings of cable entry shall have vemin proofing; g) False ceiling shall be provided in conference room, SCADA room, Store room and Passage etc.; h) Furniture like conference table, chair and sofa etc. for 10 persons; i) Lighting points and fixtures; and j) Plumbing fixtures. This Control Room

cum Conference Room should have a terrace that is accessible through proper RCC stairs.

vi. Control Room should have appropriate area for fixing necessary panels and battery banks, RCC cable trench with necessary trays with cover at top, necessary lighting points and should having sufficient height and ventilation. Conference Room also have adequate size SCADA cabin with necessary 2 numbers of work station with drowers of Godrej/ Durian/ Zuari make, 2 numbers Computer and 1 number of LED TV of 48 inch of Sony/ Phillips / Samsung make, 4 numbers of chairs for workstation and. Conference Room shall also be equipped with conference table of 10 persons with Power Sockets with 10 chairs of Godrej/ Durian/ Zuari/ Usha/ Lexus and sofas. In conference cum control room, except control room (where panels are fixed) all other rooms like SCADA cabin, conference room, store, pantry and passage shall have false ceiling of Gypsum board tiles with Armstrong suspended channel system. False ceiling shall be fixed such that at no place suspended ceiling system should be visible. Conference room shall be equipped with printer with scanner, phone, refrigerator (150 litre), projector and screen of 2m x 2m. All material, installations, accessories to be provided shall be of best quality and of standard manufacturer as approved by the EIC/ the Company. All units of the Control cum Conference Room shall have marked signage of SS sheet of 1mm along with engraving words and filled with black color.

vii. Flooring and skirting for Control cum Conference room: Best quality vitrified tile flooring having min size of 600 mm x 600 mm x 8-10. mm thickness with 100mm skirting of same tile of standard manufacturers as approved by EIC or as per approved make of the Company.

viii. RCC frame structure shall have adequate size of footing, pedestal columns, plinth beam, grade slab with reinforcement as per relevant IS specifications considering seismic zone, wind and soil detail etc. The exterior walls of Control cum Conference Room shall be provided with an exterior cladding of Aluminum Composite Panels (ACP). The plinth of the RCC Control room cum conference room shall be minimum 450mm high from the formation level of the plant. Plinth protection shall be given throughout the perimeter of width 1.2 m with rough kotah on its top. Also. Termite proofing is required

before preparation of grade slab. Terrace water proofing treatment with china mosaic/bitumen layer is to be provided.

ix. Prefab Inverter Rooms and RCC Control Cum Conference Room shall have sufficient number of lighting points /ACDB /MCB board along with fans, exhaust fans and lights of standard makes. All lighting points along with Fans, Lights shall be installed properly of standard makes.

x. Air Conditioner for Control Room cum Conference Room:

The control room shall be equipped with appropriate numbers of fans of Bajaj, Khaitan, Usha make for effective heat dissipation. The SCADA cabin shall have one (1) number split type air conditioning units of 1-ton capacity. Conference room shall have minimum 2 numbers of 1.5-ton capacity of split type of air conditioning unit. Make of the split type air conditioning units shall be of Samsung/ Voltas/ Videocon or Hitachi make.

5.3.15 Toilets:

Two Toilet units, one for ladies and one for gents in each Control Room cum Conference Room shall be constructed with following finish:

a. Floor : Vitrified tiles/ ceramic tiles
b. Dado: dado tiles shall be provided in Toilet units.
c. Door window: made out of aluminum sections, 6mm wired and float glass.
d. Ventilators: Mechanical exhaust facility with exhaust fans above it.
e. Plumbing fixtures : Jaquar/ DEE ESS/ Cera/ Perryware/ Kohler
f. Sanitary ware: Hindware/ Cera or equivalent make.
g. EWC: 390 mm high with health facet, toilet paper rolls holder and all fittings. (for ladies and gents separately).
h. Two (2) numbers of Urinals (430 x 260 x 350 mm size) with all fittings of Cera/ Hindware make.
i. Wash basins: 02 Nos. (550 x 400 mm) with all fittings of Cera, Hindware make.
j. Bathroom mirrors (600 x 450 x 6 mm thick) hard board backing of Saint Gobain/ Godrej make in each bathroom.

k. CP brass towel rail (600 x 20 mm) with C.P. brass brackets for each bathroom.

l. Soap holder and liquid soap dispensers for each bathroom.

m. Water Supply for Pantry & Toilets: GI pipes (B class) Tata/ Jindal or make approved by the Company. Overhead water tank shall be of Sintex or equivalent make of 1,000-litre capacity with proper resting facility.

n. Drainage for Toilets: Drainage pipes shall be of PVC (6 kg/cm2) Supreme, Prince or equivalent make. Gully trap, inspection chambers, septic tank for 10 person separate for control cum conference room and also soak well to be constructed for above mentioned requirement.

5.3.16 Doors and Windows for Inverter rooms, Control room and Security Cabin:

Doors and windows shall be made of aluminum sections. All sections shall be 20 microns anodized. Sections of door-frames and window frame shall be of 1mm thick of Jindal, Tata or make approved by client. Door shutters shall be made of aluminum sections and combination of compact sheet and clear float/ wired glass. The control room shall require a sufficient number of windows/ louvers to provide ventilation/ fresh air circulations. All fixtures like door closure, handles, locks, stoppers for doors and windows shall be of Dorma/ Kich /Godrej make. All windows of conference room shall be covered by roller blind curtains.

5.3.17 Module Mounting Structure (MMS):

i. The MMS should be designed for an optimum tilt angle so as to meet the offered NEEGG. The angle should be systematically optimized for maximum energy generation throughout the year based on location and local weather variables for each module technology.

ii. The bottom level of MMS from the top of canal bank should be minimum 2000 mm to facilitate the safe working of the heavy machineries like JCB/Excavators.

iii. The Module mounting structures of simply supported, cantilever or any other are acceptable. The cement used in foundation shall be sulphur resistance. The termination level of foundation shall be below the bed of the canal.

iv. At every 500 mtr, suitable gap of shall be kept between module mounting structures for equipment access in canal for operation and maintenance purpose.

v. After every two tables there should be provision of walkway within the structure for cleaning purpose of module. Steps shall be provided for accessing the walkway.

vi. The MMS should be safe, and designed to allow easy replacement of any module and easy access to the O&M staff. It should be designed for simple mechanical and electrical installation, should support Solar PV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly and there should be no requirement of welding or complex machinery at site.

vii. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from Solar PV panels at the same time it will withstand wind as the wind zone of the area.

viii. The structure shall be designed for simple mechanical and electrical installation. It shall support Solar PV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site and is strictly not allowed.

ix. Seismic factors for the site to be considered while making the design of the foundation/ramming etc. or any technology. The design of array structure shall be based on soil test report of the site and shall be approved from the Company.

x. Modules shall be mounted on a non-corrosive support structures (EPDM rubber gasket is to be provided as separator). The frames and leg assemblies of the array structures shall be made of hot dip Galvanized steel as per ASTM A123. Equivalent material to hot dip Galvanized Steel as per IS4759 shall also be considered.

xi. In case of galvanization of structures, specific requirement for thickness of galvanization should be at least minimum 80 microns at any point of the galvanized structure. Galvanization shall be measure with elcometer or the material can be sent for testing laboratory. No averaging is allowed for measuring the thickness of galvanization. Inner side galvanization with same specification of any hollow components of module mounting structure is mandatory.. For

xii. All fasteners shall be of Stainless steel - SS 304 OR SS 316 OR High Strength Fasteners having equivalent or higher tensile strength then SS 304 fasteners and shall have acid resistance properties. Nut & bolts, supporting structures including the entire MMS shall have to be adequately protected against all climatic condition.

xiii. Modules shall be clamped / bolted with the structure properly. The material of construction shall be Al / Steel. Clamps / bolts shall be designed in such a way so as not to cast any shadow on the active part of a module.

xiv. Modules shall be isolated electrically from the MMS and all the modules shall be separately earthed through proper earthing using continuous copper conductor as per appropriate IS but not less than cross section area of 6 Sqmtr.. Module to module earthing is mandatory.

xv. Module mounting structures shall also be earthed through proper separate earthing.

xvi. The material of construction, structural design and workmanship shall be appropriate with a factor of safety of not less than 1.5.

xvii. The Contractor shall provide to the Company the detailed design, specifications and calculations of the MMS and take approval from the Company.

xviii. The Contractor shall specify installation details of the Solar PV modules and the support structures with appropriate diagrams and drawings.

xix. The Module Mounting Structure design shall be certified by a chartered structural engineer and it is mandatory.

xx. The structures shall be designed for simple mechanical and electrical installation. It shall support solar PV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly.

xxi. String Cables should be passes from Pipes and Cable-ties shall be used to hold and guide the Pipes (cables/wires) from the modules to inverters or junction boxes.

xxii. The Contractor shall provide to the Company the detailed design, specifications and calculations of the MMS.

xxiii. The Contractor shall specify installation details of the Solar PV modules and the support structures with appropriate diagrams and drawings.

xxiv. The Bidder shall be permitted ramming of the module mounting structure provided that they obtain consent of JREDA. JREDA shall provide such consent once it is convinced that such ramming shall not in any way deteriorate the strength of the structure and shall not reduce the structure's strength to enjoy a working life of more than 25 years.

xxv. Civil foundation design for Module Mounting Structures (MMS) as well as control room, invertor room shall be made in accordance with the Indian Standard Codes and soil conditions, with the help of Chartered Structural Designer having substantial experience in similar work. The Successful Bidder shall submit the detailed structural design analysis along with calculations and bases/ standards in the Bid.

5.3.18 Structural Steel Work:

i. The structural steelwork required for termination incoming 33 kV line/ Cable, equipment supports, lighting masts and for shielding towers together with all foundation bolts shall be included by the Bidder in its scope of work. The steel work shall be fabricated from galvanized structural sections. Specific requirement for thickness of galvanization should be at least/ minimum 80 microns at any point on any component of module mounting structure when measured.

ii. The height of structures for incoming line shall be as per the design developed by the Bidder and drawings submitted.

iii. The incoming line gantry shall be designed on the basis of ACSR conductor/Cable considered in the design and also considering that terminal tower will be located at a distance of not more than 100 meters from the incoming gantry at SPV power station switchyard. The Bidder shall take into account wind load, temperature variation etc. while designing the gantry structure. The column shall be provided with step bolts and anti-climbing devices.

iv. The entire structural steel work shall conform to IS: 802. The Bidder shall furnish design calculations for approval by the Company before procuring the material.

v. All structure pertaining to 33 kV switchyard have to be applied outdoor with white paint (lime wash).

5.3.19 Hardware

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

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

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

iv. All ferrous parts of hardware shall be galvanized in accordance with IS 2629. The galvanization shall withstand four dips of 1-minute duration each in copper-sulphate solution as per the test procedure laid down in the relevant ISS.

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

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

5.3.20 Fire Safety:

i. Fire Extinguisher

Liquefied CO2 fire extinguisher shall be upright type of capacity 10 kg having IS: 2171. 7 and 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.

ii. Fire Alarm System:

Buildings shall have fire detection and alarm system installed as per relevant standards and regulations. The installation shall meet all applicable statutory requirements, safety regulations in terms of fire protection.

1. The minimum 2 no. of fire extinguishers (CO_2 and Foam type each) shall be provided at every buildings/enclose, however Contractor must comply with

existing building code for fire Protection by NFPA, IS & State Fire Protection Department.

2. Sand bucket should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546 at strategic locations

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

4. 4 No. of Bucket stands with four buckets on each stand shall be provided in the Transformer Yard.

5.3.21 Sand Buckets:

Sand buckets should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546. Bucket stands with four buckets on each stand shall be provided in the Transformer Yard, Switchyard, Inverter Rooms, Control Cum Conference room, Security cabin and one (1) number each for the area covered by 1 MW for a plant.

5.3.22 Sign Boards:

The signboard for nomenclature of sufficient size which can visible from a distance containing brief description of various components of the power plant like switchyard, control room, invertor room etc. as well as the complete power plant in general shall be installed at appropriate locations of the power plant. Contractor shall also provide signage for fire and safety wherever required. The Signboard shall be made of steel plate of not less than 3 mm thick. Letters on the board shall be with appropriate illumination arrangements. The Contractor shall provide to the Company, detailed specifications of the signboards. The language of instructions shall be English/ Hindi as per JREDA's approval.

5.3.23 General Guideline:

Any civil or electrical work, which is not mentioned or included in this Tender Document but necessary for the plant shall be borne by the Bidder. Successful Bidder shall prepare all designs / drawings have based on the specifications given in the Tender and in light of relevant BIS standard. The Company reserves the right to modify the design at any stage, to meet local site conditions / project requirements. All work shall be carried out in accordance with the latest

edition of the Indian Electricity Act and rules formed there under and as amended from time to time.

Disclaimer:

1. Any civil / electrical / other work, which is not mentioned or included in this Tender Document but necessary for the plant shall be borne by the Bidder. All specifications mentioned in this Tender indicates minimum technical requirement.
2. The Contractor may propose alternate specifications or design though the final acceptance of the same is subject to the Company's discretion.
3. Unless otherwise specified, all equipment and materials shall confirm to the latest applicable Indian Standards. Equipment complying with any other International Standards will also be considered if it ensures performance of equipment equal to a superior to Indian Standard.

--- End of Section ---

6 General Terms and Conditions

6.1 Use of Contract Documents & Information

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

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

6.1.3 Any document other than the Contract itself shall remain the property of JREDA.

6.2 Patent Rights

6.2.1 The Contractor shall indemnify JREDA against third party claims of infringement of patent, trademark or industrial design rights arising from use of goods/design or any part thereof.

6.3 Materials and Workmanship

6.3.1 All materials shall be of the best quality and workmanship capable of satisfactory operation under the operating and climatic conditions as may be specified. Unless otherwise specified, they shall conform in all respect to the latest edition of the relevant Bureau of Indian Standard (BIS) specification wherever Indian specifications apply or British Standard (BS) or International Electro-technical Commission (IEC) or internationally accepted standard.

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

6.3.3 If the Contractor offers equipment manufactured in accordance with other international well recognized standards, he shall, in that case, supply a copy in English of the Standard Specification adopted and shall clearly mention in what respect such standard

specification differs from Indian Standard Specifications. The plant, equipment, and materials offered by the Contractor should comply with one consistent set of Standards only as far as possible.

6.3.4 No deviation in foreign exchange rate shall be admissible at any point of time after submission of the Bid.

6.4 Inter-changeability

6.4.1 All the parts shall be made accurately to standard gauges and specifications so as to facilitate replacement and repairs. All corresponding parts of similar apparatus shall be inter-changeable.

