

accepted and the Discom & CEL shall have right to reject it and recover the cost so incurred from the contractor.

Cost of inspection: All the expenses related to inspection team like lodging, boarding, travelling, and air tickets of Discom inspector to be borne by the Contractor. The Contractor will provide necessary inspection & testing facility for Discom inspector at his cost.

However, if the material is not kept ready for inspection after intimation of the offered quantity on the scheduled date for inspection then all consequences will be to Contractor account and CEL will recover the re-inspection charges @ Rs. 15,000/- for outside Rajasthan State inspection and within Rajasthan State @ Rs. 7,500/-.

The Contractor will offer BOS and components of system for inspection at the OEM works to CEL. Inspection can also be offered at one place in Rajasthan (main distributor's place), where requisite inspection facilities are available. CEL & DISCOM reserves the right to inspect any number of SPV systems at OEM works at their discretion.

Systems installed under the allocated work in this tender shall meet technical specification and construction standards as specified by BIS and MNRE from time to time. Non-compliance will be taken seriously to the extent of blacklisting of the vendor, in the same manner as specified, apart from taking action under any other law in force. Evaluation of implementation of Component-C will be carried out through third party selected for this purpose. In order to ensure, the scheme meets expected outcomes continuous evaluation of scheme would be undertaken and mid-course correction, as required, shall be implemented.

On Commissioning quality monitor as appointed under KUSUM Scheme, as applicable shall inspect the SPV system. Contractor shall provide all requisite details built drawings (in line with MNRE specifications in tender document and Joint measurement sheet to the inspector to conduct. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations. The inspection of materials and components of the project carried out by Discom's / MNRE / TPIA representative & CEL representatives shall not relieve the Contractor from full responsibility of completing the project confirming to the requirement of the Contract.

Guarantee

The Grid connected SPV System for the Project supplied, installed and commissioned shall be guaranteed by the Contractor for a minimum period of 5-five years from the date of successfully commissioning of the last system, in regard to quality of design, survey, material, workmanship, quality of process/ manufacturing, performance, efficiency, installation, etc.

In the event any defect is found or developed in the system within guarantee period, shall be rectified/replaced by the Contractor at his own expense promptly.

In case the defects are not rectified within 72 Hours of the receipt of the complaint by the Contractor, CEL shall have full liberty to rectify such defect or undertake such repairs as may be necessary to restore the system in working condition at the risk and cost of the Contractor.

The expenditure so incurred by Discom & CEL shall be deducted from Contractor's pending claims, security, PBG etc. and if necessary may be recovered in other mode provided under the law. In the event of failure of the complete SPV system, if necessary, the whole SPV system shall be replaced by the Contractor.

The Contractor will submit the manufacturer Warranty on NJS of Rs 500/- after PO.

Any other item not specifically mentioned in the specifications but which are required for Supply, Installation, Testing and Commissioning of Distributed Grid connected SPV Systems for the project are deemed to be included in the scope of the specification as per relevant and latest

IS, IEC, MNRE guidelines, standards of Rural Electrification Corporation (REC) and specified by CEL unless specifically excluded.

Specification of all the items covered under this Tender Document is given separately. However, if any item is left out, standard specification of relevant and latest IS, IEC, MNRE, Rural Electrification Corporation (REC) and specified by CEL will be applicable for the same.

System approval from the CEL representative

The concerned CEL representative for the lot shall issue approval of the entire distributed Grid connected SPV Systems for the purpose of energization of the SPV system.

Original/attested photocopies of the latest Type test certificate(s) not older than 5 (five) years from MNRE approved / any recognized Government Laboratory, for all type tests wherever prescribed in the relevant latest edition of MNRE/BIS (as applicable) as mentioned in technical specification shall be furnished by the Contractor to CEL before commencement of work (supply of SPV systems). However the bidder shall have to furnish declaration to this effect with the Bid that in the event of PO “they shall submit type test reports for approval”. However, CEL reserves the right to get type tests conducted afresh by the Contractor.

CEL & Discom may visit and inspect the manufacturing unit of every part /item of the SPV systems after issuance of Work Order or during implementation of the programme to ensure the status and infrastructure and process of quality control of product.

The Contractor shall be required to furnish the routine/manufacturer(s) factory test certificate(s) for the tests carried out during manufacture in accordance with the relevant standard specifications.

Protection of property

The Contractor shall be solely responsible for any damage resulting from his operations up to commissioning and handing over of the system. He shall also be responsible for protection of all persons including members of public and employees of the respective Discom, CEL and the employees of other Contractor and sub-Contractor and all public and private property including structures, building, other plants and equipment and utility either above or below the ground up to commissioning and handing over of the system.

The Contractor will ensure provision of necessary safety equipment such as barriers, signboards, warning lights and alarms, etc. to provide adequate protections to persons and property. The Contractor shall be responsible to give reasonable notice to the Engineer, CEL representative and the Discom of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his works and shall make all necessary arrangements with such employers, related to removal and / or replacement or protection of such property and utilities.

The contractor shall adopt and implement all required measures to ensure non-tampering with any equipment or theft of electricity. This shall include but not limited to, installation of both the energy meters (solar meter and net meter) at adequate height with the metering console and proper sealing.

Work & Safety Regulations

The Contractor shall ensure proper safety of all the workmen, materials, plants and equipment belonging to him or to the CEL or to others, working at the site. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislations and the engineer, as they may deem necessary.

All equipment used in construction and erection by Contractor shall meet Indian/International standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the Contractor in accordance with manufacturer's operation manual and safety instructions and as per guidelines / rules of the CEL & Discom in this regard.

The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need.

The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the CEL & Discom under any circumstances, whatsoever, unless expressly permitted in writing by the CEL & Discom to handle such fuses, wiring or electrical equipment.

