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RATE CONTRACT

HARYANA RENEWABLE ENERGY DEVELOPMENT AGENCY (HAREDA)
(DEPARTMENT OF NEW & RENEWABLE ENERGY, HARYANA)

Akshay Urja Bhawan, Institutional Plot No. 1, Sector-17, Panchkula

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Email: drehareda@gmail.com Website: www. hareda.gov.in

Rate Contract No. **DRE-HAREDA/2016-17/ 454-59** Dated:**01.05.2017**

To

1. M/s Ritika Systems Pvt. Ltd.
C/22, Sector 57, Noida
E-Mail: info@ritikasystems.in, neemrana@ritikasystems.in
Mobile:+919811051315
2. M/s Fourth Partner Energy Pvt Ltd.
Flat No. 703&704, Krishana Apartments, Abids,
Hyderabad-4010938,
E-Mail: info@fourthpartner.co
Mobile:+919910032110
3. M/s Power One Micro Systems Pvt. Ltd.
GF 3 KSSIDC Building,
5th Cross Ist Stage, Peenya Ind. Estate,
Banglore
E-Mail: poweroneups@poweroneups.com
Mobile:+919035010264
4. M/s Novus Green Energy Systems Pvt. Ltd.
100 Siddhi, P&T Colony Trimulgherry
Secundrabad
E-Mail: amits@novusgreen.in
Mobile:+919717869494
5. M/s Mittal Machines Pvt. Ltd.
Prince Chowk, 1- Haridwar Road, Dehradun
E-Mail: dehradun@mittalmachinery.com
Mobile:+917060855333



6. M/s Tapan Solar Energy Pvt. Ltd.
M/s Tapan Solar Energy Pvt. Ltd.
SF 40, 2nd Floor, Crossriver Mall, C.B.D. Ground,
Sahadra, Delhi-10032
info@tapansolar.com
Mobile No. 9818743828

SUBJECT: RATE CONTRACT FOR DESIGN, SUPPLY, ERECTION, TESTING & COMMISSIONING OF GRID CONNECTED ROOFTOP SOLAR POWER PLANTS IN THE STATE OF HARYANA.

Reference: (i) This office tender enquiry opened on 31.12.2015.
(ii) Your quotation submitted against the said tender enquiry followed by your subsequent last letter.

1. You are hereby informed that your above referred tender read with subsequent letter mentioned above for the stores specified in the schedule- A annexed has been accepted. This Rate Contract will be governed by the terms and conditions given in schedule-B. The rate contract and the schedules annexured here to shall be sole responsibility of this Rate Contract/ transaction.
2. This rate contract for design, Supply, Erection, Testing & Commissioning of Grid Connected Rooftop Solar Power Plants, including comprehensive maintenance for a period of 5 years, at various places in State of Haryana, including supply of Bi Directional Meter with five years warrantee of complete system, as per terms & conditions of the DNIT, shall be valid for one year from the date of its issue or up to placement of work order/s of cumulative capacity of 4.875 MW, whichever the earlier.
3. The other terms and conditions and specifications not mentioned in the schedule- B & C, shall be as per DNIT.



4. Please acknowledge receipt of this Rate Contract within a week's time from the date of issue by returning the second copy duly signed and stamped by authorized representative of your firm.

5. This Rate Contract contains 30 pages, including this page.

Annexures:

1. Schedule "A" - Description of Stores, Prices, Duties/ Taxes.
2. Schedule "B" - General Terms & Conditions of the Contract.
3. Schedule "C" -Technical Specifications Of Grid Connected Rooftop Solar Power Plants.

-sd-
Chief Scientific Engineer
for Director,
New & Renewable Energy
Department Haryana,
Panchkula.

Encl: As above



Schedule-A

DESCRIPTION OF STORES, PRICES, DUTIES/ TAXES

Approved Rates & Firms

Sr. No. of item	Description of System/Item	Total cost including transportation, packaging, installation, commissioning, Warrantee, CMC, VAT / taxes/ duties etc.	Name of the firm whose rates have been approved	Ratio of the work to be allotted with
A1 (i)	with String inverters (1-10 Kwp) (Rates Per watt)	Rs. 75.00	M/s Power One Micro Systems Pvt. Ltd. Banglore	70%
			M/s Mittal Machines Pvt. Ltd. Dehradun	30%
A1 (ii)	with String inverters (11-50 Kwp) (Rates Per watt)	Rs. 66.80	M/s Tapan Solar Energy Pvt. Ltd. Sahadra	40%
			M/s Fourth Partner Energy Pvt Ltd. Hyderabad	30%
			M/s Ritika Systems Pvt. Ltd. Noida	15%
			M/s Novus Green Energy Systems Pvt. Ltd. Secundrabad	15%
A1 (iii)	with String inverters (51-500 Kwp) (Rates Per watt)	Rs. 60.40	M/s Tapan Solar Energy Pvt. Ltd. Sahadra	50%
			M/s Ritika Systems Pvt. Ltd. Noida	25%
			M/s Fourth Partner Energy Pvt Ltd. Hyderabad	25%
A2 (i)	with Hybrid Power Conditioning Unit(PCU) without Battery Bank (1-10 Kwp) (Rates Per watt)	Rs. 78.00	M/s Ritika Systems Pvt. Ltd. Noida	100%
A2 (ii)	with Hybrid Power Conditioning Unit (PCU) without Battery Bank (11-50 Kwp) (Rates Per watt)	Rs. 72.85	M/s Ritika Systems Pvt. Ltd. Noida	70%
			M/s Tapan Solar Energy Pvt. Ltd.	30%



			Sahadra (Rates of Battery not approved)	
A2 (iii)	with Hybrid Power Conditioning Unit(PCU) without Battery Bank (51-500 Kwp) (Rates Per watt)	Rs. 67.50	M/s Ritika Systems Pvt. Ltd.Noida	100%
B1 (Addl. Item)	VRLA GEL Tubular (12 V Battery Type) (Rates Per VAH)	Rs. 8.925	M/s Ritika Systems Pvt. Ltd.Noida	100%