6.5 Packing and Marking

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

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

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

6.6 Negligence

6.6.1 If the Contractor neglects to manufacture or supply the plant and equipment with due diligence and with expeditiousness or refuses or neglects to comply with any reasonable order given to it in writing by JREDA or contravenes any provisions of the Contract, JREDA may give Seven (7) days' notice in writing to the Contractor, to make good the failure, neglect or contravention complained of. If the Contractor fails to comply with the notice within reasonable time from the date of serving thereof, in the event of failure, neglect or contravention capable of being made good within that time, then in such case, if JREDA thinks fit, it shall be lawful for it to take the manufacture or supply of plant wholly or in part, out of the Contractor's hand and give it to another person on Contract at a reasonable price and JREDA shall be entitled to retain any balance which may be otherwise due on the Contract by it to the Contractor or such part thereof as may be necessary, to the payment of the cost of manufacture or supply of such plant as aforesaid.

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

6.7 Statutory Responsibility

6.7.1 The Contractor shall comply with all applicable laws, by laws, rules, and regulations and shall procure and maintain their validity all necessary Municipal, Panchayat and Government permits & licenses etc. at its own cost.

6.8 Insolvency and Breach of Contract

6.8.1 JREDA may at anytime by notice in writing summarily terminate the Contract without compensation to the Contractor in any of the following events:

a. If the Contractor at any time, is adjudged insolvent or have a receiving order or order from administration of its state made against it or shall take any proceeding for compensation under any Insolvency Act for the time being in force or make any conveyance or assignment with its creditors or suspend payment. If the Contractor being a company is wound up voluntarily or by the order of a court or a Receiver,

Liquidator or manager on behalf of the Debenture holder is appointed or circumstances have arisen which entitle the Court or debenture holder to appoint a Receiver, Liquidator or Manager.

6.9 Timeline

6.9.1 The Contractor shall provide full programme of the supply in detail 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.

6.9.2 The work must be completed as per the Timeline below from the date of handing over of site.

Sr.	Stage	Reference from Zero Date ("D")
1.	Issue of Letter of Intent	D
2.	Completion of site developmental work	D+30
3.	Approval of major drawings	D+60
4.	Completion of supply of major balance of system	D+130
5.	Completion of supply of PV modules	D+160
6.	Installation and interconnection of all major equipment	D+180
7.	Interconnection and testing of entire plant	D+200
8.	Commissioning of entire plant	D+210
9.	Operational Acceptance Test & Completion of Facilities (Tentative)	D+240
10.	Security Deposit Test-cum-Final Acceptance Test (Tentative)	D+605

6.9.3 The Contractor shall also provide a Bar/ PERT Chart indicating completion schedule for various items involved in the work within the stipulated completion period and the Contractor should strictly adhere to that schedule.

6.9.4 The issue of LoI shall be considered as the Zero Date

6.9.5 The Bar/ PERT Chart provided by the Contractor shall submitted to JREDA for approval prior to commencement of the execution of the Project. All comments and modifications provided by JREDA shall be incorporated and adhered to by the Contractor in the Timeline, Bar/ PERT Chart, detailed execution plan, etc. for execution of the Project.

6.9.6 This schedule shall be prepared so as to ensure the commissioning of complete plant within 180 days from issue of LoI.

6.9.7 Partial commissioning of the solar PV plant shall not be considered.

6.10 Delay in Execution or Failure to Supply

6.10.1 Any delay in completion of the work shall attract liquidated damage/ penalty for late completion as per Liquidated Damage Clause 6.11 of this Tender.

6.10.2 If the Contractor fails to deliver the plant or fails to start the work within specified time frame after issue of LoI or leaves the work site after partial execution of the work, JREDA shall have the right to get the work done through any other agency at the risk and cost of the Contractor. Further to this, JREDA may, without prejudice to the right of the Contractor to recover damages for breach of trust of the Contract, may impose penalties.

6.11 Liquidated Damages for Delay and Underperformance

A. <u>Delay in Commissioning</u>

6.11.1 In case the Contractor fails to achieve successful Commissioning of plant by the due date indicated in Timeline Clause 6.9.2, then JREDA shall levy the Liquidated Damages on the Contractor (wherein partial commissioning shall not be accepted).

6.11.2 The Liquidated Damages levied to the Contractor at half percent (0.5%) of EPC Contract Value (including taxes & duties) for delay of one (1) week or part thereof upto maximum of ten percent (10%) of EPC Contract Value.

6.11.3 The maximum time period allowed (with penalty) delay for Commissioning of the Project shall be five (05) months from the date of schedule date of commissioning. In case of delay for more than five (05) months, JREDA may terminate the Contract and get the Project complete by other suitable agency at the risk and cost of the Contractor.

6.11.4 For calculation of penalty, date of LoI shall be the reference date.

B. Underperformance

At the time of the Operational Acceptance Test, any shortfall in the Performance Ratio (PR) as determined through the Test Procedure in the Appendix 15: Procedure for Performance Testing will attract imposition of Liquidated Damages. For any shortfall in PR below 0.75 by the bidder, a penalty of 1% of the EPC Contract Value (including taxes & duties) shall be levied. In case if the first Test is unsuccessful then penalty shall not be charged but the Contractor has to make the necessary corrections to conduct the test again within the stipulated maximum 60 days. In the second (2nd) time, a penalty at the rate specified above shall be levied on the Contractor. The penalty shall be deducted from the pending payment and Performance Bank Guarantee. However, if Contractor feels that NEEGG may not be achieved and want to carry out further correction, the same will be allowed for the one more time i.e. 3rd time but PG Test and O&M period shall start from such later date as mentioned in Point No. A (xi) in NIT; Table Pg. 4. However, if the Contractor fails in the 3rd attempt as well then, the penalty deducted at the time of 2nd unsuccessful attempt shall not be returned and the Operation Acceptance Test shall be deemed completed.

C. Security Deposit Test / Final Acceptance Test

6.11.5 If the "Actual Delivered Energy" at metering point is less than the base NEEGG (corresponding to NEEGG quoted for 1st year of O&M) based on the procedure mentioned in the Appendix 16, then the penalty at a rate of Rs. **[Tariff as per JREDA's PPA *1.50] per kWh** shall be charged for the shortfall. The Bidder/ Contractor shall make necessary correction to meet quoted NEEGG. In case contractor fails to pay penalty as above within 30 days, then the entire Performance Bank Guarantee shall be en-cashed by the Owner and all the remaining payments yet to be made by the Owner to the Contractor shall also be forfeited.

6.12 Penalty for Loss of Generation during O&M

6.12.1 For each Contract Year, the Contractor shall demonstrate "Actual Delivered Energy" at the Metering Point as compared to the '*Base NEEGG'* for the particular year (calculated as per the methodology given in Appendix16).

6.12.2 If for any Contract Year, it is found that the "Actual Delivered Energy" is less than 'Base NEEGG' for the particular year, the Contractor shall pay the compensation to JREDA equivalent to Rs**. [Tariff as per JREDA's PPA *1.50] per kWh** of under-generation. In addition, JREDA will also recover from the Contractor, the full penalty (including the charges of Renewable Energy Certificate) imposed by the Company's Power Purchaser on the Company due to less generation, as per agreement between JREDA and Power Purchaser. All penalties shall be recovered from payments yet to be made by JREDA to the Contractor and/ or from the Bank Guarantees available with JREDA. Liquidated damage on underperformance shall be charged on the NEEGG considering the actual weather data received at the plant size. For quoted NEEGG weather data of NASA is already provided for the site location.

6.12.3 In case of any defect in the system after Commissioning, the Contractor shall initiate action repair it within Forty-eight (48) hours. After 48 hours, penalty shall be charged and the same shall be deducted from the Bank Guarantee submitted to JREDA. A penalty at the rate of Rs. [**Tariff as per JREDA's PPA*1.50**] per kWh shall be charged by the company for the loss of generation. The loss of generation shall be calculated with respect to the NEEGG of that particular year based on the actual radiation.

6.12.4 However, in case the Contractor fulfils the NEEGG at the end of the year then the amount deducted as a penalty for loss of generation as per this Clause shall be adjusted in the Contractor's bill or reimbursed. In case the Contractor fails to meet the NEEGG at the end of the year then above-mentioned penalty shall be adjusted from the penalty calculated at the end of the year for the shortfall in the generation so that there is no duplication of penalty for the same loss of generation. The first 48 hours shall not be considered for the penalty in case of any defect.

6.12.5 In case the Project fails to generate any power continuously for 6 months any time during the O&M period, it shall be considered as an "Event of Default".

6.12.6 Upon occurrence of any Event of Default mentioned in Clause 6.12.5 herein above, JREDA shall have the right to encash the entire amount of O&M Bank Guarantee submitted by the Contractor and withheld any other pending payment.

6.12.7 The Company reserves the right to perform random audits of weather monitoring system of the plant anytime during the entire O&M period. If any discrepancy is found between the measured parameters, the difference between the measured parameters by JREDA from secondary sources and the weather monitoring system installed by the Contractor at the site will be factored in calculating the adjusted NEEGG during the entire year. However, JREDA will have the final authority to decide on this matter.

6.13 Defect Liability

6.13.1 The Contractor must warrant that the facilities or any part thereof shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed.

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

6.13.3 The Contractor shall be liable for the operation and maintenance of the Facility and consequently shall be required to rectify any defects that emerge during the operation of the Facilities for the entire term of this Contract. The Defect Liability Period shall be eighteen (18) months from the date of start of O&M Period ("Defects Liability Period").

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

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

a. Improper operation or maintenance of the Facilities by the Contractor during operation and maintenance of the Facility; or
b. Operation of the Facilities violating specifications of the Facilities.

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

6.13.7 JREDA shall provide the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations.

6.13.8 The Contractor may, with the consent of the Company, remove from the Site any Plant and Equipment or any part of the Facilities that are defective, if the nature of the defect and/ or any damage to the Facilities caused by the defect is such that repairs cannot be expeditiously carried out at the Site.

6.13.9 If the repair, replacement or making good is of such a nature that it may affect the efficiency of the Facilities or any part thereof, the Company may give to the Contractor

a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, whereupon the Contractor shall carry out such tests.

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

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

6.13.12 If the Facilities or any part thereof cannot be used by reason of such defect and/ or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the Facilities or such part cannot be used by the Company because of any of the aforesaid reasons. Upon correction of the defects in the Facilities or any part thereof by repair/ replacement, such repair/ replacement shall have the defect liability period of eighteen (18) months from such replacement.

6.13.13 In addition, the Contractor shall also provide an extended warranty for any such component of the Facilities and for the period of time. Such obligation shall be in addition to the Defect Liability Period specified under Clause 6.13.3.

6.14 Termination for Default

6.14.1 The Company may, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the Contractor, terminate the Contract in whole or in part if the Contractor fails to deliver or execute any or all of the goods within the time period(s) under the Contract or any extension thereof granted by JREDA pursuant to

the clause for Delay in Execution or Failure to Supply or, If the Contractor fails to perform any other obligations(s) under the Contract.

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

6.14.3 In case the Contractor is not able to demonstrate the "Actual Delivered Energy" as per the "Base NEEGG" based on the procedure mentioned in Appendix 16 during the Security Deposit Test and after the penalties levied as mentioned in Clause 6.12.; JREDA reserves the right to terminate the Contract at its discretion if there are no efforts are made from the Contractor to correct the issues regarding plant performance.

6.14.4 In case termination of the Contract due to default, the Contractor may be blacklisted by JREDA, and its associate companies, etc. for future work.

6.15 Breach and Cancellation of the Contract

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

6.15.2 The Company may cancel the order or a portion thereof, and if so purchase or authorize purchase of the plant/equipment not so delivered or order Plant/ Equipment of similar description (opinion of the Company shall be final) at the risk and cost of the Contractor.

6.16 Force Majeure

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

6.16.2 The term "Force Majeure" shall have herein mean riots (other than among the Contractor's employee), Civil commotion, War (whether declared or not), invasion, act of foreign enemies hostilities, civil war, rebellion, revolution, insurrection, military coup, damage from aircraft, nuclear fission, embargoes, quarantines, acts of god such as earthquake (above 7.0 magnitude on Richter scales), lightning, unprecedentedfloods, fires not caused by the Contractors negligence and other causes which the Contractor has no control and accepted as such by JREDA whose decision shall be finaland binding. Normal rainy season and monsoons are not Force Majeure.

6.16.3 Upon occurrence of such causes and upon its termination, the party alleging that it has been rendered unable as aforesaid, thereby, shall notify the other party in writing by registered notice within 24 (Twenty-four) hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of its claim.

6.16.4 Time for performance of the relative obligation suspended by the Force Majeure shall stand extended by the period for which such clause lasts.

6.16.5 If works are suspended by Force Majeure conditions lasting for more than two (2) months, JREDA shall have the option of cancelling this Contract in whole or part thereof, at its discretion.

6.16.6 The Contractor shall not claim any compensation for Force Majeure conditions and shall take appropriate steps to insure men and materials utilized by it under the Contract well in advance.

6.17 Progress Report of Work

6.17.1 The Contractor shall submit a weekly progress report on execution of works conforming to bar/ PERT Chart and format provided by JREDA. In case of any slippage(s) or delay in execution of work reasons for such delay along with details of hindrances will be submitted by the Contractor along with modified Bar/ PERT Chart mentioning the action plan being taken to keep the due date of completion of project unchanged. If required, the Contractor shall use additional manpower to keep the due date of completion of Project unchanged.

6.17.2 The authorized representative of the Contractor shall review the progress of the Project work every fortnight on a prefixed day at project site with JREDA or its representative as per the network and record the minutes.

6.18 Insurance

6.18.1 During the construction period, i.e. before the Commissioning of the Project, all insurance related expenses shall be borne by the Contractor. The goods supplied under the Contract shall be fully insured against the loss or damage incidental to manufacture or acquisition, transportation, storage, delivery, theft, natural or other disaster, etc. in such a manner that the Company shall not incur any financial loss, as long as the construction of the Project continues to remain under the custody of the Contractor.

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

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

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

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

6.18.6 Comprehensive insurance is to be arranged by the Contractor during the O&M period of the Contract.

6.18.7 At the end of the term of insurance undertaken by the Contractor, the Contractor shall provide all the necessary documents to the satisfaction of the Company in order to enable the Company to take up the insurance of the Plant.

6.19 Statutory Acts, Rules and Standards

6.19.1 The work shall be executed in conformity with the relevant standard of Bureau of Indian Specification (or equivalent International Standard), Electricity Rules, 2010 (as amended up to date), Indian Electricity Act, BARC/DAE rules, Explosive Act 1948, Petroleum Act 1934, National Building Code and relevant Rules in vogue at the time of execution including operation and maintenance period.

