

Notice Inviting Limited Quotations

Ref No. INKEL/RED/KA-NLQ/2024-25/01

Date: 10.05.2024

INKEL Ltd. is an accredited and empanelled agency for executing solar power plant works for at different offices of Rural Development & Panchayat Raj Department, Zilla Panchayats and subordinate Departments of Zilla Panchayats, Taluk Panchayats and Grama Panchayats all over Karnataka.

Date of publishing bid documents	10-05-2024
Last Date & Time of Submission of Quotation document	23-05-2024, 04:00 PM
Opening of Bids	23-05-2024, 05:00 PM

Accordingly, INKEL looking for an execution partner for various solar related works and here by invites competitive quotes from qualified reputed Contractors for carrying out various activities as detailed in the Scope of Work and Technical Specifications of this NLQ.

1. Eligibility Criteria

- 1.1. The bidder must be registered under GST.
- 1.2. The bidder must have executed similar works for an aggregate capacity of at least 500 kWp at Govt. Institutions in Karnataka during last 3 years.
- 1.3. The bidder must have installed at least one single plant of capacity 10kWp or above.
- 1.4. The bidder must have an average annual turnover of Rs. 5.0 Crores in the last 3 Financial Years.
- 1.5. The bidder must have on payroll competent technical staff to look over various technical aspects of the project.
- 1.6. The bidder must comply to PF/ESI
- 1.7. Bidder must have service facility in all districts in Karnataka. Work will be awarded only for those districts where the bidder has an arrangement for timely rectification of defects.
- 2. The General Conditions, Technical specifications and scope of work are scheduled in Annexure 1



All the Quotation documents are to be submitted as given in **Annexure – 4** by Speed post/courier and in the designated covers on the below address by mentioning name of work.

The Head – Renewable Energy INKEL Limited, Door No. 14/812 & 813 1st Floor, Ajiyal Complex, Kakkanad, Cochin, Pin: 682030

The Quotation documents can also be submitted online via email as password protected pdf on **tenders.re@inkel.in**

INKEL Ltd reserves the right to modify/cancel any or all quotations without assigning any reasons thereof.

3. Bid Submission Checklist

The bidder shall submit the following:

- 1. The entire NIQ signed and sealed as a token of acceptance of terms and conditions.
- 2. Contact Form Duly filled and signed Appendix 2
- 3. Price Bid as per Appendix 3 in separate sealed cover.
- 4. Copy of GST registration certificate.
- 5. Copy of Credentials
- 6. Document to prove eligibility criteria as per Sl. No. 3.
- 7. Audited Balance Sheet for Last 3 Financial Years.

4. <u>Annexures</u>

- 4.1. Annexure 1 Scope of Work and General Conditions
- 4.2. Annexure 2 Technical Specifications
- 4.3. Annexure 2 Contact Form
- 4.4. Annexure 3 Price Bid



ANNEXURE – 1

SCOPE OF WORK AND GENERAL CONDITIONS

1. SCOPE OF WORK

This project encompasses the work for Installation and Maintenance of Grid Interactive Hybrid Solar Rooftop Power Plant at Offices under Rural Development & Panchayath Raj, Zilla Panchayath and Subordinate Departments of Zilla Panchayath, Taluk Panchayath and Grama Panchayath in various district in Karnataka.

The various activities to be carried out under this contract is briefed below:

- 1.1. Obtaining work order from various panchayaths on behalf of INKEL with concurrence of INKEL.
- 1.2. Site survey and preparation of site feasibility reports as required by the Departments jointly in co-ordination with INKEL
- 1.3. Supply of Major materials from approved vendors/makes as is approved under RDPR and concurred by INKEL.
- 1.4. Installation activities of the solar power plant including but not limited to MMS erection including civil work, PV Module laying, DC/AC Cabling, installation of DCDB/ACDB/Solar PCU/Battery/Energy meters/LT Panels, earthing & lightning protection system as per standards, supply and installation of Fire protection system and equipment.
- 1.5. Obtaining Clearances from statutory agencies and government bodies for the PV Plant readiness for operation and commissioning.
- 1.6. Testing and commissioning of the plants.
- 1.7. Operation and maintenance of the PV Plants for 5 years.
- 1.8. Site inspections is to be arranged/facilitated and completed for satisfactory certification by client.
- 1.9. Each site visit is to be intimated in advance to INKEL also to ensure participation as is required.
- 1.10. Contractor will have to achieve milestone completion within the timelines and as per the requirement of work order and other tender requirements of RDPR.
- 1.11. Contractor has to depute competent resources to Client meetings as is required by INKEL.
- 1.12. Work order will have to be collected and facilitated for and on behalf of INKEL. For each WO from Panchayath there will be a suitable execution work order issued to the contractor stating the sow, rated and T&C. An agreement will also be entered into under the common agreement.
- 1.13. Contractor will be responsible for coordinating and facilitating payment follow up for timely release of payment form client.



