

**Bid Specifications for
Design, Engineering, Supply, Installation, Testing & Commissioning of 600 KWp of Grid
connected SPV Power Plants including five years Comprehensive Maintenance Contract
(CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.**

(JREDA)

Government of Jharkhand

Tender reference no.: 02/JREDA/SPV/AIRPORT/21-22



Jharkhand Renewable Energy Development Agency (JREDA)

3rd Floor, S.L.D.C. Building, Kusai Colony, Doranda, Ranchi-834002.

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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.: 02/JREDA/SPV/AIRPORT/21-22

Dated: 16.07.2021

Online bids are invited for the work of Design, Engineering, Supply, Installation, Testing & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand. The details are as follows:

1	Name of the work	Design, Engineering, Supply, Installation, Testing & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.
2	Estimated cost (Rs.)	Rs. 12,75,00000.00
3	Tentative quantity (kWp)	5X600 kWp
4	Completion of work	06 (Six) Months
5	Period of contract	5 years and 6 Months
6	Date of publication of NIT on website: http://jharkhandtenders.gov.in	16.07.2021 (Friday)
7	Date & time of Pre-bid meeting	26.07.2021 (Monday) at 2.00 P.M.
8	Last date & time for receipt of online bids	10.08.2021 (Tuesday) upto 05:00 PM
9	Submission of original copies of Bid fee & EMD (Offline)	10.08.2021 and 11.08.2021 up to 5.00 P.M.
10	Technical Bid Opening Date	12.08.2021 (Thursday) at 3.00 P.M.
11	Name & address of office inviting tender	Director, Jharkhand Renewable Energy Development Agency (JREDA) 3 rd Floor, SLDC Building, Kusai, Doranda, Ranchi- 834002 (Jharkhand)
12	Contact no. of procurement officer	0651-2491163/67/61
13	Helpline no. of e-procurement	0651-2491163/67/61

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

**Director,
JREDA, Ranchi**

Section -1: List of Important dates & details of Bids
NIB No: 02/JREDA/SPV/AIRPORT/21-22

1.	Name of work	Design, Engineering, Supply, Installation, Testing & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.	
2	Tender reference no.	02/JREDA/SPV/AIRPORT/21-22	
3	Contract period	5 years and 6 months	
4	Mode of submission of tender	Online through www.jharkhandtenders.gov.in	
5	Tentative Quantity	Grid Connected SPV Power Plants at different airports in the state of Jharkhand: 5x600 kWp (approx.) The quantity mentioned above is tentative and subject to increase or decrease depending on the actual requirement at the time of placing order and resources available.	
6	Tender fee	❖ For General Bidders: Rs. 15,000/- (Fifteen Thousand) only. ❖ For MSEs of Jharkhand: Nil.	
7	Earnest Money Deposit	❖ For General Bidder: Rs. 5.10 lakhs per project. The bidders quoting for higher capacities are required to submit EMD in the same proportion. ❖ For MSEs of Jharkhand: Nil.	
8	Maximum/Minimum Project size	Maximum: 2 Nos. Minimum: 1 No. No bidder shall submit bid for projects for more than maximum Project size.	
9	Publishing on website	16.07.2021 (Friday)	
10	Period of downloading of bidding documents	Start date: 20.07.2021	Time: 10.00 AM
		End date: 10.08.2021	Time: 05.00 PM
11	Bid online submission	Start date: 20.07.2021	Time: 11.00 AM
		End date: 10.08.2021	Time: 05.00 PM
12	Technical bid opening date	12.08.2021 (Thursday)	Time: 03.00 PM
13	Authority inviting bids	Director, Jharkhand Renewable Energy Development Agency (JREDA)	
14	Address	Jharkhand Renewable Energy Development Agency (JREDA) 3 rd Floor, SLDC Building, Kusai, Doranda, Ranchi- 834002. Ph. No: 2491161, Fax No: 0651-2491165 Web site: www.jreda.com E-mail: info@jreda.com	

Note: The Tender Fee & EMD in original must be submitted on 10.08.2021 and 11.08.2021 up to 05:00 PM. If tender fee and EMD are not received before mentioned date and time, tender shall be considered invalid. MSEs seeking exemption from Tender fee & EMD, shall submit documentary evidence supporting the exemption.

Place for receiving Tender fee & EMD:

Jharkhand Renewable Energy Development Agency (JREDA), 3rd Floor, SLDC Building, Kusai, Doranda, Ranchi- 834002.

Section-2: Instructions to Bidders
NIB No: 02/JREDA/SPV/AIRPORT/21-22

1. The guidelines to submit bid online can be downloaded from website <http://Jharkhandtenders.gov.in>
2. The interested bidders can download the bid from the website "<http://Jharkhandtenders.gov.in>".
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.
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.
5. Bids will be opened online as per time schedule mentioned in Section 1
6. Bidders should get ready with the scanned copies of cost of documents & tender fee 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.
7. Bidders who are not availing benefit of Jharkhand MSEs have to produce the original D.D. towards tender fee 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 specified in the tender documents should be the same as submitted online (scanned copies) otherwise tender will summarily be rejected.
8. Bidder who are not availing benefit of Jharkhand MSEs have to submit the original Bank Guarantee against Earnest Money Deposit (EMD) in favour of "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 Bank Guarantee specified in the tender documents should be the same as submitted online (scanned copies) otherwise tender will summarily be rejected.
9. 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.
 - i. The department will not be responsible for delay in online submission due to any reason.
10. All the required information for bid must be filled and submitted online.
11. Other details can be seen in the bidding documents.
12. Details of documents to be furnished for online bidding
Scanned copies of the following documents must be up-loaded in pdf. format on the website <http://Jharkhandtenders.gov.in>.
 - i. D. D. towards Tender fee. (Only General Bidder)
 - ii. Earnest Money Deposit (EMD). (Only General Bidder)
 - iii. GST certificate.
 - iv. PAN Card
 - v. Certificate of Incorporation (Not required for Proprietorship firm)

- vi. A bidder can either apply under General category or in MSEs category therefore bidder have to submit an undertaking which should clearly mention the category (General/MSEs of Jharkhand). Bid will be evaluated under the provision of that particular category.
 - vii. In case the bidder wants to avail benefit of MSEs of Jharkhand then bidder must submit
 - i. Registration certificate of MSEs of Jharkhand/ UDYAM issued by Industry Dept. duly verified by GM-DIC mentioning whether unit is existing/ functional and doing regular production at what capacity as per Industry Policy of Jharkhand.
 - ii. Date of Production (DOP) certificate as per Jharkhand Industry Policy.
 - iii. Proof of Production of PV Module/ PCU in the factory situated in Jharkhand either IEC or BIS certificate for PV Module/ PCU.
 - viii. Work Orders and Work Experience Certificate (Work Order/ Certificate issued by only Central/ State Government, SNA, PSU or other Government Bodies within 7 years)
 - ix. Test Report of PV Module and PCU for all parameters as described in technical specification of this NIB along with authorization letter from the manufacturer in case bidder is not manufacturer of that component.
 - x. Audited Balance sheet of last three years (FY 2017-18, 2018-19, 2019-20).
 - xi. Income tax return certificate of last three years (FY 2017-18, 2018-19, 2019-20).
 - xii. List of current litigant cases in which the bidder is involved (in format given in ITB).
 - xiii. An affidavit for non-engagement of related persons.
 - xiv. Authorized address & contact numbers of the bidder as per instruction in the Notice Inviting Bid duly digitally signed.
 - xv. Bid Capacity
 - xvi. Undertaking of Bidder that he is able to invest minimum of cash up to 10% as defined in ITB.
 - xvii. Undertaking for validity of bid for 180 days
- A. Scanned Copies of the Annexure as per the enclosed formats should be uploaded after converting the same to .pdf format.
- i. Annexure-1: Covering letter for Bid fee.
 - ii. Annexure-2: Covering letter for Earnest Money.
 - iii. Annexure-3: Information about the bidding firm.
 - iv. Annexure-4: Declaration by the bidder.
 - v. Annexure-5: Annual Turnover.
 - vi. Annexure-6: Net Worth certificate.
 - vii. Annexure-7: Format for power of attorney for signing of bid.
 - viii. Annexure-8: Details of orders received and executed in last 7 years
 - ix. Annexure-9: Contact Person for the NIB
 - x. Annexure-10: Format for technical details
 - xi. Annexure-11: Technical details form
- B. 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 on receipt of such letter, which will be sent through registered post.
- C. SBD is not to be uploaded by the bidder. The bidder has to give affidavit stating agree / disagree on the conditions in the SBD. The bidders, who disagree on the conditions of SBD, cannot participate in the tender.

Section-3: Notice Inviting Bid
NIB No: 02/JREDA/SPV/AIRPORT/21-22

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

Preamble:

JREDA wishes to select competent, experienced and financially sound agency for Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC). The bidders should be a registered manufacturing company/ Firm/ Corporation in India (Including MSEs of Jharkhand).

Above work is to be carried out on **“Turn Key Basis”** which includes design, supply of SPV systems with all accessories and equipment’s, installation, testing, commissioning and maintenance services for 5 years with free replacement warranty on spare parts against manufacturing defects for five years. JREDA will provide the details of airports where solar systems need to be installed. The successful bidders have to execute the Supply, Installation & Commissioning of Grid connected SPV Power Plants for airports.

Part –I: -The Technical Conditions:

The bidder should fulfill the following technical eligibility conditions: -

- a. A registered manufacturing company/ Firm/ Corporation in India in the field of Energy Sector (Including MSEs of Jharkhand) or EPC Contractor in the field of Energy Sector. **Joint Ventures, Authorized dealers and subcontractors are not eligible to participate.**
2. The bidder should be a functional organization. To substantiate this claim, the bidder should submit the copy of audited balance sheet with profit & loss account for last 3 years or from the date of establishment to 31.03.2020, whichever is applicable. These audited balance sheets should be duly certified by the Statutory Auditor with his stamp.
3. Bidders claiming benefit of Micro & Small Enterprises (MSEs) of Jharkhand should be registered with the Directorate of Industries/District Industries Centre, Industrial Area Development Authority and National Small Industries Corporation Limited or any other body specified by Directorate of Industries, Jharkhand Govt. from time to time and other industrial units/enterprises which have submitted IEM and been issued Date of Production (DOP) certificate by GM, DIC/MD, Industrial Area Development Authority/Director, Industries, GoJ

or

MSEs having Udyog Aadhar Number issued by Ministry of Micro, Small and Medium Enterprises, GoI duly verified, whether unit is existing/functional and doing regular production at what capacity by GM, DIC/ MD, Industrial Area Development Authorities/ Director, Industries, GOJ”

MSEs units/bidder has to submit relevant document as per existing norms of Ministry of Micro, Small and Medium Enterprises, GoI/ GM, DIC/MD, Industrial Area Development Authorities/Director, Industries, GOJ to substantiate above claim.

MSEs of Jharkhand State availing preferential treatment should fulfill all the criteria as per Clause-3.0 (Applicability) of Jharkhand Procurement Policy 2014 and its amendment thereof and shall submit an undertaking with respect to (i) to (iv) of Clause 3.0 including a categorical statement that the products/services being supplied to JREDA has been manufactured/created

by the unit located in Jharkhand only, giving details of batch no./date or any other identifiable tag as per prevalent established practice.

4. **Technical Eligibility:**

For General/ MSEs Bidder:

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

- a. Three similar completed works costing not less than the amount equal to 40% of the estimated Project cost.
or
- b. Two similar completed works costing not less than the amount equal to 50% of the estimated Project cost.
or
- c. One similar completed work costing not less than the amount equal to 80% of the estimated Project 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"
5. The offered PV Modules should be as per IEC61215 edition II / BIS 14286 from an NABL or IECQ accredited laboratory standards having test certificates prescribed by MNRE. The valid test certificate with authorization letter of the manufacturer should be uploaded as annexure. The offered PV Modules should be Crystalline Silicon PV Modules as per IEC 61215 Standards or IS14286 and having test certificates prescribed by MNRE. In addition, the modules must conform to IEC 61730 part I – requirement for construction and part – II requirement for testing, for safety qualification or equivalent IS. The offered modules shall be of standard make; specifications of any reputed brand approved by MNRE having test certificates issued from **MNRE specified** test laboratories.
 6. The bidder must be in possession of valid test report of PCU from any of the following test centers (Details of test report required is mentioned in Section 6, Technical Specification of NIB): -
 - Solar Energy Centre Gwalpahari – Gurgaon, Haryana (SEC)
 - Electronics Regional Test Laboratory (East)) Bidhan Nagar, Kolkata (ERTL)
 - Central Power Research Institute, Bangalore (CPRI).
 - Any other test centre approved by MNRE.

Part –II: -The Financial Conditions:

The bidder should fulfill the following financial eligibility conditions: -

1. Financial Eligibility:

I. Turnover Requirement:

- (i) **For General Bidder:** Average Annual financial turnover during the last 3 years, ending 31st March of the previous financial year, should be at least **30%** of the estimated cost of **Bidding Capacity** derived from the last three financial years ending on 31.03.2020 on the basis of audited annual accounts.
- (ii) **For MSEs of Jharkhand:** Bidder should have the average Annual Turnover of **10% of Bidding Capacity** derived from the last three financial years ending on 31.03.2020 on the basis of audited annual accounts.

The certificate should be as per the Performa given at [Annexure-5](#)

II. Net worth Requirement:

- (i) **For General Bidder:** Bidder should have Positive Net Worth of minimum **10%** of **Bidding Capacity** as on 31.03.2020 on the basis of audited annual accounts.

(ii) **For MSEs of Jharkhand:** Bidder should have Positive Net Worth of minimum **5%** of **Bidding Capacity** as on 31.03.2020 on the basis of audited annual accounts.

Net worth certificate should be as per the Performa given at [Annexure-6](#)

2. The Participant should have valid GST No.
3. The Bidder should confirm that they have the resources and capability to supply the offered quantity within the scheduled period in the form of an undertaking.
4. Bidders have to download the bid document from website (www.jharkhandtenders.gov.in) and submit the scan copy of the cost of the bid document to be submitted in shape of demand draft of requisite value as mentioned in Section-1 (List of Important dates & details of Bids) in favour of "Director, JREDA" on any Indian Nationalized Bank/Scheduled Bank, payable at "Ranchi". The tender fee in original must be submitted by **10.08.2021 by 05.00 PM** in the office of JREDA.