In case any accident occurs during the construction / erection or during guarantee period of 05 years for the activities undertaken by the Contractor thereby causing any minor or major or fatal injury to his employees / labourer due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the Engineer in charge of concerned Sub Division of Discom in prescribed form and also to all the authorities envisaged under the applicable laws. For any fatal / nonfatal accident to human or animal or any mishap within area of installation due to mishandling or reason whatsoever attributable to Contractor at the time of commissioning of SPV system, Contractor has to pay compensation as provided under the relevant applicable Act. The Contractor shall follow and comply with the CEL's & Discom's safety rules relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be applicable from time to time without any demur, protest or contest or reservations. In case of any discrepancy between statutory requirement and Discom's safety rules referred above, the latter shall be binding on the Contractor unless the statutory provisions are more stringent.

It will be the Contractor's sole responsibility to take the materials up to the installation site.

Repeat/ Additional Orders

CEL, as applicable, reserves the right to place repeat orders / additional orders on the Successful Bidder/ Contractor Agency up to 50% of the original quantity of the order at the same prices, terms and conditions stipulated in the original contract within one year of original purchase order date.

Security

The Contractor shall have total responsibility for security of all equipment and materials in his custody/stores, loose, semi-assembled and/or erected by him at site. The Contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss up to commissioning of the system.

Indemnity

The Contractor agrees to defend, indemnify and hold harmless the Discom, CEL, its officers, Directors, consultant, agents, employees and affiliates (and their respective officers, directors, agents and employees) from and against any and all claims, liabilities, actions, demands, judgments, losses, costs, expenses, suits, actions and damages arising by reason of bodily injury, death or damage to property sustained by third parties that are caused by an act of negligence or the willful misconduct of the Contractor, or by an officer, Director, agent or employee of the Contractor. Indemnity Bond, if applicable & required shall be submitted by Contractor.

Termination of Contract

In case, the Contractor fails to deliver the stores / materials / equipment or any consignment thereof within contractual period of delivery or in case the stores are found not in accordance with prescribed specification, CEL reserves the right to terminate the contract Or CEL shall exercise its discretionary power either:

a. In case material is not found as per specification, CEL has right to seek replacement of the same material without any incremental cost to CEL.

OR

b. To purchase from elsewhere after giving due notice to the Contractor on account and at the risk & cost of the supplier such stores not so delivered or other similar description without cancelling the contract in respect of the consignment not yet due for delivery

OR

c. to cancel the contract.

In the event of the risk purchase of stores of similar description, the opinion of CEL shall be final. In the event of action taken under clause (b) & (c) above, the Contractor shall liable to pay for any loss which CEL may sustain on that account but the Contractor shall not be entitled to any saving on such purchases made against default.

If the Contractor neglects to execute the work with due diligence and expedition or refuses or neglect to comply with any reasonable orders within two days of notice given in writing to the Contractor and if he fails to comply with the notice, then in such a case CEL shall be at liberty to get the work or any part of it as per GCC.

The decision of CEL shall be final as regards the acceptability of stores supplied by the Contractor and CEL shall not be required to give any reason in writing or otherwise at any time for rejection of the stores.

Further, "CEL reserves the right to terminate the Contract (i.e. Purchase order) at any time, without assigning any reasons, whatsoever, by giving a notice period of ONE month from the date of Notice of termination of the Contract. Contractors will not be entitled for any compensations / damages / losses, whatsoever, on account of such termination of the Contract.

In the event of termination of the contract, CEL shall be at liberty to get the remaining part of the work done through any other agency at the risk and cost of the Contractor and in the manner and on the terms it thinks proper. If the cost of executing the work as aforesaid shall exceed the balance due to the Contractor, and Contractor fails to make good the deficiency, CEL may recover it from the Contractor in any lawful manner.

The Contractor shall have to comply with all rules, regulations, laws and bylaws enforced by local, State Govt., Central Government and also the organization in whose premises the work has to be done.

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The Contractor shall not, without consent in writing of CEL, transfer, assign or sublet the work under this contract or any substantial part thereof to any other party.

CEL shall have at all reasonable time access to the works being carried out by the Contractor under this contract. All the works shall be carried out by the Contractor to the satisfaction of CEL.

Note: CEL reserves the right to terminate the contract or part thereof at any time giving 01 (One) months' notice of Termination or the reasons thereof. Contractor/s will not be entitled for any compensation / damages / losses, whatsoever, on account of such termination of the Contract.

CEL will be entitled to deduct directly, from the bills to be paid to the Contractor, any sum or sums payable by him and which sum/sums due to the Contractor or the Discom is required to pay as a principal employer on account of Contractor's default in respect of all liabilities referred to. The Contractor shall specifically note that any overwriting or corrections or manuscript in the offer shall be ignored and will not be considered authentic unless same are signed and Contractor's Stamp / Seal is affixed.

CEL reserves the right to split the contract into two or more Agency per feeder. In such cases, the term for completion period will be negotiated and reduced proportionate to the offered quantity / value.

In case of any doubt or interpretation of the terms and condition, the decision of the CEL as applicable will be final and binding upon the Contractor and no dispute in this regard will be entertained.

CEL reserves the right to accept any offer or reject any or all Bids or cancel / withdraw or re invitation to offer without assigning any reason. Such decision of the CEL shall not be subject to question by any Bidder and the CEL shall bear no liability whatsoever for such decision.

CEL has right to make minor changes / modifications in the Technical & Site condition matter. In such matter, decision of CEL as applicable shall be final and binding to the Contractor to carry out work accordingly.

Completion of Contract

Unless otherwise terminated under the provisions of any other relevant clause, this Contract shall be deemed to have been completed on the expiry of the Comprehensive Maintenance during guarantee period.