2. QUALITY ASSURANCE:

- 2.1. The successful bidder shall establish a Quality Assurance system for the work and shall be subject to the approval of INKEL or authorized personnel designated.
- 2.2. Strict compliance with the approved, proven & established quality assurance systems and procedures during the different stages of the plant starting from sizing, selection of make, storage (at site), during erection, testing and commissioning have to be ensured by the contractor.
- 2.3. All works shall be undertaken with the highest levels of quality and workmanship. Work shall be carried out in conformity with quality and safety norms.
- 2.4. The successful bidder shall furnish a detailed quality assurance plan (QAP) for the plant. The test and Inspection shall be done in accordance with the relevant standards and the Manufacturer's standard before the delivery to site as well as after the erection and commission at site.
- 2.5. The following inspections are to be conducted mandatorily:

2.5.1. **Pre-Dispatch Inspection (PDI)**

- 2.5.1.1. The Contractor shall intimate the Employer regarding their readiness for pre-dispatch inspection provided that not less than 15% of the allotted cumulative capacity is manufactured and ready at the factory / warehouse at Bengaluru for carrying out pre-dispatch inspection.
- 2.5.1.2. Not more than four (4) pre-dispatch inspections will be carried out at each allotted district with allotted cumulative capacity.
- 2.5.1.3. The Employer shall appoint Competent Authority / Predispatch Inspection sub-committee who shall carry out the predispatch inspection.
- 2.5.1.4. The pre-dispatch inspection will be carried out at the factory / warehouse of the Tenderer / OEM at Bengaluru only.

2.5.2. Post Delivery Inspection

- 2.5.2.1. The Contractor shall intimate the Purchaser regarding their readiness for Post-delivery Inspection after delivery to the respective sites.
- 2.5.2.2. Not more than four (4) post-delivery inspections will be carried out at each allotted district wise allotted cumulative capacity.
- 2.5.2.3. The Employer shall appoint 3rd Party Inspection Agency / Team, who shall carry out the post commissioning inspection.

2.5.3. Post Commissioning Inspection (PCI)

- 2.5.3.1. The Contractor shall intimate the Purchaser regarding their readiness for Post Commissioning Inspection provided that a minimum of 25% of the allotted cumulative capacity at the district level has been supplied, installed, net metered, tested and commissioned at the sites.
- 2.5.3.2. Not more than four (4) post commissioning inspections will be carried out at each allotted district wise allotted cumulative capacity.



- 2.5.3.3. The Employer shall appoint 3rd Party Inspection Agency / Team, who shall carry out the post commissioning inspection.
- 2.5.4. INKEL along with client's representatives will attend FAT, SAT and TP Inspections.
- 2.5.5. INKEL will issue material dispatch clearance based on the approval of client.
- 2.6. Quality control and QA as is insisted under RDPR and also requested by INKEL in such formats and docs will have to be provided during installation and O&M for releasing eligible payments.

3. SUBMISSION OF DOCUMENTS/REPORTS

The contractor shall submit the following reports to INKEL on a periodic basis or whenever required.

- 3.1. Site Survey Reports
- 3.2. Monthly Project Progress Report
- 3.3. Payment Status Report
- 3.4. Site handing Over Report

A handing over report shall be submitted along with all documents related to the solar power plant which including but not limited to the following:

- 3.4.1. Completion report
- 3.4.2. Clearances and sanctions obtained from authorities
- 3.4.3. Warranty certificates (including the ones from manufacturer)
- 3.4.4. User manuals
- 3.4.5. Test certificates of components
- 3.4.6. Calibration reports of energy meters, sensors and data acquisition system
- 3.4.7. Any other documents relevant to the solar power plant installed.

4. OPERATION AND MAINTENANCE

- 4.1. The Successful bidder shall carry out the periodical/plant maintenance as given in the manufacturer's service manual and perform at least minimum requirement.
- 4.2. Preventive/Routine Maintenance shall be done by the Successful bidder at least once in a every three months and shall include activities such as, cleaning and checking the health of the SPV system, cleaning of module surface, tightening of all electrical connections, mounting structure, Inverter operations, battery water top-up and any other activity that may be required for proper functioning of the SPV system as a whole.
- 4.3. Regular periodic checks of the modules, inverters and batteries shall be carried out as a part of routine preventive maintenance.
- 4.4. In order to meet the maintenance requirements stock of consumables are to be maintained as well as various spare as recommended by the manufacturer.
- 4.5. Particular care shall be taken for outdoor equipment to prevent corrosion. Cleaning of the junction boxes, cable joints, insulators etc. shall also be carried out at every three-month interval.