6.20 Tools and Tackles

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

6.21 Safety Measures

6.21.1 The Contractor shall have to provide necessary and adequate safety measures including personal protective equipment and precautions to avoid any accident, which may cause damage to any equipment/ material or injury to workmen. The Company shall not be responsible for any such accidents.

6.22 Hazardous Material

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

6.23 Stoppage of Work

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

6.24 Hindrance Register

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

6.25 Responsibility of the Contractor

6.25.1 The Contractor shall provide guarantee and be entirely responsible for the execution of the Contract in accordance with this Tender including but not limited to its specification, schedules, and annexure. The Contractor shall further provide guarantee and be responsible for the quality and workmanship of all materials and completed works, correct designs and drawings, correct delivery of material, erection, testing and commissioning including operation and maintenance.

6.26 Right of the Company to Make Change(s) in Design

6.26.1 All designs shall be approved by JREDA prior to the execution of such designs.

6.26.2 The Company shall have the right to make any change in the design, which may be necessary in the opinion of JREDA to make the plant and materials conform to the provisions and contents of the specification without extra cost to JREDA.

6.27 Manuals

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

6.28 Governing Language

6.28.1 The Contract shall be written in English Language. All correspondence and documents pertaining to the Contract, which are exchanged by the Company and Contractor, shall be written in English.

6.29 Order Amendments

6.29.1 No variation in or modification of the terms of the contract shall be made except by written amendments issued by the Company.

6.30 Assignments or Subletting of Contract

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

6.31 Subcontracts

6.31.1 The Contractor shall notify the Company in writing of all subcontracts awarded under the Contract if not already specified in his Bid. Such notification in its original Bid or later shall not relieve the Contractor from any liability or obligation under the Contract.

6.31.2 Subcontracting a work shall not, under any circumstances, relieve the Contractor from its obligations towards the Project and the Company.

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

6.32 Inspection and Testing

6.32.1 The Company or its authorized representative including appointed Consultant for the project shall have, at all times, access to the Contractor's premises and also shall have the power to inspect and examine the materials and workmanship of project work

during its manufacture, shop assembly and testing. If part of the plant is required to be manufactured in the premises other than the Contractor's, the necessary permission for inspection shall be obtained by the Contractor on behalf of JREDA or its dulyauthorized representative.

6.32.2 JREDA shall have the right to serve notice in writing to the Contractor on any grounds of objections, which he may have in respect of the work. The Contractor has to satisfy the objection, otherwise, the Company at his liberty may reject all or any component of plant or workmanship connected with such work.

6.32.3 The Contractor shall issue request letter to JREDA or his authorized representative for testing of any component of the plant, which is ready for testing at least fifteen (15) days in advance from the date of actual date of testing at the premises of the Contractor or elsewhere. When the inspection and the tests have been satisfactorily completed at the Contractor's works, JREDA shall issue a certificate to that effect. However, the Company at its own discretion may waive the inspection and testing in writing under very special circumstances. In such case, the Contractor may proceed with the tests which shall be deemed to have been made in JREDA's presence, and it shall forthwith forward six (6) sets of duly certified copies of test results and certificates to the Company for approval of the Company. The Contractor, on receipt of written acceptance from JREDA, may dispatch the equipment for erection and installation.

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

6.32.5 The Company or his authorized representative shall have the right to carry out inward inspection of the items on delivery at the 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.

6.32.6 If the Company desires, testing of any component(s) of the plant be carried out by an independent agency, the inspection fee, if any, shall be paid by the Company. However,

the Contractor shall render all necessary help to JREDA whenever required free of charge.

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

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

6.33 Authorized Test Centres

6.33.1 The PV modules, inverters, transformers, panels, wires, etc. deployed in the power plants shall have valid type test certificates for their qualification as per above specified IEC/ BIS Standards by one of the reputed labs of the respective equipment (preferably NABL Accredited Test Centres) in India. In case of module or other equipment for which such Test facilities may not exist in India, test certificates from reputed ILAC Member Labs abroad will be acceptable.

6.34 Delivery of Equipment

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

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

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

6.35 Liabilities during Transit

6.35.1 The Contractor shall be responsible for loss, damages, or depreciation to goods or of plant, equipment, and machineries up to delivery at the Site.

6.36 Deduction from Contract Price

6.36.1 All costs, claims, damages or expenses, which the Company may have paid for which the Contractor is liable, will be deducted by the Company from deposited bank guarantees or from any money due or which become due to him under this Contract or any contract are being executed elsewhere with the Company.

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

6.37 Terms of Payment

6.37.1 The Company shall pay the Contractor in the following manner for Supply of material and at the following time for achieving the respective milestones:

Sr.	Payment Milestones	Amount
1	On Receipt of PV Modules from manufacturer's works to the canal top site on production of invoices and satisfactory evidence of shipment which shall be original Goods Receipt or receipted GR / Rail Receipt, etc. including Material Dispatch Clearance Certificate (MDCC) issued by the JREDA.	45% of EPC Contract Price of supply
2	Submission of invoice and receipt of material (other than PV module i.e. MMS Structure, Inverters ,DC Cable, Junction boxes etc.) at site	25% of EPC Contract Price of Supply
3	Upon achieving Installation of the Plant Against PV Module	10% of EPC Contract Price of

		Supply
4	Upon complete delivery of Balance of Systems including transformers, AC cables ,other AC side Components(i.e. RMU, Control **panels, CT & PT etc** at site	10% of EPC Contract Price of Supply
5	Upon achieving Completion of the Facilities and completion Operational Acceptance Test (OAT), whicheveris later	10% of EPC Contract Priceof Supply
	Total	**100%**

Note:

1. All works shall be considered for payment on pro-rata basis of payment milestones per approved billing break up to be approved after award of contract.
2. The Contractor shall submit all the invoices related Project and invoices of the O&M to The Director, JREDA, Ranchi. All material shall be consigned to Director, JREDA, Ranchi, Jharkhand.
3. For payment against Milestone 3, the joint recording of work done at site shall be attached with the invoices
4. EPC Contract Price of Supply means the Supply part of theEPC Contract Price.

6.37.2 The Company shall pay the Contractor in the following manner for all the erection, testing and commissioning works and at the following time for achieving the respective milestones:

Sr.	Payment Milestones	Amount
1.	Upon complete erection of Module Mounting Structure at site	10% of EPC Contract Price of Works
2.	Upon complete erection of inverters & junction boxes	15% of EPC Contract

	at site	Price of Works
3.	Upon erection and acceptance of installation of all PV modules on module mounting structures at site	40% of EPC Contract Price of Works
4.	Upon complete erection of Balance of Systems including transformers, cables etc. at site	10% of EPC Contract Price of Works
5.	Upon achieving Commissioning of the Plant	10% of EPC Contract Price of Works
6.	Upon Completion of the Facilities and Completion of Operational Acceptance Test	15% of EPC Contract Price of Works
7.	On successful Operation and Maintenance of the Solar Power Plant on quarterly basis for each year till 10 years	Year 1: OM-1 Year 2: OM-2 Year 3: OM-3 Year 4: OM-4 Year 5: OM-5 Year 6: OM-6 Year 7: OM-7 Year 8: OM-8 Year 9: OM-9 Year 10: OM-10

Note:

1. EPC Contract Value of Works is equal to the price of Works (all the erection, testing and commissioning works) portion of "EPC Contract Price" (including taxes) quoted by the Contractor in its Financial Proposal.

2. 'OM' indicates the each year "O&M Contract Price" quoted by the Contractor for each individual year in its Financial Proposal.

6.38 Payments

6.38.1 Subject to any deduction which the Company may be authorized to make under this Contract, and or to any additions or deductions provided for in this Contract, the Contractor shall be entitled to payment as follows:

a. All payments shall be made in Indian Rupees, unless otherwise specified in the LoI /Contract Agreement. All payment shall be made on the basis of actual measurement for the quantified items as per schedule of works.

b. The Contractor shall submit the bill / invoice for the work executed showing separately GST, and any other statutory levies in the bill / invoice.

- All taxes and deductions shall be applicable as per prevailing income tax and other statutory rules and provisions in force.

6.39 Warranty/ Guarantee

6.39.1 The Plant shall perform as per the Guaranteed Performance indicated by the Bidder in its Financial Proposal.

6.39.2 PV modules used in grid connected solar power plants must be warranted for peak output power at Standard Testing Condition (STC), which shall not be less than 90% at the end of ten (10) years and not less than 80% at the end of Twenty-five (25) years.

6.39.3 The mechanical structures, electrical works, all plant equipment and components and overall workmanship of the grid solar power plants shall be warranted for a minimum of 5 years.

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

6.39.5 The warranty / guarantee period shall be as follows:

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

b. Inverters: Inverters shall be warranted for the guarantee period provided by the original equipment manufacturer. Same shall be furnished with its Bid.

c. Transformers, associated switchgear and others: Bidder shall furnish in detail its warranties/ guarantees for these items.

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

6.39.7 At the end of Guarantee / Warranty period, the Contractor's liability shall cease. In respect of goods not covered above, JREDA shall be entitled to the benefit of such Guarantee / warranty given to the Contractor by the original Contractor or manufacturer of such goods.

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

6.39.9 Material Warranty:

Material Warranty is defined as: The manufacturer / contractor should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a

period not less than ten (10) years from the date of sale to the Solar Power Company:

- Manufacturing defects and/or failures due to materials, including PID defect
- Non-conformity to specifications due to faulty manufacturing and/or inspection processes.

  If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at JREDA's sole option.

(a) Performance Warranty:

The manufacturer should warrant the output of Solar Module(s) and if, Module(s) fail(s) to exhibit such power output in prescribed time span, the Contractor will either deliver additional PV Module(s) to replace the missing power output with no change in area of land used or repair or replace the PV Module(s) with no change in area of Canal used at JREDA's sole option. Total Canal-length available from JREDA is fixed and the bidder shall design the plant so that in this case he has enough space within this land to accommodate additional capacity.

6.39.10 Insurance or Bank Guarantee

A) Bank Guarantee:

B) Bank Guarantee against PV Modules Warranty: The Successful Bidder shall provide security in form of Bank Guarantee for an amount as specified in Clause No. 3.11.7 (iii) before releasing of PBG & O&M BG. However, the Bidder can submit BG valid for 5 years and further extend it for another 5 years. The BG shall be submitted prior to the return of SD under the subject package. <Or>

C) **Insurance**: The PV module power output warranty as per the technical specification shall be insured and backed up through an insurance policy by a reputed insurance company which will cover against the PV module power output warranty in case of insolvency or bankruptcy of the PV module manufacturer. The Bidder shall submit a suitable insurance from Third Party.

6.40 Arbitration

6.40.1 All matters, questions, disputes, differences and / or claims arising out of and / or concerning, and /or in connection with, and /or in consequence of, and /or relating to any contract, whether or not obligations of either or both the Certifying agency and the Corporation under that contract be subsisting at the time of such dispute and whether or not the contract has been terminated or purported to be terminated or completed, shall be referred to the sole arbitration of Director, JREDA or an officer appointed by Director, JREDA as his nominee. The award of the Arbitrator shall be final and binding on both the parties to the contract.

6.40.2 The objection that the Arbitrator has to deal with matters, to which the contract relates, in the course of his duties or, he has expressed his views on any or all of the matters in dispute or difference, shall not be considered as a valid objection.

6.40.3 The Arbitrator may, from time to time, with the consent of the parties to the contract enlarge the time for making the award. The venue of the arbitration shall be the place from which the acceptance of offer is issued or such other place as the Arbitrator, in his discretion, may determine.

6.41 Court of Competent Jurisdiction

6.41.1 All legal proceedings / matters arising in connection with the contract will be subject to the exclusive jurisdiction of local courts at Ranchi, Jharkhand High Court or Supreme Court of India, New Delhi.

6.42 Law and Procedure

6.42.1 The law which is to apply to the Contract and under which the Contract is to be construed shall be Indian Law.

6.43 Construction of Contract

6.43.1 The Contract shall in all respect be construed and operated, as a Contract as defined in the Indian Contracts Act, 1872, and all the payments there under shall be made in Indian Rupees unless otherwise specified.

6.44 Notices

6.44.1 For all purpose of the Contract, including arbitration there under, the address of the Contractor mentioned in the Bid shall be the address to which all communications addressed to the Contractor shall be sent, unless the Contractor has notified a change by a separate letter containing no other communication and sent by registered post with acknowledgement due to JREDA. The Contractor shall be solely responsible for the consequence of an omission to notify change of address in the manner aforesaid.

6.44.2 Any communication or notice on behalf of the Company in relation to the Contract Agreement may be issued to the Contractor by the Company and all such communication and notice may be served on the Contractor either by registered post or under certificate of posting or by ordinary post or by hand delivery at the option of the officer.

6.44.3 Instructions or notices to the Contractor and notices from the Contractor to JREDA recorded in a minute signed by the authorized representatives of both JREDA and the Contractor. Such notice or instruction shall be valid notice of instruction for the purpose of the Contract.

6.45 Final Bill

6.45.1 The Final EPC Bill relating to the Contract shall be prepared only after the Security Depositd Test of the plant has been observed as under Appendix 15: Procedure for Performance Testing and it will include the adjustments of all claims against the Contractor by the Company and awarded in its favour by the arbitrator up to the date of preparation of the final bill.

6.46 Degradation of Solar Modules

6.46.1 The Contractor should warrant for the output of each Solar Module(s) for at least 90% of its actual rated capacity at Standard Testing Condition after initial 10 years and 80% of its rated capacity after 25 years upon commissioning of the Plant.

6.46.2 The derating of module should not be more than 1% in any year except for the first year of operation, which should be limited to 2.5%.

6.46.3 If, Module(s) fail(s) to exhibit such power output, the Contractor will either:

a. Deliver additional PV Module(s) to replace the loss of power output with no change in area of land used;

<or>

b. Repair or replace the existing PV Module(s) with no change in area of canal used

<or>

c. Compensate JREDA with an amount equivalent to the loss of revenue from the date of audit to 25th years which shall be calculated based on Net Present Value of amount of loss of revenues from the date of audit to 25th years discounted at the rate of JREDA's cost of capital.

6.46.4 The Company will specifically do the audit of solar PV module by third-party at any point of the operation period and in case the Contractor fails to demonstrate the value as per the maximum deration allowed then, the Contractor shall compensate as per the Clause no. 6.46.3.

6.47 Risk Purchase

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

6.48 Confidential Information

6.48.1 JREDA and the Contractor shall keep confidential and shall not, without the written consent of the other Party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other Party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from JREDA to the extent required for the Subcontractor(s) to perform its work under

the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause 6.48.