Packing and forwarding charges

The quoted prices by Bidders shall be inclusive of packing & forwarding charges. The stores shall be strongly and adequately packed to ensure safe arrival at destination. The materials dispatched from overseas by Air / Shipping shall be packed in such a way that it can withstand rough handling and possible corrosion due to exposure to salt laden atmosphere, salt spray or open storage. All packing must be clearly marked with order Number and consignee's name and address.

Insurance

Transit Insurance

All the materials (including PV modules supplied by CEL) under the Solarization part will be required to be supplied up to farmer's site and shall have transit insurance (including PV modules supplied by CEL) against all transit risks, such as damage, loss, theft, fire, etc. The transit insurance period shall cover 60 days after the date of receipt of materials at destination to enable Discom & CEL to check the stores fully. The cost of damaged, defective stores materials will however be deducted from the bills of the suppliers and will be refunded only after replacement thereof. It will be the responsibility of the supplier to lodge claim against the insurance on receiving necessary advice from the consignee. Transit Insurance of the material (including PV modules) shall remain the responsibility of the Contractor till the time of Commissioning.

Insurance for Five Years:

a) The Contractor has to take the insurance for the whole Solar PV systems (including modules supplied by CEL) with inverter supplied and installed by them as per the Solarization part as well as the metering system supplied by third party for the risk covering, theft, damage, fire and damage or loss due to natural calamities for five years from the date of commissioning of the last system of the project.

b) The Contractor shall file insurance claim and shall be responsible to bring an insurance claim to a final settlement. And in such cases the Contractor has to restore the whole Solar PV system (including PV modules supplied by CEL and inverter) in working condition within 15 (fifteen) calendar days without waiting for settlement of insurance claim. Insurance coverage for 5(five) years is compulsory.

c) The Contractor shall get the solar system (including solar modules supplied by CEL) insured and submit the Insurance Policy jointly in the name of the CEL and beneficiary, covering risks as mentioned above for the period of five years to CEL immediately after commissioning of the project, failing which, the payment towards installation and commissioning part will not be released until production of the insurance.

Statutory Deduction

Statutory deduction will be made as per applicable rules & rates for TDS, Worker welfare cess, or any other taxes applicable time to time etc. All other statutory liabilities towards this contract will be on the part of Contractor.

Acceptance of Stores

All or any stores and materials to be supplied at F.O.R. Destination (Farmer's site), against this contract will be subject to their acceptance by the consignee or any Authorized Officer deputed by CEL for this purpose. CEL will be at liberty to reject whole lot without assigning any reasons and the decision of the Officer concerned will be considered as final.

Unloading

Unloading of the materials (including modules supplied by CEL) at farmer's site shall be arranged by the contractor.

Statutory variation

Any statutory increase or decrease in the taxes and duties including GST and Cess as applicable or in the event of introduction of new tax/cess or cessation of existing tax/cess subsequent to submission of Price Bids by Bidders if it takes place within the original contractual delivery date will be to CEL's account subject to the claim being supported by documentary evidence and reimbursement by DISCOM to CEL. However, if any decrease takes place after the contractual delivery date, the advantage will have to be passed on to CEL.

Random Checking of Material at Site

From the lots inspected by CEL & DISCOM Inspector, the Inspector of designated Wing, Discom & CEL if required, may pick up samples from the lots supplied & Installed at beneficiaries' site at random for quality check only. The samples picked up will be tested for acceptance test as decided by CEL & CEL's customer at MNRE/ Government approved laboratory in presence of representatives of Contractor, CEL & DISCOM as per relevant IEC/ISS/BIS/Discom specifications. The test results will be binding on the Contractor, CEL and Discom, in general will not allow re-sampling. If the material fails in any of the acceptance tests carried out, the full lot of materials will be considered as rejected. The decision in this regard for acceptance as above of Discom & CEL shall be final and this will be binding on the supplier.

In case of any ambiguity in the interpretation of provision mentioned in the tender document than decision of MNRE/ CEL & Discom shall be final. Further, the provision contained in RTPP Act 2012 and RTPP Rules 2013 shall prevail wherever applicable.

SPECIAL CONDITIONS:

- a) The contractor/bidder shall not display the photographs & content of the work and also will not take advantage through publicity of the work without written permission of CEL. Non-compliance to this may result in blacklisting of Contractor.**
- b) Service level agreement has to be signed on 100/-INR stamp paper within 2(two) weeks after award of PO.**
- c) Price adjustment is not allowed. The prices quoted by the Bidder shall be fixed for the entire duration of the contract period including 5 years CMC.**