- 4.6. According to the recommendations, stock of special tools and tackles shall be maintained for modules, inverters and other major electrical equipment.
- 4.7. Manufacturer's approved methods for preventive maintenance shall be adopted.
- 4.8. A maintenance record is to be maintained by the Successful bidder to record the regular maintenance work carried out as well as any breakdown maintenance along with the date of maintenance, reasons for the breakdowns, steps taken to attend the breakdown, duration of the breakdown etc. should be maintained in each location.
- 4.9. The Maintenance of the Rooftop solar PV plant should be carried out only with the prior written approval of /custodian of site.
- 4.10. The Successful bidder will attend to any breakdown jobs immediately for repair/replacement /adjustments and complete at the earliest working round the clock. The details of the emergency assistance personnel of the Successful bidder shall be displayed in all locations. During breakdowns (not attributable to normal wear and tear) at O&M period, the Successful bidder shall immediately report the accidents, if any, to the parties involved showing the circumstances under which it happened and the extent of damage and or injury caused.
- 4.11. If negligence / mal-operation of the Successful bidder's operator results in failure of equipment such equipment should be repaired/replaced by Successful bidder at free of cost.

5. EXECUTION OF AGREEMENT

5.1. The successful bidder shall execute an agreement with INKEL for this for the work as well as O&M of individual solar PV plants within 10 days from the date of issue of Letter of Award of contract, with INKEL as per the terms and conditions set forth in the Bid document.

6. STATUTORY COMPLIANCES

- 6.1. The Successful bidder shall comply with the provision of all relevant acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Mines Act 1952, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970, Electricity Act 2003, Grid Code, Metering Code, MNRE guide lines or any modification thereof or any other law relating whereto and rules made there under from time to time.
- 6.2. The Successful bidder shall at his own expense provide all amenities to his workers as per applicable laws and rules.
- 6.3. The Successful bidder shall ensure that all safety measures are taken at the site to avoid accidents to his Workmen.

7. PAYMENTS

- 7.1. Payments will be on a back-to-back basis on receipt from respective Panchayats as below:
- 7.2. **Stage 1 –** 80% of the contract value will be paid against successful delivery of all Bill of Materials at site along with submission of the following documents to the Purchaser:



- 7.2.1.1. Invoice in triplicate.
- 7.2.1.2. Delivery Challan duly certified by the Purchaser (or any authority authorized by the Purchaser).
- 7.2.1.3. Pre-dispatch Inspection Report duly certified by Employer (or any authority authorized by the Employer).
- 7.2.1.4. Acknowledgement Copy of the application submitted to respective ESCOM for Net metering.
- 7.2.1.5. Post-delivery Inspection Report duly certified by Purchaser (or any authority authorized by the Purchaser).
- 7.3. **Stage 2 (Final Stage)** 20% of the contract value will be paid against installation, testing, net metering and commissioning of the project at site along with submission of the following documents certified by the District Nodal Officer
 - 7.3.1. Invoice in triplicate.
 - 7.3.2. "Installation, Net metering and Commissioning Report" duly certified by the Purchaser (or any authority authorized by t6he Purchaser).
 - 7.3.3. Copy of synchronization certificate for the Plant issued by ESCOM.
 - 7.3.4. Post-Commissioning Inspection Report duly certified by the "3rd Party Inspection Technical expert nominated by the Employer".
- 7.4. In case of any delay in the Commissioning and Synchronization of the Plant for reasons not attributable to the bidder (contractors), the Purchaser may at his discretion release the Stage 2 (final stage) 20% payment against submission of Bank Guarantee of 5% amount by the bidder (contractors) valid for a period of 5 years. Within 30 days of completion of the Commissioning and Synchronization of the Plant by Bidder (contractors), the Purchaser shall release the Bank Guarantee back to the bidder (contractors).
- 7.5. If the payments received from the client is less than what is specified in the above milestone stages, the contractor's payment also will be processed accordingly applying appropriate percentage to his claim.

8. WARRANTY

- 8.1. The entire power plant including module mounting structure, electrical works including power conditioners/inverters/battery/maximum power point tracker units/distribution boards/digital meters/ switchgear etc. and overall workmanship of the SPV power plants/ systems must be warranted against any manufacturing/ design/ installation defects for a minimum period of 5 years. The contractor shall furnish manufacturer's warranty certificate in this regard.
- 8.2. The contractor shall submit all original warranty cards of the components to INKEL.
- 8.3. Warranty shall be jointly in the name of INKEL and the contractor.
- 8.4. Any component found defective during the warranty period shall be repaired/replaced free of cost.
- 8.5. PV modules must be warranted for their output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.
- 8.6. PV modules that do not meet the above criteria shall be replaced free of cost.