Part -III: -Award of Work:

- (i) Solarization of one airport with 600 KWp of Solar Power Plant shall be considered one project.
- (ii) The lowest rate i.e. L1 received per project shall be the appropriate rate for awarding the work per project.
- (iii) Maximum **2** Nos of projects shall be awarded to any successful bidder.
- (i) No bidder shall submit bid for projects for more than maximum Project size.
- (ii) Allocation of the project to MSEs registered in Jharkhand will be made as per the provisions made in Jharkhand Procurement Policy 2014 and amendments thereof. The MSE should be functional & should have running production unit of the Jharkhand and should fulfil all the criteria as fixed in Jharkhand Procurement Policy 2014.
- (iii) JREDA reserves the right to distribute projects among the bidders as per the requirement and needful credential of the successful bidders.

Section-4: Instructions to Bidders

NIB No: 02/JREDA/SPV/AIRPORT/21-22

A. General

1. Scope of Bid

- 1.1. The JREDA invites bids for the work as described in these documents and referred to as "the works". The name and identification number of the works is provided in the Notice Inviting Bid.
- 1.2. The successful Bidder will be expected to complete the Works by the Intended Completion Date specified in the Part (I)- General Conditions of Contract.
- 1.3. Throughout these documents, the terms "bid" and "tender" and their derivatives (bidder/ tenderer, bid/ tender, bidding/ tendering) are synonymous.

2. Source of Funds

- 2.1. The JREDA has decided to undertake the works of "Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand." through funds from the Government of Jharkhand to be implemented through JREDA.

3. Eligibility Criteria

- 3.1. This Invitation for Bids is open to all bidders as defined in the Notice Inviting Bid.
- 3.2. Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices by the Central Government, the State Government or any public undertaking, autonomous body, authority by whatever name called under the works.

4. Qualification of the Bidder

- 4.1. All bidders shall provide in Section 3, Forms of Bid and Qualification information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.
- 4.2. All bidders shall include the following information and documents with their bids in Section 3, Qualification Information unless otherwise stated in the Notice Inviting Bid/ITB.
 - a) Copies of original documents defining the constitution or legal status, place of registration, and principal place of business.
 - b) Copy of written power of attorney of the signatory of the Bid to commit the Bidder.
 - c) Reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the last three years for General Bidder and MSEs of Jharkhand category only.
 - d) Information regarding any litigation or arbitration during the last seven years in which the Bidder is involved, the parties concerned, the disputed amount, and the matter;
- 4.3. **Bids from joint venture are not allowed.**
- 4.4. Each bidder must produce:
 - i) The current income-tax clearance certificate/PAN.
 - ii) An affidavit that the information furnished with the bid documents is correct in all respects; and
 - iii) Such other certificates as defined in the Notice Inviting Bid. Failure to produce the certificates shall make the bid non-responsive.

- 4.5. To qualify for a package of contracts made up of this and other contracts for which bids are invited in the Notice Inviting Tender, the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts.
- 4.6. Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:
 - i) made misleading or false representations in the forms, statements, affidavits and attachments submitted in proof of the qualification requirements; and/or
 - ii) Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures
 - iii) Participated in the previous bidding for the same work and had quoted unreasonably high or low bid prices and could not furnish rational justification for it to JREDA.

5. One Bid per Bidder

- 5.1. Each Bidder shall submit only one Bid for one work. A Bidder who submits more than one Bid will cause the proposals with the Bidder's participation to be disqualified.

6. Cost of Bidding

- 6.1. The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the JREDA will, in no case, be responsible or liable for those costs.

7. Site Visit

- 7.1. The Bidder, at his own cost, responsibility and risk, is encouraged to visit, examine and familiarize himself with the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for supply & installation of the Works. The costs of visiting the Site shall be at the Bidder's own expense. He may contact the person whose contact details are given in the Notice Inviting Bid.

B. Bidding Documents

8. Content of Bidding Documents

- 8.1. The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 12 of ITB.
 1. e-procurement notice
 2. Instructions to Bidders
 3. Qualification Information
 4. Conditions of Contract
 5. Specifications
 6. Bill of Quantities
 7. Form of Bid
 8. Form of Bank Guarantee.
- 8.2. The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms and specifications, bill of quantities, forms in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk. Pursuant to clause 26 hereof, bids, which are not substantially responsive to the requirements of the Bid Documents, shall be rejected.

9. Clarification of Bidding Documents and Pre-bid Meeting

- 9.1. A prospective Bidder requiring any clarification of the bidding documents may notify the JREDA in writing at the JREDA's address indicated in the Notice Inviting Tenders. The JREDA will respond to any request for clarification received earlier than 10 days prior to the deadline for submission of bids or as per date mentioned in the bid. Copies of the JREDA's response will

be forwarded or uploaded on our website www.jreda.com to all purchasers of the bidding documents, including a description of the inquiry, but without identifying its source.

- 9.2. If JREDA decides to hold a pre-bid meeting, the bidder or his authorized representative shall be invited to attend it.
- 9.3. The purpose of such a meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
- 9.4. The bidder is requested to submit any questions in writing or by cable so as to reach the JREDA not later than two days before the meeting.
- 9.5. Minutes of the meeting, including the text of the questions raised and the responses given will be transmitted without delay to all purchasers of the bidding documents. Any modifications of the bidding documents listed in Clause 10.1 of ITB, which may become necessary as a result of the pre-bid meeting shall be made by the JREDA exclusively through the issue of an Addendum pursuant to Clause 12 of ITB and not through the minutes of the pre-bid meeting. Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

10. Amendment of Bidding Documents

- 10.1. Before the deadline for submission of bids, the JREDA may modify the bidding documents by issuing addenda.
- 10.2. Any addendum thus issued shall be part of the bidding documents and shall be communicated in writing by registered post or by cable to all purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum by cable to the Employer.
- 10.3. To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the JREDA shall extend, if necessary, the deadline for submission of bids, in accordance with Clause 19.2 of ITB.

C. Preparation of Bid

11. Language of Bid

- 11.1. All documents relating to the Bid shall be in the language specified in the Notice Inviting Bid.

12. Documents Comprising the Bid

- 12.1. Technical Bid – (Fee/Pre-Qualification/Technical Cover)
- 12.2. **Tender Fee (For General Bidder)** Scanned Copy of Demand draft drawn in favour of "DIRECTOR, JREDA", payable at Ranchi towards Cost of Tender Fee as specified in the Notice Inviting Bid.
- 12.3. **Earnest Money Demand (For General Bidder)** Scanned Copy of Demand draft or bank guarantee drawn in favour of "DIRECTOR, JREDA", payable at Ranchi towards EMD as specified in the Notice Inviting Bid.
- 12.4. Jharkhand MSEs related document as per section-3, technical eligibility or section-2 clause 12 (Only for Jharkhand MSEs willing to avail benefit of Jharkhand MSEs as per Jharkhand Procurement Policy).

12.5. Technical Details & Declaration

- a) Proposed work programme (work method, time schedule and financial flow), description, and charts as necessary (Duly to be signed digitally) to comply with the requirement of the Bidding Document.
- b) Scanned copy of an Affidavit by the Bidder that he/she has accepted the S.B.D.

12.5.1. Technical Details of documents

Scanned copies/Prescribed Formats of Documents to be attached in "My Document" in .pdf format file duly digitally signed by the bidder.

- a) Income Tax clearance certificate
- b) PAN Card
- c) GST certificate.
- d) A bidder can either apply under General category or in MSEs category therefore bidder have to submit an undertaking which should clearly mention the category (General/MSEs of Jharkhand). Bid will be evaluated under the provision of that particular category.
- e) In case the bidder wants to avail benefit of MSEs of Jharkhand then bidder must submit
 - i. Registration certificate of MSEs of Jharkhand/ UDYAM issued by Industry Dept. duly verified by GM-DIC mentioning whether unit is existing/ functional and doing regular production at what capacity as per Industry Policy of Jharkhand.
 - ii. Date of Production (DOP) certificate as per Jharkhand Industry Policy.
 - iii. Proof of Production of PV Module/ PCU in the factory situated in Jharkhand either IEC or BIS certificate for PV Module/ PCU.
- f) Proof of completion of similar works during the last 7 years and list of similar works in hand in the prescribed formats in the ITB duly signed by the competent authority of the issuing Department (in format given in ITB)
- g) Test report of all the component along with authorization if bidder is not component manufacturer.
- h) Financial Report for the last 3 years (up to 31/3/2020) certified by chartered Accountant.
- i) Annual Turn over Details certified by Chartered Accountant.
- j) Net worth certificate certified by Chartered Accountant.
- k) List of current litigant cases in which the bidder is involved (in format given in ITB).
- l) An affidavit for non-engagement of related persons.
- m) Authorized address & contact numbers of the bidder as per instruction in the Notice Inviting Bid duly digitally signed.
- n) Bid Capacity
- o) Undertaking of Bidder that he is able to invest minimum of cash up to 10% as defined in ITB.
- p) Undertaking for validity of bid for 180 days All the annexures as provided (except price breakup annexure.

12.5.2 Document Checklist

*NA: Not Applicable

Note: Document Checklist must be Attached with covering letter/ First page of Bid Documents.

Sl.No.	Details of Scan Copy uploaded in bid	Complied (Yes/ No/ NA)	For Office Use only
1	D. D. towards Tender fee. (Only General Bidder)		
2	Earnest Money Deposit (EMD). (Only General Bidder)		
3	GST certificate.		
4	PAN Card		
5	Certificate of Incorporation (Not required for Proprietorship firm)		
6	A bidder can either apply under General category or in MSEs category therefore bidder have to submit an undertaking which should clearly mention the category (General/MSEs of Jharkhand). Bid will be evaluated under the provision of that particular category.		
7	In case the bidder wants to avail benefit of MSEs of Jharkhand then bidder must submit documents as mentioned in serial no. 8, 9, 10 & 11		
8	Registration certificate of MSEs of Jharkhand/ UDYAM issued by Industry Dept. duly verified by GM-DIC mentioning whether unit is existing/ functional and doing regular production at what capacity as per Industry Policy of Jharkhand.		
9	Date of Production (DOP) certificate as per Jharkhand Industry Policy.		
10	Proof of Production of PV Module/ PCU in the factory situated in Jharkhand either IEC or BIS certificate for PV Module/ PCU.		
11	Work Orders and Work Experience Certificate (Work Order/ Certificate issued by only Central/ State Government, SNA, PSU or other Government Bodies within 7 years)		
12	Test Report of Module and PCU for all parameters as described in technical specification of this NIB along with authorization letter from the manufacturer in case bidder is not manufacturer of that component.		
13	Audited Balance sheet of last three years (FY 2017-18, 2018-19, 2019-20).		
14	Income tax return certificate of last three years (FY 2017-18, 2018-19, 2019-20).		
15	List of current litigant cases in which the bidder is involved (in format given in ITB).		
16	An affidavit for non-engagement of related persons.		
17	Authorized address & contact numbers of the bidder as per instruction in the Notice Inviting Bid duly digitally signed.		
18	Bid Capacity		
19	Undertaking of Bidder that he is able to invest minimum of cash up to 10% as defined in ITB.		
20	Undertaking for validity of bid for 180 days		
21	Annexure-1: Covering letter for Bid fee.		
22	Annexure-2: Covering letter for Earnest Money.		
23	Annexure-3: Information about the bidding firm.		
24	Annexure-4: Declaration by the bidder.		
25	Annexure-5: Annual Turnover.		
26	Annexure-6: Net Worth certificate.		
27	Annexure-7: Format for power of attorney for signing of bid.		
28	Annexure-8: Details of orders received and executed in last 7 years		
29	Annexure-9: Contact Person for the NIB		
30	Annexure-10: Format for technical details		
31	Annexure-11: Technical details form		

12.6. Financial Bid –

12.6.1. Duly Quoted & digitally signed Bill of Quantity (BOQ) in the file supplied by JREDA in .xls and .pdf format shall be uploaded. Price Breakup Annexure should also be uploaded along with financial bid.

12.7. The following documents, which are not submitted with the bid, will be deemed to be part of the bid.

Section Particulars

- i. Notice inviting Tender
- ii. Instruction to the bidders
- iii. Conditions of Contract
- iv. Contract Data
- v. Specifications
- vi. Drawings if any

13. Bid Price

13.1. The Bidder shall adopt the Item Rate Method as specified in the Notice Inviting Bid only the same option is allowed to all the Bidders.

13.2. All duties, taxes, royalties and other levies payable by the Contractor under the Contract, or for any other cause, shall be included in the rates, prices, and total Bid price submitted by the Bidder.

13.3. The rates and prices quoted by the Bidder shall be fixed for the duration of the Contract and shall not be subject to adjustment.

13.4. Quoted price for grid connected SPV power plants are complete in all respect as per Technical Specifications inclusive of all Central/State/Local taxes & duties, packing, forwarding, transit insurance, loading & unloading, transportation & other charges etc. FOR destination at any site in Jharkhand and inclusive of installation, testing, commissioning, performance testing and training.

14. Bid Validity

14.1. Bids shall remain valid for a period of 180 (One hundred and Eighty Days) days after the deadline date for bid submission specified in Clause 18 of ITB. A bid valid for a shorter period shall be rejected by the JREDA as non-responsive.

14.2. In exceptional circumstances, prior to expiry of the original time limit, the JREDA may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his Earnest Money. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his earnest money for a period of the extension, and in compliance with Clause 14 of ITB in all respects.

15. Earnest Money

15.1. The Bidder shall furnish, Earnest Money, in the amount specified in the Notice Inviting Bid.

15.2. The Earnest Money shall at the Bidder's option, be in the form of Bank Guarantee/Demand Draft of a scheduled commercial bank, issued in favour of the name given in the Notice Inviting Bid. The Bank Guarantee shall be valid for 12 months or more after the last date of receipt of price bids.

- 15.3. Any bid not accompanied by an acceptable Earnest Money at the time price bids are called, unless exempted in terms given in the Notice Inviting Bid, shall be rejected by the JREDA as nonresponsive.
- 15.4. The Earnest Money of unsuccessful bidders will be returned after finalization of the Bid.
- 15.5. The Earnest Money of the successful Bidder will be discharged when the Bidder has signed the Agreement and furnished the required Security Deposit.
- 15.6. The Earnest Money may be forfeited:
- a) if the Bidder withdraws the Bid after bid opening (technical bid) during the period of Bid validity;
 - b) in the case of a successful Bidder, if the Bidder fails within the specified time limit to
 - i. sign the Agreement; and/or
 - ii. Furnish the required Security Deposit.