SECTION - I: DETAILED SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

Overall Scope

- a) The scope of work includes design, survey, supply, installation, testing, commissioning & 5 years comprehensive maintenance of distributed grid connected solar PV systems for solarization of grid connected agriculture consumers under “KUSUM Scheme – Component C” in Jaipur DISCOM.
- b) The Bidder shall be responsible for acquainting oneself with all terms and conditions of this Tender document, site location(s) and conditions prior to quoting. In case of any safety or compliance issues foreseen by the Bidder, the same shall be immediately reported by the Bidder to CEL.
- c) For effective management of the project, **feeder-wise implementation** is to be carried out for solarisation of grid connected agricultural pumps. Feeders may be selected based on load, technical and commercial losses, number of consumers, etc. Contractor shall ensure that all identified sites of agriculture pumps (as per the work area / site locations listed in this tender) in a feeder are solarized before proceeding the work on to the next feeder.
- d) The solar PV plants shall consist of complete system including PV modules, grid-tie inverters, SPV controller, module mounting structures (MMS), AC and DC junction boxes, solar meter, net-meter, cables, earthing, lightning protection, associated civil works, and accessories as described in this section.
- e) The capacities of the solar PV plants shall have three SPV system unit sets 4.5 kWp, 7.5 kWp & 11.25 kWp. The capacity of the PV plant shall be based on the existing sanctioned load of the Agriculture Consumer as described in this section.
- f) All components and works shall adhere to relevant Indian Standards, State and Central policies and regulations, and all statutory provisions under the Indian law.
- g) Contractor shall adhere to all Boundary Conditions described in the tender document including but not limited to outreach and handholding of Agriculture Consumers on the given feeder; integrating the Contractor’s own Scope of Work with the supplier of the metering and communicating equipment; obtaining insurance on the PV system including metering set; and so on.
- h) The Contractor shall be entirely responsible for the execution of the Scope of Work in accordance to this Tender Document including but not limited to its specification, schedules, and annexure. The Contractor shall further provide guarantee and be responsible for the quality and workmanship of all materials and completed works, survey, correct designs and drawings (in line with MNRE specifications), correct delivery of material, erection, testing, commissioning and comprehensive maintenance.
- i) Safe Transportation & storage of all materials supplied by Successful bidder as well as CEL material to the site. In case of any losses, theft or damage of material (CEL’s and their own), the contractor shall alone be responsible to make alternate arrangement for completion of the project within contractual delivery, commissioning & handing over of systems within quoted price. CEL shall in no way, whatsoever, be responsible to compensate the contractor in this account.
- j) The Solar PV Modules would be supplied by CEL. If any Solar PV Modules is found defective during the warranty & CMC period of 5 years the same shall be made available to CEL, Sahibabad by the contractor and the repaired materials shall be transported back to the site from CEL, Sahibabad by the contractor.
- k) Any other work which is not mentioned but necessary for successful commissioning and CMC (5 years) would be in the scope of bidder. All approvals required for successful commissioning of the systems shall be in the scope of contractor.
- l) The Contractor shall be responsible for undertaking all applications and obtaining all approvals, permissions, etc. in order to successfully complete the Scope of Work. In cases where CEL’s certifications are required, the Contractor shall inform the CEL and provide the requisite formats for such certificates well in advance.
- m) The Contractor shall provide a generation guarantee and maintain an active local office cum service center in each operation district where work is carried on under this tender, to rectify faults within the stipulated timeframe described in the tender document.

- n) The Contractor shall adhere to best practices in terms of safety, quality and performance while undertaking the Scope of Work, and the same shall be included within the Contractor's contract price.
- o) The Contractor shall repair at its own cost any damage caused to the CEL/Discom's premises due to implementation of the Scope of Work.
- p) Submissions of brochures, technical specifications, designs, data sheets, etc. at the time of Bidding do not imply approval of the same. All such approvals shall be taken up separately at the time of project execution by the Contractor in coordination with CEL from the Discom. All the documents & certificates required for arranging Class "A/B" registration in the name of CEL shall be arranged by you and all the charges incurred for arranging certificates & documents shall be borne by contractor.
- q) All final specifications, designs, drawings (in line with MNRE specifications), bill of material, quality assurance plan, etc. shall be inspected, vetted and approved by the CEL/Discom or the TPIA.
- r) It is mandatory for Contractor to provide for Comprehensive Maintenance Contract (CMC) for five years from the date of commissioning of the last system of total awarded work or, 9 month from the date of PO, whichever is later, helpline, district level office cum service center and comply standards of performance in dealing with complaints.
- s) It will be mandatory for Contractor to create remote monitoring system to monitor performance of the system post-installation. Detailed specifications of Remote Monitoring System (RMS) enclosed in the technical specifications. It will be mandatory to submit quarterly maintenance report along with performance data of solar power plant online to MNRE and/ or CEL in a manner and format prescribed by MNRE and/ or CEL.
- t) It will be mandatory to use indigenously manufactured solar panels with indigenous solar cells and modules. To ensure the same, submission of authorization or DCR certificates from Indian cell supplier(s) will be mandatory. Domestic manufacturing of solar cells and panels will also be ensured through inspection and verification at module manufacturing unit of the respective OEM. Further, inverters/controllers and the balance of system should also be manufactured indigenously. If required, MNRE may conduct its independent inspection or verification to ensure domestic manufacturing requirement. The contractor has to declare the list of imported components used in the solarisation system.
- u) Systems installed under this Scheme shall meet technical specification and construction standards as specified by BIS and MNRE from time to time. Non-compliance will be taken seriously to the extent of blacklisting of the Contractor, in the same manner as specified, apart from taking action under any other law in force.
- v) Survey shall include assessing the works/approvals required on the Sites/ location of the list of agriculture consumers which will be provided by Discom and getting consent from agricultural consumers for solarization of water pumps.
- w) Format of Guarantee card shall be provided by CEL after award of contract.
- x) The contractor shall adopt and implement all required measures to ensure non tampering with any equipment or theft of electricity. This shall include but not limited to, installation of both the energy meters (solar meter and net meter) at adequate height with the metering console and proper sealing.
- y) In line with maintenance and servicing report requirement, cleaning of dust from SPV panel shall be in scope of the contractor.