8.7. Warranty shall be invoked/enforced by Contractor. It shall be the Contractors' responsibility to coordinate and rectify the defects where warranty claims are applicable.

9. INSURANCE

- 9.1. The Contractor shall secure and maintain throughout the duration of this Contract, insurance of such types and in such amounts as may be necessary to protect himself and the interests of INKEL, against all usual hazards or risk of loss. The form and limits of such insurance and the company together with the underwriting thereof in each case, such as will be acceptable to INKEL but, regardless of such acceptance, it shall be the responsibility of the Contractor to maintain adequate insurance coverage at all times. Failure of the Contractor to maintain adequate coverage shall not relieve him of any contractual responsibility.
- 9.2. The insurances shall be in the joint names of Contractor and INKEL and shall cover:
 - 9.2.1. the Contractor against all losses or damage, from whatsoever cause arising from the start of work at the site until the date of issue of the relevant taking over certificate in respect of the works or any section or part thereof as the case may be, and
 - 9.2.2. The Contractor for his liability:
 - 9.2.2.1. during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of Defect Liability Period,
 - 9.2.2.2. for loss or damage caused by the Contractor in the course of any operations carried out by him under the terms of the Contract, and
 - 9.2.2.3. for loss or damage caused by the Contractor in the course of any operation carried out by him during execution of works to the neighboring habitats, life and property around the boundary of the site.

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SECTION 7 - SPECIFICATIONS

[Grid In: Factive Hybrid Solar Rooftop Power Plants]

A. Configuration of Secur Plant

1. The configuration of \mathbb{C} har Plant with one(1) hour batter backup is as follows:

	Grid interactive Hybrid rooftop Solar power plant capacity in KW	Grid Interactive Solar Hybrid inverter in KW	Total Minimum VAH of Low Maintenance Tubular battery 4	Battery backup hour's	Remarks
1	1KW – 1Phase	1KW	1800 VAH	1 HOUR	The make of the major items like
2	2KW - 1Phase	2KW	3600 VAH	1 HOUR	solar panels,
3	3KW - 1Phase	ЗКЖ	5760 VAH	1 HOUR	Batteries & solar Inverters to be
4	4KW - 1Phase	4KW	7200 VAH	1 HOUR	supplied under this
5	5KW- 1Phase	5KW	9600 VAH	1 HOUR	contract, should be the same make
6	10kW – 3Phase	10kW	19200 VAH	1 HOUR	accepted in the EOI stage

2. The configuration of Solar Plant with two (2) hours batter backup is as follows

	Grid interactive Hybrid rooftop Solar power plant capacity in KW	Grid Interactive Solar Hybrid inverter Ti KW	Total Minimum VAH of Low Maintenance Tubular Battery	Battery backup hour's	Remarks
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1	1KW – 1Phase	1KW	3120 VAH	2 HOUR	The make of the major items like
2	2KW - 1Phase	2KW	6240 VAH	2 HOUR	solar panels,
3	3KW - 1Phase	ЗКЖ	9600 VAH	2 HOUR	Batteries & solar Inverters to be
4	4KW - 1Phase	4KW	12480 VAH	2 HOUR	supplied under this
5	5KW- 1Phase	5KW	14400 VAH	2 HOUR	the same make
6	10kW – 3Phase	10kW	28800 VAH	2 HOUR	accepted in the EOI stage

- 3. The capacity of the system is defined as the total capacity of solar modules.
- 4. The grid Interactive Hybrid solar PV power plant comprises of solar PV modules with Hybrid invoter should have inbuilt MPPT should charge the battery

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and converts solar DC power to AC power & feeds AC power to electrical loads and feeding the excess generated electricity to the grid of Distribution Licensee through NET metering facility. The connectivity should be as per BESCOM Guidelines as per KERC (Implementation of solar rooftop Photovoltaic power plants) Regulations 2016.