16. Alternative Proposals by Bidders

- 16.1. Bidders shall submit offers that comply with the requirements of the bidding documents, including the Bill of Quantities and the basic technical design as indicated in the drawings and specifications. Alternative proposals will be rejected as non-responsive.

D. Submission of Bids

17. Sealing and Marking of Bids

- 17.1. The Bidder shall place the two separate files (File I) marked "Technical Bid". The file will have markings as follows:
- Technical Bid: To be opened on (date and time of Technical Bid opening as per clause 19.2 of ITB.)
- The contents of the Technical bid shall be as specified in clause 12.1 of ITB. All documents are to be signed digitally by the bidder.
- 17.2. The files containing the Technical bid shall a) be addressed to the JREDA at the address provided in the Notice Inviting Bid b) bear the name and identification number of the Contract as defined in clause 1.1 of ITB; and c) provide a warning not to open before the specified time and date for Bid opening as defined in clause 19.1 of ITB.

18. Deadline for Submission of Bids

- 18.1. Complete Bids must be received by the JREDA at the address specified in the Notice Inviting Bid not later than the date and time indicated in the Notice Inviting Bid.
- 18.2. The JREDA may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10.3 of ITB, in which case all rights and obligations of the JREDA and the bidders previously subject to the original deadline will then be subject to the new deadline.

E. Bid Opening and Evaluation

19. Bid Opening

- 19.1. The JREDA will open the bids received (except those received late). In the event of the specified date for the submission of bids being declared a holiday for JREDA, the Bids will be opened at the appointed time and location on the next working day.
- 19.2. The files containing the technical bid shall be opened. The document marked "cost of bidding document" will be opened first and if the cost of the bidding documents is not there, or incomplete, the remaining bid documents will not be opened, and bid will be rejected.
- 19.3. In all other cases, forms and validity shall be announced. Thereafter, the bidders' names and such other details as the JREDA may consider appropriate, will be announced by the JREDA at the opening.

- 19.4. The JREDA will prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Clause 19.3 of ITB.
- 19.5. Evaluation of the technical bids with respect to bid security, qualification information and other information furnished in Part-I of the bid in pursuant to Clause 12.1 of ITB, shall be taken up and completed and a list will be drawn up of the responsive bids who all bidders can be considered for empanelment
- 19.6. The JREDA shall inform, by email, telegram or fascimal, the bidders, whose technical bids are found responsive, date, time and place of opening as stated in the Notice Inviting Bid.

20. Process to be Confidential

- 20.1. Information relating to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any attempt by a Bidder to influence the JREDA's processing of bids or award decisions may result in the rejection of his Bid

21. Clarification of Bids and Contacting the JREDA

- 21.1. No Bidder shall contact the JREDA on any matter relating to its bid from the time of the bid opening to the time the contract is awarded.
- 21.2. Any attempt by the bidder to influence the JREDA's bid evaluation, by any means, bid evaluation, bid comparison or contract award decision may result in the rejection of his bid and blacklisting of the bidder.

22. Examination of Bids and Determination of Responsiveness

- 22.1. During the detailed evaluation of "Technical Bids", the JREDA will determine whether each Bid (a) meets the eligibility criteria defined in Clauses 3 and 4; (b) has been properly signed; (c) is accompanied by the required securities; and (d) is substantially responsive to the requirements of the bidding documents. During the detailed evaluation of the "Financial Bids", the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications and drawings.
- 22.2. A substantially responsive "Financial Bid" is one, which conforms to all the terms, conditions, and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the bidding documents, the JREDA's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
- 22.3. If a "Financial Bid" is not substantially responsive, it will be rejected by the JREDA, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

23. Corrections of Errors

- 23.1. Bids determined to be substantially responsive, will be checked by the JREDA for any arithmetic errors. Errors will be corrected by the JREDA as follows:
- a) where there is a discrepancy between the rates in figures and in words, the rate in words will govern; and
 - b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.
- 23.2. The amount stated in the Bid will be adjusted by the JREDA in accordance with the above procedure for the correction of errors and shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount, the Bid will be rejected, and the Earnest money shall be forfeited in accordance with Clause 15.6(b) of ITB.

24. Evaluation and Comparison of Bids

- 24.1. The JREDA will evaluate and compare only the bids determined to be substantially responsive in accordance with Clause 26 of ITB.
- 24.2. In evaluating the bids, the JREDA will determine for each Bid the evaluated Bid price by adjusting the Bid price by making correction, if any, for errors pursuant to Clause 27 of ITB.
- 24.3. If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the JREDA may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.
- 24.4. After its evaluation, the JREDA may require that the amount of the performance security set forth in Clause 29 be increased at the expense of the successful Bidder to a level sufficient to protect the JREDA against financial loss in the event of default of the successful Bidder under the Contract. The amount of the increased performance security shall be decided at the sole discretion of the JREDA, which shall be final, binding and conclusive on the bidder.

25. Price Preference

- 25.1. There will be no price preference to any bidder.

F. Award of Contract

26. Award Criteria

- 26.1. Subject to Clause 27 of ITB, the JREDA will award the Contract to the Bidder whose Bid has been determined:
- i. to be substantially responsive to the bidding documents and who has offered the lowest evaluated Bid price, provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause 3 of ITB, and (b) qualified in accordance with the provisions of Clause 4 of ITB; and as per clause 14 of Notice Inviting Bid (Section-4).

27. JREDA's Right to accept any Bid and to reject any or all Bids

- 27.1. Notwithstanding Clause 27 above, the JREDA reserves the right to accept or reject any Bid, and to cancel the bidding process and reject all bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for the JREDA's action without any reason.

28. Notification of Award and Signing of Agreement

- 28.1. The bidder whose Bid has been accepted will be notified of the award by the JREDA prior to expiration of the Bid validity period by cable, email, telex or facsimile confirmed by registered

letter. This letter (hereinafter and in the Part I - General Conditions of Contract called the "Letter of Acceptance") will state the sum that the JREDA will pay to the Contractor in consideration of the execution and completion of the Works (hereinafter and in the Contract called the "Contract Price").

28.2. The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause 29.

28.3. The Agreement will incorporate all agreements between the JREDA and the successful Bidder. It will be signed by the JREDA and the successful Bidder after the performance security is furnished.

28.4. Upon the furnishing by the successful Bidder of the Performance Security, the JREDA will promptly notify the other Bidders that their Bids have been unsuccessful.

29. Security Deposit

29.1. Successful General bidder shall submit a security deposit @10% of the allotted work order value in the form of DD/Bank Guarantee valid for one year on or before 15 days from issuing work order. If Bank Guarantee will not be submitted within stipulated period from the date of issue of work order, then JREDA shall cancel the work order.

29.2. Successful MSEs bidders shall be required to deposit only 1% of security deposit as per Jharkhand Procurement Policy in the form of Bank Guarantee for one year on or before 15 days from issuing work order. If Bank Guarantee will not be submitted within stipulated period from the date of issue of work order, then JREDA shall cancel the work order.

29.3. The Security Deposit shall be refunded / released to the bidder after successful completion of work and submission of performance guarantee.

30. Performance Guarantee

30.1. Successful General bidder shall submit a performance guarantee @5% of the allotted work order value in the form of DD/Bank Guarantee valid for five years on or before release of payment of installation.

30.2. Successful MSEs bidders shall submit a Performance Guarantee @2.5% of the allotted work order value in the form of DD/ Bank Guarantee before release of payment of installation.

30.3. The Performance Guarantee will have to be maintained by the bidder with JREDA till the completion of warranty period.

30.4. The Security Deposit/Performance Guarantee shall be submitted in the form of DD/Bank Guarantee in favour of "Director, JREDA" payable at Ranchi from any Indian Nationalized bank/Scheduled bank.

30.5. Non-submission of Security Deposit/Performance Guarantee within the time frame, shall lead to forfeiture of EMD and cancellation of LOI/LOA.

30.6. If Bidder/MSE unit fails to carry out the work allotted to him as per the provisions of the tender documents, then such Bidder/MSEs unit may be black listed for future awards of work.

31. Plant Performance Evaluation

31.1. The successful bidder shall be required to meet minimum guaranteed generation with Performance Ratio (PR) at the time of commissioning and related Capacity Utilization Factor as per the GHI levels of the location during the O&M period. PR should be shown minimum of 75% for Grid connected plant at the time of inspection for initial commissioning acceptance to qualify for release of CMC payment. Minimum CUF of 15% for Grid connected plant should be maintained for a period of 5 Years for fulfilling one of the conditions for release of PBG. The

bidder should send the periodic plant output details to JREDA for ensuring the CUF. The PR will be measured at inverter output level during peak radiation conditions.

32. Five Years Comprehensive Maintenance Contract (CMC)

- 32.1. The Grid Connected SPV Power Plant contract price includes the provision of 5 years mandatory Comprehensive Maintenance Contract (CMC). To ensure long term sustainability of the system, the bidder must provide his representatives name, full address, mobile number and photographs to JREDA with one hard copy as well as the names and contact details of all technicians must also be provided. Failure to do shall invite penalty and action.
- 32.2. The Comprehensive Maintenance Contract shall include servicing & replacement guarantee for parts and components (such as battery, electronics, Inverter, PV modules and other hardware) of Grid Connected SPV Power Plant for five years from the date of installation. **PV modules shall be warranted for 25 years.** Battery should be warranted for a minimum life of 5 years. The date of CMC maintenance period shall begin on the date of actual commissioning of Grid Connected SPV Power Plant. It is mandatory for the contractor to carry out CMC regularly and submit report to JREDA monthly. Failure to submit monthly CMC reports timely shall invite penalty and action.
- 32.3. For any issue related to operation & maintenance, a contact number shall be made available to the concerned departments to resolve immediately, if the bidder do not attempt the rectification of any such defect within three days of communication of such complaint to the bidders, the bidder will be liable for a penalty of Rs. 100 per day beyond three days of reporting of such complaint. Further if the outage of the plant is more than 30 days continuously, then the 50% PBG amount shall be encashed by JREDA and if the outage is exceeding more than 60 days than complete PBG amount shall be encashed by JREDA. This will be applicable till 5 years of O&M as per the scope of the RFP. Bidder shall submit monthly CMC report as per the **Annexure- 17** with generation data of month within 7 working days of subsequent month.
- 32.4. Failure to submission of CMC report with generation data as per **Annexure-17** within 7 working days of subsequent month will be considered as CMC is not carried for that month and payment of CMC for that month will be deducted.

33. Preventive/Routine Maintenance

This shall be done by the supplier/contractor at least once in every month and shall include activities such as, cleaning and checking the health of the SPV system, cleaning of module surface, tightening of all electrical connections, regular checks to identify any leakage of electricity, cleaning & greasing of battery terminals and any other activity that may be required for proper functioning of the Solar Photovoltaic Power Plant. The maintenance record should be kept properly and to be submitted at JREDA office time to time. CMC documents should be certified by Beneficiary.

34. Breakdown / corrective Maintenance

Whenever a complaint is lodged by the user the bidder shall attend the same immediately. It is clarified that effective CMC means that the bidder should ensure smooth working of solar power plant throughout the CMC period and therefore, if any complaint in this level of service is found by the JREDA officials and if the bidder do not attempt the rectification of any such defect within three days of communication of such complaint to the bidders, the bidder will be liable for a penalty of Rs. 100 per day beyond three days of reporting of such complaint.

35. Advances

The JREDA will not provide Mobilization Advance and Advance against the security of equipment as provided in Part I - General Conditions of Contract.

36. Corrupt or Fraudulent Practices

The JREDA requires the bidders/Contractors to strictly observe the laws against fraud and corruption in force in India, namely, Prevention of Corruption Act, 1988. Also, if any of the documents submitted by bidder found out to be fake or incorrect in that JREDA has right to blacklist the company from future tenders and also cancel the work order.

Section-5: General Terms & Conditions

NIB No: 02/JREDA/SPV/AIRPORT/21-22

1. Introduction

The instruction/information contained in the bid documents are for guidance and compliance of the intending bidder. Bidders are advised to obtain clarification from JREDA, if any, prior to submission of their bid, failing which it will be deemed that the stipulation made in the bid documents have been read, understood and are acceptable to the bidder.

Bidder shall bear all costs associated with the preparation and submission of the bid, journeys undertaken by them and subsequent bidding process till the award of the order to successful bidder and the JREDA shall in no case, shall be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

2. Scope of work

- 2.1. Preparation of Pre-feasibility Report (PFR) of the proposed sites of SPV Power Plants and submit to JREDA.
- 2.2. Support in obtaining metering approval from concerned DISCOM for grid connectivity.
- 2.3. Execution of the work shall be carried out in an approved manner as per the technical specification of NIB, in case of any dispute relevant MNRE/BIS/ISI specification shall be followed and work carried out to the reasonable satisfaction of the engineer in charge.
- 2.4. The contractor shall complete the work of Design, supply, civil work, erection, testing and commissioning of SPV grid connected Power Plant within 180 days from the date of issuance of work order.
- 2.5. The work for "**Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.**" complete set in all respects along with one set of operational instruction cum maintenance manual (both English and Hindi) for each set and delivery on destination/site (door delivery) basis across the State of Jharkhand as per the direction of JREDA.
- 2.6. **Establishing "Operation and Maintenance Centres" in concerned area to cater the maintenance needs for 5 years.**
- 2.7. All the material required for the installation of solar power plant as per the work order issued shall be kept at sight in custody of the contractor, JREDA shall not be responsible for any loss or damage of any material during the installation. The contractor shall be responsible and take an insurance policy for transit-cum-storage-erection for all the materials.
- 2.8. The contractor shall take entire responsibility of electrical safety of the installations including connectivity with the grid and follow all the safety rules and regulations applicable as per Indian Electricity Act-2003 and CEA guidelines, it shall be responsibility of the contractor to take NOC from concerned authority and engage person as per provisions as per in CEA Rules and Regulations.

3. Timeline of project completion

Sr. No.	Particular	Timeline (in Days)
1	Letter of award	0 Day
2	Survey of site and submission of all the report such as design and drawing of MMS and other necessary document as per Project.	20 Days
3	Approval of report	30 Days
3	PDI Offer	40 Days
4	Material Dispatch	60 Days
5	Commissioning of plant including installation of meter as per JBVNL guideline and JCERC regulations.	180 Days

4. Bid documents

Tender documents shall comprise of all the documents mentioned in this Bid. In addition to these any other documents/amendments/revisions or instructions issued by JREDA from time to time to bidders till due date of opening of the offers, shall also be deemed to be integral part of the bid document.