Following make of the respective firms have been approved with the system

Sr. No.	Name of Firm	Make of Modules	Make of Inverter/PCU	State of Billing	Capacity of the firm (in 4 Months)
1	M/s Ritika Systems Pvt. Ltd. Noida	RITIKA	Inverter: Schneider/ Delta/ Powerone; PCU: Optimal/ Liebert	Other than Haryana	500 kWp
2	M/s Fourth Partner Energy Pvt Ltd. Hyderabad	Sri Savitr above 240 W capacit/ Vikram Make of 250W & above capacity	Delta/Fronius/ Schneider/ power one	Other than Haryana	2000 kWp
3	M/s Power One Micro Systems Pvt. Ltd. Banglore	Vikram	Power One	Haryana	500 kWp
4	M/s Novus Green Energy Systems Pvt. Ltd. Secundrabad	SIRIUS	Schneider/ Consul Neowatt	Haryana	2000 kWp
5	M/s Mittal Machines Pvt. Ltd. Dehradun	Renesola/ Navitas (250 W & above)	Delta	Other than Haryana	2000 kWp
6	M/s Tapan Solar Energy Pvt. Ltd. Sahadra	TAPAN	ABB, Power One, Fronius, Schneider make inverter, Neowatt make PCU	Other than Haryana	4000 kWp

As the test reports of the above make of modules and inverters/PCUs have been accepted, the above makes of modules & inverters/PCUs have been approved for supply with the GCRT solar power plants under this rate contract.



Schedule- B

GENERAL TERMS AND CONDITIONS OF CONTRACT

1. SCOPE OF WORK/DESCRIPTION OF STORES

Design, Supply, Erection, Testing & Commissioning of Rooftop Grid Connected SPV Power Plants including comprehensive maintenance for a period of 5 years at various places in State of Haryana, including supply of Bi Directional Meter. The size of each project shall be in the range of 1 kWp to 500 kWp capacity.

2. SECURITY DEPOSIT / PERFORMANCE SECURITY DEPOSIT:

The successful tenderer shall have to deposit Security Deposit (SD) equivalent to **10% of the work order value within 30 days** from the date of issue of the work order. The EMD of such successful bidders shall be released on submission of SD in the shape of DD or Bank guarantee valid for a period of five year & six months. After the successful completion of the work order, the SD shall be treated as Performance Security Deposit (PSD) & shall be released on successful completion of the warrantee period of five years from the date of commissioning of the project. In case of delays, the validity of the SD/PSD will be extended by the firm failing which it will be encashed.

3. PAYMENT TERMS:

The payments shall be made as per the following terms and conditions:

- a. **80% of the ordered value** after the supply of the complete system at site for the systems where installation & commissioning is required supported with material receipt issued by user and P.O/A.P.O of the concerned district
- b. **20% of the ordered value** after installation, commissioning & VERIFICATION of the system for at least a period of 30 days supported with Joint Commissioning Report(JCR), along with satisfactory performance report, bill of material, photographs of complete system(before & after installation) duly signed by the SUPPLIER, district PO/APO and end user. The Joint Commissioning Report shall be signed by concerned ADC-CPO (RE).



4. TIME SCHEDULE, INSPECTION, COMMISSIONING, PENALTY/ LIQUIDATED DAMAGES:

A The time schedule for these systems shall be as under:

Capacity of Solar Power Plant	Time period for completing the work which includes inspection, supply, installation and commissioning	Time period for supply of material at site	Date for the pre dispatch/at site inspection of material to be offered by the supplier #
1	2	3	4
1KWp -10 KWp (Category A-1)	90 days from the date of work order	75 days from the date of work order	Atleast 15 days prior to last date of supply of the system
11 KWp -50 KWp (Category A-2)	105 days from the date of work order	90 days from the date of work order	Atleast 15 days prior to last date of supply of the system (if material is offered to be inspected at site then Atleast 15 days prior to last date of commissioning of the system)
51 KWp- 500 KWp (Category A-3)	120 days from the date of work order	100 days from the date of work order	Atleast 15 days prior to last date of supply of the system (if material is offered to be inspected at site then Atleast 20 days prior to last date of commissioning of the system)

Although the supplier shall give the date of inspection in the inspection offer which should reach in the office of RE Department/HAREDA at least 10 days before the date of inspection proposed by the supplier. To illustrate it further, if the last date of supply is 31st March and supplier sends the inspection call on 30th March for inspection on 31st March, the inspection date shall be considered as 9th April (10 days notice) & period from 1st April to 9th April shall be under penalty clause. However, the Director RE/HAREDA may have the right to re-schedule the date of inspection.

It shall be the sole responsibility of the supplier to complete the commissioning of systems in the defined time period. Time period is the essence of the contract.

- (i) The systems above 10 KWp shall preferably be inspected at site. However on the request of the supplier, the Director, RE/HAREDA may consider to allow to inspect the material of the systems irrespective of any capacity at supplier's premises of the firm or at site before erection.
- (ii) After receipt of call for inspection with date for the inspection, the material shall be inspected by the Director, HAREDA or a committee authorized for this purpose. Material shall be dispatched after acceptance of the same by the Inspection Committee, if inspected at premises of the firm; the same shall be installed and commissioned after acceptance by the Inspection Committee, if inspected at site.
- (iii) If the proposal for pre-dispatch inspection is received within defined & valid time period in the office of Director, HAREDA from the supplier and inspection is not



carried out by the HAREDA due to any reasons within 10 days of receipt of such letter, the time period for supply, installation & commissioning will be extended equivalent to delayed period, from the next day of expiry of these 10 days till the date of actual inspection and no penalty will be imposed for this extended period

(B) Further in addition to the above following milestones should be achieved by the firm for execution of the project:

- i. Though the work order shall be released, after entire satisfaction about clearance of the site conveyed by the district office, the firm shall also visit the site and inform HAREDA through email within 20 days, if site is not clear. In case no communication is received from the firm about the site within 20 days, it will be assumed that the site is clear and no correspondence/request for additional time without penalty in this regard shall be entertained at later stage.
- ii. Material will be dispatched by the supplier after inspection by the Director, HAREDA or his/her representative at the premises or at the site, as the case may be, and acceptance of the same. It shall be mandatory to follow the time period as mentioned above.
- iii. The supplier shall provide without any extra charge, all material, tools, testing equipments, labour assistance of every kind which the Inspecting officer/team may consider necessary for any test or examination. HAREDA can also get the systems tested from any MNRE/NABL accredited test centre/laboratory and expenses shall be borne by the supplier. Rejected material, if any, will have to be replaced by the supplier at its cost within a week time.
- iv. In case the material offered for inspection fails to meet the specifications stipulated in NIT /Order /Contract and the samples are rejected by the Inspecting Committee, the Indenting Department will have the right to levy a penalty at 0.1% of the order value. In case the material offered for inspection fails during the 2nd inspection also, the Indenting Department will have the right to increase the penalty to 0.25% of the order value. In case, the material offered fails during the 3rd and final inspection also, the firm will be liable for penal action including forfeiture of EMD, risk purchase, debarring/blacklisting in future, and no further opportunity for inspection will be provided to the supplier firm.
- v. Director, HAREDA or his /her representative or user is free to draw sample(s) from the supplied quantity and send the same to test in a MNRE/NABL accredited lab at the cost of the supplier for any kind of test. The decision of the HAREDA on the same shall be binding on the supplier. Failure of the sample will invite penalty and disqualify the supplier from future tenders also, after giving due opportunity as per government rules.

(C) The installation work shall be carried out under the close supervision of the Project Officer/ APO of the district & the user. **The final inspection after installation and commissioning shall be carried out by a committee constituted by the Director,**



RE/HAREDA and user. The supplier is required to supply, install and commission the systems within the time scheduled given above. In case the time taken in supply, installation and commissioning of the material exceeds the time schedule, the excess period shall be counted for levy of penalty. Therefore, it is necessary & in the interest of a supplier to get inspected the material well in advance before the stipulated time period. The supplier shall arrange all type of material required for installation and commissioning of the systems at site.

(D) The time for and date of delivery or installation and commissioning of the systems stipulated in the work order shall be deemed to be the essence of the contract and should the contractor fail to deliver, install and commission the system within the period prescribed for such delivery or installation and commissioning of the systems stipulated in the supply order, the delayed consignment will be subject to **2% penalty per consignment per month** subject to max. of 10% of the work order value recoverable on the value of the stores supplied. Once the maximum is reached, the "HAREDA" may consider termination of the contract. In case of non-payment by the contractor, recovery will be made from his bills or amount of Earnest money or security deposited with Director, HAREDA, provided also that :

(i) No recovery of penalty will be made if the Director, HAREDA accepts the delayed supplies/commissioning by extending the delivery period by recording in writing that the exceptional circumstances were beyond the control of the supplier and there was no loss to the Government on written request by the supplier on valid grounds before the expiry of the allowed time. Requests for extension received after the expiry of the allowed time shall not be entertained and shall be subject to penalty.

(ii) On the failure of the suppliers to make supply, installation and commissioning of the systems within the extended period or otherwise and the receipt of such information in the office of the Director, HAREDA, risk purchase at the cost of the supplier will be made by the Director, HAREDA within two months of the expiry of stipulated delivery period by obtaining consent from the L2, L3 bidders or approved RC holder of DGS&D, GOI or any State empanelled supplier or by inviting short terms quotations from the Registered and other known suppliers. The difference of excess cost thus, incurred will be recovered from the supplier from his pending bills, earnest money or security whichever is available. This procedure will be adopted after serving a registered notice to the supplier to supply stores within 15 days.

(E) The Contractor shall not;

(i) Without the consent in writing of HAREDA transfer, assign or sublet the work under this contract or any substantial part thereof to any other party. HAREDA shall have at all reasonable time access to the works being carried out by the contractor under this contract. All the work shall be carried out by the contractor to the satisfaction of HAREDA.



- (ii) Disclose details of the conditions governing this contract to unauthorized persons (Indenting against this contract is permissible only for the bonafide use of Governments departments and quasi public and not for private parties or for the private use of the Government officers).
- (F) In the event of the contractor failing duly and properly to fulfill or committing breach of any of the terms and conditions of the tender or repeatedly supplying goods liable to rejection hereunder or failing, declining, neglecting/ or delaying to comply with any demand or requisition or otherwise not executing the same in accordance with the terms of this tender, or if the bidder or his agents or servants being guilty of fraud in respect of the contract or any other contract entered into by the contractor or any of his partners or representatives thereof with Government directing, giving, promising or offering any bribes, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise to any person in the employment of Government in any way relating to such officers or person of persons, office or employment or if the contractor or any of his partners become insolvent or apply for relief as insolvent debtor or commence any insolvency proceedings or make any composition with his/ their creditors or attempts to do so then without prejudice to Government rights and remedies otherwise, HAREDA/ Government shall be entitled to terminate this contract forthwith and to **blacklist the contractor** for a period as deemed fit by the competent authority and purchase or procure or arrange from Government's stocks or otherwise at the contractor's risk and at the absolute discretion of the Director, NRE/ HAREDA as regards the manner, place or time of such purchases, such supplies as have not been supplied or have been rejected under this agreement or are required subsequently by Government there under and in cases where issues in replacement are made from Government's stocks or supplies, the cost of value of stocks or supplies together with all incidental charges or expenses, shall be recoverable from the contractor on demand and the contractor shall not be entitled to benefit from any profit which may accrue to Government.
- (G) The inspection report should be submitted to HAREDA within three days from the date of inspection by the inspection committee. Similarly, the commissioning report duly signed by the user should be submitted by the supplier to the concerned district office with an advance copy to HAREDA **within three days** from the date of commissioning either by hand or by e-mail/fax, failing which the commissioning date shall be considered three days prior to the date of submission of the report in HAREDA and the period of late submission of commissioning report shall be counted towards delay. The district office after verification will issue the JCR or shall report any discrepancy to the supplier with a copy to HAREDA within a week time . In case of discrepancy in the system commissioned, the commissioning date shall be counted from the date when the discrepancy has been removed to the entire satisfaction of HAREDA/District Office/User.
- (H) The firm will print the words '**PROMOTED BY HAREDA DURING YEAR-2017-18**' on the body of the Systems in permanent manner so as to minimize any possible malpractices.