6.48.2 Notwithstanding the generality of the foregoing Clause 6.48.1, all maps, plans, drawings, specifications, schemes and the subject matter contained therein and all other information given to the Contractor, by the Company in connection with the performance of the Contract shall be held confidential by the Contractor and shall remain the property of the Company and shall not be used or disclosed to third parties by the Contractor for any purpose other than for which they have been supplied or prepared. The Contractor may disclose to third parties, upon execution of secrecy agreements satisfactory to the Company, such part of the drawings, specifications or information if such disclosure is necessary for the performance of the Contract.

6.48.3 Maps, layouts and photographs of the unit/integrated plant including its surrounding region's showing vital installation for national security shall not be published or disclosed to the third parties or taken out of the country without prior written approval of the Company and upon execution of secrecy agreements satisfactory to the Company with such third parties prior to disclosure.

6.48.4 Title to secret processes, if any, developed by the Contractor on an exclusive basis and employed in the design of the unit shall remain with the Contractor. The Company shall hold in confidence such process and shall not disclose such processes to the third parties without prior approval of the Contractor and execution by such third parties of secrecy agreements satisfactory to the Contractor prior to disclosure.

6.48.5 Technical specifications, drawings, flow sheets, norms, calculations, diagrams, interpretations of the test results, schematics, layouts and such other information which the Contractor has supplied to the Company under the Contract shall be passed on to the Company. The Company shall have the right to use these for construction erection, start-up, commissioning, operation, maintenance, modifications and/ or expansion of the unit including for the manufacture of spare parts.

6.48.6 The obligation of a party under this Clause 6.48, however, shall not apply to that information which:

a. now or hereafter enters the public domain through no fault of that Party,

b. can be proven to have been possessed by that Party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other Party hereto, or

c. otherwise lawfully becomes available to that Party from a third party that has no obligation of Confidentiality.

6.48.7 The above provisions of this Clause 6.48 shall not in any way modify any undertaking of Confidentiality given by either of the Parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof.

6.48.8 The provisions of this Clause 6.48 shall survive Termination, for whatever reason, of the Contract.

6.49 Limitation of Liability (LLP)

6.49.1 The total liability of the Contractor under or in connection with this Tender and the consequent Contract shall not exceed the full EPC Contract Price inclusive of taxes and duties.

6.49.2 This sub-Clause shall not limit the liability in case of fraud, deliberate default/ negligence, reckless misconduct or illegal or unlawful acts by the Contractor.

--- End of Section ---

7 Special Terms and Condition

7.1 Definition

7.1.1 The General Terms and Conditions as well as the Special Terms and Conditions of the Tender are complementary to each other, and wherever there is a conflict, the Special Terms and Conditions shall prevail.

7.2 Objective of the Project

7.2.1 The main objective of this project is "Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi , Jharkhand" on turnkey basis at Sikidiri, Ranchi in the state of Jharkhand for JREDA.

7.3 Compliance with JBVNL/JUUNL/JUVNL Guidelines

7.3.1 The Bidders and Contractor shall make themselves fully aware of and comply with the norms and guidelines provided by JBVNL/ JUUNL/ JUVNL if any, towards the Project.

7.3.2 The Contractor shall ensure that the Project shall comply with all the norms and guidelines of JBVNL/ JUUNL/ JUVNL if any, and subsequent clarifications or amendments issued from time to time. The Contractor is required to refer the compliance documents of JBVNL/ JUVNL if any, for necessary compliances of JBVNL/ JUUNL/ JUVNL requirements.

7.3.3 In case of any conflict between the compliance of JBVNL/ JUUNL/ JUVNL and this Tender or any aspect of the Project, the Contractor shall immediately notify JREDA for clarity.

7.3.4 Any changes in the Tender or the Contract including but not limited to the Scope of Work, Guarantees and Warranties to comply with the guidelines or provisions of the Scheme under which this project is being executed shall have no bearing on the EPC Contract Price & O&M Contract Price.

7.4 Project Site

7.4.1 Details of the Project Site will be as per the Annexure 1: Details of Plant Location and Site.

7.5 Scope of Service

7.5.1 The item of work to be performed on all equipment and accessories shall include but not limited to the following:

a. Transportation, unloading, receiving and storage at site.
b. Arranging to repair and/or re-order all damaged or short-supply items.
c. Final check-up of equipment and commissioning and putting the system into successful operation, feeding power to the local internal grid.

7.6 Training of JREDA's Personnel

7.6.1 The Bidder shall provide training on Plant operations and maintenance to three (3) teams of 5-10 personnel each (Engineers and Technician/ Operators) of JREDA and JUUNL as and when requested by JREDA.

7.7 Mode of Execution

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

7.8 Programme of Work

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

7.9 Starting of Work

7.9.1 The Contractor shall be required to start the work within 15 (Fifteen) days from the date of issue of Letter of Intent and shall thereof, report to JREDA accordingly.

7.10 Completion Schedule

7.10.1 The time of completion and Commissioning of the Plant is One Hundred and Eighty Days (180) from the date of issue of Letter of Intent. The O&M Contract Period is for ten (10) years.

7.10.2 The Contractor shall inform JREDA at least Thirty (30) days advanced preliminary written notice and at least Fifteen (15) days advanced final written notice, of the date on which it intends to synchronize the Power Project to the Grid System.

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

7.10.4 The Contractor shall provide the power evacuation schedule as and when required or asked by any Central or State Government agency(s).

7.11 Site Inspection & Basis of Bid

7.11.1 The volume and quantity of work indicated in schedule of works may vary. The Contractor should visit the Site before quoting rate for civil works. After taking in to consideration all aspects of the site, condition of soil etc., the Contractor should quote for civil works. No extra claim will be entertained at post bidding stage. The foundation design of module structure and the building shall have to be approved by JREDA. In case of any defects arising in the building during guarantee period, the Contractor shall have to rectify the same at its own cost.

7.12 Price Escalation

7.12.1 The rate(s) quoted against the work shall remain firm during the entire Contract period.

7.13 Taxes and Duties

7.13.1 The price quoted shall be exclusive GST & inclusive of all other applicable taxes, duties, levies as applicable (as per the format of the Financial Proposal), which shall be paid on production of documentary evidences for the same.

7.13.2 Bidders shall quote the rates as well as taxes and duties based on the concessional exemption in the same that can be availed by the Bidder. JREDA shall only provide documents to facilitate the Contractor. However, all the exemptions for ED & CD or any other from MNRE has to be taken by the Contractor.

7.13.3 Statutory variations in the tax shall be permitted as under:

(A) Statutory variations during original contractual completion period:

(i) If any increase takes place in taxes and duties due to statutory variation, then JREDA shall admit the same on production of documentary evidence.

(ii) If any decrease takes place in taxes and duties due to statutory variation, the same shall be passed on to JREDA or JREDA shall admit the decreased rate of taxes and duties while making the payment.

(B) Statutory variations beyond original contractual completion period:

(i) If reasons for extension of contractual completion period is attributable solely to JREDA, the provisions of (A) (i) above shall apply.

(ii) If reasons for extension of contractual completion period is attributable to Bidder, then:

(a) If any increase takes place in other taxes and duties (except GST) due to statutory variation, then JREDA shall not admit the same; however JREDA shall admit increase/decrease in GST.

(b) If any decrease takes place in taxes and duties due to statutory variation, the same shall be passed on to JREDA or JREDA shall admit the decreased rate of taxes and duties while making the payment.

7.13.4 Variation on account of exchange rate will not be payable. No statutory variation shall be payable by JREDA on the input items. i.e. raw materials etc.

7.13.5 No statutory variation shall be admitted if the excise duty becomes payable because of exceeding of the prescribed limits for turnover of the Bidder.

7.14 Procurement of Materials

7.14.1 The Contractor shall procure all necessary material required for the project work and arrange to store them properly. In respect of the materials procured by the Contractor, Valid Type Test certificates in accordance with the specifications are to be furnished by the Contractor to JREDA for verification.

7.15 Samples

7.15.1 Apart from adhering to special provision made in the specification regarding submission of details, the Contractor shall within forty (40) days of its receipt of Letter of Intent, provide to JREDA detailed literature of all materials it proposes to use irrespective of the fact that specific make/ material might have been stipulated.

7.16 Notice of Operation

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

7.17 Rejection of Materials

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

7.18 Power and Water Supply during Construction

7.18.1 The Contractor shall arrange for the temporary Power Supply at the site for construction purpose at its own cost.

7.18.2 Cost of water shall be as per prevailing rate and to be borne by the Contractor. However, sweet water tapping at one point may be provided by JREDA.

7.18.3 Cost of electricity required during construction shall be payable by the Contractor. For construction, temporary connection from Distribution Company shall be arranged by the Contractor as per applicable tariff.

7.18.4 JREDA shall not provide facility for storage of material, and accommodation for labours at site. The Contractor shall make his own arrangement for the same. JREDA will provide land within a plant boundary for material storage and labour camp. However, it shall be on full responsibility of the Contractor to maintain hygienic condition for labour camp and accordingly the Contractor to construct necessary temporary blocks.

7.19 Labour Engagement

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

7.19.2 Strict adherence of various applicable labour laws like the Factories Act, Minimum Wages Act, ESI Act, Payment of Wages Act, the Workman's Compensation Act, EPF Act, Contractor labour (Regulation & Abolition) Act, 1970 and all other statutory requirements as amended from time to time to the entire satisfaction of Central/State Govt. Authorities, shall be the responsibility of the Contractor and he shall have to make good loss, if any, suffered by JREDA on account of default in this regard by the Contractor.

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

7.20 Handing Over –Taking Over

7.20.1 The Project shall be taken over by JREDA upon successful completion of all tasks to be performed at Site(s) on equipment supplied, installed, erected and Commissioned by

the Contractor in accordance with provision of this Tender. During handing over complete Project work, the Contractor shall submit the following for considering final payment:

a. All as- Built Drawings;

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

c. Bill of material; and

d. Inventory of spares at projects Site.

e. Copies of all warranties/guarantees (in original).

7.20.2 Immediately after taking over of complete Plant, the same will be handed over to the Contractor for Operation & Maintenance for a period as mentioned in the Tender.

7.20.3 Handing over will be done only after Completion of Facilities and completion of Operational Acceptance Test.

7.21 Termination on the death of Contractor

7.21.1 Without prejudice to any of the rights or remedies under this contract, if the Contractor dies, the Engineer-in-Charge on behalf of JREDA shall have the option of terminating the Contract without compensation to the contractor.

7.22 Retired Government servants taking to Contract

7.22.1 No engineer of gazette rank or other gazette officer employed in engineering or administrative duties in the Engineering Department of the Company is allowed to work as contractor for a period of two years of his retirement from Company's service without the previous permission of the Company. This Contract is liable to be cancelled if either the Contractor or any of his employees is found at any time to be a person who had not obtained the permission of the Company as aforesaid before submission of the Tender or engagement in the contractor's service as the case may be.

7.23 EPF

7.23.1 The contractor will deduct and deposit EPF of his labour staff/worker as applicable from time to time in his own EPF A/c code and then produce a photocopy of documentary evidence of EPF Challan with each R.A. Bill for the concerned period.

7.24 Miscellaneous

7.24.1 The project manager appointed by EPC contractor shall not be replaced without the prior written approval of JREDA.

7.24.2 Any project manager or member of the Contractor at Site shall be replaced within a period of Forty-eight (48) hours of intimation by JREDA without assigning any reason thereof.

7.24.3 The Contractor shall take care of all statutory, local clearance, approvals, etc.

7.24.4 All warranties on the equipment shall be in the name of JREDA with reference to the Clause No. 6.39.

7.24.5 The Contractor shall be responsible for claiming and retaining any subsidy and shall quote only final price and responsibility of Project registration/ applications etc. shall lie with the Bidder only. In no case, JREDA is responsible to provide any additional amount other than the EPC Contract Price & O&M Contract Price.

7.24.6 The Contractor shall provide arrangement for water drainage, which shall be appropriately arranged for dispersion/ evacuation as per the local statutory norms without causing any local inconvenience or hindrance.

7.24.7 The design philosophy and related specifications mentioned in this Tender are to be treated as baseline specifications. The Contractor may further improve the design of the Plant through minor modifications and execute the same contingent on JREDA's approval of the new design or specification.

7.24.8 Based on reviewing the Project, if the progress is below expectation as judged based on JREDA's discretion, then JREDA shall reduce the Scope of the Contractor in part

or full and assign the same to other contractor(s) at the risk and cost of the existing Contractor.

7.24.9 The Contractor shall continue to provide all the monitoring services, licenses, software, access to all information (real-time or stored) that has been used during the O&M Contract period by the Contractor to JREDA at the time of hand over at no extra cost to JREDA for the rest of the life of the Plant.

7.24.10 The Contractor shall construct a dedicated site office including tables, chairs, functional power outlets, light, fan air conditioner, etc. for at least Eight (8) people to host JREDA's employees or authorized representatives at the time of construction of the Plant.

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

--- End of Section ---

Appendix 1: Format for Covering Letter

To,

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

Sub: Submission of the Tender Document No. **NIB No. 16/JREDA/CANALTOP/22-23**

Dear Sir,

We, the undersigned, have considered and complied with the "Instructions to Bidders" and have accepted the terms stipulated in the Tender Document No. 07/JREDA/CANALTOP/19-20.

The Scope of Work to be offered by us shall include but not be limited to Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand.

In full cognizance and compliance with these aforesaid conditions and the regulations of local government authorities, we the undersigned do hereby offer our Bid and agree for the following:

i. The work covered under the Bid shall be completed to the entire satisfaction of yourselves or your representative in conformity with the Tender Document at the prices accompanying this Bid.
ii. The Project shall be handed over installed, interconnected, tested, commissioned and modified and we shall achieve commissioning in not later than One Hundred and Eighty (180) days from the date of issue of LoI.
iii. I/We further certify that in regard to matters relating to security and integrity of the country, we or any of our Associates have not been charge-sheeted by any agency of the Government or convicted by a Court of Law.

iv. I/ We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by JREDA in connection with the selection of Applicants, selection of the Bidder, or in connection with the selection/ bidding process itself, in respect of the above mentioned Project and the terms and implementation thereof.

v. We agree to keep the bidding valid for acceptance for a period of 180 days from the opening the Price Bid and the Bid shall not be withdrawn on or after the opening of bidding till the expiry of this period or any extension thereof.

vi. We also acknowledge and accept that you shall not pay for any discontinuance or low performance rate resulting from malfunction of / or inadequacy of our equipment, instruments or personnel.

vii. We further represent that we have familiarized ourselves with all the terms and provisions of the various parts of the bidding documents and that in making our Bid, we do not rely upon any representation made by any agent or employee of yourselves in respect of the terms of the bidding documents or the nature of the performance of the works.