5. Price

The bidder shall quote his price as per schedule of items of work. The contract price rates shall be firm and binding and shall not be subject to any variation of taxes and duties during the contractual completion period. **The price shall be inclusive of all taxes, duties and levies including GST and 5 years CMC etc. as on the opening date of tender.** The price shall also include designing, manufacturing, inspection, supply, transport, insurance, handling etc. All applicable charges for taking necessary clearance such as commercial tax, road permit etc. wherever required are also deemed to be included in the contract price.

6. Rate for award of work after opening of Financial Bid

The lowest rate i.e. L1 received per project shall be the appropriate rate for awarding the work per project.

7. Inspection of the factory and Tests

JREDA reserves the right to inspect manufacturer's works/factory to ascertain the capability/availability of necessary equipment and infrastructure required for manufacture of the items offered. JREDA shall have the access and right to inspect the work or any part thereof at any stage and to test the goods to confirm their conformity to the technical specifications. Successful bidder shall inform JREDA at least 15 days in advance of schedule dispatch for technical sample audit.

8. Payment terms and conditions

Subject to any deduction which JREDA may be authorized to make under this contract, the contractor shall be entitled to payment as follows:

- 8.1. **60%** of the Contract Price shall be paid against supply and delivery of goods in full and in good condition as certified by Consignee and/or JREDA Officials after submission of following documents:
 - 8.1.1. Original Commercial invoice raised from the state of Jharkhand for the supply made in triplicate (1+2).
 - 8.1.2. Copy of duly raised delivery challan / transportation challan /lorry receipt/dispatch clearance.

- 8.1.3. Duly filled **Annexure-14** should be submitted in three sets (one for Consignee record, one for JREDA Hq. and one for JREDA's field Executive Engineer).
- 8.1.4. Photographs of all the equipment (materials) at destination with signature & seal of Consignee/JREDA Officials. This record should be kept in the office of Consignee for verification.
- 8.2. **30%** of the Contract Price shall be paid against Installation, Testing & Commissioning after submission of following documents:
 - 8.2.1. Copy of Original Commercial invoice raised at the time of supply in triplicate (1+2).
 - 8.2.2. Duly filled **Annexure-15**.
 - 8.2.3. Certificate for minimum seven days of satisfactory performance with photographs of the each installed Grid Connected SPV Power Plant with GPS Co-ordinates in Soft copy(CD).
- 8.3. **Rest 10%** of the Contract Price shall be paid @2% of the Contract Price on completion of every one year period of the 5 year CMC period. This payment can also be released against submission of Bank Guarantee of equivalent value valid till CMC period of complete system. For this bidder has to submit a total of 5(five) nos. of Bank Guarantees of 2% value to the work order each having validity respectively for 1 year, 2 years, 3 years, 4 years and 5 years & 3 months. The Bank Guarantee shall be revoked by JREDA in case the Contractor fails to submit the CMC report in JREDA within one month of end of the respective quarters. The Payment shall be released after submission of following documents:
 - 8.3.1. Copy of Original Commercial invoice raised at the time of supply in triplicate (1+2).
 - 8.3.2. Submission of monthly reports of CMC undertaken by the manufacturer as per **Annexure-16**.

The payment for the items to be procured/installed will be released on availability of funds.

"The efforts will be made by JREDA to make available the due payments to the agency within three months against satisfactory completion of the work."

9. **Dispatch Instructions**

All items/equipments shall be subject to **Pre-Dispatch Inspection (PDI)** by JREDA or its authorized representatives at the manufacturing site before their dispatch. The manufacturing site must have sufficient testing facilities. **The manufacturer will give the test report with regard conformity to technical specifications for the items to be dispatched to work site of JREDA and also issue the warranty certificate of items/equipments supplied to JREDA on their letter head at the time of PDI.** However, equipments will be dispatched from the manufacturing site only after the receipt of "**Dispatch Clearance**" from JREDA after acceptance of test report. No consignment shall be dispatched without the receipt of dispatch clearance from JREDA. No PDI shall be done at any site other than the concerned manufacturing site. Successful bidders have to arrange necessary equipments for testing the materials to be supplied during the pre-dispatch inspection by JREDA at their manufacturer's unit. Failure to fulfill the PDI conditions shall lead to cancellation of work order and forfeiture of security deposit.

The items which are being procured through this bid have to be installed on the basis of demand to be received by JREDA. Therefore, JREDA does not take responsibility that it will procure 100% quantity as has been indicated in the bid. Further, as JREDA will receive the demand, the supply order shall be placed to the successful bidder for execution in due time.

10. Liquidated Damages for Delay in Completion & CMC

If the supplier fails in the due performance of the contract to deliver any part of the equipment or complete the work within the time fixed under the contract or any extension thereof granted to him by JREDA and/or to fulfill his obligations in time under the contract, he shall be liable to pay to JREDA @0.5% per week maximum up to 10% of work value delayed beyond contract period. The same will be applicable if monthly CMC report will not be submitted within a week of due date.

11. Risk & Cost

If the contractor fails to complete the awarded work up to extended period of one year from the scheduled date of completion, then JREDA will be at liberty to cancel the said work order and will get the full or part of left-over work to be completed by way of engaging alternate contractor and completion of the said work shall be got completed at risk & cost of the failed contractor and failed contractor shall be liable to pay all the dues to JREDA.

12. Insurance

The supplier shall arrange for transit, erection and CMC period insurance of the materials & equipments for setting up of Solar Photovoltaic System. In case of any theft or damage of equipment during erection period and upto CMC period the same will be responsibility of supplier to get it rectify at their own cost.

13. Assignment/ Sub-letting

The Manufacturer shall not assign or sublet, manufacture, shop testing, packing & forwarding, transportation, transit insurance, supply in whole or part, and its obligations to any third party to perform under the order/contract.

In the event the manufacturer contravenes this condition, JREDA reserves the right to reject the equipment/work contract and procure the same from elsewhere at manufacturer's risk and cost. The Manufacturer shall be solely liable for any loss or damage which JREDA may sustain in consequence or arising out of such replacing of the contract work.

14. Completeness of Tender

All fittings, assemblies, accessories, hardware items etc. & safety and protection devices as required shall be deemed to have been included in the tender, whether such items are specifically mentioned in the BoM or not.

15. Compliance with Regulations

The supplier/contractor shall comply with all applicable laws or ordinances, codes approved standards, rules and regulations and shall procure all necessary municipal and/or other statutory bodies and government permits & licenses etc. at his own cost. The contractor shall leave the purchaser, Director, JREDA harmless as a result of any infractions thereof.

16. Agreement

The successful qualified suppliers shall have to enter into an agreement within fifteen days from the date of issue of work order in the office of the Director, JREDA, in prescribed format.

17. Income Tax / GST

Without prejudice to the obligations of the supplier under law, any income tax and GST which JREDA may be required to deduct by law/statute, shall be deducted at source and shall be paid to income tax authorities on account of the supplier. JREDA shall provide the supplier a certificate for such deductions of tax.

18. Training Program, After Sales Service and Availability of Spare Parts

18.1. The responsibility of organizing training program for Solar Power Plant will rest on the successful bidder. The training program will be organized in consultation with

JREDA/Consignee. The training program will focus on operation and maintenance of Solar Power Plant. Printed leaflet/literature should be made available in Hindi by the Supplier regarding the operation and maintenance of their Solar Power Plant.

18.2. The Supplier shall depute authorized Service Engineer within 7 days from the date of the intimation of fault, and establish sufficient inventory of spares in the State in consultation with JREDA to provide satisfactory and uninterrupted services during the warranty period.

19. Force Majeure conditions

In the event of either party being rendered unable by force majeure to perform any obligation required to be performed by them under this agreement, relative obligation of the party affected by such force majeure shall be treated as suspended during which force majeure condition last.

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, rebellion, insurrection, military coup to usurp power, act of god such as earthquake, lightning, floods, fires not caused by contractor's negligence and other cause which the contractor has no control and accepted as such by the Director, JREDA, whose decision shall be final and binding.

If the work is suspended by force majeure conditions lasting for more than 45 days, the purchasers shall have the option of canceling this contract in whole or part thereof, at its discretion. The contractor shall not claim for compensation for force majeure conditions.

20. Jurisdiction of the Court

All disputes would be settled within Ranchi jurisdiction of court of law only.

Section-6: Technical Specification

NIB No: 02/JREDA/SPV/AIRPORT/21-22

Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

1. General Description & Configuration

The brief technical details for the SPV power plants are as follow:

S. N.	SPV Power Plant Capacity (kWp)	SPV Capacity (kWp)	Battery Bank Size (AH/Volt)	PCU Rating (KVA)	Module Mounting Structure (MMS)	Balance of System (BOS)
1	600 kWp	600 kWp	Without Battery Bank	Same as SPV Capacity	As per design	As per design

The Power Plant shall provide a reliable and independent power supply at a voltage and frequency levels to suit the grid voltage and frequency. Roofs may be used as per the requirement and availability of the space at the site.

2. Working of the PV System

Solar Power Plant is planned to meet the energy requirements of the concerned airport at any places in Jharkhand from solar power to ensure reliability and reduce dependence on grid power. The system is required to power the lights, fans, computer and other electrical appliances during office hours as well as during night time and holidays. The system is expected to work in the following way:

- 2.1. During day time when sufficient sun light is available, the connected load should be powered from the solar electricity generated and any excess solar energy produced ,then the extra power exported to the utility grid through the bidirectional meter which records the net energy exported to the grid.
- 2.2. During day time when sufficient solar electricity is not available to power the load, the balance energy should be drawn from the Utility Grid.
- 2.3. During night time, when no solar energy is available, the load should be powered from the Utility Grid.
- 2.4. In general, the priority of usage of input energy sources should be in the following order.

First Priority: Solar

Second priority: Mains

There should be no break in the supply while changing from one mode to another mode of operation.

3. Major Components of the system

The following are the major components of the system:

- Solar PV Modules
- Module Mounting Structure
- Junction Boxes
- Power Conditioning Unit/ Inverter
- Data Logger
- Cables
- Bi-Directional Meter

3.1. Solar PV Module / Array :

- 3.1.1. Solar Photo Voltaic (SPV) modules/ array shall be of high efficiency made of crystalline silicon solar PV cells and shall also satisfy the **MINIMAL TECHNICAL REQUIREMENTS / STANDARDS FOR SPV SYSTEMS**
- 3.1.2. The terminal box on the module should have a provision for opening for replacing the cable, if required.
- 3.1.3. The rating of each individual module should not be less than **330Wp** at Standard Test conditions (Higher ratings can be used) and shall meet following minimum requirement:

Efficiency of module \geq 17%

Fill factor shall be greater than 70%.

General requirements for PV module:

- a. Module shall be made up of mono or poly crystalline silicon cells or as per latest technology.
- b. The interconnected cells shall be laminated in vacuum to withstand adverse environmental conditions
- c. The module frame is made of corrosion resistant materials, preferably having aluminium anodized finish
- d. The minimum clearance between the lower edge of the modules and the developed ground level shall be 300 mm.
- e. Surge arresting device to be provide at junction box and module shall be provided with bypass diode.
- f. The SPV module must be IEC 61215, IEC 61730 Part I and Part II, IEC 61701 certified from any of the accredited certifying agencies.
- g. Each solar PV module shall be warranted by the manufacturer for at least 90% of its rated power after initial 10 years and 80% of its rated power after 25 years from the completion of the trial run.
- h. "The derating of module should not be more than 0.8% in any year except for the first year of operation, which should be limited to 2.5%. For Mono crystalline solar PV modules the derating of 3% for 1st year shall be allowed."
- i. Each PV module deployed must use a RF identification tag. The following information must be mentioned in the RFID used on each module. (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions).
 - Name of the manufacturer of the PV module
 - Month & year of the manufacture (separate for solar cells and modules)
 - Country of origin (separately for solar cells and module)
 - I-V curve for the module
 - Wattage, I_m , V_m and FF for the module
 - Unique Serial No and Model No of the module
 - Date and year of obtaining IEC PV module qualification certificate
 - Name of the test lab issuing IEC certificate
 - Other relevant information on traceability of solar cells and module as per ISO 9001.

3.2. Module Mounting Structure (MMS):

- (i) The MMS should be designed for an optimum tilt angle. 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 Module mounting structures of simply supported, cantilever or any other are acceptable. The cement used in foundation shall be sulphur resistance.
- (iii) 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.
- (iv) 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.
- (v) 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.
- (vi) 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.
- (vii) 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 JREDA
- (viii) Modules shall be mounted on a non-corrosive support structures. 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.
- (ix) 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 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.
- (x) 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.
- (xi) 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.
- (xii) Module mounting structures shall also be earthed through proper separate earthing.
- (xiii) The material of construction, structural design and workmanship shall be appropriate with a factor of safety of not less than 1.5.
- (xiv) The Contractor shall provide detailed design, specifications and calculations of the MMS and take approval from JREDA
- (xv) The Contractor shall specify installation details of the Solar PV modules and the support structures with appropriate diagrams and drawings.
- (xvi) The Module Mounting Structure design shall be certified by a chartered structural engineer and it is mandatory.
- (xvii) The Contractor should design the structure height considering highest flood level at the site. The minimum clearance between the lower edge of the module and the ground shall be the higher of (i) above highest flood level at the site and (ii) minimum 600 mm.
- (xviii) 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.
- (xix) 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.

- (xx) The Contractor shall provide detailed design, specifications and calculations of the MMS.
- (xxi) The Contractor shall specify installation details of the Solar PV modules and the support structures with appropriate diagrams and drawings.
- (xxii) 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.
- (xxiii) Civil foundation design for Module Mounting Structures (MMS) as well as control room, inverter 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.
- (xxiv) The Contractor shall provide to the Owner the detailed design, specifications and calculations of the MMS. The design of MMS should be done by considering the life of the structure of 25 years. Minimum height of Pile Cap of Module Mounting Structure (MMS) shall be 200 mm from ground level.
- (xxv) The Module Mounting Structure design shall be certified by a licensed structural engineer and it is mandatory.
- (xxvi) Seismic factors for the site to be considered while making the design of the foundation etc. Or any technology. The foundation design of array structure shall be based on soil test report of the site and shall be approved from the Owner / Consultant. Before final approval of drawing/design pile foundation for any type of structure i.e MMS, result shall be submitted to JREDA.