5. **PRICE FALL CLAUSE:**

- (i) The prices charged for the stores supplied under the Contract by the Contractor shall in no event exceed the lowest price at which the Contractor sells the Stores or offer to sell stores of identical description to any Department of the Central Government or any Department of a State Government or any statutory undertaking of the Central or a State Government, as the case may be, during the period till all Supply Orders placed during the currency of Rate Contract is completed.
- (ii) If at any time during the said period, the Contractor reduces the Sale price, sells or offers to sell such stores to any person(s)/organisation(s) including the Purchaser or any Statutory Undertaking of the Central or a State Government, as the case may be, at a price lower than the price chargeable under this Contract, he shall forthwith notify such reduction or Sale or offer of Sale to the Director, Renewable Energy Department, Haryana/HAREDA and the price payable under the Contract for the stores supplied after the date of coming into force of such reduction or sale or offer of sale stand correspondingly reduced. The above stipulation will, however, not apply to :
 - (a) Export/deemed Export by the Contractor
 - (b) Sale/ normal replacement.
- (iii) The Contractor shall furnish the following certificate to the Paying Authority along with each bill for payment for supplies made against the Rate Contract.

“I/We certify that there has been no reduction in sale price of the Stores of Description identical to the Stores supplied to the Government under the contract herein and such Stores have not been offered/sold by me/us to any person(s)/organisation(s) including the purchaser or any Department of Central Government or any Department of a State Government or any statutory Undertaking of the Central or State Government as the case may be upto the date of the bill/the date of completion of supplies against all supply orders placed during the currency of the R/C at a price lower than the price charged to the Government under the Contract except for quantity of Stores categorized under sub clause (a) and (b) Sub-para (ii) above details of which are as follows:-

NOTE: The Contractor will also inform the Paying Authority and the Director, New & Renewable Energy Department, Haryana/HAREDA as soon as the supplies against all the Supply Orders placed against the Rate Contract are completed.

6. **WARRANTY:**

- (i) The Warranty period shall be 25 Years for the PV modules and 5 years for complete system from the date of commissioning and handing over of the system (or as per latest MNRE, GoI guidelines). The contractor shall rectify defects developed in the system within Warranty period promptly. The procedure to rectify the complaint/service to be provided during warrantee period is as follows :



During the warrantee period, the firm shall ensure proper functioning of the systems and complaint, if any, forwarded to the supplier against the system, will have to be attended within 7 days of forwarding such complaints. The procedure to rectify the complaints shall be as under:

- a) The notice through E-mail/hard copy to rectify the complaints shall be issued by the HQ/district officer/User to the supplier with copy to the HAREDA. This shall be followed by two reminders on 3 days intervals each after completion of 7 days. If possible, district officer shall specify the nature of defect in the system in the complaint letter. The district office shall maintain proper record of the complaints.
 - b) Even after this, the complaints remain unattended the penalty @ Rs. 100 per day per system will be imposed after the expiry of 13 days from the initial date of complaint & same will be deducted from the payment due to the supplier / out of the Performance Security Deposit/ bank Guarantee. The firm if failed to repair/ replace the defective system within next 10 days after the expiry of the earlier specified 13 days of forwarding of the complaint then concerned ADC-cum-CPO/user shall forward the case to the Director, HAREDA along with estimated expenditure for the replacement/ repair. Director, HAREDA may consider repairing/ replacing such defective system at the cost of the supplier. **The firm who shall be penalized by revoking PSD/Bank guarantee shall deemed to be considered as unfit to participate in all the tenders floated by HAREDA in future and shall be treated as unsatisfactory performer.**
 - c) If the whole PSD/ bank guarantee is utilized and the complaints are still pending then an online/registered notice will be sent to the firm to attend the complaint within 15 days.
 - d) If the firm still does not attend the complaint within the above mentioned period then the firm may be blacklisted and a legal proceeding may be initiated against the firm for Breach the agreement.
- (ii) The supplier shall affirm as per standards for quality that anything to be furnished shall be new, free from all defects and faults in material, workmanship and manufacture, shall be of the highest grade and consistent with established and generally accepted standards for material of the type ordered, shall be in full conformity with the specifications, drawing or samples, if any and shall if operable, operate properly.
 - (iii) Performance of Equipment: In addition to the warranty as already provided, the supplier shall guarantee satisfactory performance of the equipment and shall be



responsible for the period or up to the date specified in sub-clause (i) hereof after the equipment has been accepted by the HAREDA to the extent for any defects that may develop, such defects shall be removed at his own cost when called upon to do so by the HAREDA/user.