Yours Sincerely,

Signature: _____

In the capacity of: _____

Duly authorized to sign Tenders for and on behalf of (Name & Address)

_____

_____

_____

Witness _____

(Sign and Seal of Bidder)

Appendix 2: Format of Details of Bidder

1. (a) Name:

   (b) Country of incorporation:

   (c) Address of the corporate headquarters and its branch office(s), if any, in India:

   (d) Date of incorporation and/ or commencement of business:

2. Brief description of company including details of its main lines of business and proposed role and responsibilities in this Project:

3. Details of individual(s) who will serve as the point of contact/ communication for company:

   (a) Name:
   (b) Designation:
   (c) Company:
   (d) Address:
   (e) Telephone Number:
   (f) E-Mail Address:
   (g) Fax Number:

4. Particulars of the Authorised Signatory of the Bidder:

   (a) Name:

   (b) Designation:

   (c) Address:

   (d) Phone Number:

   (e) Fax Number:

(Sign and Seal of Bidder)

Appendix 3: Format of Details of Similar Technical Experience

INSTRUCTIONS:

A. The Bidder shall indicate similar EPC experience of grid-connected solar photovoltaic projects herein.

B. The Bidder shall duly attach the Letter of Award (LOA) from the Client, Commissioning Certificate, and Certificate of Satisfactory Completion of Work from the Client.

C. Projects without sufficient documentary evidence of execution, commissioning and completion as per the discretion of JREDA shall not be considered towards technical evaluation of the Bidder.

D. The Bidder may indicate more than five (5) projects.

Sr.	Name of Client (with name and contact information of Contact Person)	PV Project AC/ DC Capacity (in MW)	For Official Use Only		
			LOA attached?	Commissioning Certificate attached?	Certificate of Satisfactory Completion attached?
1.			Yes/ No	Yes/ No	Yes/ No
2.			Yes/ No	Yes/ No	Yes/ No
3.			Yes/ No	Yes/ No	Yes/ No
4.			Yes/ No	Yes/ No	Yes/ No
5.			Yes/ No	Yes/ No	Yes/ No

(Sign and Seal of Bidder)

Appendix 4: Format of Details of Qualified Technical Staff

Sr. No.	Name	Relevant Qualification	Additional Certifications	Total Years of Relevant Experience	Remarks
1.					
2.					
3.					
4.					
5.					
6.					

Note: *Kindly submit copies of resumes and appropriate certifications with this sheet.*

Additional sheets may be used to provide accurate information.

Appendix 5: Format of Disclosure of PV Technology Proposed

PV MODULE		
Type	:	Select One: ϒ Poly-crystalline Silicon ϒ Mono-crystalline Silicon ϒ Other variant of the above. Please specify ….. ….
Manufacturer	:	
Model Number	:	
Module Capacity	:	..... W
No. of Cells per Module	:	
No. of Modules	:	
PV INVERTER		
Type	:	Select One: Central Inverter String Inverter (ALLOWED) Micro Inverter (NOT ALLOWED) Other, Please specify (NOT ALLOWED)
Configuration	:	Select One: Independent Operation Master-Slave Operation □ Other, Please specify.....
Manufacturer	:	
Model Number	:	
Inverter Capacity	:	..... kW
Number of Inverters	:	
MODULE TRACKING		
Type	:	Select One: Fixed 1-Axis Manual Seasonal 1-Axis, Fixed Tilt, Automatic, Daily Tracking 1-Axis, Azimuth, Automatic, Daily Tracking 2-Axis, Automatic, Tracking □ Other, Please specify .....

Note: Name of 4 (four) PV module Manufacturers and Inverter Manufacturers is to be provided by the Bidder and if the Bidder is awarded the Contract then out of these Manufacturers of PV modules and Inverters, the Contractor has to supply the material.

Appendix 6: Format of Project Execution Plan

I. Division of Scope of Work

Discipline/ Equipment	Basic Engineering	Design/ Detailed Engineering	Procurement	Supply	Project Management	Construction/ Fabrication/ Installation	Commissioning

NOTES: 1. Bidder shall clearly indicate the agency which will carry our each activity and the location of activity.

2. In case any activity is proposed with back-up consultant, Bidder shall clearly indicate role of back-up consultant

3. Bidder to identify major equipment / items and discipline

II. DETAILED PROJECT SCHEDULE

Sr.	Activity	Start Date	End Date
1.	Issue of LoI	Zero Date	
2.			
3.			

NOTES: 1. The Bidder shall ensure that the entire work is completed within 180 days of issue of LoI.

2. All Start Dates and End Dates to be indicated with respect to the Zero Date, e.g. +3 Days.

3. The Bidder may use as many lines as required to satisfactorily provide the detailed project schedule.

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

JREDA SEAL **DATE** ----------

Appendix 7: Format of Declaration of Compliance

Date:

To,

The Director,
Jharkhand Renewable Energy Development Agency (JREDA)
3rd Floor, SLDC Building,
Kusai Colony, Doranda
Ranchi-834 002, Jharkhand

Sub: Declaration of Compliance for the Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand.

Dear Sir,

This is to certify that I,_____, am the duly authorized signatory appointed on behalf of my organization to submit this Bid. The authorization letter is attached herewith. I agree to all the terms and conditions set forth in this Tender Document.

If awarded the job, the Scope of Work shall also conform to the terms and conditions, as well as specifications indicated in the Tender Document and as finally indicated by the Evaluation Committee.

I further certify that all the information provided in this document is accurate to the best of my knowledge.

Signature:_____ Designation:_____

Name:_____ Organization:_____

Address: _____ Email: _____

_____ Phone: _____

(Sign and Seal of Bidder)

Appendix 8: Format of No Deviation Certificate

Date:

To

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

Sub: No Deviation Certificate regarding Tender for Design, Engineering, Procurement& Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand.

Dear Sir,

We, _____

(Bidder's name), confirm our acceptance to all terms and conditions mentioned in the Tender Document, and all subsequent clarifications, in totality and withdraw all deviations raised by us, if any.

_____

SEAL AND SIGNATURE OF BIDDER

Date: _____

Appendix 9: Format of Declaration on Bidder's Relation to Directors

Date:

To

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

Sub: Declaration of relationship with Directors/any other employee/associates

Dear Sir,

This has reference to our proposed Bid regarding **Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand** and for the purpose of Section 184/188 of the Companies Act 1956 or Companies Act, 2013, we certify that to the best of my/our knowledge:

i) I am not a relative of any Director of JREDA or;

ii) We are not a firm in which a Directors of JREDA or its relative is a partner;

iii) I am not a partner in a firm in which a Directors of JREDA or, or its relative is a partner;

iv) We are not a private company in which a Director of JREDA or is a member or director;

v) We are not a company in which D0irectors of JREDA hold more than 2% of the paid-up share capital of our company or vice-versa.

_____

Authorised Signatory of the Contracting Party

Appendix 10: Format of Power of Attorney as Authorized Signatory

(On a non-judicial stamp paper of appropriate value)

Know all men by these presents, we, ...(name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorise Mr. / Ms_____(Name)____, son/daughter/wife of_____and presently residing at _____, who is presently employed with us and holding the position of _____, as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Bid for the Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand pursuant to the Tender Document no. 16/JREDA/CANALTOP/22-23 issued by JREDA, including but not limited to signing and submission of all applications, Bids and other documents and writings, participate in Bidders' and other conferences and providing information/responses to JREDA,representing us in all matters before JREDA, signing and execution of all contracts including the Contract Agreement and undertakings consequent to acceptance of our Bid, and generallydealing with JREDA in all matters in connection with or relating to or arising out of our Bid for the said Project and/or upon award thereof to us and/or till the entering into of the ContractAgreement with JREDA.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE,_____, THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS _____ DAY OF _____, 20_____

(Sign and Seal of Bidder)

For……..

(Signature, name, designation and address)

Witnesses:

1.

2.

Accepted Notarised

(Signature, name, designation and address of the Attorney)

Notes:

1. *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.*
2. *Wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.*
3. *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Apostille certificate.*

Appendix 11: Format of summary of Audited Financial Statements

To

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

Sub: Summary of Financial Statement

Ref: *Request for Proposal for Bid for Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand.*

Dear Sir,

This is to certify that..... *[Insert name of Bidder]* (the "Bidder") having its Registered Office at ..... *[Insert Registered Address of the Bidder]* with PAN No. ..... *[Insert PAN No. of the Bidder]* is in the business of ..... *[Insert briefly the nature of the business]*, has recorded the following turnovers and net worth:

Financial Year	Turnover (in INR)	Net Worth (in INR)	For Official Use Only
			Audited Statement Attached?
2017-18			Yes / / No
2016-17			Yes / No
2015-16			Yes / No

All figures indicated herein are arrived from the Audit Reports of the Bidder duly submitted to the Income Tax Department

(Sign and Seal of Bidder)

Sincerely yours,

.....

[Official seal of the Chartered Accountant]

[Insert Name of the Chartered Accountant]

Date: [Insert Date]

[Insert address and contact information of the Chartered Accountant]

Place: [Insert Place]

All figures indicated herein are calculated as per the guidelines mentioned in the Tender.

[NOTES:

A. If the Bidder is seeking financial qualification based on the financial standing of the Parent Company, then a similar certificate summarizing the financial statement of the Parent Company shall be attached by the Bidder as a part of the Bid.
B. All audited statements to be attached by the Bidder as a part of the Bid.

Appendix 12: Format of Authorization by Parent Company

[On the Official Letterhead of the Parent Company]

[Reference No.]

From: [Name of Parent Company]

[Address of Parent Company]

[Date]

To:

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

Sub: Authorization of use of financial capability by Parent JREDA.

Ref: Request for Proposal for Bid for Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand

Dear Sir,

A. With reference to the abovementioned Tender, we confirm that we hold..... [Insert percentage of share held in words] percent ([Insert percentage of share held in figures] %) share in M/s..... [Insert Name of the Bidder].

B. We confirm that M/s.....[Insert Name of the Bidder] is authorized by us to use our financial capability for meeting the financial criteria as specified in the Tender, meeting all the provisions including but not limited to terms and conditions of the Tender and undertaking the Scope of Work as defined in the Tender.

C. We further confirm that we shall by jointly and severely be held responsible for the performance of M/s ..... [Insert Name of the Bidder] as per the various provisions including but not limited to the terms and conditions in undertaking the Scope of Work as defined in the Tender.

D. Our financial summary is attached as a part of the Bid submitted by..... [Insert Name of the Bidder] as per the appropriate format indicated in the Tender.

For and on behalf of ..... [Insert Name of Parent Company]

[Signature and Stamp of any Whole-Time Director]

Name: [Insert name of the Whole-Time Director]

Place: [Insert Place]

Date: [Insert Date]

[NOTE:

A. The Authorization of use of financial capability by Parent Company shall be supported by a specific Board Resolution of the Parent Company satisfactorily conveying the same.]

Appendix 13: Format of Financial Proposal

Date:

To,

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

Sub: Financial Proposal for Bid for Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand

Dear Sir,

I,_____,

present the Financial Proposal for the Bid for "Tender for Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand on EPC basis through the Tender Document No. 16/JREDA/CANALTOP/22-23, confirming that:

i. I agree to all the terms and conditions set forth in this Tender Document. If awarded the Project, the implementation of the Project shall also conform to the terms and conditions, as well as specifications indicated in the Tender Document and as finally indicated by the Evaluation Committee.

ii. Rates quoted in this Bid is for destination prices exclusive GST& inclusive of all other taxes (unless stated otherwise), levies, duties, packing, forwarding, freight, insurance, loading, unloading, supply, installation, commissioning, and any/all charges for successful Engineering, Supply & Installation, Construction, Comprehensive Operation and Maintenance of "Project" at the Site. The break-up of taxes considered are also furnished in price bid.

iii. Rates quoted in this Bid are exclusive GST & INCLUSIVE of all other taxes and duties. The statutory variationin taxes shall be admissible in accordance with the Clause no. 7.13 Taxes and duties of Tender Document. Under no circumstances shall escalation in the prices of this Tender Document be entertained.

iv. The details quoted herein stand valid for at least six months from the date of opening of the Price Bid.

(A) Table 13.A: Price Quote for EPC Contract (must be submitted in Price Part)

Sr. No.	Item	Unit rate/ 2 MW (without taxes & duties)	Freight and transportation	Custom Duties (if applicable)	Other Taxes & Duties (if applicable)	Good and Services Tax (GST)	Final Rate For 2 MW Canal-top SPV Plant
		(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)= (A+B+C+ D+E)**
		(In Rs.)	**(In Rs.)**	**(In Rs.)**	**(In Rs.)**	**(In Rs.)**	**(In Rs.)**
1	PV Modules						
2	Inverters						
3	Supply of Balance of System includes all equipment, materials, spares, accessories, MMS etc. excluding 1 & 2 above						
4	Civil work						
5	General work including erection, testing, commissioning, etc. of entire plant including MMS excluding 4 above						
6= (1+2+3+4+5)	Total Cost						
	"EPC Contract Price" quoted by the Bidder (in Words) (=Total of final rate for 2 MW Canal Top SPV Plant, Column (F)						

Note:

1. EPC cost with other taxes and duties (except GST) shall be considered for evaluation of bid.
2. No variation due to change in forex rate shall be admissible.
3. Payment shall be made in Indian National Rupees (INR) only. Bidder(s) has to quote their rate in INR only.
4. Arithmetical errors will be rectified on the following basis: If there is a discrepancy between words and figures, the amount written in words will prevail.

(C) Table 13.B: Price Quote for O&M Contract for Solar PV Plant including Transmission Line up to Pulling Substation: (must be submitted in Price Part)

Sr. No.	Head	Annual Rate for Comprehensive O&M (each year "O&M Contract Price") (A)	Except GST Taxes& Duties (B)	O&M charges including taxes (C=A+B)	NEEGG (D)	Discounting factor for NPV @10.69 % (E)	NPV of O&M charges (F=AxE)
		(In Rs.)	(In Rs.)	(In Rs.)	(In kWh)		(In Rs.)
1.	O & M for **First Year.**					1	
2.	O & M for **Second Year.**					0.9034	
3.	O & M for **Third Year.**					0.8162	
4.	O & M for **Fourth Year.**					0.7374	
5.	O & M for **Fifth Year.**					0.6661	
6.	O & M for **Sixth Year.**					0.6018	

7.	O & M for **Seventh Year.**					**0.5437**	
8.	O & M for **Eighth Year.**					**0.4912**	
9.	O & M for **Ninth Year.**					**0.4437**	
10.	O & M for **Tenth Year.**					**0.4009**	
11	**TOTAL (In Figures)**						
12	**TOTAL Rate for Comprehensive O&M excluding all taxes " Total O&M Contract Price" (In Words) –(As per Column 11A)**						
13	**TOTAL NEEGG (In Words) – (As per Column 11D)**						

All applicable taxes including service tax and any surcharge or cess thereon are included in the quoted number.