3.3. **Junction Boxes:**

- 3.3.1. The junction boxes are to be provided in the PV array for termination of connecting cables. The J. Boxes (JBs) shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JB's shall be such that input & output termination can be made through suitable cable glands.
- 3.3.2. Copper bus bars/terminal blocks housed in the junction box with suitable termination threads conforming to IP65 standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Single / double compression cable glands. It should be placed at 5 feet height or above for ease of accessibility.
- 3.3.3. Each Junction Box shall have High quality Suitable capacity SPDs, suitable Reverse Blocking Diodes. The Junction Boxes shall have suitable arrangement monitoring and disconnection for each of the groups.
- 3.3.4. Suitable markings shall be provided on the bus bar for easy identification and the cable ferrules must be fitted at the cable termination points for identification.
- 3.3.5. All fuses shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers

3.4. **Grid-Tied String or Central Inverter:**

- a. Grid Connected Inverters shall convert DC energy produced by the solar array to AC energy such that it synchronizes with the existing AC power sources on site. The AC power output of the inverter shall be fed to the rated AC distribution board (metering panel & isolation panel), which also houses the energy meter. The system should always work in solar priority mode such that power drawn from other sources (Grid or DG) is minimum depending upon the load requirement.
- b. The inverter shall have inbuilt MPPT (Maximum Power Point Tracker) feature so as to extract maximum power from PV modules at any moment of time.
- c. The system shall have inbuilt shut down/ wake feature such that it automatically wakes-up in the morning and supply power, provided there is sufficient solar energy and the grid voltage

and frequency are in range. Similarly, once the Solar is down it should automatically go in to sleep mode to minimize the losses.

- d. The Inverter can be of either Central or String type.
- e. The inverter shall have inbuilt Anti-Islanding feature such that whenever the grid voltage and/or frequency go out of pre-set range, the inverter shall be immediately disconnected from the grid. The inverter will reconnect after a pre-determined time when the grid is back in the range. The same shall be applicable when there is a power cut.
- f. The unit shall be able to synchronize with Diesel Generators (DG). The quality of DG or Hybrid PCU shall be such that voltage and frequency output is within the stipulated limits.
- g. The Inverter shall provide 3 phase outputs, 415V (with grid tracking of -20% to +15 %/), 50 Hz (with grid tracking of $\pm 5\%$ i.e., 47.5 to 52.5 Hz) supply on AC side.
- h. At rated power, the inverter output's current THD shall be less than 3%.
- i. Also, the Inverter should perform at 100% capacity throughout the operating temperature range (i.e. 0-55 degrees ambient). There should be no de-rating of output power within the operating temperature range.
- j. It shall be capable of complete automatic operation, including wakeup, synchronization and shut down.
- k. Ingress protection: For outdoor installation, Minimum IP-65 and for indoor installation minimum IP-20 degree of protection is required. This is valid for both string and central type inverter. For outdoor installation inverter is to be placed under shade.
- l. MPPT controller, inverter and associated control and protection devices, etc. all shall be integrated into the PCU.
- m. PCU shall have the facility to display the basic parameters of the system. Typically, it could be a 4 line by 20 characters' type LED/LCD display. Displays of a bigger size can also be provided.
- n. PCU includes ground lugs for equipment and PV array groundings. The DC circuit ground shall be a solid single point ground connection.
- o. To allow maintenance of the PCU, means of isolating the PCU from the DC side and the AC side shall be provided.
- p. Since metering may not permitted at the time of installation at some places, facility to prevent generated PV power into the Grid (beyond utility meter) would be preferred. This should not be implemented via shut down of solar inverter or Reverse power relay. Instead, inverter should have the facility of export power control.
- q. In PCU/Inverter, there shall be a direct current isolation provided at the output by means of a suitable isolating transformer. If Isolation Transformer is not incorporated with PCU/Inverter, there shall be a separate Isolation Transformer of suitable rating provided at the output side of PCU/PCU units.
- r. The PCU/ inverter generated harmonics, flicker, DC injection limits, Voltage Range, Frequency Range and Anti-Islanding measures at the point of connection to the utility services should follow the latest CEA (Technical Standards for Connectivity Distribution Generation Resources) Guidelines.
- s. The power conditioning units / inverters should comply with applicable IEC/ equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683 and IEC 60068-2 (1,2,14,30)/ Equivalent BIS Std.

- t. The MPPT units environmental testing should qualify IEC 60068-2 (1, 2, 14, 30)/ Equivalent BIS std. The junction boxes/ enclosures should be IP 65 (for outdoor)/ IP 54 (indoor) and as per IEC 529 specifications.
- u. The PCU/ inverters should be tested from the MNRE approved test centres/ NABL/ BIS/ IEC accredited testing- calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses.

Technical Parameters of Pure Grid-Tied String or Central Inverter

PARAMETERS	SPECIFICATIONS
Switching devices	IGBT/MOSFET
Control	Microprocessor /DSP
Output Voltage/ Frequency	415V for 3 phase systems & 50Hz
Voltage Synchronization Range	-20% to +15% of the nominal output voltage
Frequency Synchronization Range	±5% of Nominal Output Frequency
Continuous Rating	As per the site but without any de rating from 0-50 degrees
Inverter Type	String/ Central Inverters
Galvanic Isolation	Must for both String and Central Inverters above 100 kW.
THD	Less than 3%
Regulation	≤ 2%
Internal Protection System	Array ground fault protection Input reverse polarity protection Grid Over/ Under Voltage & Frequency Anti-islanding Protection
Indications/ Displayed parameters	Inverter ON Grid ON Inverter under voltage/over voltage Inverter over-temperature Earth Fault/ Low Insulation Resistance
Circuit Breakers	➤ PV ➤ Mains
Environmental	
Operating Temperature Range	0-50 degrees ambient
Humidity	98% non-condensing
Enclosure	IP-65
Standards	
Efficiency Measurement	IEC 61683
Environmental testing	IEC 60068-2 (1,2,14,30)
Interfacing with utility grid	IEC 61727 or Equivalent
Islanding Prevention Measurement	IEC 62116 or Equivalent
General Electrical data	
Efficiency	> 95% at nominal voltage & power as per IEC 61683 or equivalent international efficiency standards
No load losses	Less than 1% of rated power
Cooling	Forced air cooling with temperature-controlled cooling fan
Display	
Display type	LCD / LED Display
Display parameter	
DC	Voltage Current Power
On grid connected mode	Line status Grid voltage Grid frequency Export Power Cumulative Export Energy
Interface (Communication protocol)	Suitable port to be provided in the inverter. i) On site upgrade of Software ii) On site dumping data from the memory iii) Web based remote monitoring system
Web monitoring	Matched with the monitoring and data logging system

Protection	
DC Side	Input over voltage Reverse-polarity protection Reverse current to PV array protection, over voltage, Under voltage protection Over current
AC side	i) DC inject protection to grid ii) Over voltage and Under voltage iii) Over current iv) Over and under grid frequency protection v) Anti-Islanding protection
Isolation Switch	PV array Isolation switch (DC)
Safety	IEC 62109 Part 1 & 2
Environmental Testing	As per IEC 60068-2

DATA ACQUISITION SYSTEM/PLANT MONITORING/REMOTE MONITORING:

Data Acquisition System shall be provided for each of the solar PV plant capacity.

Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis with the high quality, suitable PC. Metering and Instrumentation for display of systems parameters and status indication to be provided.

Solar Irradiance: An integrating Pyranometer / Solar cell-based irradiation sensor (along with calibration certificate) provided, with the sensor mounted in the plane of the array. Readout integrated with data logging system.

Temperature: Temperature probes for recording the Solar panel temperature and/or ambient temperature to be provided complete with readouts integrated with the data logging system

The following parameters are accessible via the operating interface display in real time separately for solar power plant:

- a. AC Voltage (V)
- b. AC Output current(I)
- c. Output Power (W)
- d. Total output consumption by load (kWh)
- e. Daily output consumption by load (kWh)
- f. Power factor.
- e. DC PV Input Voltage (V)
- f. DC PV Input Current (I)
- g. Total PV generation(kWh)
- h. Daily PV generation(kWh)
- k. Time Active.
- l. Time disabled.
- m. Time Idle.
- n. Total & daily import energy from Grid (kWh)
- o. Total & daily import energy from Grid (kWh)
- p. Protective function limits (Viz-AC Over voltage, AC Under voltage, over frequency, under frequency ground fault, PV starting voltage, PV stopping voltage).

All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.

PV array energy production: Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system provided. Energy meter along with CT/PT should be of 0.5 accuracy class.

Computerized DC String/Array monitoring and AC output monitoring shall be provided as part of the inverter and/or string/array combiner box or separately.

String and array DC Voltage, Current and Power, Inverter AC output voltage and current (All 3 phases and lines), AC power (Active, Reactive and Apparent), Power Factor and AC energy (All 3 phases and cumulative) and frequency shall be monitored.

Computerized AC energy monitoring shall be in addition to the digital AC energy meter.

The data shall be recorded in a common work sheet chronologically date wise. The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.

All instantaneous data shall be shown on the computer screen.

Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.

Provision for instantaneous Internet monitoring and download of historical data shall be also incorporated.

Remote Server and Software for centralized Internet monitoring system shall be also provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and temperature monitoring system.

Ambient / Solar PV module back surface temperature shall be also monitored on continuous basis.

Simultaneous monitoring of DC and AC electrical voltage, current, power, energy and other data of the plant for correlation with solar and environment data shall be provided.

Remote Monitoring and data acquisition through Remote Monitoring System software at the owner/JREDA location with latest software/hardware configuration and service connectivity for online/real time data monitoring/control complete to be supplied and operation and maintenance/control to be ensured by the bidder.

The bidders shall be obligated to push real-time plant monitoring data on a specified intervals (say 15 minute) through open protocol at receiver location (cloud server) in XML/JSON format, preferably. Suitable provision in this regard will be intimated to the bidders.

All the relevant parameters of Inverter should be available for remote monitoring over internet using GPRS based monitoring solution. The monthly charge of SIM card and server will be borne by bidder. The list of parameters should include:

PV Side	PV Voltage, PV Current, PV Power, Daily PV Generation, total Generation etc.
Inverter Side	<ul style="list-style-type: none"> ➤ Inverter Voltage, Current, Frequency ➤ Mains Voltage, Current, Frequency ➤ Daily & Total load energy consumption(kWh) ➤ Daily & Total energy import energy from Grid(kWh) ➤ Daily & Total energy export energy from Grid(kWh) ➤ Active Faults

3.5. DC Distribution Board (DCDB):

DC DPBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 protection. The bus bars are made of copper of desired size. Suitable capacity MCBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

DCDB shall consist of MCBs of suitable specifications which can withstand respective flow of current, with the purpose of providing the option for isolating the SPV arrays.

3.6. **AC Distribution Board (ACDB):**

- 3.6.1. AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.
- 3.6.2. All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.
- 3.6.3. The **changeover switches, cabling work** should be undertaken by the bidder as part of the project.
- 3.6.4. All the Panel's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz
- 3.6.5. The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.
- 3.6.6. All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better. Should conform to Indian Electricity Act and rules (till last amendment).
- 3.6.7. All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance.

3.7. **Cables and Accessories:**

Cables of appropriate size to be used in the system shall have the following characteristics:

- a. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards
- b. Temp. Range: -10oC to +80oC.
- c. Voltage rating 660/1000V
- d. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation
- e. Flexible
- f. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum (2%)
- g. For the DC cabling, XLPE or, XLPO insulated and sheathed, UV-stabilized single core multi-stranded flexible copper cables shall be used; Multi-core cables shall not be used.
- h. For the AC cabling, PVC or, XLPE insulated and PVC sheathed single or, multi-core multi-stranded flexible copper/aluminium cables shall be used; Outdoor AC cables shall have a UV-stabilized outer sheath.
- i. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use. Outer sheath of cables shall be electron beam cross-linked XLPO type and black in colour.
- j. The DC cables from the SPV module array shall run through a UV-stabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.

- k. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers
- l. All cables and conduit pipes shall be clamped to the rooftop (as required), walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm; the minimum DC cable size shall be 4.0 mm² copper; the minimum AC cable size shall be 4.0 mm² copper/aluminium. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires.
- m. Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified. In addition, cable drum no. / Batch no. to be embossed/ printed at every one meter.
- n. Cable Jacket should also be electron beam cross-linked XLPO, flame retardant, UV resistant and black in colour.
- o. All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions including High temperatures, UV radiation, rain, humidity, dirt, salt, burial and attack by moss and microbes for 25 years and voltages as per latest IEC standards. DC cables used from solar modules to array junction box shall be solar grade copper (Cu) with XLPO insulation and rated for 1.1kV as per relevant standards only.
- p. The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant shall be provided by the bidder. Any change in cabling sizes if desired by the bidder shall be approved after citing appropriate reasons. All cable schedules/ layout drawings shall be approved prior to installation.
- q. Multi Strand, Annealed high conductivity copper conductor PVC type 'A' pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground laying. All cable trays including covers to be provided. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below:

BoS item / component	Standard Description	Standard Number	Cables	General Test and Measuring Methods,
	PVC/XLPE insulated cables for working Voltage up to and including 1100 V, UV resistant for outdoor installation	IS /IEC 69947.		
- r. The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%.
- s. The total voltage drop on the cable segments from the solar grid inverter to the distribution board shall not exceed 2.0%.

3.8. Metering and Solar Meter:

- a. All the meters shall adhere to the standards and provisions specified in CEA (Installation and Operation of Meters), Regulations, 2006 and subsequent amendments thereof.
- b. **Solar Generation Meter:** The appropriate meter shall be single phase or three phase as per requirement. An energy meter shall be installed in between the solar grid inverter and the distribution board to measure gross solar AC energy production (the "Solar Generation Meter") for Pure Grid tied systems. For Hybrid Systems, **separate DC meter shall be installed between DCDB and PCU/Inverter. The Solar Generation Meter shall be of the same accuracy class as the JBVNL service connection meter or as specified by JSERC.**
- c. **Meter:** The appropriate meter shall be single phase or three phases as per requirement. The meter to be installed shall be of the same or better Accuracy Class Index than the existing meter installed at the premises.

- d. The appropriate meter(s) at the premises of the consumer shall be procured and installed by the bidder.

3.9. **Earthing and Lightning Protection:**

Each array structure of the PV system should be grounded/earthed properly using adequate number of earthing kits as per IS: 3043-1987 or as per latest revision. In addition the lightning arrester/masts should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representative of Department/JREDA as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly. **Earth conductor size should not be less than 16 sq. mm cu cable or equivalent. All electrical component (i.e. DCDB, ACDB, etc.) body earthing should be done in SPV plant.**

Earth resistance shall not be more than 5 ohms. It shall be ensured that all the earthing points are bonded together to make them at the same potential. The earthing resistance values shall conform to relevant IS/ Indian electricity rules.