- 5. The plant should be sized based on the availability of shade free area for installing solar module array and the feasibility to connect to the grid by the distribution licensee.
- 6. The system should be connected to the mains -Single phase/ three phase through a net/export-import meter tested and approved by a lab approved by the Distribution Licensee. Another Energy meter (or existing unidirectional meter) also has to be installed between the Inverter and the point of interconnection, to record electricity generated from Solar power plant.
- 7. Technical compliance certificate/ Test report from the approved laboratory of MNRE, NABL, IEC, BIS accredited has to be submitted for the main system components (solar PV module, Hybrid Inverter & Tubular Battery) of all the models proposed.
- 8. Grid Interactive Hybrid Solar Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Battery bank, & Hybrid Solar Inverter, AJB, DCDB, ACDB, L.A, Earth kits, Interconnect cables & Civil works. PV Array is mounted on a suitable structure. The Grid Interactive Hybrid SPV power plant should be designed to charge the battery bank as well as feed the excess power to the grid. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, Hybrid Solar Inverters etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

B. Solar PV Modules

- 9. Only crystalline silicon cell PV modules of 300Wp or higher capacity (Indian Module) should be used in the power plant.
- 10.Each PV module used in any solar power project must use a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module laminate, but must be able to withstand harsh environmental conditions.
 - 10.1. Name of the manufacturer of PV Module

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- 10.2. Name of the manufacturer of Solar cells
- 10.3. Month and year of the manufacture (separately for solar cells and module)
- 10.4. Country of origin (separately for solar cell and module)
- 10.5. I-V curve for the module
- 10.6. Peak Wattage, Im, Vm and FF for the module
- 10.7. Unique Serial No. and Model No. of the module
- 10.8. Date and year of obtaining IEC PV module qualification certificate
- 10.9. Name of the test lab issuing IEC certificate
- 10.10. Other relevant information on traceability of solar cells and module as per ISO 9000 series
- 11. The following details should be provided on the module
 - 11.1. Name of the manufacturer
 - 11.2. Month and year of manufacture
 - 11.3. Rated Power at STC
 - 11.4. Vmp, Imp, Voc, Isc
- 12.The PV modules must conform to the latest edition of any of the following IEC /equivalent BIS Standards for PV module design qualification and type approval: Crystalline Silicon Terrestrial PV Modules: IEC 61215 / IS14286. In addition, the modules must conform to IC 61730 Part 1 requirements for construction and Part 2 requirements for testing for safety qualification or equivalent IS.
- 13.PV modules interconnection diagram shall be provided for each type of package mentioned in Section 9.

C. Warranties for SPV Modules

14. Material Guarantee:

- 14.1. The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than five (05) years from the date of sale to the original customer ("Customer")
- 14.2. Defects and/or failures due to manufacturing
- 14.3. Defects and/or failures due to quality of materials
- 14.4. Non-conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this Guarantee, the manufacturer will repair or replace the solar module(s), at the owners sole option

15.Performance Guarantee:

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15.1. The predicted electrical degradation of power generated by SPV modules not exceeding 20% of the minimum rated power over the 25 year period and not more than 10% after ten years period of the full rated original output.

D. Battery Bank

- 16.Batteries should be Low maintenance Tubular lead acid battery confirming to the standard of IS 13369 (NABL test report as per IS 13369 should be enclosed along with the Bid.)
- 17. Battery Bank should be designed to meet 1 hour / 2 hour backup for the rating of the Solar Hybrid inverter and total VAH should not be less than as mentioned in solar system configuration.
- 18. Suitable Anti corrosive paint coated Metal battery stand should be provided along with the battery
- 19.Battery make should be any one of the approved brand as per Karnataka Government E-Governance Notification No. DPAR/50/EGM/2019-DS-dparegovsec (G.O.No. DPAR 50 EGM 2019 Dated: 06.09.2019). The battery make shall be as accepted during the EOI stage.
- 20.Batteries used are to be of C10 rating which are more suitable for solar applications.

E. Grid Interactive Hybrid Solar Inverter

- 21. Hybrid Inverter OEM qualification criteria
 - 21.1. The make of the inverter should have been empaneled in BESCOM.In case inverter manufacturer is empaneled with BESCOM but the manufacturer could not renew the empanelment due to lockdown, the bidder can submit the inverter manufacturer empanelment issued earlier by BESCOM along with the acknowledgment of Renewal Application and Processing Fee submitted to BESCOM by the inverter manufacturer. The bidder will be empaneled in the EOI subject to the bidder submitting the renewal of inverter manufacturer empanelment with BESCOM, which should be submitted by the Bidder to the Employer, prior the last date of submission of bid stated in the tender schedule, failing which the bid submitted by the bidder will be treated as non-responsive.
 - 21.2. The OEM should have Min 15 service centers across the state of Karnataka.