Signature:_____

Designation: _____

Name:_____

Address:

_____

_____

_____

Seal of JREDA / Organization:

_____

Phone:

_____

Email:

_____

Appendix 14: Bid Evaluation Criteria (BEC)

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

Parameters Quoted by the Bidder:

i. Quoted EPC Contract Price,
ii. Quoted Annual Net Electrical Energy Generation Guarantee (NEEGG) at the metering point of the Plant for each year during the O&M period (of 10 years),
iii. Quoted O&M Contract Price for each year during the O&M period (of 10 years),

Parameters assumed constant for evaluation of each Bidder:

iv. Discount Factor of 10.69% annually.

The Evaluated Bid Value (EBV) shall be calculated using the abovementioned parameters as follows:

Step 1		:	Quoted EPC Contract Price at the zeroth (0th) year
Step 2		:	Net Present Value (NPV) of 10 years of O&M Cost quoted by the Bidder
Step 3	ADD	:	EPC Contract Price and NPV of O&M for 10 years
Step 4		:	Summation of quoted NEEGG for 10 years
Step 5	DIVIDE		(Sum of EPC Contract Price and NPV of each year O&M Contract Price for 10 years) by (Summation of quoted NEEGG for 10 years) i.e. *(Step3/Step4)*

The Evaluated Bid Value (EBV) shall be the Net Present Value (NPV) as calculated above.

Evaluated Bid Value (EBV) =

$$\frac{\textbf{EPC Cost + NPV of each year O\&M Contract Price of 10 years}}{\textbf{\textsum NEEGG of 10 years}}$$

The Bidder with the lowest EBV in Rs./ kwh shall be the Successful Bidder.

EXAMPLE:

The following example will further clarify the methodology of comparison:

Note: Figures quoted by Bidder are in **Box**.

Figures Quoted by Bidder 1						Derived/ Evaluated Figures	
EPC Price	:	Rs.	**55.0**	Crore			
Year			NEEGG	O&M Cost			
			(MU)	(Rs. Cr.)			
0			NA	NA			
1			**15.99**	**0.70**			
2			**15.83**	**0.70**			
3			**15.67**	**0.70**			
4			**15.52**	**0.70**			
5			**15.36**	**0.70**			
6			**15.21**	**0.70**			
7			**15.05**	**0.70**			
8			**14.90**	**0.70**			
9			**14.75**	**0.70**		**NPV of each year O&M Contract Price for 10 years (in Rs)**	**Rs. 4,15,55,134**
10			**14.61**	**0.70**			
Total			**152.89**	**7.00**		**EBV (in Rs/ kWh)**	**3.8691**

Figures Quoted by Bidder 2		Derived/ Evaluated Figures

EPC Price	:	Rs.	58.30	Crore		
Year			NEEGG	O&M Cost		
			(MU)	(Rs. Cr.)		
0			NA	NA		
1			16.50	0.94		
2			16.34	0.94		
3			16.17	0.94		
4			16.01	0.94		
5			15.85	0.94		
6			15.69	0.94		
7			15.53	0.94		
8			15.38	0.94		
9			15.23	0.94	**NPV of each year O&M Contract Price for 10 years (in Rs)**	**5,58,02,608**
10			15.07	0.94		
Total			157.77	9.40	**EBV (in Rs/ kWh)**	**4.0490**

Result:

- EBV in Rs/kWh of Bidder 1 is Rs. 3.8691 per kWh.
- EBV in Rs/kWh of Bidder 2 is Rs. 4.0490 per kWh.
- EBV of Bidder 2 is higher than Bidder 1.
- Hence, Bidder 1 would be preferred as the Successful Bidder compared to Bidder 2. Bidder with lower EBV in Rs./kWh shall be L-1 and Bidder higher than that shall be the L-2 and so on.

Appendix 15: Procedure for Performance Testing

Part A: Solar PV power plant Net power generation

1. The Contractor shall quote the 'Net Electrical Energy Generation Guarantee" for annual basis considering the Reference Global Average Radiation indicated in this Tender.
2. The Contractor shall demonstrate "Actual Delivered Energy" at metering point as compared to the '*Base NEEGG'* for every year from the date of starting of O&M Period.
3. The quoted NEEGG as in Table no. 14 B in Appendix 14 for any year shall be permitted with maximum 1 % degradation factor in previous year generation.
4. The quoted NEEGG will be used for the calculating CUF.
5. The Bidder shall clearly mention the technology used i.e. fixed/tilt or seasonal tracker (please specify) as per Table given in Appendix 6.

<u>Operational Acceptance Test Procedure</u>

Performance Ratio (PR) - Test Procedure

1. Performance Ratio as determined through the PR Test Procedure specified here should not be less than 0.75 for Operational Acceptance Test.
2. The Performance Ratio Test to prove the guaranteed performance parameters of the power plant shall be conducted at site by the Contractor in presence of the Company. The Contractor's Engineer shall make the plant ready to conduct such tests. The Operational Acceptance Test shall be commenced, within a period of one (1) month after successful Commissioning and, there will be continuous monitoring of the performance for 30 days. Any extension of time beyond the above one (1) month shall be mutually agreed upon. These tests shall be binding on both the parties to the contract to determine compliance of the equipment with the guaranteed performance parameters. This monitoring will be performed on the site under the supervision of the Company/ Company's engineer.

3. The test will consist of guaranteeing the correct operation of the plant over 30 days, by the way of the efficiency rate (performance ratio) based on the reading of the energy produced and delivered to the grid and the average incident solar radiation. During this period of 30 days, any 05 (Five) instances of 15 (Fifteen) minutes shall be taken to calculate the instantaneous Performance Ratio of 15 minutes block as per the formula given below in Point No. 5. If the PR of these 05 (Five) instances is above 75%, then Operational Acceptance Test (OAT) shall be considered successful.

4. PR shall be demonstrated against the installed DC Capacity.

5. The Efficiency or performance ratio (PR) of the PV Plant is calculated as follows (according to IEC 61724)

Performance Ratio (PR) = Y_A / Y_R

Where;

Y_A = Final (actual measured) PV system yield in kilo-watt hours at the point of measurement during the testing period, and

Y_R = Reference yield calculated as the product of the insolation on the plane of the collector (i.e. PV modules) in kWh/ m^2 during the testing period and the installed DC capacity of the plant in kW.

= [Insolation on the plane of the collector (i.e. PV modules) in kWh/ m^2 during the testing period] x Area of the collector of Installed DC Capacity x Installed DC Capacity

= (kWh/m^2) x m^2 x Installed DC Capacity

Monitoring System for PR Verification

The following instrumentation will be used to determine the Solar Plant Performance:

- Power Meter at the delivery point.
- Power Meter for each inverter for reference only.
- One nos. calibrated pyranometer to determine irradiance on the plane of array (with a target measurement uncertainty of ± 2).

- One nos. calibrated pyranometer to determine irradiance on horizontal plane (with a target measurement uncertainty of ± 2)
- Two nos. thermocouples to measure module temperature with a measurement uncertainty of ±1 °C.
- Shielded ventilated thermocouple with a measurement accuracy of ±1°C.
- An anemometer mounted on a 10m mast to measure wind speed (without additional shadowing on modules).
- Data measurement shall be witnessed in the format mutually agreed before the start of PR test by the employer and the contractor jointly for the said period.
- The Contractor shall show the specified PR for Operational Acceptance.

Part C: The procedure for Security Deposit Test (PGT) - cum- Final Acceptance Test- shall be as follows:

1. A weather station with a calibrated pyranometer shall be installed by the Contractor at the location mutually agreed by the Contractor and JREDA. The test report for the calibration shall be submitted by the Contractor for approval by JREDA. The calibration should be traceable to a national/international laboratory. The output of this pyranometer for shall be logged in the SCADA system.
2. In case the pyranometer is found to be working erratically then immediately the Contractor shall take necessary steps to rectify and/or recalibrate the instrument to the satisfaction of JREDA. However, for the dispute period for which such error has occurred and until the instrument is recalibrated to the satisfaction of JREDA, data from any one of the following list of sources as decided by JREDA will be used:
    i. A separate pyranometer installed by the Company near the site, if available
    ii. Average of two closest solar power projects, as identified by JREDA
    iii. Nearest MNRE weather station
3. "Actual Delivered Energy" from the plant supplied by the Contractor shall be noted for every month and summed up for entire year. For this purpose, the net delivered energy at the metering point shall be taken into account.
4. The measured value of energy at step (3) shall be compared with '*Base NEEGG'* and hence with 'B*ase CUF'* value. *"Base NEEGG/ CUF"* for a month is calculated by

using the NEEGG quoted in the offer by the Contractor adjusted with a correction factor to take into account the actual average global solar radiation measured by the calibrated pyranometer for that year.

5. Further, if the plant is not able to achieve the calculated *Base NEEGG/CUF* during PGT and O&M period and there is a shortfall in energy generation, then the Contractor shall be penalized as per relevant Clause of the Tender.
6. The Contractor shall share with JREDA all the radiation, generation, etc. parameters details and all other factors necessary for JREDA to corroborate the estimate. JREDA has the right to cross verify data submitted by the Contractor by all possible means/sources.

Following factors may be noted for computing the Base NEEGG/ CUF:

1. Effect due to variation in annual insolation shall only be considered for computing the Base NEEGG/ CUF.
2. Effect due to variation of meteorological parameters e.g. ambient temperature, wind speed, humidity etc. shall not be considered.
3. **Generation loss due to grid outage**: The measured global solar radiation of the period of the outage of the power evacuation system shall be excluded to calculate average global solar radiation for the period of PGT and O&M.

Solar Radiation:

Ideally, actual measurement of solar radiation at the site is desirable for estimating the projected power output since solar energy is the raw material for power generation. It may be noted that the annual average solar radiation measurement even for 1-2 years is not sufficient. World over, an average radiation value for at least 8-10 years is used for solar power project designing since climatic variations are quite wide year-to-year. Under such a situation, the prevailing practice world over is to develop software which uses satellite measured solar radiation and matches it with the actual ground measured data for the particular site where actual data has been obtained for many years. There are radiation data from reputed agencies like NASA available. The derived values are tabulated below:

.

Month	GHI
	GHI (kWh/m^2/month)
January	134.5
February	144.8
March	187.2
April	193.2
May	206.6
June	163.9
July	139.0
August	137.8
September	133.6
October	140.8
November	131.3
December	128.4
Annual	**1,841.2**

Source: NASA

The above radiation data shall be used by the Bidder to calculate NEEGG. This radiation data is for evaluation purpose. However, for every year actual radiation shall be considered to calculate the NEEGG by the Bidder.

Illustration:
If the GHI of a year is more or less then the reference GHI then NEEGG will be calculated as follows:

NEEGG = (Actual GHI x NEEGG guaranteed by contractor on reference GHI)/ (Reference GHI)

NEEGG guaranteed by Contractor = 31,53,610 KWh

Reference GHI= 1841.2 KWh/m^2 per annum

For Example:

Case A) for higher irradiation:

If Actual GHI = 2000 kWh/m^2 per annum then NEEGG will be:

NEEGG = (2000 x 31,53,610)/ 1841.2

NEEGG = 34,25,603 KWh/ Annum

Case B) for lower irradiation:

If Actual GHI = 1800 kWh/m^2 per annum then NEEGG will be:

NEEGG = (1800 x 31,53,610)/ 1841.2

NEEGG = 30,83,042 KWh/ Annum

Appendix 16: List of Banks (for Bank Guarantee)

Bank Guarantee from the following Banks will be acceptable.

1. All Scheduled Nationalized Bank
2. The Bank Guarantee submitted should have the clear one-time validity in all respect and up to the completion period. If by any reason the contract period is extended, bidder shall undertake to renew the Bank Guarantee at least one month before the expiry of the validity failing which JREDA will be at liberty to encash the same.

Appendix 17: Format of Performance Bank Guarantee

[To be on non-judicial stamp paper of Rupees One Hundred Only (INR 100/-) or appropriate value as per Stamp Act relevant to place of execution, duly signed on each page.]

Ref.: _____ Bank Guarantee No.: _____

Date: _____

To,

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

PERFORMANCE BANK GUARANTEE FOR CONTRACT PERFORMANCE

WHEREAS Jharkhand Renewable Energy Development Agency, incorporated as a society act in year 2001 under the administrative control of the Department of Energy, Govt. of Jharkhand, having its Registered Office at 3rd Floor, SLDC Building, Kusai Colony, Doranda, Ranchi, Jharkhand (India) (Hereinafter referred to as the "Company" which expression shall unless repugnant to the context include its successors, executors, administrators, legal representatives and assigns) is setting-up a **2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand (India)** (Hereinafter referred to as "Project").

WHEREAS the Company has placed a Letter of Intent No…..... dated …….. as also a Contract dated…..... (hereinafter called the CONTRACT) on; M/s ..... registered in India under the Companies Act, 1956, having its Registered Office..... (Hereinafter referred to as the "Contractor") for setting up of the said Project on the terms, specifications

and conditions specified therein for **Design, Engineering, Procurement & Supply, Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand** which shall include any amendments/alterations made in the Tender Document thereto before the date of submission of the Tender by the Company, which has been unequivocally accepted by (the "Contractor").

AND WHEREAS in conformity with the provisions of Clause No. .....of the said CONTRACT, the "Contractor" has agreed to· furnish an unconditional Bank Guarantee for an amount equivalent to 10% of the EPC Contract Price i.e. Rs…….……..... for the timely completion and faithful execution of the Contract and successful completion of the Security Deposit Tests of plant equipment to demonstrate the guaranteed values.

AND WHEREAS the Company has agreed to accept a Bank Guarantee for Rs..... from ……. Bank having its Head Office at ……
Through its Branch……. (hereinafter referred to as the "Bank" which expression shall unless repugnant to the co0ntext include its successors and permitted assigns).

In consideration of the above, the "Bank" hereby unconditionally and irrevocably guarantees and undertakes as a direct responsibility, to pay to the Company merely on demand any amount not exceeding Rs. …… without any demure, reservation, recourse, contest or protest and *I* or without reference to the "Contractor".

Any such demand made by the "Company" on the "Bank" shall be conclusive and binding notwithstanding any difference between Company and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The bank undertakes not to revoke this guarantee herein contained and shall continue to be enforceable till the Company discharge this guarantee.