Obligation towards Agriculture Consumers

- a) It shall be the prime responsibility of the Contractor to manage all Agriculture Consumers connected to the Agriculture Feeder assigned to the Contractor.
- b) The Contractor shall directly deal with the Agriculture Consumers on a regular basis to:
 - i. Educate, create awareness and market the Scheme to the Agriculture Consumers,
 - ii. Obtain all necessary approvals, permissions, etc. towards installation and commissioning of the PV system on behalf of the Agriculture Consumer,

- iii. Obtain the necessary insurance on the PV system on behalf of the Agriculture Consumer to comply with loan guidelines,
- iv. Coordinate successful operation and maintenance of the PV system.
- c) The Contractor shall identify a suitable location for the installation of the PV system within the premises of the Agriculture Consumer. This location shall be identified in close coordination with CEL representative, Discom Official and agreement of the Agriculture Consumer in writing. The cable routing of the PV system shall also be mutually agreed upon by the Contractor, CEL, Discom Official and the Agriculture Consumer in writing. The Scope of Work includes AC cabling for a distance between the inverter and interconnection point.
- d) The Contractor shall provide prompt service to the Agriculture Consumer in times of fault of breakdown of the PV system. Any complaint received from the Agriculture Consumer/ Discom/CEL shall be rectified by the Contractor within 72 (seventy two) hours of such complaint. In case of theft, the complaint is to be resolved within 15 calendar days provided theft is duly certified by the nodal officer. If the down time period for any beneficiary complaint exceeds 72 hours (15 calendar days in case for theft cases) and the contractor fails to make the plant operational, a penalty for the time period exceeding 72 hours (15 calendar days in case for theft cases), as per the below mentioned schedule shall be deposited by the contractor to the concerned AO of circle / as decided by DISCOM & CEL.

Water pump capacity (in HP)	Penalty applicable (in INR per day)
3	140
5	235
7.5	355

The loss in generation shall be decided on daily basis.

For any system / consumer complaint, the maximum applicable amount as penalty against loss of generation shall not be more than 10% of the respective cost of the SPV system installed at the consumer premises.

The Contractor shall be issued a notice to pay the applicable penalty within 7 days to the concerned AO of circle / as decided by DISCOM & CEL. If the Contractor fails to pay the penalty within notice period, the CEL shall encash the Performance Bank guarantee immediately.

Interfacing with Metering and Communication Solution Provider

- a) The Contractor shall work in close coordination with the CEL, M&P Wing of Discom / IT Wing of Discom/ Billing agency of Discom/ or any other agency assigned by the Discom.
- b) Detailed specifications of Remote Monitoring System (RMS) of MNRE enclosed as in the tender document and any further amendment(s) issued by MNRE shall be used by bidder for the purpose of metering and communication.
- c) The Contractor shall install the hardware including but not limited to energy meters and communication gateway (data logger, modem and antenna) provided in an enclosure to be provided by the Contractor. The GPRS sim shall be provided by the Contractor and maintain the sim for complete 5 year maintenance period at its own cost.
- d) The Contractor shall mount this hardware as per Discom’s standards, make appropriate connections to this hardware with respect to power cables and communication cables.
- e) The Contractor shall connect all its inverters to the appropriate interconnection point within the hardware via a shielded RS-485 communication cable. The Contractor shall ensure appropriate cable laying standards for both power cable(s) and RS-485 cable(s). The Contractor shall ensure avoidance of signal attenuation within the RS- 485 cable and install repeaters if required.
- f) The Contractor shall only utilize grid-tie inverters with Modbus communication capability via RS-485 serial port, and share the details of the protocol with the CEL and all concerned representatives of DISCOM as advised by CEL Project incharge or any other agency assigned by the Discom. Further, the Contractor shall assist CEL and all concerned representatives of DISCOM as advised by

CEL Project incharge or any other agency assigned by the Discom to ensure successful communication of the inverter data to the designated server by the Discom & CEL.

- g) The Contractor shall assist the CEL and all concerned representatives of DISCOM as advised by CEL Project incharge or any other agency assigned by the Discom in case any hardware adjustments are required by the CEL and all concerned representatives of DISCOM as advised by CEL Project incharge or any other agency assigned by the Discom or if any support is required during configuration of the inverter communication or commissioning of the metering and communication hardware.
- h) Net-Meter: The bi-directional Smart energy meter shall be installed for the measurement of import/Export of energy, as per relevant specifications by MNRE/ CEA/Discom. Detailed indicative specifications shall be shared with successful bidder.
- i) Solar Meter: Uni-directional Smart energy meter shall be installed to log the actual value of Energy generated by the PV system be provided, as per relevant specifications by MNRE/ CEA/Discom. Detailed indicative specifications shall be shared with successful bidder.
- j) All parameters of the meter shall be transferred online to CEL and all concerned representatives of DISCOM as advised by CEL Project incharge or any other agency assigned by the Discom.

Insurance during Construction of PV system

- a) During the construction period, i.e. before the commissioning of the PV system, all insurance-related expenses shall be borne by the Contractor. The goods supplied by the Contractor as well as supplied by CEL shall be fully insured against the loss or damage incidental to manufacture or acquisition, transportation, storage, delivery, theft, natural or other disaster/calamity, etc.

- b) In case of any loss or damage or pilferage or theft or fire accident or natural calamity or combination of the said incidents under the coverage of insurance, the Contractor shall lodge the claim as per rules of insurance. Any FIR required to be lodged at the local Police Station shall be the responsibility of the Contractor.
- c) The Contractor shall arrange to supply/ rectify/ recover the materials even if the claim is unsettled for timely completion of the Project. The final financial settlement with the insurance company shall be rested upon the Contractor.

Insurance during Operation of PV system

- a) Upon commissioning of the PV system, the Contractor shall undertake insurance on the PV system against theft and vandalism and natural calamities for a minimum period of 5 (five) years and include the same within the quoted cost.
- b) The insurance shall comply with terms and conditions of the loan obtained from the financial institution.
- c) The metering and communication hardware supplied by Contractor shall also be covered under the insurance by the Contractor at the Contractor's cost.
- d) The Contractor shall assist the Agriculture Consumer for insurance claims during the 5 (five)-year comprehensive maintenance period.
- e) At least 2 months before the end of the term of insurance undertaken by the Contractor, the Contractor shall ensure to provide all the necessary documents & guidance to the satisfaction of the Agriculture Consumer in order to enable the Agriculture Consumer, in case he wants to renew or to take up the insurance of the PV system at the end of the term of Insurance.