- (iv) HAREDA/the consignee will have the liberty to get the sample for the item(s) supplied tested from any of the MNRE/NABL accredited lab. at any time during the inspection or warranty period to ascertain the performance of the item(s) as per DNIT specifications. The cost of testing will be borne by the supplier. The sample, if drawn, will be collected jointly by the user, supplier & representative of Director, HAREDA/ the consignee. However if supplier or his representative fail to reach, at the time and venue, to draw the sample, then HAREDA/ the consignee will have the right to draw the sample in its absence. If sample is drawn, then the supplier have to make a standby provision to make the system operational during the period of testing of sample i.e. the supplier has to supply alternate item(s) which have been drawn for the testing till the sample received back after testing. Failure of sample can lead to strict penalty and disqualify the firm from future tenders also.
- (v) The Contractor in consultation with concerned Project Officer will provide training to the users, focusing on main features, operation and maintenance of the systems.
- (vi) The Contractor/supplier shall continue to provide spare parts after the expiry of warranty period at the users cost on demand of user. If the contractor fails to supply spare parts and services to users then HAREDA shall take appropriate action against the firm, if any complaint is received from the user(s).

7. FORCE MAJEURE:

- (i) Notwithstanding the provisions of clauses contained in this deed; the contractor shall not be liable for forfeiture of its performance security, liquidated damages, termination for default, if he is unable to fulfill his obligation under this deed due to event of force majeure circumstances.
- (ii) For purpose of this clause, "Force majeure" means an event beyond the control of the contractor and not involving the contractor's fault or negligence and not foreseeable. Such events may include, but are not restricted to, acts of Govt. either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and fright embargoes.
- (iii) Obstruction in procurement of components /raw material by the firm from the manufacturers with whom they have tied up for execution of the projects under



this tender shall not be covered under force majeure condition. The bidders are advised to make suitable arrangements for timely supply of parts and components for implementation of the tendered projects within allowed timeframe.

- (iv) However, if a force majeure situation arises, the contractor shall immediately notify the “HAREDA” in writing. The decision of the Director General, HAREDA in above conditions shall be final.

8. ARBITRATION:

If any question, dispute or difference arises between HAREDA and the contractor, in the connection with this agreement except as to matters, the decisions for which have been specifically provided, either party may forthwith give to the other notice in writing of existence of such question, dispute or difference and the same shall be referred to the sole arbitration of the Principal Secretary/Chairman, HAREDA or a person nominated by him. This reference shall be governed by the Indian Arbitration Act, and the rules made there under. The award in such arbitration shall be final and binding on both the parties. Work under the agreement shall be continuing during the arbitration proceedings unless the HAREDA or the arbitrator directs otherwise.

9. JURISDICTION FOR SETTLING DISPUTES

Where a contractor has not agreed to Sole Arbitration Clause of the Conditions of the Rate Contract, Governing contracts the dispute/claims arising out of the contract entered into with him will be subject to the jurisdiction of Civil Court Panchkula.

10. OTHER TERMS AND CONDITIONS:

- (i) The prices are FOR anywhere in the State of Haryana inclusive of all taxes and duties, custom duty, excise duty, service tax, sales tax, C.S.T., local taxes, Trade Tax/VAT, Income Tax, Surcharge on income tax etc. if any, including 5 years CMC. A supplier/ contractor shall be entirely responsible for all taxes, duties, license fees, etc. All taxes payable as per Government income tax & service tax norms will be payable by the contractor. If any new tax/duty is levied during the contract period the same will be borne by the firm exclusively. TDS will be deducted from the payment of the contractor as per the prevalent laws and rules of Government of India and Government of Haryana state in this regard.
- (ii) Material shall be strictly as per DNIT specifications. If there is any left out specification, the same shall be considered as per the latest specifications applicable as per MNRE/ BIS/International Standards.



- (iii) The make of parts of systems should be strictly as per the make mentioned in the technical bid and test reports submitted along with the offer.
- (iv) In case of any ambiguity in interpretation of any of the clauses/ provision of the said rate contract/DNIT, the decision of the Director, HAREDA shall be final and binding.
- (v) It shall be the sole responsibility of the contractor to get verified the quality & quantity of the supplied material at the site of delivery.
- (vi) The Contractor shall indemnify the HAREDA against all third party claims of Infringement of patent, royalty's trademark or industrial design rights arising from use to the goods or any part thereof.
- (vii) Contractors, wherever applicable, shall after proper painting, pack and crate all the equipment in such manner as to protect them from deterioration and damage during rail and road transportation to the site and storage at the site till time of installation. Contractor shall be held responsible for all damage due to improper packing.
- (viii) The contractor shall inform the HAREDA of the date of each shipment from his works and the expected date of arrival at the site for the information of the concerned Project Officers at least 7 days in advance.
- (ix) All demurrage, wharfage and other expenses incurred due to delayed clearance of the material or any other reason shall be to the account of the contractor.
- (x) The goods supplied under the contract shall be fully insured against loss or damage incidental to manufacture or acquisition, transportation, shall be included in the bid price.
- (xi) HAREDA may at any time terminate the contract by giving written notice to the contractor without compensation to the contractor, if it becomes bankrupt or otherwise insolvent, provided that such termination will not prejudice or affect any right of action or remedy, which has accrued or will accrue thereafter to the HAREDA.
- (xii) HAREDA, may by written notice sent to the supplier, terminate the contract, in whole or in part at any time for its convenience.
- (xiii) Any material /instrument required to complete /successful running of the project which is not mentioned in the DNIT will be provided by the supplier in the quoted rates only and no additional payment shall be made.