The SPV power plants shall be provided with lightning & overvoltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IEC 62305 standards. The protection against induced high-voltages shall be provided by the use of surge protection device (SPDs) and suitable earthing such that induced transients find an alternate route to earth. **The SPV plant should have ESE type lightning arrester. The earthing GI strip / Solid GI cable / Solid Cu cable should be lay down with insulator on the roof surface / wall. The lightning arrester should be installed with insulator.**

Based on available land or roof area solar PV panels will be installed on the land or roof of the building. The output of the panels (DC electricity) connects to the power conditioning unit / inverter which converts DC to AC. The inverter output will be connected to the control panel or distribution board of the building to utilize the power. The inverter synchronizes with grid and also with any backup power source to produce smooth power to power the loads with preference of consuming solar power first. If the solar power is more than the load requirement, the excess power is automatically fed to the grid. For larger capacity systems connection through step up transformer and switch yard may be required to feed the power to grid. In case of grid failure, there should provision of protection for isolating the SPV plant from the grid.

4. **Quality and adaptability of the equipment:**

Interested Companies must verify the grid behavior, solar insolation levels and general site conditions on their own before bidding. The bidder shall accordingly ensure that the equipment and the design submitted shall be able to perform as per guaranteed performance levels in the available site conditions. The design of the plant and the equipment offered shall be evaluated for its quality and adaptability to the site conditions.

5. **Tools & Tackles and Spares:**

After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the bidder for maintenance purpose. List of tools and tackles to be supplied by the bidder for approval of specifications and make from JREDA/ owner.

A list of requisite spares in case of PCU/Inverter comprising of a set of control logic cards, IGBT driver cards etc. Junction Boxes. Fuses, MOVs / arrestors, MCCBs etc. along with spare set of PV modules be indicated, which shall be supplied along with the equipment. A minimum set of spares shall be maintained in the plant/service centre itself for the entire period of warranty and Operation & Maintenance which upon its use shall be replenished.

6. Danger Boards and Signage:

Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date. Three signage shall be provided one each at control room, solar array area and main entry from administrative block. Text of the signage may be finalized in consultation with JREDA/ owner.

7. Fire Extinguishers:

The fire fighting system for the proposed power plant for fire protection shall be consisting of:

- a. Portable fire extinguishers in the control room for fire caused by electrical short circuits
- b. Sand buckets in the control room
- c. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards.

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

8. Drawings & Manuals:

Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

Approved ISI and reputed makes for equipment be used.

For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to JREDA before progressing with the installation work

9. Drawings to be furnished by bidder after award of contract:

The Contractor shall furnish the following drawings Award/Intent and obtain approval:

- a. General arrangement and dimensioned layout
- b. Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
- c. Structural drawing along with foundation details for the structure.
- d. Itemized bill of material for complete SV plant covering all the components and associated accessories.
- e. General Arrangement of Solar Power Plant
- f. Single Line Diagram
- g. Earthing Layout of Solar Power Plant
- h. Shadow analysis of the ground area or roof

10. Safety Measures:

The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.

11. Display Board:

The bidder has to display a board at the project site mentioning the following:

Plant Name, Capacity, Location, Type of Renewable Energy plant (Like solar wind etc.), Date of commissioning, details of tie-up with transmission and distribution companies, Power generation and Export FY wise.

The size and type of board and display shall be approved by Engineer-in-charge before site inspection.

12. Manpower Training

The supplier/contractor shall train the users for the operation & maintenance of the plant.

13. Civil and Other Non-Electrical Work:

- i. **Foundations:** The Contractor shall design and construct appropriate civil foundations for MMS, pre-fabricated/engineered structures/RCC, transformers, switchyard equipment, feeder bay etc.
- ii. **Inverter room/ Control Room:** pre-fabricated/engineered /RCC structures are to be planned and constructed by the Contractor.
- iii. **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 module cleaning, the contractor shall provide a pipeline network with valves. However, contractor is also free to provide automatic robot-based cleaning system.
- iv. **Chain-Link Fencing and Boundary Wall:** The Contractor shall provide chain-link fencing of the entire plant boundary for plant sites.
- v. **Roads and Pathways:** The Contractor shall provide road and pathways of asphalt type for plant site.
- vi. **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.
- vii. **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.
- viii. **Plant Safety Equipment:** The Contractor shall provide appropriate numbers of foam type fire extinguishers / CO2 extinguishers, sand buckets and transformer discharge rod at Inverter Rooms, Control Room, 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.
- ix. 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.
- x. 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, JREDA approval/consent needs to be taken. The Contractor has to prepare bar bending schedule and cement consumption for the total project in advance and has to submit to the Company and Consultant 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. The Contractor 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) on site. The booklet of Standard Specifications for Civil Works will be applicable wherever there is dispute in the items of civil works. The Company will not supply any material for this work.

14. 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 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 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. Company 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 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 JREDA.
- x. The company 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.

15. 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 JREDA 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 be submitted 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 will assess and approve the documents within 10 days of submission of 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 per instructions /comments given by JREDA
- ii. If required, prior to execution. Subsequent revisions and the final version of the documents shall also be submitted in hard and soft copy to JREDA. 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.
- iii. 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 JREDA.
- iv. 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.
- v. 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.
- vi. 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(site specific), basic MMS design, civil foundations and anchoring design / details, electrical SLD, shading analysis and generation estimation report etc.
- vii. 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.

16. 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.

17. 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/LT lines, 11 kV switchgear equipment etc. The Contractor shall carry out soil investigation through Government approved / NABL certified soil consultant. These reports shall be furnished to JREDA prior to commencing work. All RCC works shall 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.

18. 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/ murrum 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.

19. 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. 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.
- ii. RCC structures for control room, pre-fabricated/engineered inverter rooms, shall be strictly as per relevant IS standards.

20. 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.

21. 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 any damage during construction & Operation and Maintenance Phase.

22. 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.
- 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.

23. Fencing:-

The contractor shall provide chain link fencing with barbed wire at top to protect the entire plant premises for restriction the entry of trespassers. 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.

24. 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 JREDA 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

25. Roads:

Contractor has Design as per relevant IS, submit and take approval from JREDA for Asphalt and WBM roads Road which connecting Control Room, Switchyard shall be of Asphalt with sufficient base courses like WBM layer, Wet Mix layer, DBM layer and at top Seal Coat. Also all peripheral roads and pathways from central road to Inverter room road shall be WBM road. WBM/Asphalt road width shall be of 4m and with sufficient thickness to access heavy equipment like transformers/inverters/switchyard equipment transportation.

26. Water supply:

The contractor shall have to make arrangement for total water cleaning system. The cleaning system shall consist of 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.

27. Prefabricated/engineered Inverter 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/ Consultant. The drawings of panels with the make of components should be approved from the Company.
- iii. The Contractor has the option to construct either Pre-fabricated/engineered or RCC based Inverter Rooms. The Pre-fab Inverter Room shall be of adequate size and should 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.
- iv. 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. 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.
 - vi. Flooring and skirting for Control: 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.
 - vii. 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 450 mm 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.
 - viii. 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.

Annexure-1: Format for Covering Letter for Bid fee
NIB No: 02/JREDA/SPV/AIRPORT/21-22

(To be submitted in the official letter head of the company)

To,

The Director,
Jharkhand Renewable Energy Development Agency
3rd Floor, S.L.D.C. Building,
Kusai Colony, Doranda,
Ranchi - 834002.

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand

Sir,

We are hereby submitting our offer in full compliance with the terms and condition of the above NIB No. We have submitted the requisite amount of "Bid Fee"/ Document to claim for exemption from Bid Fee.

The tender is uploaded on www.jharkhandtenders.gov.in as per the requirement of the website separately Technical Bid & Financial Bid.

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

Annexure-2: Format for Covering Letter for Earnest Money
NIB No: 02/JREDA/SPV/AIRPORT/21-22

(To be submitted in the official letter head of the company)

To,

The Director,
Jharkhand Renewable Energy Development Agency
3rd Floor, S.L.D.C. Building,
Kusai Colony, Doranda,
Ranchi - 834002.

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

Sir,

We are hereby submitting our offer in full compliance with the terms and condition of the above NIB No. We have submitted the requisite amount of "Earnest Money" in the form of Bank Guarantee, valid for twelve months/ or document to claim exemption from Ernest Money.

The tender is uploaded on www.jharkhandtenders.gov.in as per the requirement of the website separately Technical Bid & Financial Bid.

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

Annexure-3: Information About The Bidding Firm

NIB No: 02/JREDA/SPV/AIRPORT/21-22

(To be submitted in the official letter head of the company)

SL. No.	Particulars	
1.	Name of the Bidder	
2.	Address of Bidder with Telephone, Fax, email	
3.	Address of the Registered Office	
4.	Address of the works	
5.	GPS Co-ordinate of Registered Office	
6.	GPS Co-ordinate of Factory Campus	
7.	Name & Designation of Authorized Signatory for Correspondence (Attach Power of Attorney as per Annexure-7)	
8.	Nature of Firm (Proprietorship/Partnership /Pvt. Ltd./Public Ltd. Co./Public Sector)	
9.	Permanent Account Number (PAN)/TIN (Attach proof)	
10.	Firm's Registration Number (Attach proof)	
11.	GST Certificate (Attach proof)	
12.	Specify the Item Originally Manufactured (SPV module/Electronics) (Attach copy of Registration Certificate of Industry Department)	
13.	Details of in-house testing facility (Attach Proof)	
14.	Office/ Dealer and Service network in Jharkhand with TIN No. (Give details)	
15.	Quoted quantity	
16.	Particulars of Earnest Money	
17.	Place where Materials will be Manufactured	
18.	Place where Materials will be Available for Inspection	
19.	Other details and remarks, if any	

Yours faithfully,
(Signature of Authorized Signatory)

Name :
Designation :
Company seal :

(Separate sheet may be used for giving detailed information duly signed)

Annexure-4: Declaration by the Bidder
NIB No: 02/JREDA/SPV/AIRPORT/21-22

(To be submitted in the official letter head of the company)

I/We _____ (here in after referred to as the Bidder) being desirous of tendering for the rate contract for work under the above-mentioned tender and having fully understood the nature of the work and having carefully noted all the terms and conditions, specifications etc. as mentioned in the tender document, DO HEREBY DECLARE THAT

1. The Bidder is fully aware of all the requirements of the tender document and agrees with all provisions of the tender document.
2. The Bidder is capable of executing and completing the work as required in the tender.
3. The Bidder accepts all risks and responsibilities directly or indirectly connected with the performance of the tender.
4. The Bidder has no collusion with any employee of JREDA or with any other person or firm in the preparation of the bid.
5. The Bidder has not been influenced by any statement or promises of JREDA or any of its employees, but only by the tender document.
6. The Bidder is financially solvent and sound to execute the work.
7. The Bidder is sufficiently experienced and competent to perform the contract to the satisfaction of JREDA.
8. The information and the statements submitted with the tender are true.
9. The Bidder is familiar with all general and special laws, acts, ordinances, rules and regulations of the Municipal, District, State and Central Government that may affect the work, its performance or personnel employed therein.
10. The Bidder has not been debarred from similar type of work by any SNA/ Government Dept. /PSU.
11. This offer shall remain valid for Six months from the date of opening of the tender.
12. The Bidder gives the assurance to execute the tendered work as per specifications terms and conditions.
13. The Bidder confirms the capability to supply and install required no. of systems per month.
14. The Bidder accepts that the earnest money be absolutely forfeited by JREDA if the Bidder fails to undertake the work or sign the contract within the stipulated period.

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

Annexure-5: Format For Financial Requirement – Annual Turnover

NIB No: 02/JREDA/SPV/AIRPORT/21-22

[On the letterhead of Bidding Company]

To,

The Director,
Jharkhand Renewable Energy Development Agency
3rd Floor, S.L.D.C. Building,
Kusai Colony, Doranda,
Ranchi - 834002

Dear Sir,

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

We certify that the Bidding Company had an average Annual Turnover of Rs. -----
----- based on audited annual accounts of the last three years ending 31.03.2020/21.

Sl. No.	Financial Year	Turnover (in Rupees)
1.	2017-18	
2.	2018-19	
3.	2019-20	
	Average Annual Turnover	

UID No.:

Authorised Signatory
(Power of Attorney holder)

Statutory Auditor
(Stamp & Signature)

Annexure-6: Format For Financial Requirement - Net Worth Certificate

NIB No: 02/JREDA/SPV/AIRPORT/21-22

[On the letterhead of Bidding Company]

To,

The Director,
Jharkhand Renewable Energy Development Agency
3rd Floor, S.L.D.C. Building,
Kusai Colony, Doranda,
Ranchi - 834002

Dear Sir,

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

This is to certify that Net worth of _____ {insert the name of Bidding Company}, as on 31st March 2020 is Rs _____. The details are appended below.

Particulars	Amount (In Rs.)
Equity Share Capital	
Add: Reserves	
Subtract: Revaluation Reserve	
Subtract: Intangible Assets	
Subtract: Miscellaneous Expenditure to the extent not written off and carried forward losses	
Net Worth as on 31 st March 2020	

UID No.:

Authorised Signatory
(Power of Attorney holder)

Statutory Auditor
(Stamp & Signature)

Annexure -7: Format of Power of Attorney for Signing Bid

NIB No: 02/JREDA/SPV/AIRPORT/21-22

POWER OF ATTORNEY

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.)

Know all men by these presents, we.....(name and address of the registered office) do hereby constitute, appoint and authorize Mr. / Ms.....(name and residential address) who is presently employed with us and holding the position of.....

as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our bid for **NIB No: 02/JREDA/SPV/AIRPORT/21-22**, including signing and submission of all documents and providing information / Bids to Jharkhand Renewable Energy Development Agency, representing us in all matters before [Insert Name], and generally dealing with Jharkhand Renewable Energy Development Agency in all matters in connection with our bid for the said Project.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

For

_____Signature

Accepted by

..... (Signature)

(Name, Title and Address of the Attorney)

Note: The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, lay down by the applicable law and the charter documents of the executants (s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

Annexure-8: Details of Orders Received and Executed in Last 7 Years

NIB No: 02/JREDA/SPV/AIRPORT/21-22

Details of Orders Received & Executed by the Manufacturer/Supplier for Supply of **SPV Power Plant** to SNA/ Govt. Organization during Last Seven Years.