Technical Specifications

PV System Capacity

- a) The AC and DC Capacity of the grid-connected PV system shall be based on the sanctioned load of the Agriculture Consumer's pump connection. In case the Agriculture Consumer is applying addition/ alteration in sanctioned load, prior to installation of the PV system, then the Contractor shall size the PV system based on the revised capacity of the connection as confirmed by the Discom/CEL.
- b) The AC and DC Capacity of the PV system shall be based on the pump connection capacity as follows (i.e. as per MNRE guideline):

S.No.	Sanctioned Load	Minimum AC (Invertor) Capacity	Minimum DC (PV Module) Capacity
	(HP)	(kW)	(kW @STC)
1.	3	4.5	4.5
2.	5	7.5	7.5
3.	7.5	11.25	11.25

Applicable Standards

Table of Applicable Standard with description

Sr. No.	Applicable Standard	Description
1.	Solar PV Modules	
(a)	IEC 61215/IS 14286	Design qualification and type of approval for crystalline silicon Terrestrials photovoltaic Modules
(b)	IEC 61853-1/IS 16170-1	Photovoltaic (PV) module performance testing and energy rating-Irradiance and temperature performance measurements and power rating
(c)	IEC 61730-1,2	Photovoltaic (PV) Module safety Qualifications
(d)	IEC 62759-1	Photovoltaic (PV) modules - Transportation testing
(e)	IEC 61701:	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
(f)	IEC 62716:	Photovoltaic (PV) Modules – Ammonia (NH ₃) Corrosion Testing (As per the site condition like dairies, toilets)
2.	Solar PV Grid-tie Inverters	
(a)	IEC 62109-1,2	Safety of power converters for use in photovoltaic power systems
(b)	BS EN 50530:2010 + A1:2013 /IEC 62891	Overall efficiency of grid connected photovoltaic inverters
(c)	IEC 61683	Photovoltaic Systems –Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)

Sr. No.	Applicable Standard	Description
(d)	IEC 62116/UL 1741/IEEE 1547	Utility-interconnected inverters - Test procedure of islanding prevention measures
(e)	VDE V 0126-1-1	Automatic disconnection device between a generator and the public low-voltage grid
(f)	IEC 60255-27:2013	Measuring relays and protection equipment - Part 27: Product safety requirements
(g)	IEC 60068-2(1,2,14,27,30,64)	Environmental testing of PV system –Power Conditioners and inverters
(h)	IEC 62093	Balance-of-system components for photovoltaic systems - Design qualification natural environments
3.	Fuses and switches	
(a)	IS/IEC 60947(1,2,3), EN 50521	General Requirements for connectors, switches, circuit breakers(AC/DC)
(b)	IEC 60269-6	Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
4.	Cables	
(a)	IEC 60227/IS694, IEC 60502/IS 1554 (1,2)	General Test and measuring method for PVC insulated cables
(b)	IS 7098-1	Cross linked polyethylene insulated PVC sheathed cables up to 1000 V
(c)	BS EN 50618	Electric cables for photovoltaic systems, mainly for DC cables
5.	Surge Arrestors	
(a)	IEC 61643-11/IS 15086-5	Low voltage surge and protection devices, requirements and test methods
(b)	BFC 17-102:2011	Lightening Protection Standard
6.	Earthing/ Lightning	
(a)	IEC 62561 (1,2,7)	Lightning protection system components
(b)	IS 2309	Protection of Buildings and Allied Structures Against Lightning
7.	Junction Boxes	
(a)	IEC 60529	Degree of protection provided by the enclosure
8.	Smart Solar Meter	As per relevant specifications by MNRE/ CEA/Discom. Detailed indicative specifications shall be shared with successful bidder.
9.	Smart Net Meter	As per relevant specifications by MNRE/ CEA/Discom. Detailed indicative specifications shall be shared with successful bidder.
10.	PV Mounting structure	
(a)	IS 2062/IS 4759	Material for the structure mounting

If the equipment offered by the Contractor conform to other standards, salient points of difference between the standards adopted and the specific standards shall be clearly

brought out in relevant schedule. In case of any difference between provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail. One hard copy of such standards with authentic English Translations shall be furnished for consideration of such approvals.

Grid-tie Inverter

Specifications for SPV water pumping systems of MNRE vide Circular No. F. No. 41/3/2018-SPV Division dated 17.7.2019 enclosed and any further amendment(s) issued by MNRE, shall be applicable under this tender.

Make of only those Grid-tie Inverters which are commissioned for more than 1 MW capacity in other solar PV projects in India and operational for more than 1 (year) shall be considered. The Contractor shall provide sufficient information for the satisfaction of Discom prior placing the order for the inverters.

All inverters shall consist of associated control, protection and data logging devices and remote monitoring hardware, software for string level monitoring.

Capacity of single unit of inverter shall be at least 4.5 kW.

Inverter shall conform to the following details:

S. No.	Particulars	Details
1	Nominal AC Output Voltage	As per the manufacturer's guidelines
2	Type of solar charge controller	415 VAC $\pm 15\%$, 3 phase, 50 Hz
3	Switching Devices	MPPT-based Solar Charge Controller
4	Maximum Input Voltage	MOSFET/ IGBT-based
5	Output Waveform	Not more than 1000 VDC
6	DC voltage range, MPPT	Pure Sine wave
7	Peak Efficiency	As per design
8	Euro Efficiency	At least 97%, measure as per IEC 61683
9	Output frequency	At least 96%, measure as per IEC 61683
10	Power Factor	50 Hz +3% to - 5% Hz
11	Maximum THD at rated power	0.8 lag- 0.8 lead
12	Ambient dry bulb temperature range	$\leq 3\%$ 0 to 50° deg C
13	Humidity	15% to 95 % non- condensing
14	Enclosure	At least IP21 for indoor installation, At least IP65 for outdoor installation, as per IEC-60068-2 (environmental)
15	Protection rating (as per IEC-60721-3-3)	Classification of chemically active substances: 3C2 Classification of chemically active substances: 3S2
16	Grid Specifications	IEC 61727, VDE 0126
17	Nominal Voltage & Frequency	415 Volts, 3-phase & 50 Hz
18	Grid Voltage Tolerance	+ 15% and -10%
19	Communication protocol and interface	Modbus protocol over RS-485 interface

The inverters shall comply with applicable IEC/ equivalent BIS standard for environmental tests as per standard codes IEC 60068- 2 (1,2,14,30)/ Equivalent BIS Standard.