- (xiv) Income Tax/Cess will be deducted at source from contractor' bills/dues in accordance with latest Govt. orders from time to time. The contractor will have no objection to this effect.
- (xv) The manufacturer shall supply all technical literature and drawing considered necessary for the installation, operation and maintenance of the equipment and its fittings. These shall essentially include:-
- Drawing showing over all dimensions and all other details including sectional view of the equipments.
 - List of parts with reference to nos.
 - Manual of instructions for the operation, maintenance and repairs/equipment and special fittings, if any.
 - Checking methods and schedule for cleaning the system.
 - Any other relevant technical data which would be of assistance for efficient operation and maintenance of the system including energy savings etc.
 - Detail of manufacturing equipment, plant and machinery with their make, specification, cost and year of purchase.
- (xvi) The firm shall put up a MS iron display board (atleast of the size 3'x2') duly painted at site indicating salient features like year of installation, capacity of system, cost, technology, important technical parameters etc. along with the names of MNRE, GoI and HAREDA as the sponsoring agency after approval of the same from HAREDA.
- (xvii) In view of RFID tag made mandatory by MNRE for each SPV module, the supplier shall provide required tag reader at the time of inspection of modules.
- (xviii) The make and serial number of major component like module/ PCU/battery etc. must be recorded by the manufacturer in a permanent manner on the body of the component along with the serial number and year of manufacture of that item. This will enable verification with sale/supply records.
- (xix) The manufacturer should issue excise gate pass for the products sold so that sale of product can be independently verified, where applicable.
- (xx) HAREDA reserve the rights to verify the claimed capacity of the bidder, at any stage, from their own or through a third party. Successful supplier will have to



extend all cooperation. If the claim of the bidder is found negative, then HAREDA may consider to cancel the contract.

- (xxi) Supplier should issue the bill of the material at the time of supply of the material at site as per prevailing rules.

11. OPERATION AND MAINTENANCE MANUAL:

The supplier shall provide the guidelines containing DO's & DO NOT's in Hindi and English for Operation and Maintenance of the complete system to the user for proper maintenance of the system.

Note:

Placing of any work order under this rate contract will require prior approval/ sanction of the Director, HAREDA. Any work order, referring to this rate contract, placed without the prior approval/ sanction of the Director, HAREDA, shall not be accepted by the contractor.



Schedule-C

DETAILED TECHNICAL SPECIFICATIONS (Grid Connected Solar Rooftop Photo Voltaic (SPV) power plant)

The projects shall be installed and commissioned as per the technical specifications given below.

1. DEFINITION

A Grid Connected Solar Rooftop Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Inverter/Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid connected SPV power plant is without battery and should be designed with necessary features to supplement the grid power during day time. However, minimum battery bank may be installed to enhance performance reliability. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, inverters/PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

2. SOLAR PHOTOVOLTAIC MODULES:

- (i) The PV modules shall be of indigenous make
- (ii) The efficiency of the PV modules should be minimum 15% and fill factor should be more than 70%.
- (iii) Test Certificate issued by one of the IEC authorized test centers.
- (iv) Modules of any type mono/poly crystalline can be used
- (v) Module shall consists of Solar Cell of minimum 3 Bus Bar technology. At the time of supply the supplier shall submit the certificate from the manufacturer of the module certifying that he has supplied the modules to (name of supplier) strictly manufactured as per BOM of IEC certificate mentioning the technology of the solar cell (as per Performa- VI).
- (vi) The module type must be qualified as per IEC 61215 latest edition or IEEE 1262 or CEC 503 for crystalline silicon. Modules must qualify to IEC 61730 Part I and II for construction and safety qualification testing. Certificate for module qualification from IEC or equivalent to be submitted as part of the bid offer. Self undertaking from manufacturer / supplier that the modules being supplied are as per above.
- (vii) For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701
- (viii) The total solar PV array capacity should not be less than allocated capacity (kWp) and should comprise of solar crystalline modules of minimum 180 Wp and above wattage. Module capacity less than minimum 180 watts shall not be accepted.



- (ix) Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.
- (x) PV modules must be tested and approved by one of the IEC authorized test centers.
- (xi) The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.
- (xii) The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid. HAREDA/owners shall allow only minor changes at the time of execution.
- (xiii) Other general requirement for the PV modules and subsystems shall be the Following:
 - a) The rated output power of any supplied module shall have tolerance of plus 3%.
 - b) The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall not vary by more than 2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.
 - c) The module shall be provided with a junction box with weather proof lid of sealed type and IP-65 rated.
 - d) I-V curves at STC shall be provided with the module.
- (xiv) Each PV module must use RFID tag which must contain information as per MNRE requirements. The following information must be mentioned in the RFID used on each modules (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions).
 - a) Name of the manufacturer of the PV module
 - b) Name of the manufacturer of Solar Cells.
 - c) Month & year of the manufacture (separate for solar cells and modules)
 - d) Country of origin (separately for solar cells and module)
 - e) I-V curve for the module Wattage, I_m , V_m and FF for the module
 - f) Unique Serial No and Model No of the module
 - g) Date and year of obtaining IEC PV module qualification certificate.
 - h) Name of the test lab issuing IEC certificate.
 - i) Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001
- (xv) **Warranties:** The PV Modules must be warranted for output wattage, which should not be less than 90% at the end of 10 years and not less than 80% at the end of 25 years.
- (xvi) Non conformity to specifications due to faulty manufacturing and/or inspection processes: If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the Owner's sole option.



3. **ARRAY STRUCTURE:**

- (i) The PV modules should be mounted on aluminum structures of adequate strength and appropriate design, which can withstand load of modules and high wind velocities up to 150 km per hour.
- (ii) The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels
- (iii) Regarding civil structures the supplier needs to take care of the load bearing capacity of the roof and to arrange suitable structures based on the quality of roof. The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m^2 . Suitable civil work for installation of the structure is to be done by the supplier.

4. **JUNCTION BOXES (JBs):**

- a. 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 Aluminum /cast aluminum 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.
- b. 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 compression cable glands. Provision of earthings. It should be placed at 5 feet height or above for ease of accessibility.
- c. Each Junction Box shall have High quality Suitable capacity Metal Oxide Varistors (MOVs) / surge arrestors, suitable Reverse Blocking Diodes. The Junction Boxes shall have suitable arrangement monitoring and disconnection for each of the groups.
- d. 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.