SL. No.	Name of Agency/ Organization	Purchase Order No., Date & Ordered Qty.	Capacity of SPV Power Plant	Delivery Schedule	Qty. Supplied Within Delivery Schedule	Qty. Supplied After Delivery Schedule	Date of Full Supply

Yours faithfully,

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

Note:

- (a) Attach Photocopies of Work Orders
- (b) Attach Photocopies of Certificate of Satisfactory Performance Issued by Concerned Nodal Agency/*PSU*/ Govt. Organization
- (c) Separate sheet may be used for giving detailed information in seriatim duly signed. This bid Performa must be submitted duly signed in case separate sheet is submitted

Annexure-9 Contact Person for the NIB

NIB No: 02/JREDA/SPV/AIRPORT/21-22

[On the letterhead of Bidding Company]

1	Name of Proprietor/ Partners/ CMD/Director	
2	Contact Person name for the NIB	
3	Designation	
4	Contact No. (mobile/phone)	
5	Fax No.	
6	e-mail ID	
7	Corresponding address with pin code	
8	Remarks	

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

Annexure-10: Format for Technical Details

NIB No: 02/JREDA/SPV/AIRPORT/21-22

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

S. N	Particulars	Details	Make
1	Mounting arrangement for Solar module		
2	Solar module frame material		
3	Module type		
4	No. of solar cells per module		
5	Make of Solar module (Attach IEC Certificate)		
6	Country		
7	Weather resistant HDPE junction Box (IP55)		
8	Max. Temperature rise of solar cells under severe working condition over max. ambient temperature		
9	Nominal voltage		
10	Operating voltage of solar module (nom)		
11	Peak power voltage (Vmp)		
12	Peak Power current (Imp)		
13	Open circuit voltage (Voc)		
14	Short circuit current (Isc)		
15	Make of PCU and Origin		

Undertaking

- a) We agree to manufacture and supply quality Solar Power Plant as per NIT specifications.
- b) We agree to give performance guarantee as specified and to abide by the scope of the guarantee as prescribed under the tender document.
- c) We agree to operate as per the terms & conditions of the tender.

We undertake to supply quality products for promoting energy efficiency in the era of lighting systems.

(Signature of Authorized Signatory with Name Designation & Company Seal)

Filling Instructions:

1. The **SPP** components will be generally guaranteed as per General Terms & Conditions. The manufacturer can also provide additional information about the system and conditions of Guarantee as necessary. The Guarantee card to be supplied with the system must contain the details of the system supplied as per format given above.
2. During the Guarantee period JREDA/users reserve the right to cross check the performance of the systems for their minimum performance levels specified in the MNRE specifications.

Annexure-11: Technical Detail Form
NIB No: 02/JREDA/SPV/AIRPORT/21-22

(To be submitted in the official letter head of the company)

Warranty Card

1.	Name & Address of the Manufacturer/ Supplier of the System	
2.	Name & Address of the Purchasing Agency	
3.	Date of Supply of the System	
4.	Details of PV Module(s) Supplied in the System	
	(a) Name of the Manufacturer	
	(b) Make	
	(c) Model	
	(d) Serial No.	
	(e) Wattage of the PV Module(s) under STC	
	(f) Guarantee Valid Up To	
5.	Details of PCU & Other BOS Items	
	(a) Name of the Manufacturer	
	(b) Make	
	(c) Model	
	(d) Serial No(s).	
	(e) Month & Year of Manufacture	
	(f) Guarantee Valid Up To	
6.	Designation & Address of the Person to be Contacted for Claiming Warranty Obligations	

(Signature of Authorized Signatory with Name Designation & Company Seal)

Filling Instructions:

- The SPV Power Plants components will be generally guaranteed as per General Terms & Conditions. The manufacturer can also provide additional information about the system and conditions of Guarantee as necessary. The Guarantee card to be supplied with the system must contain the details of the system supplied as per format given above.
- During the Guarantee period JREDA/users reserve the right to cross check the performance of the systems for their minimum performance levels specified in the MNRE specifications.

Annexure-12 : Price Break up
NIB No: 02/JREDA/SPV/AIRPORT/21-22

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

A. For 600 kWp (Grid Connected):

B. Name of the Site Bidding for.....(Bidder shall mention separate sheets mentioning the names of the site bidding for)

S. N	Component	Quantity	Bidders to enter cost for 600 KWp (inclusive of all taxes and charges) (In Rs.)
1	SPV Modules		
2	Inverter (Grid Connected)		
3	Module Mounting Structure (MMS)		
4	ACDB, DCDB & Junction Boxes		
5	Cables		
6	Installation Cost		
7	Net Meter		
8	Other Cost (Mention items)		
9	CMC cost (5 years)		
	Total		

Note: Need to be submit in .PDF file with price bid (not with the technical bid) on company letterhead.

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

Annexure-13: Format for Submitting Bank Guarantee for Earnest Money

NIB No: 02/JREDA/SPV/AIRPORT/21-22

(To be submitted in Rs. 100/- Non-Judicial Stamp Paper to be purchased in the name of the issuing bank)

To,

The Director,
Jharkhand Renewable Energy Development Agency
3rd Floor, S.L.D.C. Building,
Kusai Colony, Doranda,
Ranchi - 834002.

WHEREAS (Supplier's name) (hereinafter 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, point no. 3 Earnest Money" has agreed to establish a Bank Guarantee in Your favour through us valid up to (date) instead of deposit of earnest money in cash.

WHEREAS you have agreed to accept a Bank Guarantee 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. **02/JREDA/SPV/AIRPORT/21-22**
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. : **02/JREDA/SPV/AIRPORT/21-22** 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-14: Project Report Format

NIB No: 02/JREDA/SPV/AIRPORT/21-22

**Certificate of Delivery of Grid Connected SPV Power Plant received by the Consignee/ JREDA Official
as Proof of Compliance by the Supplier**

Name & Designation of Consignee:.....

Name of Department:.....

Address of Department:.....

.....

Certified that we have received following materials and handed over to supplier for installation of Grid Connected SPV Power Plants:

1. Nos. & Capacity of SPV Modules:-----
2. Nos. & Capacity of PCUs:.....
3. Balance of Systems:.....
4. Date of Supply.....

Above materials have been supplied by M/s.....

Signature & Seal of Supplier

Signature of Consignee along with Seal/JREDA Official:.....

Date.....

Certificate of JREDA Representative

Certified that above-mentioned materials have been inspected as per the specification and handed over to the Supplier at site for installation & commissioning.

Signature & Seal of JREDA Representative

**Format for Summary Project Report for
Grid Connected SPV Power Plants**

1. Name of Bidder
2. Rfs no.
3. Project details (Site location & Address)
4. Brief about the Solar Power Generation System
5. Details of the beneficiary
6. Specifications of the Components and Bill of Material/ Quantities

Sl. no	Component	Specifications	Quantity	Make
A	Solar PV module			
A.1	Aggregate Solar PV capacity (kWp)			
B	Grid Tie inverter (Type and Capacity)			
B.1	Aggregate Inverter capacity (kVA)			
C	Module mounting structure (Certified by a Structural Engineer)			
D	Array Junction Box			
E	AC Distribution Board			
F	Cable (All type)			
G	Earthing Kit (maintenance free)			
H	Meters			
I	Online monitoring System			
J	Any other component			

7. Unit cost of solar power generation
8. Cost benefit analysis, payback period
9. Expected output/annum
10. Respective drawings for layout, electrical wiring connections, earthing, components etc.
11. Connectivity details with grid and metering arrangement (with sketch diagram)
12. Copy of electricity bill of the beneficiary and consumer number
13. Any other information

(The above information should be limited up to 2-3 pages only)

Annexure 15: Project Completion Report for Grid-Connected Solar System

NIB No: 02/JREDA/SPV/AIRPORT/21-22

Certificate of Installation & Commissioning of Grid Connected SPV Power Plant

Certificate

Name of Consignee:..... Designation:-.....

Name of Department:.....

Address of Department:.....

This is to certify that Solar Power Plant of -----kWp have been installed successfully by M/son Dated..... in Airport Campus.

This Solar Power Plant is working satisfactorily from last seven days.

Signature & Seal of Supplier

Signature of Consignee along with Seal.....

Date.....

Signature & Seal of JREDA Representative.....

Date.....

JOINT COMMISSIONING REPORT OF SOLAR POWER PLANTS

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

1. JREDA Work Order No.:

2. Name of Contractor:

3. Solar Power Plant Location:

4. Solar Power Plant Capacity:

5. Date of Commissioning:

Date:

Seal and Signature of the Contractor:

Place:

Name:

Designation

JOINT COMMISSIONING REPORT OF SPV POWER PLANTS

1. Name of the Site:
2. Capacity of SPV Power Plants installed: -----kWp.
3. Work Order No.:
4. Actual Date of Commissioning:
5. Stipulated Date of commissioning as per W.O.:
6. Extension granted till: Not Applicable vide JREDA letter no. Not Applicable
7. Name & address of the contractor:
8. This is hereby certified that the contractor ----- has successfully installed & commissioned the ----- kWp SPV Power Plant at -----on --.--.2020 with major components as mentioned in **Annexure I** appended hereto, as per the terms and conditions of the work order mentioned at serial No. (3) Above.
9. The work order has been fully executed as per the work order and the SPV Power Plant at ----- of ----- kWp handed over to the Consignee cum User Agency in good working condition. We shall provide complete warranty against all manufacturing defects and defective/erroneous installation for a period of five years from this date of Commissioning. The above-mentioned SPV Power Plant is hereby handed over by the contractor to the Consignee cum User Agency in fully satisfactory working condition.

Date: _____ Seal and Signature of the Contractor:
Place: _____ Name: _____
Designation: _____

SPV Power Plant Installed at ----- of -----kWp have been verified by JREDA Engineer-In -Charge and handed over to consignee in working condition.

Seal and Signature of Consignee cum User Agency
Name: _____ Seal and Signature of JREDA Engineer-In - Charge
Designation: _____ Name: _____
Designation: _____

Annexure-I

Forming integral part of the Joint Commissioning report dated -----showing details of major components installed at-----of SPVPP of ----- kWp Capacity.					
S. N.	Name of the items Installed/works commissioned at site	Size	Unit	Quantity	Remark
1	Control Room Building: No cable is exposed. Proper casing capping (Conduit pipe) is provided with distribution line. Control Room has been provided by Consignee.	-----	Sq. Mtrs.	N/A	Provided
2	Matting as required for Control Room	Provided			
3	SPV Modules of -----Wp, ----- Cells each of ----- make (Serial No's as mentioned in enclosed Annexure II.)		Wp	Nos.	As per specification
4	SPV Module Mounting Structure for the ----- Nos. of modules for ----- kWp capacity unit on structure including design & construction of PCC/RCC foundation base for holding the above structures the work includes necessary excavation, concreting, back filling, shoring and shattering etc.)	----- Modules in ----- structure		----- Nos.	As per specification
5	PCU/Inverter: Capacity -----KVA ----- V, Digital sine wave, Make of -----, suitable for grid tie and hybrid mode of operation along with all protection, controlling, arrangement and required accessories suitable for the power plant commissioned.		KVA	-----No's	As per specification
6	Lightening Protection System		Numbers	----- No	
7	Over Voltage protection System				
8	DCDB		Numbers	----- No	
9	ACDB		Numbers	----- No	
10	Array Junction Box:		Numbers	----- No's	
11	Earthing Protection: The earthing pit is as per IS:3043	OPITS	Numbers	-----Sets	
12	Cable/wire 4 Sq. mm PVC Copper	-----	Meters		
13	Cable/Wire 25 Sq. mm PVC Copper	-----	Meters		

Date:

Seal and Signature of the Contractor:

Name:

Place:

Designation:

Verification Report of JREDA Engineer-In -Charge:

Above mentioned **Annexure-I** w.r.t. installation of Solar Power Plant of ---kWp at -----have been verified and found as per the specification.

Seal and Signature of JREDA Engineer-In -Charge

Name:

Designation:

Annexure-II

SPV Modules Details

SPV Modules Installed at ----- of -----kWp Capacity.

Total Capacity: ----- kWp
Each Modules Capacity: -----Wp
Total No of Modules: -----Nos.

S. No.	Module Sl. No.	S. No.	Module Sl. No.	S. No.	Module Sl. No.
1		9		17	
2		10		18	
3		11		19	
4		12		20	
5		13		-	
6		14		-	
7		15		-	
8		16		-	

Date:

Seal and Signature of the Contractor:

Name:

Designation

Place:

Verification Report of JREDA Engineer-In -Charge:

Above mentioned Module Sl. No. w.r.t. installation of Solar Power Plant of ---kWp at -----have been verified and found as per the specification.

Seal and Signature of JREDA Engineer-In -Charge

Name:

Designation:

Power Conditioning Unit (PCU)/Inverter

Make: -----

Sl. No: -----

Photographs Enclosed:

Date:

Seal and Signature of the Contractor:

Name:

Designation

Place:

Verification Report of JREDA Engineer-In -Charge:

Above mentioned photograph w.r.t. installation of Solar Power Plant of ---kWp at -----have been verified and found as per the specification.

Seal and Signature of JREDA Engineer-In -Charge

Name:

Designation:

Photograph of Solar Power Plants

Photographs:

Date:

Seal and Signature of the Contractor:

Name:

Place:

Designation

Verification Report of JREDA Engineer-In -Charge:

Above mentioned photograph w.r.t. installation of Solar Power Plant of ---kWp at -----have been verified and found as per the specification.

Seal and Signature of JREDA Engineer-In -Charge

Name:

Designation:

Warrantee Certificate

It is hereby certified that the Solar Photovoltaic Power Plant of -----kWp Capacity has been successfully Supplied, Installed & Commissioned against Work Order No. ----- of JREDA at site at ----- on dated -----.

The Mechanical Structures, Electrical Works including Power Conditioner/Inverter/Charge Controller/MPPT Unit/ Distribution Boards/ Digital Meters/ Switch Gear etc. overall workmanship of SPV Power Plant/System remain warranted against any manufacturing /design/installation defects for a period of five years from the date of Installation & Commissioning.

However, for Solar PV Modules the warranty shall be in line with the warranty offered by the module manufacturer which is "PV modules used in solar power plant/ system will remain warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years."

Date:

Seal and Signature of the Contractor:

Place:

Name:

Designation:

Note: Original copy of warranty certificate issued by manufacturer for SPV Module, PCU/Inverter and Battery as applicable should also be submitted in JREDA, Ranchi.