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

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

All inverters shall be compliant with IEEE standard 929-200 or equivalent. The Contractor shall select the inverter as per its own system design so as to optimize the power output.

Display: The inverter shall have local LCD (Liquid crystal display) and keypad for monitoring instantaneous parameters, event logs and data logs. Display should be simple and self-explanatory, and should indicate:

- (a) Instantaneous DC power input
- (b) DC input voltage
- (c) DC Current
- (d) Instantaneous active AC power output
- (e) Instantaneous reactive AC power output
- (f) AC voltage (all the 3 phases and line)
- (g) AC current (all the 3 phases and line)
- (h) kWh Produced during entire day
- (i) Total kWh produced during its life time
- (j) PCU must be provided with display

DC input terminals must be in enough numbers so as each terminal is connected to dedicated single input from the PV string. Two DC inputs cannot be connected to a single input DC terminal of the inverter. If adequate numbers of inputs are not available in the selected inverter by the Contractor then a DC junction box shall be incorporated into the design.

The inverter shall be tropicalized and design shall be compatible with conditions prevailing at site. Provision of exhaust fan with proper ducting for cooling of inverter's internal circuitry shall be incorporated in the inverter, keeping in mind the extreme climatic condition of the site.

The Contractor shall completely adhere to the installation guidelines of the inverter manufacturer including but not limited to protection from exposure to sun, rain and other weather condition.

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

(Grid Connectivity) CERC/ RERC regulations and grid code as amended and revised from time to time shall be complied with.

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

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

The inverter shall be capable of synchronizing with the grid in less than 1 (one) minute.

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

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

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

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

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

- (a) Ground fault monitoring
- (b) Gird monitoring
- (c) DC surge protection, Type II (if the inverter does not have integrated DC surge arrestors, then the surge arrestors shall be separately installed in the DC junction box on the positive and negative DC inputs)
- (d) DC reverse polarity
- (e) AC short-circuit capability
- (f) Over-voltage and over-current
- (g) Anti-islanding (as per IEEE 1547/UL 1741/ equivalent BIS standard)
- (h) Balancing of unequal phases
- (i) Negative earthing
- (j) Manual DC isolator

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

Inverter shall meet the reactive Power requirement of the induction motor pump set installed in Agriculture connections. Appropriate arrangements, if required, such as installing VFD mechanism can be considered for the same.

DC inputs of the inverters shall have suitably rated isolators on both positive and negative DC inputs to allow safe start up and shut down of the system. Circuit breakers used in the DC lines must be rated suitably.

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

The inverter shall have the facility of unit wise and integrated data logging.

The inverter shall be entirely self-managing and stable in operation. A self- diagnostic system check shall occur on start-up. Functions shall include a test of key parameters on start up.

The inverters shall be tested from the MNRE approved test centres/ NABL/BIS/IEC- accredited testing/ calibration laboratories.

Maximum power point tracker (MPPT) shall be integrated in the inverter to maximize energy drawn from the Solar PV array. The MPPT shall be microprocessor- based to minimize power losses. The MPPT unit shall conform to IEC 62093 for design qualification and efficiency of MPPT shall be greater than 99%.

Inverter shall be capable to convert the DC using its MPPT feature to produce AC power as per following:

- (a) The AC output voltage and frequency of the inverter must synchronize automatically to the exact AC voltage and frequency of the grid. Grid voltage shall be continuously monitored and in the event of voltage dip or rise above a pre-set value, the solar system shall be disconnected from the grid within the set time.

(b) In the case of inverters connected on different phases in the plant shall be capable of communicating with other and in the event of the fault even on a single phase all the inverters must be disconnected from the grid.

(c) Inverters shall have adjustable voltage setting and time settings. The output power factor shall be of suitable range to supply or sink reactive power.

The inverter shall have an RS-485 interface and support communication of its operational parameters and logs over Modbus protocol. The register mapping/ memory mapping of the inverter data shall be made available by the Contractor from the inverter supplier and the Contractor/ inverter supplier shall provide full support for integration of inverter's communication data with third- party software and hardware as directed by the CEL/Discom.

CEL/Discom or the TPIA reserves the right to inspect the inverters at the manufacturer's site prior to dispatch.

Note: In case of non-availability of power from grid, the pump should be able to run taking power from solar panels while avoiding any power supply to the grid (suitable arrangement is to be made by the contractor in this regard).

(a) SPV Controller

1. Maximum Power Point Tracker (MPPT) shall be included to optimally use the power available from the SPV array and maximize the water discharge.

2. The SPV Controller must have IP (65) protection or shall be housed in a cabinet having at least IP (65) protection.

3. Adequate protections shall be provided in the SPV Controller to protect the solar powered pump set against the following:

- a) Dry running;
- b) Open circuit;
- c) Accidental output short circuit;
- d) Under voltage;
- e) Reverse polarity;
- f) SPD to arrest high current surge; and
- g) Lightning arrestor.

4. A good reliable DC Circuit Breaker as per IS/IEC 60947-2 suitable for switching DC power ON and OFF shall be provided in the SPV Controller.