5. Specifications For Inverter/Power Conditioning Unit (PCU):

Specifications of Inverter/PCU		
Parameters	Detailed Specifications	
Nominal Voltage	230V / 415V as the case may be	
Voltage range	+10% -20% at nominal voltage	
Operating frequency range	50 Hz (47.5 to 52 Hz)	
Grid Frequency Synchronization range	± 5 Hz (shall also compatible for Synchronization with DG Set)	
Waveform	Sine Wave	
Harmonics	AC side total harmonic current distortion < 5%	
Ripple	DC voltage ripple content shall not be more than 1%.	
Efficiency	<ul style="list-style-type: none"> • For string inverters: ≥95% • For PCU of capacity < 5KW: >85% • For PCU of capacity ≥ 5KW: ≥90% 	
Losses	Maximum losses in sleep mode: 2W per 5kW Maximum losses in stand-by mode: 10W	
Casing protection levels	Degree of protection: Minimum IP-21 for internal units and IP 65 for outdoor units	
Temperature	Should withstand from -10 to +60 deg Celsius	
Humidity	Should withstand up to 95% (relative humidity)	
Operation	Completely automatic including wake up, synchronization	
MPPT	Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array. MPPT range must be suitable to individual array voltages in power packs	
Protections	For String Inverter	For Hybrid PCU
	Inverter Over voltage	PCU Over voltage
	Mains Under / Over Voltage	Mains Under / Over Voltage
	Over current	Inverter Over Load / Current Limiting
	Over/Under grid frequency	Mains Under / Over Frequency
	Over temperature	Over Temperature
	Short circuit	Short circuit
	Lightening	Lightening



	Surge voltage induced at output due to external source	Surge voltage induced at output due to external source
	Anti Islanding (for grid synch mode)	Anti Islanding (for grid synch mode)
		Battery Under Voltage
		Temperature compensation
System Monitoring Parameters	For String Inverter	For Hybrid PCU
	Inverter voltage & current Mains Voltage, Current & Frequency PV Voltage, Amps & KWH System Mimic & Faults	PCU voltage & current Mains Voltage, Current & Frequency PV Voltage, Amps & KWH System Mimic & Faults Battery voltage, Current & Temperature
Recommended LCD Display on Front Panel	Accurate displays on the front panel:	
	DC input voltage	
	DC current	
	AC Voltage (all 3 phases, in case of 3 phase)	
	AC current (all 3 phases in case of 3 phase)	
	Ambient temperature	
	Instantaneous & cumulative output power	
	Daily DC energy produced	
	Battery Voltage (in case of Hybrid PCU)	
Communication interface	RS485 / RS 232 PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array to the power conditioning unit/inverter should also be DG set interactive.	
Power Factor	> 0.9	
Test Certificates	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.	

In case of Hybrid systems the PCU shall have following functions:

Condition-1

SPV present, Mains available, Battery Charging through MPPT charger + mains & Load supplied through Mains.

Condition-2

PV available, Battery charged, Mains available, surplus power exported to grid.



Condition-3

SPV not available, Mains available, Battery charging through Mains

Condition-4

SPV not available, Mains OFF/ not available, Inverter supplying power to connected loads through Battery

Condition-5

SPV & Mains not available, Battery discharged, Start DG command, Battery charging through DG

6. INTEGRATION OF PV POWER WITH GRID:

- (i) In case of Power plant without battery bank (i.e. with string inverter), the existing uni-directional meter of the user shall be installed for gross metering of solar generation while a Bi-directional meter shall be installed for net-metering purpose
- (ii) In case of Power plant with battery bank (i.e with PCU), one DC energy meter shall be installed for gross metering of solar generation while a Bi-directional meter shall be installed for net-metering purpose.
- (iii) The purchase of Bi-directional meter is in the scope of bidder.
- (iv) CEA guideline 2013 for interconnecting solar power with Grid shall be followed.
- (v) Certification of Islanding protection in the inverter/PCU from the manufacturer of the equipment shall be mandatory. This shall be arranged by the supplier from the manufacturer.
- (vi) Verification report/test report shall be issued by the DISCOM or their authorized agency.
- (vii) Technical Standards for Interconnection:

Sl. No.	Parameters	Requirements	Reference
1.	Overall Conditions of Service	Reference to regulations	Conditions for Supply of Electricity of Distribution Licensees in the
2.	Overall Grid Standards	Reference to regulations	Central Electricity Authority (Grid Standards) Regulations 2010
3.	Equipment	Applicable industry	IEC standards/IS



4.	Safety and Supply	Reference to regulations, Chapter III (General Safety Requirements)	Central Electricity Authority (Measures of Safety and Electricity Supply) Regulations, 2010 and subsequent amendments
5.	Meters	Reference to regulations and additional conditions issued by the Commission.	Central Electricity Authority (Installation & Operation of Meters) regulations 2006 and subsequent amendments
6.	Harmonic Current	Harmonic current injections from a generating station shall not exceed the limits specified in IEEE 519	IEEE 519 relevant CEA (Technical Standards for Connectivity of the distributed generation resource) regulations 2013 and subsequent amendments
7.	Synchronization	Photovoltaic system must be equipped with a grid frequency synchronization device, if the system is using synchronizer inherently built into the inverter than no separate synchronizer	Relevant CEA (Technical Standards for Connectivity of the distributed generation resources) regulations 2013 and subsequent amendments.
8.	Voltage	The voltage-operating window should minimize nuisance tripping and should be under operating range of 80% to 110% of the nominal connected voltage. beyond a clearing time of 2 seconds, the Photovoltaic system must isolate itself from the	
9.	Flicker	Operation of Photovoltaic system shouldn't cause voltage flicker in excess of the limits stated in IEC 61000 or other equivalent Indian	Relevant CEA regulations 2013 and subsequent if any, (Technical Standards for Connectivity of the



10.	Frequency	When the Distribution system frequency deviates outside the specified conditions (52 Hz on upper side and 47.5 Hz on lower side up to 0.2 sec), the Photovoltaic system shouldn't energize the grid and should shift to island mode.	distributed generation resource)
11.	DC Injection	Photovoltaic system should not inject DC power more than 0.5% of full rated output at the interconnection point. or 1% of rated inverter output current into distribution system under any operating conditions	
12.	Power Factor	While the output of the inverter is greater than 50%, a lagging power factor of greater than 0.9 shall be maintained	
13.	Islanding and Disconnection	The Photovoltaic system in the event of voltage or frequency variations must island/disconnect itself within IEC standard on stipulated period	
14.	Overload and Overheat	The inverter should have the facility to automatically switch off in case of overload or overheating and should restart when normal conditions are restored	