The decision of the Company as to whether the "Contractor" has fulfilled its obligation or not under the CONTRACT shall be final and binding on the "Bank" and the "Contractor".

The Company 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 Company 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 forebear to enforce any covenants contained or implied in the Contract between the Company and “the Contractor” or any other course of remedy or security available to the Company. The Bank shall rot be released of its obligations under these presents by any exercise by the Company of its liberty with reference to matters aforesaid or any of them or by reason of any other act or' forbearance to other acts of omission or commission on the part of the Company of any other indulgence shown by the Company or by any other matter or thing whatsoever which under the law would, but for this provision, have the effect of relieving the Bank.

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

This Guarantee shall be valid for a period of …… (Refer NIT) months from ..... i.e. up to ..... The Guarantee herein contained shall be a continuing Guarantee and shall not be affected by any change in the constitution of the “Bank” or of the “Contractor”. This Guarantee shall be in addition to and shall not affect or be affected by any other security now or hereafter held by the Company and Company at its discretion and without any further consent from the Bank and without affecting the liability of the “Bank” and other indulgence to or make other arrangements with the Contractor and nothing done or omitted to be done by the Company in pursuance of any authority contained in this guarantee shall affect or discharge the liability of the Bank.

However, it has been agreed between the Contractor and the Company that there shall be only one composite Bank Guarantee for Security Deposit valid for a period of twenty four (24)

months from the date of issue of Letter of Intent (LOI) or timeline referred in of *NIT, Table B* whichever is later, as per the terms of the referred Tender Document.

NOTWITHSTANDING anything herein before above contained, the liability of the Bank under this Guarantee shall be restricted to Rs..... *<10% of the EPC Contract Price>* and the Guarantee shall remain in force up to and including _____.

This Bank Guarantee shall be revalidated automatically till the Contract Security Deposit is extended.

Bank undertakes not to revoke this guarantee during its currency except with the previous expressed consent of the Company in writing and agrees that any change in the constitution of the Bank or the Contractor shall not discharge our liability hereunder.

IN WITNESS WHEREOF we have set our hands and seal hereunder at this…… day of
…… at .....

For,_____Bank,

Signature:_____
Name:_____
Designation:_____
Address: _____
_____
Power of Attorney No._____
_____
Banker's Stamp and Full address

Dated this_____day of_____, 20xx

Appendix 18: Format of O&M Bank Guarantee

[To be on non-judicial stamp paper of Rupees One Hundred Only (INR 100/-) or appropriate value as per Stamp Act relevant to place of execution, duly signed on each page.]

Ref.: _____ Bank Guarantee No.: _____

Date: _____

To,

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

O&M BANK GUARANTEE FOR CONTRACT PERFORMANCE

WHEREAS Jharkhand Renewable Energy Development Agency, incorporated as a society act in year 2001 under the administrative control of the Department of Energy, Govt. of Jharkhand, having its Registered Office at 3rd Floor, SLDC Building, Kusai Colony, Doranda, Ranchi, Jharkhand (India) (Hereinafter referred to as the "Company" which expression shall unless repugnant to the context include its successors, executors, administrators, legal representatives and assigns) is setting-up a **2 MW Grid-Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand (India)** (Hereinafter referred to as "Project").

WHEREAS the Company has placed a Letter of Intent No…..... dated …….. as also a Contract dated…….. (hereinafter called the CONTRACT) on; M/s …… registered in India under the Companies Act, 1956, having its Registered Office ..... (Hereinafter referred to as the "Contractor") for setting up of the said Project on the terms, specifications and conditions specified therein for **Design, Engineering, Procurement & Supply,**

Construction, Commissioning And Comprehensive Operation & Maintenance For Ten (10) Years of 2 MW Grid Connected Canal-top Solar Photovoltaic Power Plant at Sikidiri Canal, Ranchi, Jharkhand which shall include any amendments/alterations made in the Tender Document thereto before the date of submission of the Tender by the Company, which has been unequivocally accepted by (the "Contractor").

AND WHEREAS in conformity with the provisions of Clause No. ----------of the said CONTRACT, the "Contractor" has agreed to· furnish an unconditional Bank Guarantee for an amount equivalent to 10% of the EPC Contract Price i.e. Rs…….……..... against any loss or damage, costs, charges and expenses caused to or suffered by Company by reason of non-performance and fulfilment or for any breach on the part of the Contractor of any of the terms and conditions of the referred Tender Document/Contract Agreement.

We,_____Bank, further agree that the Company shall be the sole judge whether the said Contractor has failed to perform or fulfil the O&M scope of work and the extent of loss, damage, cost, charges and expenses suffered or incurred or would be suffered or incurred by the Company on account thereof and we waive in favour of the Company all the rights and defences to which we as Guarantors and/or the Contractor may be entitled to.

AND WHEREAS the Company has agreed to accept a Bank Guarantee for Rs..... from ……. Bank having its Head Office at ……Through its Branch… ..... (hereinafter referred to as the "Bank" which expression shall unless repugnant to the context include its successors and permitted assigns).

In consideration of the above, the "Bank" hereby unconditionally and irrevocably guarantees and undertakes as a direct responsibility, to pay to the Company merely on demand any amount not exceeding Rs. …… without any demure, reservation, recourse, contest or protest and *I* or without reference to the "Contractor".

Any such demand made by the "Company" on the "Bank" shall be conclusive and binding notwithstanding any difference between Company and the Contractor or any dispute pending

before any Court, Tribunal, Arbitrator or any other authority. The bank undertakes not to revoke this guarantee herein contained and shall continue to be enforceable till the Company discharge this guarantee.

The decision of the Company as to whether the “Contractor” has fulfilled its obligation or not under the CONTRACT shall be final and binding on the “Bank” and the “Contractor”.

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

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

This Guarantee shall be valid for a period of …… {*Refer NIT*} days from ..... [*the date of both A) Completion of Facilities and B) Successful Operational Acceptance Test, whichever is later,*] i.e. up to ..... .The Guarantee herein contained shall be a continuing Guarantee and shall not be affected by any change in the constitution of the “Bank” or of the “Contractor”. This Guarantee shall be in addition to and shall not affect or be affected by any other security now or hereafter held by the Company and the Company at its discretion and without any further consent from the Bank and without

affecting the liability of the "Bank" and other indulgence to or make other arrangements with the Contractor and nothing done or omitted to be done by the Company in pursuance of any authority contained in this guarantee shall affect or discharge the liability of the Bank.

NOTWITHSTANDING anything herein before above contained, the liability of the Bank under this Guarantee shall be restricted to Rs..... *<10% of the EPC Contract Price>* and the Guarantee shall remain in force up to and including _____. [*One year plus **45 days** from the date of both A) Completion of Facilities and B) Successful Operational Acceptance Test, whichever is later*],

This Bank Guarantee shall be revalidated automatically till the Operational & Maintenance Period is over.

Bank undertakes not to revoke this guarantee during its currency except with the previous expressed consent of the Company in writing and agrees that any change in the constitution of the Bank or the Contractor shall not discharge our liability hereunder.

IN WITNESS WHEREOF we have set our hands and seal hereunder at this…… day of
…… At .....

For,_____Bank,
Signature:_____
Name:_____
Designation:_____
Address: _____
_____
Power of Attorney No._____

_____
Banker's Stamp and Full address

Appendix 19: Format of EMD

[To be on non-judicial stamp paper of Rupees One Hundred Only (INR 100/-) or appropriate value as per Stamp Act relevant to place of execution, duly signed on each page.]

Ref.: _____ Bank Guarantee No.: _____

Date: _____

To,

The Director,

Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, SLDC Building,

Kusai Colony, Doranda

Ranchi-834 002, Jharkhand

EMD BANK GUARANTEE FOR CONTRACT PERFORMANCE

WHEREAS ..... (Supplier's name) (thereinafter referred to as "Supplier"), a company registered under the Companies Act, 1956 and having its registered office at..... is required to deposit with you, the Purchaser, by way of Earnest Money Rs. ……..…….. (Rupees ..... only) in connection with its tender for the work with reference to Notice Inviting Bid (NIB) No. ……..…… dated ……..……. as per specification and terms and conditions enclosed therein.

WHEREAS the Supplier as per "Notice Inviting Bid" has agreed to establish a Bank Guarantee /DD in Your favour through us valid up to …….…….….. (date) instead of deposit of earnest money in cash.

WHERAS you have agreed to accept a Bank Guarantee/DD from us in …… instead of earnest money in cash from the Supplier.

1. We …….…… (Bank) hereby agree and undertake to pay you on demand the said amount of Rs. …….. (Rupees..... only) without any protest or demur in the event the Supplier/Tenderer after submission of his tender, resiles from or withdraws his offer or modifies the terms and conditions thereof in a manner not acceptable to you or expresses his unwillingness to accept the order placed and/or letter of intent issued on the Supplier/Tenderer for the work under "Notice Inviting Bid Ref. No.:" 16/JREDA/CANALTOP/22-23".

2. Your decision as to whether the Supplier/Tenderer has resiled from or has withdrawn his offer or has modified the terms and conditions thereof in a manner not acceptable to you or has expressed his unwillingness to accept the order placed and/or Letter of Intent issued by you on the Supplier/Tenderer for the work under "Notice Inviting Bid Ref. No. : 16/JREDA/CANALTOP/22-23 in this regard, shall be final and binding on us and we shall not be entitled to question the same.

3. Notwithstanding anything contained in the foregoing, our liability under this Guarantee shall be restricted to Rs. ..... (Rupees ..... only).

4. This Guarantee shall remain valid and in full force and effect up to ..... (Date) and shall expire thereafter unless an intimation is given to the Bank by you earlier in writing discharging us from our obligation under this Guarantee.

5. We shall not revoke this Guarantee during its currency except by your consent in writing.

6. This Guarantee shall not be affected by any change in the constitution of the Supplier/Tenderer or yourselves or ourselves but shall ensure to your benefit and be enforceable against our legal successors or assignees by you or your legal successors.

7. Notwithstanding anything contained herein above unless a demand or claim under this Guarantee is made on us in writing within six months from the date of expiry of this Guarantee we shall be discharged from all liabilities under this Guarantee thereafter.

8. We have power to issue this Guarantee under our Memorandum and Articles of Association and the undersigned who is executing this Guarantee has the necessary power to do so under a duly executed Power of Attorney granted to him by the Bank.

Signed and Delivered

For and on behalf of..... Bank.

(Banker's Name)

Name of Bank Manager:

…….

Address

……..……

……..…

Annexure 1: Details of Plant Location and Site Analysis

1.1 Proposed Project Site Location

Canal is originating from the Getalsud Dam on Subarnarekha River which is in the Angara Tehsil, Ranchi district. It is approximately 40 Km from Ranchi. Starting point of Canal is approx. 4-5 km from “Ranchi-Dhanbad Road” ie. “SH 320” and end of the stretch under consideration crosses the “SH 320” near Sikidiri. The whole 5 km stretch under consideration is flowing from south west to north east with little deviation in the middle.