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- 21.3. The OEM should have installed Hybrid inverters of cumulative 2.5 MW capacity in any Government organization during past 5 years.
- 22. Hybrid solar inverter should be a combined unit comprising of MPPT charge controller, visual display, necessary protections and provision to export excess power to Grid and with option of blocking the export.
 - 22.1. It should have Integrated MPPT Charge Controller. In case of MPPT charge controller is not built-in inside the Inverter, IEC 62093 test certificate should be provided separately for charge controller as per BESCOM technical standards.
 - 22.2. It should not over charge the batteries once all the batteries are fully charged.
 - 22.3. It should sustain both the temperature during winter and summer season
 - 22.4. It should have protection from over voltage, under voltage, over current protection.
 - 22.5. It should have short circuit protection.
 - 22.6. It should be rated for continuous operation at full load.
 - 22.7. It should have solar priority grid charging.

SI.	Feature	Minimum Specification
1.	Switching elements	IGBT /MOSFET
2.	Type of Charge Controller	MPPT charge controller
3.	Nominal Inverter	1-Phase : 1kW,2kW,3kW,4kW and 5kW
	Capacity	3-Phase : 10kW
4.	Nominal Array Capacity	Equivalent/More to the Inverter capacity
5.		180V DC for 1-phase inverters and
	Maximum DC voltage	1000V DC for 3-phase inverter.
6.		65 V-115 V DC for 1-phase inverters
	mppt voltage range	400V-800V DC for 3-Phase inverters
7.	Battery nominal Volt	\leq 60V. Due to space constraint and as per MNRE Guidelines in view of safety above 60V DC is not accepted.
8.	Inverter Surge Rating @ 40 deg C 105% > 10 sec	
9.	Inverter Output Voltage	230V +/- 1% for single phase (During solar/Battery mode) 415V +/- 1% for three phase (During solar/Battery mode)
10.	Inverter Output	50+/- 0.5 Hz (Synchronized to Mains during grid
	Frequency (export
	Synchronization	operation)

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SI.	Feature	Minimum Specification
	range)	
11.	Grid synchronization Voltage range	170V - 260V. (Inverter should charge the battery & Inverter Should able to work at this voltage range.)
12.	Grid Frequency range	50 Hz (47 to 53 Hz)
13.	Inverter Efficiency @ 40 deg C, Nominal load	Above 80% for 1 kw & 2 kw Above 90 % for 3 kw ,4kw, 5kw & 10 kw
14.	Operating Ambient Temperature	0 to 50 deg C
15.	Humidity	95% max. non condensing
16.	Enclosure	IP 20, powder coated
17.	Cooling	Forced air cooling
18.	Protection	Short Circuit,Overload Over Temperature Over Voltage / Under Voltage
19.	Output wave form	Pure Sine wave
20.	Mounting Type	Wall Mounting only to save the floor space and also for easy visibility of inverter operation.
21.	Dimension	 Upto 5kW - (DXWXH) 200X310X500 in mm (preferred due to space constraint) 10kW - (DXWXH) 175X500X650 in mm (preferred due to space constraint) Inverters with upto 50% more than above dimensions are acceptable subject to space constraints at site.
22.	Grid Charger capacity	Suitable to charge the battery and feed to Inverter simultaneously, minimum 10% to the battery AH capacity to be provided to charge the battery
23.	IEC Test Certificates from lab as per below standards should be enclosed along with the bid.	
24.	Environmental Testing-	IEC 60068-2 (1,2,14,30)
25.	Efficiency Measurements	IEC 61683
26.	Safety Measurement	IEC 62109-1 & IEC 62109-2
27.	Anti-Islanding Protection and utility interface	IEC 62116:2014 and IEC 61727:2004
28.	Electromagnetic compatibility& electromagnetic interference of inverter	IEC 61000-3, IEC 61000-4

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23. In case of delay in installing the net meter there should be provision to block the export of power to grid.

F. Module Mounting Structure

- 24. Module mounting structure should be installed on the roof. Modules shall be mounted on a non-corrosive support structures towards suitable direction and inclination to maximize annual energy output. Support structure design and foundation or fixation mounting arrangements should withstand horizontal wind speed up to 150 km/hr. Module mounting structure designed to install solar panels should be made of 3mm MS hot dip galvanized. Thickness of galvanizing should be 120µm (Microns). Minimum clearance of Solar panels from roof should be 300 mm in case of RCC roof and it may vary based on the type of roof these modules are installed. All fasteners used to fix solar panels with module mounting structure should be of SS 304. All exposed metallic parts should be properly grounded.
 - 24.1. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed.
 - 24.2. Anti-theft bolts should be used to fix the PV modules
 - 24.3. The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.
 - 24.4. Structural material shall be corrosion resistant and electrolytic ally compatible with the materials used in the module frame, its fasteners, nuts and bolts. Aluminum structures also can be used which can withstand the wind speed of respective wind zone. Necessary protection towards rusting need to be provided either by coating or anodization.
 - 24.5. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels. The MMS should be grouted to RCC roof & civil foundation with RCC of minimum size 300mm x300mm.
 - 24.6. If RCC roof is not capable to withstand drilling holes / if the roof is different other than RCC, suitable module mounting structure to be designed and suitable arrangements has to be done for installation as per site conditions.