PRECOMMISSIONING TEST REPORT

Installation & Commissioning Report of ----- kWp SPV Power Plant at -----

S. N	Particulars	Details
1	Place of commissioning of SPVPP	
2	Date of Commissioning of SPVPP	
3	Nos. of Modules	
4	Nos. of Module Mounting Structures.	
5	Nos. of ACDB	
6	Nos. of AJB	
7	Nos. of Earthing	
8	Nos. of DCDB	
9	Nos. of Pedestal	
10	Series String-1 A1	Voc..... Isc.....
11	Series String-2 A2	Voc..... Isc.....
12	Series String-3 A3	Voc..... Isc.....
13	PCU Output Voltage (V)	
14	Output Frequency (Hz)	
15	Others if any	

Date:

Seal and Signature of the Contractor:

Name:

Place:

Designation:

Verification Report of JREDA Engineer-In -Charge:

Above mentioned data w.r.t. installation of Solar Power Plant of ---kWp at -----have been verified and found as per the specification.

Seal and Signature of JREDA Engineer-In -Charge

Name:

Designation:

Project Completion Report for Solar Power Plants

S. N	Component	Observation
1	Work Order No. & Date	
2	Contractor Name and Complete Address	
	Site/Location with Complete Address	
	Longitude/Latitude	
3	Capacity of system installed (kWp)	
4	Specification of the Modules:	
	Type of modules (multi/mono)	
	Make of Modules and year of manufacturing	
	Wattage and no. of modules	
	Module Efficiency	
	No. of series & Parallel combinations	
	Tilt Angle of Modules	
4.1	IEC certificate Date of issue Agency Validity Enclose a IEC certificate	
4.2	Whether imported or indigenous	
4.3	RFID tag is pasted inside or outside	
4.4	Type of RFID	
5	PCU	
	Make & rating	
	Type of Charge controller/MPPT	
	Capacity of inverter and year of manufacturing	
	AC Output	
	Whether hybrid or stand alone	
	Whether indigenous or imported	
	Enclose test certificate as per MNRE requirement	
	Input Voltage to Inverter	
6	Structures	
	Tracking or non-tracking	
	Indigenous or imported	
7	Cables Make and size	
	Enclose Certificate: -	
	Rating: -	
	Voltage of cable	
8	Distribution Box	
	Name	
	Make	
	Certificate	
9	Earthing and protections	
	Lighting Arrester (Type)	
10	Date of Commissioning	
11	Enclose Generation data for one month (for without battery systems)	
11(a)	Enclose energy consumption data for one month (for battery based systems)	
12	Monitoring Mechanism for the installed System with ID & Password	
	Technical Person Trained to maintain system	
	Name with Mobile no.	

Date:

Seal and Signature of the Contractor:

Name:

Place:

Designation:

Verification Report of JREDA Engineer-In -Charge:

Above mentioned Project Completion Report for Solar Power Plants w.r.t. installation of Solar Power Plant of ---kWp at -----have been verified and found as per the specification.

Seal and Signature of JREDA Engineer-In -Charge

Name:

Designation:

Annexure-16: Format for Monthly O&M and CMC Report

NIB No: 02/JREDA/SPV/AIRPORT/21-22

[On the letterhead of Bidding Company]

To,

The Director,
Jharkhand Renewable Energy Development Agency
3rd Floor, S.L.D.C. Building,
Kusai Colony, Doranda,
Ranchi – 834002.

Dear Sir,

Sub: Design, Manufacture, Testing, Supply, Installation & Commissioning of 600 KWp of Grid connected SPV Power Plants including five years Comprehensive Maintenance Contract (CMC) on Turnkey basis for solarization of 5 different Airports in Jharkhand.

Date of Installation.....

JREDA Work Order No..... Dated.....

Place of Supply.....

Project Capacity:

Address of the site:

Component	Activity	Description	Date	Name / Signature	*Remarks
PV Module	Cleaning	Immediately clean any Bird droppings / dark spots on module.			
	Cleaning	Clean PV modules with plain water or mild dishwashing detergent.			
	Inspection (for plants > 50 kWp)	Infrared camera inspection for hot spots; bypass diode failure.			
	Inspection	Check the PV modules And rack for any damage.			
		If any new objects, such as Vegetation			

PV Array	Inspection	growth etc., are causing shading of the array. Remove if any.			
	Vermin Removal	Remove bird nests or vermin from array and rack area.			
Junction Boxes	Inspection	Inspect electrical boxes for corrosion, intrusion of water or vermin. Check position Of switches and breakers. Check status of all protection devices.			
Wiring	Inspection	Inspect cabling For signs of cracks, defects, lose connections, corrosion, overheating, arcing, short or open circuits, and ground faults.			
Inverter	Inspection	Observe instantaneous operational indicators on the faceplate. Inspect Inverter housing or shelter for any physical maintenance. Check for connection tightness.			
Inverter	Service	Clean or replace any air filters.			
Instruments	Validation	Verify monitoring instruments (Pyranometer etc.) with standard instruments			

		to verify their operation within tolerance limits.			
Transformer	Inspection	Inspect transformer oil level, temperature gauges, breather, silica gel, meter, connections etc.			
Plant	Monitoring	Daily Operation and Performance Monitoring.			
Spare Parts	Management	Manage inventory of spare parts.			
Log Book	Documentation	Maintain daily log records.			
Tracker (if any)	Inspection	Inspect gears, gear boxes, bearings, motors.			
	Service	Lubricate bearings, gear as required.			

Date	Generation kWh	Grid outage (hh:mm)	Inverter down period (hh:mm)	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				

Total generation for the month in kWh:

Cumulative generation since commissioning in kWh:

CUF for month in %:

Cumulative CUF since commissioning in %:

(Signature of Authorized Signatory)

Name:

Designation:

Company Seal:

*Provide details of any replacement of systems/components, damages, plant/inverter shut down (planned/forced), breakdown, etc under remarks.

*Daily register is to be maintained by the bidder at each location .The same may be inspected by JREDA or its authorized representative at any time 5 years of O&M period. The Register will have the information about the daily generation, Inverter downtime if any, Grid outages.

Annexure-17: Operation and Maintenance Guidelines of Grid Connected PV Plants

NIB No: 02/JREDA/SPV/AIRPORT/21-22

For the optimal operation of a PV plant, maintenance must be carried out on a regular basis.

All the components should be kept clean. It should be ensured that all the components are fastened well at their due place.

Maintenance guidelines for various components viz. solar panels, inverter, wiring etc. are discussed below:

1. SOLAR PANELS

Although the cleaning frequency for the panels will vary from site to site depending on soiling, it is recommended that

The panels are cleaned at least once every fifteen days.

- Any bird droppings or spots should be cleaned immediately.
- Use water and a soft sponge or cloth for cleaning.
- Do not use detergent or any abrasive material for panel cleaning.
- Iso-propyl alcohol may be used to remove oil or grease stains.
- Do not spray water on the panel if the panel glass is cracked or the back side is perforated.
- Wipe water from module as soon as possible.
- Use proper safety belts while cleaning modules at inclined roofs etc.
- The modules should not be cleaned when they are excessively hot. Early morning is particularly good time for module cleaning.
- Check if there are any shade problems due to vegetation or new building. If there are, make arrangements for removing the vegetation or moving the panels to a shade-free place.
- Ensure that the module terminal connections are not exposed while cleaning; this poses a risk of electric shock.
- Never use panels for any unintended use, e. g. drying clothes, chips etc.
- Ensure that monkeys or other animals do not damage the panels.

2. CABLES AND CONNECTION BOXES

- Check the connections for corrosion and tightness.
- Check the connection box to make sure that the wires are tight, and the water seals are not damaged.
- There should be no vermin inside the box.
- Check the cable insulating sheath for cracks, breaks or burns. If the insulation is damaged, replace the wire.
- If the wire is outside the building, use wire with weather-resistant insulation.
- Make sure that the wire is clamped properly and that it should not rub against any sharp edges or corners.
- If some wire needs to be changed, make sure it is of proper rating and type.

3. INVERTER

- The inverter should be installed in a clean, dry, and ventilated area which is separated from, and not directly.
- Remove any excess dust in heat sinks and ventilations. This should only be done with a dry cloth or brush.

- Check that vermin have not infested the inverter. Typical signs of this include spider webs on ventilation grills or wasps' nests in heat sinks.
- Check functionality, e.g. automatic disconnection upon loss of grid power supply, at least once a month.
- Verify the state of DC/AC surge arrestors, cable connections, and circuit breakers.

4. SHUTTING DOWN THE SYSTEM

- Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- To the extent possible, system shutdown will not be done during day time or peak generation.

INSPECTION AND MAINTENANCE SCHEDULE

Component	Activity	Description	Interval	By
PV Module	Cleaning	Clean any bird droppings/ dark spots on module	Immediately	User/Technician
	Cleaning	Clean PV modules with plain water or mild dishwashing detergent. Do not use brushes, any types of solvents, abrasives, or harsh detergents.	Fortnightly or as per the site conditions	User/Technician
	Inspection (for plants > 100 kWp)	Use infrared camera to inspect for hot spots; bypass diode failure	Annual	Technician
PV Array	Inspection	Check the PV modules and rack for any damage. Note down location and serial number of damaged modules.	Annual	User/Technician
	Inspection	Determine if any new objects, such as vegetation growth, are causing shading of the array and move them if possible.	Annual	User/Technician
	Vermin Removal	Remove bird nests or vermin from array and rack area.	Annual	User/Technician
Junction Boxes	Inspection	Inspect electrical boxes for corrosion or intrusion	Annual	Electrician

		of water or insects. Seal boxes if required. Check position of switches and breakers. Check operation of all protection devices.		
Wiring	Inspection	Inspect cabling for signs of cracks, defects; loose connections, overheating, arcing, short or open circuits, and ground faults.	Annual	Electrician
Inverter	Inspection	Observe instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. Inspect Inverter housing or shelter for physical maintenance, if required.	Monthly	Electrician
Inverter	Service	Clean or replace any air filters.	As needed	Electrician
Instruments	Validation	Spot-check monitoring instruments (Pyranometer etc.) with standard instruments to ensure that they are operational and within specifications.	Annual	PV Specialist
Transformer	Inspection	Inspect transformer oil level, temperature gauges, breather, silica gel, meter, connections etc.	Annual	Electrician

Quality Certification, Standards and Testing for Grid-connected Solar PV Systems/Power Plants:

Quality certification and standards for grid-connected solar PV systems are essential for the successful mass-scale implementation of this technology. It is also imperative to put in place an efficient and rigorous monitoring mechanism, adherence to these standards. Hence, all components of grid-connected solar PV system/ plant must conform to the relevant standards and certifications given below:

Solar PV Modules/Panels:	
IEC 61215/ IS 14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
IEC 61853- Part 1/ IS 16170: Part 1	Photovoltaic (PV) module performance testing and energy rating -: Irradiance and temperature performance measurements, and power rating
IEC 62716	Photovoltaic (PV) Modules - Ammonia (NH ₃) Corrosion Testing (As per the site condition like dairies, toilets)
IEC 61730-1,2	Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction, Part 2: Requirements for Testing
IEC 62804	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation. IEC TS 62804-1: Part 1: Crystalline silicon (mandatory for applications where the system voltage is > 600 VDC and advisory for installations where the system voltage is < 600 VDC)
IEC 62759-1	Photovoltaic (PV) modules - Transportation testing, Part 1: Transportation and shipping of module package units
Solar PV Inverters	
IEC 62109-1, IEC 62109-2	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems Part 2: Particular requirements for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)

IEC/IS 61683 (as applicable)	Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
BS EN 50530 (as applicable)	Overall efficiency of grid-connected photovoltaic inverters: This European Standard provides a procedure for the measurement of the accuracy of the maximum power point tracking (MPPT) of inverters, which are used in grid-connected photovoltaic systems. In that case the inverter energizes a low voltage grid of stable AC voltage and constant frequency. Both the static and dynamic MPPT efficiency is considered.
IEC 62116/ UL 1741/ IEEE 1547 (as applicable)	Utility-interconnected Photovoltaic Inverters - Test Procedure of Islanding Prevention Measures
IEC 60255-27	Measuring relays and protection equipment – Part 27: Product safety requirements
IEC 60068-2 (1, 2, 14, 27, 30 & 64)	Environmental Testing of PV System – Power Conditioners and Inverters a) IEC 60068-2-1: Environmental testing - Part 2-1: Tests - Test A: Cold b) IEC 60068-2-2: Environmental testing - Part 2-2: Tests - Test B: Dry heat c) IEC 60068-2-14: Environmental testing - Part 2-14: Tests - Test N: Change of temperature d) IEC 60068-2-27: Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock e) IEC 60068-2-30: Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) f) IEC 60068-2-64: Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance
IEC 61000 – 2,3,5 (as applicable)	Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) testing of PV Inverters
Fuses	
IS/IEC 60947 (Part 1, 2 & 3), EN 50521	General safety requirements for connectors, switches, circuit breakers (AC/DC): a) Low-voltage Switchgear and Control-gear, Part 1: General rules b) Low-Voltage Switchgear and

	Control-gear, Part 2: Circuit Breakers c) Low-voltage switchgear and Control-gear, Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units d) EN 50521: Connectors for photovoltaic systems – Safety requirements and tests
IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
Surge Arrestors	
IEC 62305-4	Lightning Protection Standard
IEC 60364-5-53/ IS 15086-5 (SPD)	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
IEC 61643-11:2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods
Cables	
IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)/ IEC69947	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation)
BS EN 50618	Electric cables for photovoltaic systems (BT(DE/NOT)258), mainly for DC Cables
Earthing/Lightning	
IEC 62561 Series (Chemical earthing)	IEC 62561-1 Lightning protection system components (LPSC) - Part 1: Requirements for connection components IEC 62561-2 Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes IEC 62561-7 Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds
Junction Boxes	
IEC 60529	Junction boxes and solar panel terminal boxes shall be of the thermo-plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use

Energy Meters	
IS 16444 or as specified by the DISCOMs	A.C. Static direct connected watt-hour Smart Meter Class 1 and 2 – Specification (with Import & Export/Net energy measurements)
IS 2062/IS 4759	Material for the structure mounting
Solar PV Mounting Structure	
IS 2062/IS 4759	Material for the structure mounting

Note: Equivalent standards may be used for different system components of the plants after due consultation with Engineer-in charge of work.