5. All cables used shall be as per IS 694. Suitable size of cable shall be used in sufficient length for inter-connection between the SPV array to SPV Controller and the SPV Controller to solar powered pump set. Selection of the cable shall be as per IS 14536.

6. Controller shall be integrated with GSM/GPRS Gateway with Geo tagging. GSM/ GPRS Charges to be included in the Costing till the end of Warranty period of the Pump set.

Module Mounting Structure

Specification of module mounting structure shall be in line with specifications for SPV water pumping systems of MNRE vide Circular No. F. No. 41/3/2018-SPV Division dated 17.7.2019 enclosed and any further amendment(s) issued by MNRE.

Supply, installation, erection and acceptance of module mounting structure (MMS) with all necessary accessories, auxiliaries and spare part shall be in the scope of the Contractor.

Design of the MMS shall take into consideration site conditions, soil report, loading data, wind data and design standards as per latest applicable IS standard.

The structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation and tilt, absorb and transfer the mechanical loads to the ground properly.

The Contractor shall be fully responsible for any damages caused by high wind velocity within guarantee period. The parameters of prevailing wind speed, soil conditions, load, and upward lift shall be taken care of while preparing the design and the same is required to be mentioned on design.

MMS shall be designed and positioned such that the PV modules are completely shadow-free solar during generation hours.

All solar panels shall be easily accessible for cleaning and the Agriculture Consumer shall not be inclined to climb on the MMS or PV modules for cleaning the PV modules.

Junction boxes shall be mounted on the MMS such that they are easily accessible and are protected from direct sunlight and harsh weather.

All the cables shall be aesthetically tied to module mounting structure.

Cutting, Welding, drilling etc. at site is not allowed for MMS. Contractor shall carry out all correction in structure (if required) at his works. If any cutting, welding, drilling is required to be done after material arrived at site then material shall be again sent for hot dip galvanization. No zinc spray shall be allowed on the MMS.

Contractor shall submit the all the quality test documents and test certificates complying with the requirement of the structure.

Contractor shall submit detailed drawings of the MMS and its civil foundations in line with MNRE specifications placed in Annexure L.3, results of design computations and stability calculations for foundations, and structural fitness of PV module mounting structures as per STADD Pro analysis.

DC Junction Box

The Contractor shall provide sufficient numbers of array junction boxes/ PV combiner boxes/ DC distribution boxes to comply with design requirements of the PV system.

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

The degree of protection for junction boxes shall be:

(a) Indoor Junction box: IP 21(Minimum)

(b) Outdoor Junction Box: IP 65 (Minimum)

Junction boxes including the module junction box, string junction box, shall be equipped with appropriate functionality, safety (including fuses, grounding, etc.), and protection (surge, etc.) if not provided on the DC-side of the inverter.

The terminals shall be connected to bus bar arrangement of proper sizes to be provided. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus bars for easy identification and cable ferrules will be fitted at the cable termination points for identification.

For array junction box/ PV combiner box, Contractor may also provide polyamide glands and MC4 Connectors. The rating of the junction box shall be suitable with adequate safety factor to interconnect the Solar PV array.

The junction boxes shall be dust, vermin, and waterproof and made of thermoplastic/ metallic in compliance with IEC 62208, which shall be sunlight/ UV- resistive as well as fire retardant and Protection Class II or higher.

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

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

Detailed junction box specifications, certifications and data sheet shall be provided by the Contractor for approval during project execution.

Discom or the TPIA reserves the right to inspect the junction box at the manufacturer's site prior to dispatch.

It is recommended that the interim, the cables of 1000 Volts DC for outdoor installations shall comply with the draft EN 50618 for service life expectancy of 25 years.

AC Distribution Board

The inverter output shall have the necessary rated AC surge arrestors and MCB/MCCB. MCB shall be used for currents up to 63 Amperes, and MCCB shall be used for currents greater than 63 Amperes. RCCB shall be used by the Agency if required for successful operation of the PV system.

AC Distribution Board (ACDB) shall house all the equipment described above.

All switches and the circuit breakers, connectors shall conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.

All the 415 VAC devices/ equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions:

- (a) Variation in supply voltage: +/- 15 %
- (b) Variation in supply frequency: +/- 3 Hz

Cables and Wires

All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions for 25 years and voltages as per latest IEC standards. (Note: IEC standards for DC cables for PV systems is under development, the cables of 1000 volts DC for outdoor installations shall comply with the draft EN 50618 for service life expectancy of 25 years.)

Wires with sufficient ampacity and parameters shall be designed and used so that average voltage-drop at full power from the PV modules to inverter shall not be more than 2% (including diode voltage drop). PV Modules shall be connected with USE-2/RHW-2 cables array to junction box conductors and junction box to photovoltaic disconnecter with the sunlight resistant insulation cable. Due consideration shall be made for the de-rating of the cables with respect to the laying pattern in buried trenches/ on cable trays, while sizing the cables. The Contractor shall provide voltage drop calculations in excel sheet during the design approvals.

All cables shall be supplied in the single largest length to restrict the straight- through joints to the minimum number. Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. All wires used on the LT side shall conform to IS and shall be of appropriate voltage grade. Only copper conductor wires of reputed make shall be used for DC connections, while copper or aluminium conductor wires may be used for AC connections.

Insulation shall be LT PVC Type-C conforming to the requirements given in Table-I of IS: 5831/1984 with latest amendments. The thickness of inner sheath shall be as given in Table-4 of IS:1554(Pt.-I)/1988. The outer sheath shall consist of type ST-2 PVC Compound conforming to the requirements of IS:5831/1984. The thickness and tolerance on thickness of insulation shall be as per Clause No.9.2 of IS:1554(Pt.-I)/1988.

Cable routing/ marking: All cable/ wires are to be suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified.

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