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- 24.7. The mounting structure steel shall be of minimum 3mm thickness.
- 24.8. The drawing of the same shall be submitted by the bidder along with the site feasibility report.
- 24.9. The Module Mounting Structure installation to be made according to site conditions by adopting best practices for its durability and long life.
- 24.10. Base plate of MMS is to be of dimension 250mm×250 mm with concrete bed dimension of 300mm×300mm.

G. Array Junction Boxes (AJB)

25. The Array junction boxes are to be provided in the PV array for termination and connecting cables for series and parallel configuration. The Array Junction Boxes (AJBs) shall be made of GRP/FRP/Powder Coated Aluminum /cast aluminum/M.S alloy with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JBs shall be such that input & output termination can be made through suitable cable glands.

H. DC Distribution Board (DCDB)

- 26.DC distribution board (DCDB) shall be provided in between hybrid solar inverter and AJB. It should be equipped with suitable rating of DC MCB, for solar input from array junction box and fuse of suitable rating between hybrid solar inverter and battery and suitable capacity SPD and DC fuse should be provided and DC SPD should be connected to DC earth, all switches, circuit breakers and connectors should comply with IEC 60947/IS 60947. DCDB incoming shall have suitable fuse having rating equal to solar array Isc rating.
- 27.DCDB Grounding to be in compliance with class-2 category.
- 28.Each Junction Box shall have High quality Suitable capacity fuse.

I. AC Distribution Board

- 29.AC Distribution Board (ADB) shall control the AC power from hybrid solar inverter and should have necessary AC SPD connected to AC earth.
- 30.All switches and the circuit breakers, should conform to IEC 60947,
- 31. Manual changeover switch from dedicated load to grid of suitable capacity should be provided to transfer the dedicated load to grid in case of power plant failure/Maintenance, any cabling work should be undertaken for bifurcation of load by the bidder as part of the project.

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- 32.All the Panels shall be metal clad, totally enclosed, rigid, wall mounted, air insulated, cubical type suitable for operation on three phase/single phase, 415 or 230 volts, 50 Hz
- 33. Suitable capacity AC circuit breaker for load side and for grid input to be provided.
- 34. Cable size and ratings for interconnection of equipments for each type of package shall be provided.

J. Cables

- 35. Cables of appropriate size to be used in the system shall have the following additional characteristics:
 - 35.1. Shall meet IEC 60227/IS 694/IEC 60502/IS1554 standards
 - 35.2. Temp. Range: -10 deg C to +80 deg C. Voltage rating 660/1000V
 - 35.3. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation and Flexible
 - 35.4. 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.
 - 35.5. Cabling from customer main panel to inverter and from inverter to loa distribution is in bidder scope.
 - 35.6. Segregation or bifurcation/Extra cabling of load wiring as per the inverter capacity in bidder scope.
 - 35.7. Organizations should adhere to the standard cable ratings specified.

K. Lightning Arrestor

36. The SPV power plants shall be provided with lightning Arrestor. 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 Lightning Arrestor connecting to suitable earth.

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L. Earthing Protection

- 37. Three separate earthing for AC side, DC side and LA to be provided
- 38.Each array structure of the PV yard should be grounded/ earthed properly. In addition, the lighting arrester/masts should also be earthed inside the array field, hybrid solar inverter, ACDB and DCDB should also be earthed properly.
- 39.Earth resistance shall not be more than 5 ohms.

M. Safety Measures

- 40. 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 BESCOM norms.
- 41. Outdoor and indoor conductors to be housed through HDPE material for safety.

N. Operation Manual

42. An Operation, Instruction and Maintenance Manual in English should be provided with the Solar PV Power Plant. The detailed diagram of wiring and connection diagrams should also be provided with the manual.

O. Display Board

43.A display board of appropriate size of MS is to be erected at the plant site indicating;



P. NETMETER

44. Contractor should provide all help require for documentation with the ESCOM to G.P /RDPR. GP/RDPR will pay official fee as per ESCOM norms for NET meter application and follow up for NET meter approval. Any up gradation in the sanction load, modification in the existing Electrical setup, and all other liasoning work pertaining to the successful implementation of this project shall be in the scope of the GP/RDPR department.

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45.Net meter to be installed as per ESCOMs approved list based on territories.

Q. Others

46.All the MCBs used to be of Double pole type.