15	Cable	For interconnecting Modules, Connecting modules and junction Boxes and junction boxes to inverter/PCU DC copper cable of proper sizes shall be used. Where battery bank is to be installed the DC Copper Cable of proper size shall be used to connect inverter/PCU with battery bank. To connect inverter/PCU with AC panel aluminium cable of proper size shall be used. All the internal cables to be used in the systems shall be included in the cost while only 10 mtr. AC Aluminium cable of proper size to be used to connect inverter/PCU to AC panel shall be included in the cost of the	Relevant CEA regulations 2013 and subsequent if any, (Technical Standards for Connectivity of the distributed generation resource)
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- a) All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.
- b) The change-over switches, cabling work should be undertaken by the bidder as part of the project.

7. DATA ACQUISITION SYSTEM / PLANT MONITORING (for 10 kWp and above).

- (i) For systems of capacity 10 kWp and above, web based remote monitoring which shall also be linked with HAREDA software monitoring system. If needed access to MNRE shall also be provided.
- (ii) PV array energy production: Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system shall be provided.
- (iii) All instantaneous data shall be shown on the computer screen.
- (iv) The user have to take approval/NOC from the Concerned DISCOM for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network and submit the same to HAREDA before commissioning of SPV plant, however the supplier have to extend all technical help to the user for getting the above clearance from DISCOMs.

8. PRIORITY FOR POWER CONSUMPTION:

Regarding the generated power consumption, in case of string inverter, priority need to given



for internal consumption first and thereafter any excess power can be exported to grid. In case of hybrid system the PCU shall have the function of combining the power from SPV and Grid (in case load is greater than PV power available), first priority shall be from Solar, second from grid and third from battery bank.

9. PROTECTIONS

The system should be provided with all necessary protections like earthing, Lightning, and grid anti- islanding as follows:

(i) Lightning Protection:

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 standard. The protection against induced high-voltages shall be provided by the use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth.

(ii) Surge Protection:

Internal surge protection shall consist of three MOV type surge-arrestors connected from +ve and –ve terminals to earth (via Y arrangement)

(iii) Earthing Protection:

Each array structure of the PV yard should be grounded/ earthed properly as per IS:3043-1987. 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/HAREDA as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly. 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.

(iv) Grid Islanding:

- a) In the event of a power failure on the electric grid, it is required that any independent power-producing inverters attached to the grid turn off in a short period of time. This prevents the DC-to-AC inverters from continuing to feed power into small sections of the grid, known as “islands.”

Powered islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.



- b) A manual disconnect pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked, if required, by the utility personnel

10. CABLES

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

- i. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards (Part I & II).
- ii. Temp. Range: -10°C to $+80^{\circ}\text{C}$.
- iii. Voltage rating 1100V
- iv. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation
- v. Flexible
- vi. 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. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use.
- vii. 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.
- viii. The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25 years.
- ix. The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant to be provided by the bidder.
- x. General Test and Measuring Method PVC/XLPE insulated cables for working voltage up to and including 1100 V and UV resistant for outdoor installation
- xi. The size of each type of DC/AC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 2%.

11. CONNECTIVITY :

The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the Distribution Code/Supply Code and amended from time to time. Following criteria have been suggested for selection of voltage level in the



distribution system for ready reference of the solar suppliers.

Plant Capacity	Connecting voltage
Up to 10 kWp	240V-single phase or 415V-three phase at the option of the consumer
Above 10kWp and up to 100 kWp	415V – three phase
Above 100kWp	415V – three phase or as per site requirement based on the availability of grid level and as per DISCOM rules

Utilities may have voltage levels other than above, DISCOMS may be consulted before finalization of the voltage level and system shall be designed accordingly.

12. 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.

13. DANGER BOARDS:

Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date.

14. DRAWINGS & MANUALS:

- (i) 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.
- (ii) Approved ISI and reputed makes for equipment be used.
- (iii) For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to HAREDA/owners before progressing with the installation work

15. DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT

- i. The Contractor shall furnish the following drawings Award/Intent and obtain approval
- ii. General arrangement and dimensioned layout
- iii. Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
- iv. Structural drawing along with foundation details for the structure.
- v. Itemized bill of material for complete SV plant covering all the components and associated accessories.
- vi. Layout of solar Power Array
- vii. Shadow analysis of the roof



16. 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. All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed there under and as amended from time to time.

17. CODES AND STANDARDS

The quality of equipment supplied shall be controlled to meet the guidelines for engineering design included in the standards and codes listed in the relevant ISI and other standards, such as :

- i. IEEE 928 Recommended Criteria for Terrestrial PV Power Systems.
- ii. IEEE 929 Recommended Practice for Utility Interface of Residential and Intermediate PV Systems.
- iii. IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Controllers.
- iv. National Electrical NEPA 70-(USA) or equivalent national standard.
- v. National Electrical Safety Code ANSI C2- (USA) or equivalent national standard.
- vi. JRC Specification 503 (Version 2.2 March 1991) or JPL Block V standard for PV modules.
- vii. The inverter manufacturer should attach efficiency certificate from Independent Third party Testing laboratory i.e. IEC, TUV, SNL/ERTL & STQC. PCU should confirm to IEC 61683 for efficiency measurements and IEC 60068 2 for environmental testing. MPPT unit should confirm to design qualification IEC 62093.
- viii. IEC 62116 for Anti Islanding
- ix. IEC 62109-1, IEC 62109-2 for safety
- x. IEC 61727 FOR UTILITY INTERFACE.