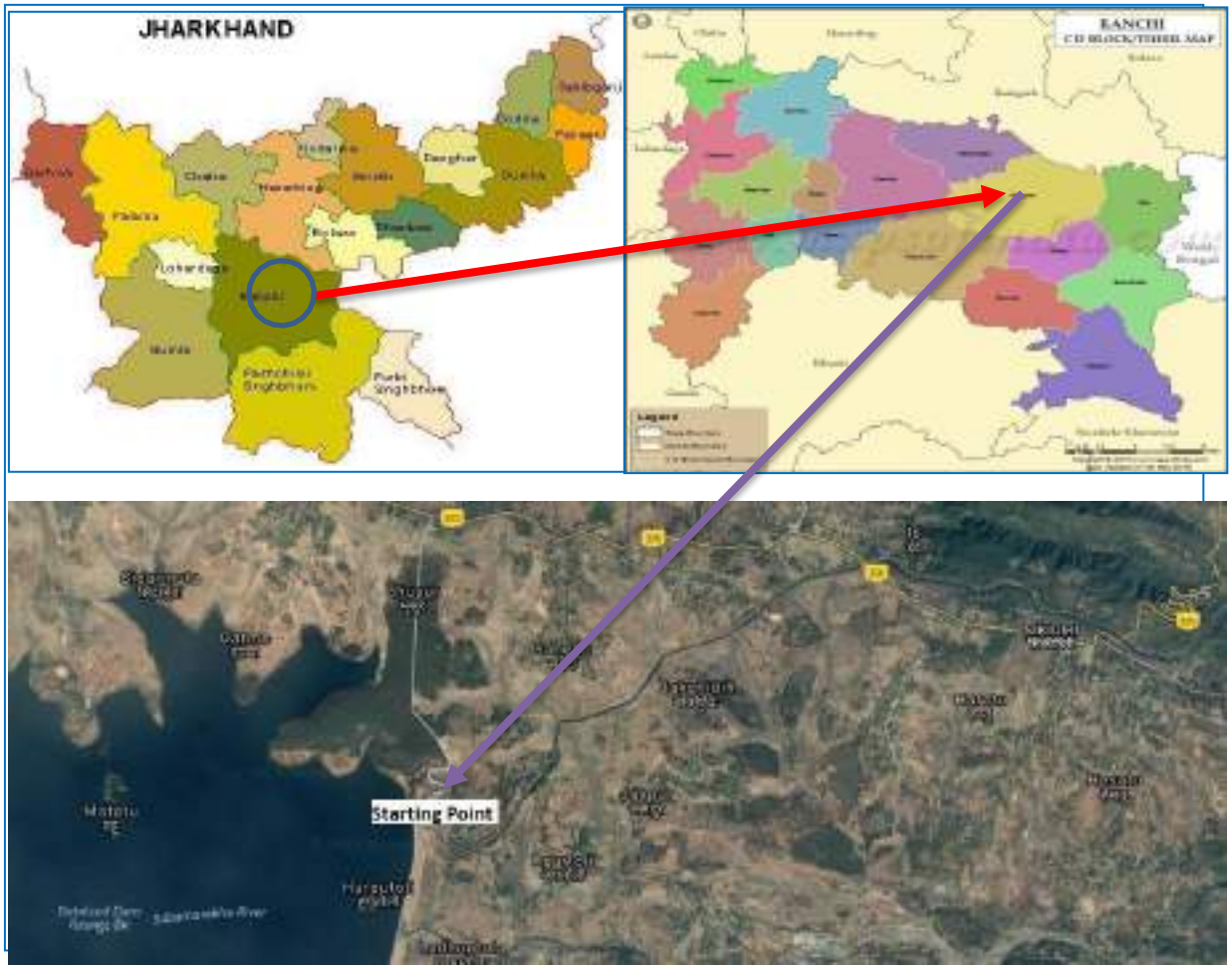


Figure 1 Project Location

Figure 2 Pictures of Project site


Control Room
Chainage. 0-5
Project Road
Service Road
Chainage. 21
Chainage. 55

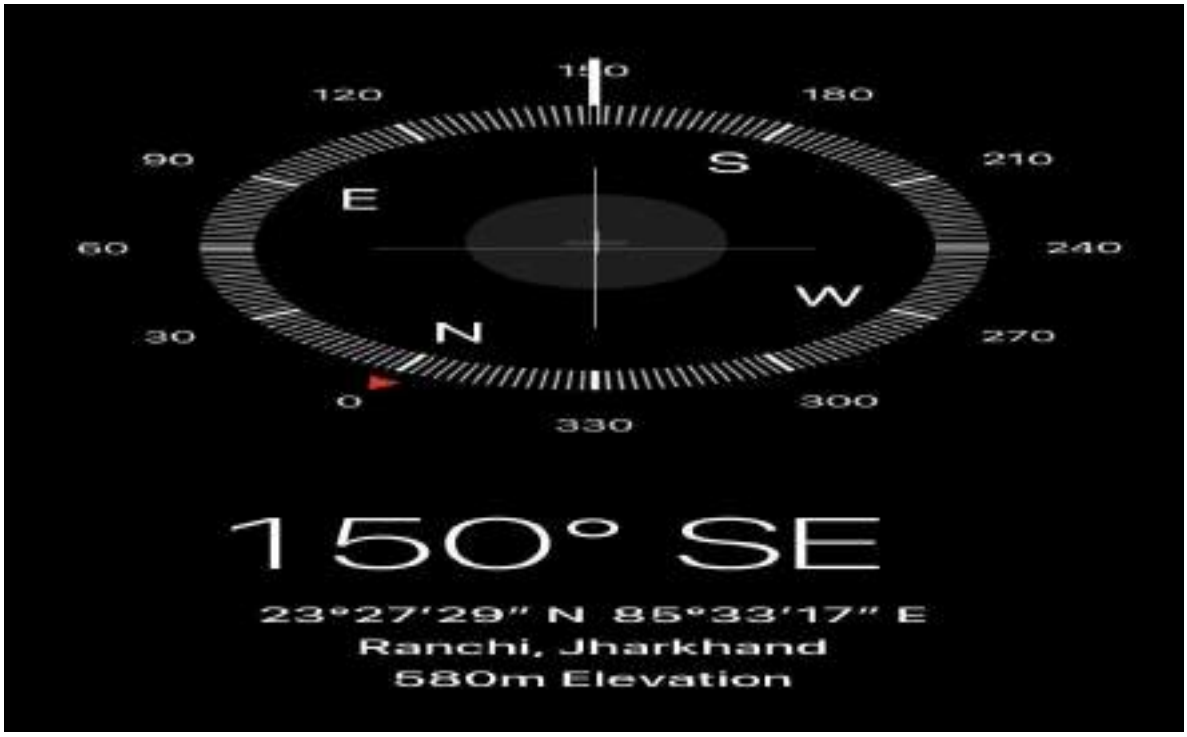

120
180
90
210
60
240
30
270
0
300
330
S
E
W
N
150° SE
23°27'29" N 85°33'17" E
Ranchi, Jharkhand
580m Elevation

Table 1 Specification of Canal

Type	Concrete lining Canal Originating from Getalsud Dam.
Chainage of Canal (Proposed)	21 CH to 55 CH
Approx. Bottom Width	4.63 Meters
Approx. Top Width	21.77 Meters
Approx. Depth	4.27 Meters
Approx. Lengths of stretch suitable for Installation	1.6 KM
Bed Lining	Concrete
Side Lining	Concrete
Embankment width	1.22 Meter

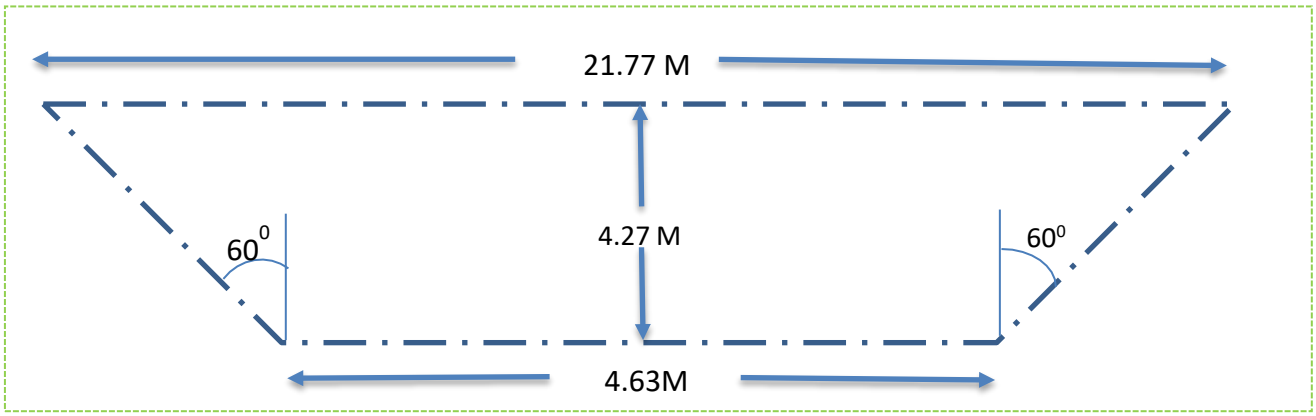


Figure 3 Cross Section of Canal

Table 2 Detailed of project site location

District	Ranchi
Tehsil	Angara
Nearby villages	Sikidiri
Latitude	23⁰28'35"
Longitude	85⁰34'37"

Altitude	580M
Approx. Length of Suitable Stretch	3000 Meter
Approx. Average Width of Canal Top	22 Meter
Approx. Area Available (Upper width *Stretch length)	16 acres

1.2 Climatic Data

Assessment of climatic data of project site is very important because it is very closely related to out of and overall performance of the solar power plant. Three vital parameters which have direct impact on generation are solar insolation available at location, temperature profile and rainfall. Last 20 years' average is as below.

1.2.1 Radiation

Monthly averaged radiation incident on equator-pointed tilted (Tilt angle 24°) is 5.15 kWh/m2/day. Radiation is maximum in the month of March and April and minimum in the month of August.

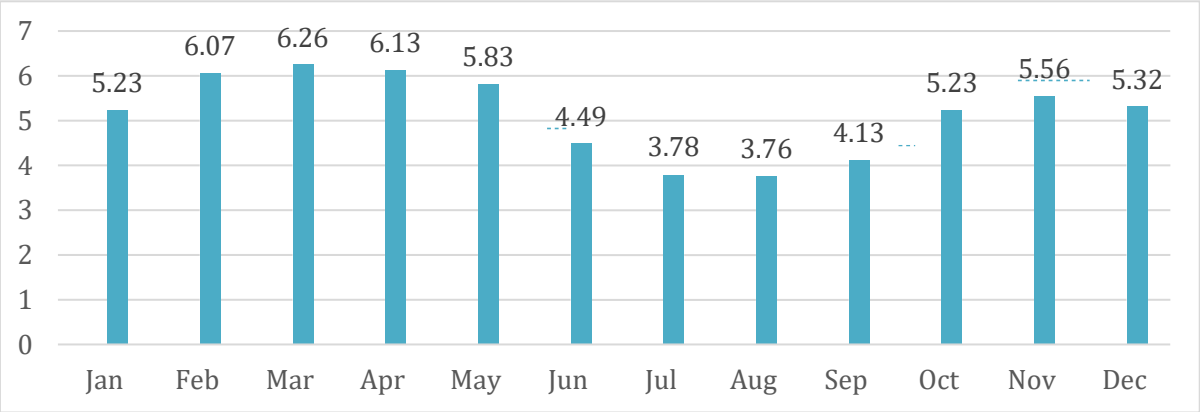


Figure 4 Radiation of location

1.2.2 Temperature

Annual average temperature at the project site is 25.6°celcius1. Temperature at site is seems moderate and there is not much variation in the monthly temperature at proposed site.

[1] NASA-22 Years Average

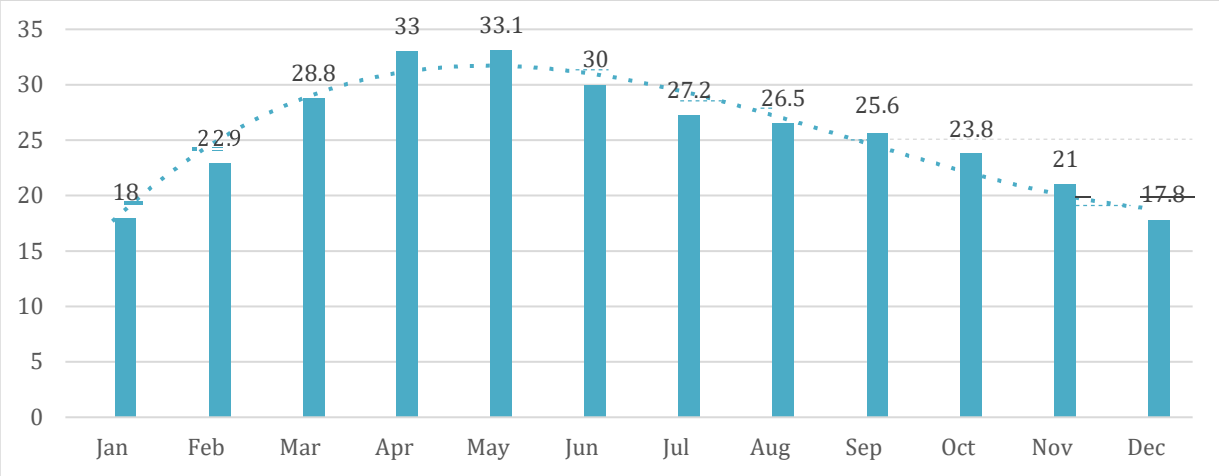


Figure 5 Temprature

1.2.3 Rainfall

Monthly Averaged Precipitation at project site is 3.48 mm/day2. June, July, Aug and September received heavy rainfall at the project site and water table in canal rises.

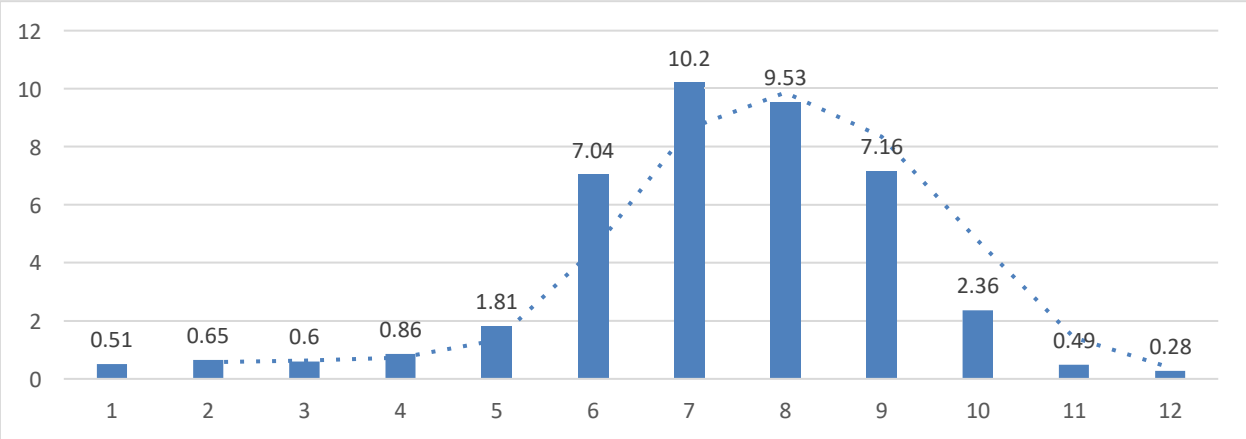


Figure 6 Rainfall

1.3 Canal Top Solar Plant Generation Details

As per the data available for the canal for the sections and stretches of the canal, a rough estimate of has been formulated. The following sections has been taken in consideration for the canal top solar plant.

Table 3 Location Coordinates

S.No.	Co-ordinates(From)	Co-ordinates (To)	Length
1	23°27'42.3"N 85°33'35.3"E	23°28'55.9"N 85°35'26.2"E	4 Km

[2] NASA-22 Years Average

Disclaimer

i. The information contained in this Tender or amendments, annexure or attachments subsequently provided to Bidders, in documentary or in any other form, by or on behalf of JREDA, any of their employees, consultants or advisors, is provided to Bidders on the terms and conditions set out in this Tender and such other terms and conditions subject to which such information is provided.

ii. This Tender is not an agreement and is neither an offer nor invitation by JREDA to the prospective Bidders or any other person. The purpose of this Tender is to provide interested parties with information that may be useful to them in the formulation of their Bid for qualification pursuant to this Tender. This Tender includes statements, which reflect various assumptions and assessments arrived at by JREDA or their employees or consultants or agents, in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require. This Tender may not be appropriate for all persons, and it is not possible for JREDA, their employees or consultants to consider the investment objectives, financial situation and particular needs of each party who reads or uses this Tender.

iii. The assumptions, assessments, statements and information contained in this Tender may not be complete, accurate, adequate or correct. Each Bidder should therefore conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this Tender and obtain independent advice from appropriate sources.

iv. Information provided in this Tender to the Bidders is on a wide range of matters, some of which depends upon interpretation of law. The information given may not be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. JREDA would not bear any responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

v. JREDA, its employees and consultants make no representation or warranty and shall have no liability to any person, including any Bidder or Bidders, under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise

for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this Bid or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of this Tender and any assessment, assumption, statement or information contained therein or deemed to form part of this Tender or arising in any way with prequalification of Bidders for participation in the Bidding process.

vi. JREDA also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this Tender. JREDA may, in their respective absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this Tender.

vii. The issuance of this Tender does not imply that JREDA is bound to select and shortlist prequalified Bids or to appoint the selected Bidder, as the case may be, for the Project and JREDA reserves the right to reject all or any of the Bid or Bids without assigning any reasons whatsoever.

viii. The Bidder shall bear all its costs associated with or relating to the preparation and submission of its Bid including but not limited to preparation, copying, postage, delivery fees, estimation, travel, expenses associated with any demonstrations or presentations which may be required by JREDA or any other costs incurred in connection with or relating to its Bid. All such costs and expenses will remain with the Bidder and JREDA shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the Bid regardless of the conduct or outcome of the Bidding process.

--- End of Section ---

NOTES