R. Training of End User

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

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Annexure – 3

CONTACT FORM

Name of the Bidder	
Complete Office Address with Phone Number and E-mail ID	
Type of Ownership	
GST No.	
PAN	
Year of Establishment	
Name of Contact Person with Designation	
Mobile Number & E-mail ID of the Contact Person	

Name of Authorized Signatory:

Signature

Official Seal

Date:



Appendix – 4

Price Quote:

S1.	Package	Item	Unit Rate (All Inclusive)
1.	A -	Supply, Installation, Netmetering, Testing,	
	1 KW	Commissioning, Maintenance and	
	1 Hour	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(Including battery)	
2.	A -	Comprehensive Maintenance Contract for 5	
	1 KW	years after completion of 5 years Warranty	
	1 Hour	period (excluding battery replacement)	
3.	В –	Supply, Installation, Netmetering, Testing,	
	1 KW	Commissioning, Maintenance and	
	2 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(including battery)	
4.	В –	Comprehensive Maintenance Contract for 5	
	1 KW	years after completion of 5 years Warranty	
	2 Hours	period (excluding battery replacement)	
5.	C –	Supply, Installation, Netmetering, Testing,	
	2 KW	Commissioning, Maintenance and	
	1 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(including battery)	
6.	C –	Comprehensive Maintenance Contract for 5	
	2 KW	years after completion of 5 years Warranty	
	1 Hours	period (excluding battery replacement)	
7.	D -	Supply, Installation, Netmetering, Testing,	
	2 KW	Commissioning, Maintenance and	
	2 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(including battery)	
8.	D -	Comprehensive Maintenance Contract for 5	
	2 KW	years after completion of 5 years Warranty	
	2 Hours	period (excluding battery replacement)	
9.	E –	Supply, Installation, Netmetering, Testing,	
	3 KW	Commissioning, Maintenance and	
	1 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty (
		including battery)	



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10.	Е –	Comprehensive Maintenance Contract for 5	
	3 KW	years after completion of 5 years Warranty	
	1 Hours	period (excluding battery replacement)	
11.	F –	Supply, Installation, Netmetering, Testing,	
	3 KW	Commissioning, Maintenance and	
	2 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(including battery)	
12.	F –	Comprehensive Maintenance Contract for 5	
	3 KW	years after completion of 5 years Warranty	
	2 Hours	period (excluding battery replacement)	
13.	G -	Supply, Installation, Netmetering, Testing,	
	4 KW	Commissioning, Maintenance and	
	1 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(including battery)	
14.	G -	Comprehensive Maintenance Contract for 5	
	4 KW	vears after completion of 5 years Warranty	
	1 Hours	period (excluding battery replacement)	
15.	Н-	Supply, Installation, Netmetering, Testing,	
	4 KW	Commissioning, Maintenance and	
	2 Hours	Operations of Grid Interactive Hybrid Solar	
		Roofton Power Plant with 5 years warranty	
		(including battery)	
16.	Н-	Comprehensive Maintenance Contract for 5	
	4 KW	vears after completion of 5 years Warranty	
	2 Hours	period (excluding battery replacement)	
17.	I –	Supply, Installation, Netmetering, Testing,	
	5 KW	Commissioning, Maintenance and	
	1 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty	
		(including battery)	
18.	I –	Comprehensive Maintenance Contract for 5	
	5 KW	years after completion of 5 years Warranty	
	1 Hours	period (excluding battery replacement)	
19.	J –	Supply, Installation, Netmetering, Testing,	
	5 KW	Commissioning, Maintenance and	
	2 Hours	Operations of Grid Interactive Hybrid Solar	
		Rooftop Power Plant with 5 years warranty (
		including battery)	
20.	J –	Comprehensive Maintenance Contract for 5	
	5 KW	years after completion of 5 years Warranty	
	2 Hours	period (excluding battery replacement)	
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21.	К -	Supply, Installation, Netmetering, Testing,
	10 KW	Commissioning, Maintenance and
	1 Hours	Operations of Grid Interactive Hybrid Solar
		Rooftop Power Plant with 5 years warranty (
		including battery)
22.	К –	Comprehensive Maintenance Contract for 5
	10 KW	years after completion of 5 years Warranty
	1 Hours	period (excluding battery replacement)
23.	L -	Supply, Installation, Netmetering, Testing,
	10 KW	Commissioning, Maintenance and
	2 Hours	Operations of Grid Interactive Hybrid Solar
		Rooftop Power Plant with 5 years warranty (
		including battery)
24.	L -	Comprehensive Maintenance Contract for 5
	10 KW	years after completion of 5 years Warranty
	2 Hours	period (excluding battery replacement)

Contractor Name & Address:

Signature

Official Seal

Date: