Government of Tamil Nadu

Rate Contract Tender Document for Selection of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off-Grid Standalone Solar Photovoltaic Water Pumping Systems (SPWPS) upto 15 hp capacities in Tamil Nadu, including complete system warranty and its repair and maintenance for 5 Years

RCT No. : AED/SC2/41113/2023 dated: 10.10.2023.

The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai, Nandanam,
Chennai-600 035,
Email : aedcewrm@gmail.com.

DISCLAIMER

I. Though adequate care has been taken while preparing the Rate Contract Tender (RCT) document, the bidder(s) shall satisfy themselves that the document is complete in all respect. Intimation regarding any discrepancy shall be given by the prospective bidders to the office immediately. If no intimation is received from any bidder within **20 (Twenty) days from the date of issuance of RCT documents,** it shall be considered that the document is complete in all respect and has been received/ acknowledged by the bidder(s).

II. Agricultural Engineering Department (AED) reserves the right to modify, amend or supplement this document.

III. This RCT document has been prepared in good faith, and on best endeavor basis. Neither AED nor their employees or advisors make any representation or warranty, express or implied, or accept any responsibility or liability, whatsoever, in respect of any statements or omissions herein, or the accuracy, completeness or reliability of information, and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of this document, even if any loss or damage is caused by any act or omission on their part.

IV. In case of any discrepancy in the documents uploaded on the websites of AED and e-procurement portal, the documents uploaded on the e-procurement portal will prevail.

Place: Chennai Date: 10.10.2023

Abbreviations in the RCT document

Sl. No.	Acronym	Abbreviations
1	AC	Alternate Current
2	AED	Agricultural Engineering Department
3	ALMM	Approved List of Models and Manufacturers
4	AoA	Articles of Association
5	BIS	Bureau of Indian Standards
6	CEA	Central Electricity Authority
7	CFA	Central Financial Assistance
8	CMC	Comprehensive Maintenance Contract
9	DC	Direct Current
10	DIC	District Industries Centre
11	DISCOM	Distribution Companies
12	EMD	Earnest Money Deposit
13	EPC	Engineering, Procurement and Construction
14	FY	Financial Year
15	GCC	General Conditions of Contract
16	GFR	General Financial Rule
17	GoI	Government of India
18	GST	Goods and Service Tax
19	IFB	Invitation for Bids
20	INR	Indian Rupee
21	kW	Kilo Watt
22	LLP	Limited Liability Partnership
23	LoA	Letter of Award
24	MAAT	Minimum Average Annual Turnover
25	MNRE	Ministry of New and Renewable Energy
26	MoA	Memorandum of Association
27	MOU	Memorandum of Understanding
28	MPPT	Maximum Power Point Tracker
29	MSE	Micro Small Enterprise
30	MSME	Micro, Small and Medium Enterprise
31	MW	Mega Watt
32	NOC	No Objection Certificate
33	NSIC	National Small Industries Corporation
34	NTP	Notice To Proceed
35	O&M	Operation and Maintenance
36	OM	Office Memorandum
37	PAN	Permanent Account Number
38	PBG	Performance Bank Guarantee
39	PDI	Pre Despatch Inspection
40	PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan
41	PSU	Public Sector Unit
42	PV	Photo Voltaic
43	QR	Qualification Requirement
44	RBI	Reserve bank of India
45	RCT	Rate Contract Tender
46	RMS	Remote Monitoring System

Sl. No.	Acronym	Abbreviations
47	SCC	Special Conditions of Contract
48	SEDM	Solar Energy Data Management
49	SI	System Integrator
50	SNA	State Nodal Agency
51	SPWPS	Solar Photovoltaic Water Pumping System
52	TANGEDCO	Tamil Nadu Generation and Distribution Corporation
53	USPC	Universal Solar Pump Controller
54	VFD	Variable Frequency Drive

Index

BID INFORMATION SHEET

The brief details of the RCT are as under:

(A)	**NAME OF WORK/BRIEF SCOPE OFWORK/ JOB**	Selection of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off Grid Standalone Solar Photovoltaic Water Pumping Systems (SPWPS) of up to 15 hp capacities in Tamil Nadu, including complete system warranty and its repair and maintenance for 5 Years (with State funds and assistance under Component-B of Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM-KUSUM) scheme of Ministry of New and Renewable Energy(MNRE), Government of India.
(B)	**RCT NO. & DATE**	RCT No. AED/SC2 /41113/2023 Dated : 10.10.2023
(C)	**TYPE OF BIDDING SYSTEM**	TWO BID SYSTEM
(D)	**TYPE OF RCT/ TENDER**	E-TENDER
(E)	**COMPLETION/ CONTRACT PERIOD**	As mentioned in RCT Document
(F)	**EARNEST MONEY DEPOSIT (EMD)**	Amount: As per clause 12 of section 3 of this RCT to be submitted through online.
(G)	**PERFORMANCE BANK GUARANTEE**	Amount: As per clause 13 of section 3 of this RCT to be submitted by the selected bidders
(H)	**DATE, TIME & VENUE OF PRE-BIDMEETING**	26.10.2023, 11.30 AM Agricultural Engineering Department (A Government Department of Tamil Nadu) No.487, Anna Salai, Nandanam, Chennai-600035. Scheduled as website. https:// www.aed.tn.gov.in

(I)	**ONLINE BID-SUBMISSION DEADLINE**	14.11.2023, 3.00 PM
(J)	**TECHNO-COMMERCIAL BID OPENING**	15.11.2023, 3.00 PM
(K)	**DETAILS OF e-PROCUREMENT PORTAL**	https://tntenders.gov.in
(L)	**DESIGNATION, ADDRESS AND OTHER DETAILS**	The Chief Engineer (AE), Agricultural Engineering Department, No.487, Anna Salai, Nandanam, Chennai-600035. Email : aedcewrm@gmail.com and aedcesolar@gmail.com
(M)	**DETAILS OF PERSONS TO BE CONTACTED INCASE OF ANY ASSISTANCE REQUIRED**	Er. R. Selvi, Assistant Executive Engineer (AE) i/c, Ph : +91 9443778124 Er.R. Dhanalakshmi, Assistant Engineer (AE), Ph : +91 9791165517 Er. S. Aravindhn, Assistant Engineer (AE), Ph : +91 9655045045

- RCT documents are invited as per the provisions in Tamil Nadu Transparency in Tender Act, 1998 and Tamil Nadu Transparency in Tender Rules 2000 and amendments thereon.
- Bids must be submitted strictly in accordance with Section-2 and 3 of the RCT, depending upon Type of Tender as mentioned at Clause no. (D) of Bid Information Sheet.
- Bidders are required to quote strictly as per terms and conditions of the RCT documents and not to stipulate any deviations/ exceptions.
- Any bidder, who meets the Qualifying Requirement and wishes to quote against this RCT, may download the complete RCT document along with its amendment(s) and clarifications if any, from https://tntenders.gov.in portal and submit their Bid complete in all respect as per terms & conditions of RCT Document on or before the due date of bid submission.

- Clarification(s)/ Corrigendum(s) if any shall also be available on the https://tntenders.gov.in.
- Bidders are requested to remain updated for any notices/ amendments/ clarifications etc., to the RCT document through the websites https://tntenders.gov.in. No separate notifications will be issued for such notices/ amendments/ clarifications etc., in the print media or individually. Intimation regarding notification on the above shall be updated and the details only will be available from https://tntenders.gov.in.

SECTION 1

INTRODUCTION & INVITATION FOR BIDS (IFB)

1. Background & Introduction

1.1. Agricultural Engineering Department (hereinafter called "AED") is a Department of Government of Tamil Nadu under the administrative control of the Agriculture – Farmers Welfare Department, Government of Tamil Nadu. From the year 2013-14, 8013 nos. of Solar Powered Pumpsets have been installed till August 2023 with subsidy assistance to the farmers by Agricultural Engineering Department in Tamil Nadu. AED has been designated as the State Implementing Agency by MNRE, GoI for implementation of the scheme in Tamil Nadu under the component-B of PM-KUSUM and so far, 3,187 nos. of Standalone Solar Powered Pumpsets have been installed with subsidy 70% assistance (30 % MNRE, CFA and 40 % State Share) to the farmers under component-B of PM-KUSUM scheme.

1.2. Besides, developing decentralized renewable power, it is planned to replace Agriculture Diesel pumpsets with Solar Water pumpsets. At present, nearly 2.79 Lakh agricultural pumpsets are diesel based in the State. Hence there is a need to provide energy to these pumpsets through solar energy.

1.3. In Tamil Nadu, over 25.62 Lakhs of electric agriculture pumpsets are available in the State. Agriculture accounts for 20% of electricity consumed in the state. There are about 4.5 lakhs applications pending with State DISCOM (viz., Tamil Nadu Generation and Distribution Corporation (TANGEDCO) for free power connections for agricultural pumpsets. By way of providing Off-Grid Standalone Solar Photovoltaic Pumping Systems, to the farmers who are waiting for free power connections, the dependency of the farmers on conventional energy is reduced and the burden to State DISCOM (TANGEDCO) for free agricultural connections is also reduced. At the same time environmental pollution is also reduced.

1.4. AED shall be the bidding agency for selection of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off-Grid Standalone Solar Photovoltaic Water Pumping Systems (SPWPS) upto 15 hp capacities in Tamil Nadu, including complete system warranty and its repair and maintenance for 5 Years under the scheme to be implemented with State funds alone / and with assistance under Component-B of PM-KUSUM scheme of MNRE, GoI. Details regarding the selection process are contained in Section-8 of the RCT.

1.5. The Bidders will be free to avail fiscal incentives like Accelerated Depreciation, Concessional Customs and Excise Duties, Tax Holidays etc., as available for such Projects. The same will not have any bearing on comparison of bids for selection. As equal opportunity is being provided to all Bidders at the time of tendering itself, it is up to the Bidders to avail various tax and other benefits. No claim shall arise on AED for any liability if Bidders are not able to avail fiscal incentives and this will not have any bearing on the Off-Grid Standalone Solar Powered Pumpsets. AED does not however, give a representation on the availability of fiscal incentive and submission of bid by the Bidder shall be independent of such availability or non-availability as the case may be of the fiscal incentives.

1.6. Solar PV capacity in kW for the pump capacity in hp will be allowed as per MNRE specifications under the scheme. **It will be mandatory to use indigenously manufactured solar panels with indigenous solar cells and modules.** In addition to the bids for Solar Photovoltaic Water Pumping System (SPWPS) with indigenously manufactured solar cells, interested bidders can also submit their bids for SPWPS with non-indigenous solar cells as per the format attached (Item wise BoQ). However, work for SPWPS with non-indigenous solar cells would be awarded only if the Government approves use of non-indigenous solar cells under Component-B of the PM- KUSUM Scheme. Further, for the purpose of price estimation under both the categories mentioned above, all other components including solar modules shall be considered as indigenous and in compliance to the provisions of the PM-KUSUM Guidelines and Approved List of Models and Manufacturers (ALMM) Guidelines of MNRE, Government of India as amended from time to time and other applicable documents/ orders issued by the Government in this regard. Further, the motor pumpsets, controller and balance of system (Variable Frequency Drive (VFD) including Maximum Power Point Tracking (MPPT) & Protections, Cables, Switches or Circuit Breakers or Connectors, Junction Boxes or Enclosures of Electronics, suction and delivery pipes, other accessories) shall be manufactured indigenously. The vendor has to declare the list of imported components used in the manufacturing of solar water pumping system.

1.7. The solar pumpsets with capacity of 3, 5, 7.5, 10, 12.5 and 15 hp of AC/DC are to be provided under the programme to the farmers for bore wells, open wells and surface storage structures.

1.8. Individual farmers will be supported to install standalone solar Agriculture pumpsets of capacity up to 7.5 hp for replacement of existing diesel Agriculture pumpsets / irrigation systems in off-grid areas, where grid supply is not available. Installation of new pumpsets shall also be permitted under this scheme except in dark zone areas. Pumpsets of capacity higher than 7.5 hp may be allowed, however, the State subsidy and MNRE subsidy will be limited to the CFA applicable for pump of 7.5 hp. Water User Associations and community based irrigation system will also be covered under this component. In order to minimize the water usage for irrigation purpose, preference will be given to the farmers using Micro irrigation systems or covered under Micro irrigation schemes or who opt for micro irrigation system. The size of pump would be selected based on water table in the area, land covered, and quantity of water required for irrigation. For solar pumpsets to be set up and used by Water User Associations/ Farmer Producer Organizations/Primary Agricultural Co-operative Credit Societies or for State based irrigation system, the State subsidy and MNRE, CFA will be allowed for solar pump capacity of higher than 7.5 hp.

1.9. MNRE, Government of India, Central Finance Assistance (CFA) under the scheme, for subsidy assistance to the farmers, 30% of the benchmark cost or the tender cost whichever is lower will be provided as MNRE, CFA under Component-B of PM-KUSUM scheme. State subsidy will be restricted to that of 7.5 hp pumpsets for higher hp pumpsets. For component-B, MNRE Central Finance Assistance (CFA) of 30% of the benchmark cost or the tender cost whichever is lower will be provided and State share of subsidy of 40% of the benchmark cost or the tender cost whichever is lower will be provided to the small, marginal and SC/ST category farmers. For the other category farmers, the State share of subsidy will be 30% of the benchmark cost or the tender cost whichever is lower will be provided. Moreover incase of submersible pumpsets, for oil filled pumpsets, subsidy assistance will be restricted to that same hp of water filled pumpsets. In all the above cases, the non-subsidy amount shall be borne by the farmers.

1.10. In addition to the above, for the cluster based irrigation system under the villages covered in Kalaignarin All Villages Integrated Agriculture Development Programme, higher capacity solar pumpsets are allowed wherever feasible. The total cost of the installation of SPWPS in community borewells for cluster based irrigation will be borne by the Government.

1.11. Under the scheme priority will be given to the individual farmers in villages selected for Kalaignarin All Villages Integrated Agriculture Development Programme.

2. Invitation for Bids

2.1. A Single Stage, Two-Envelope Bidding Procedure will be adopted and will proceed as detailed in the RCT Documents. Bidding will be conducted through the competitive bidding procedures following Tamil Nadu Transparency in Tender Act 1998 and Tamil Nadu Transparency in Tender Rule 2000 and amendments thereon and as per the provisions of Sections 2 and 3 of the RCT.

2.2. Interested bidders have to necessarily register themselves on the e-procurement system of Tamil Nadu portal (https://tntenders.gov.in) to participate in the bidding under this invitation for bids. It shall be the sole responsibility of the interested bidders to get themselves registered at the aforesaid portal to complete the registration formalities.

2.3. They may obtain further information regarding this Invitation For Bids (IFB) from the registered office of AED at the address given on the Bid Information Sheet from 10:00 hours to 17:45 hours on all working days.

2.4. For proper uploading of the bids on the e-procurement portal, it shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed in the portal as and when required, for which contact details are also mentioned on the Bid Information Sheet. AED in no case shall be responsible for any issues related to timely or properly uploading/ submission of the bid in accordance with the relevant provisions of the Bidding Documents.

2.5. Bidders should submit their bid proposal complete in all aspects on or before last date and time of Bid Submission as mentioned on e-procurement Portal (https://tntenders.gov.in), and as indicated in the Bid Information Sheet.

2.6. RCT documents which include Eligibility Criteria, Technical Specifications, various Conditions of Contract and Formats etc., can be downloaded from the e-Procurement Portal. It is mandatory to download official copy of the RCT Document from e-procurement Portal to participate in the Tender.

2.7. Any amendment(s)/ corrigendum(s)/clarification(s) with respect to this RCT shall be uploaded on e-procurement Portal. The Bidder should regularly check for any Amendment(s) / Corrigendum(s) / Clarification(s) on the above mentioned e-procurement website. The same may also be uploaded on AED website also. However, in case of any discrepancy, the information available on e-procurement website shall prevail.

2.8. AED reserves the right to cancel / withdraw/ defer this invitation for bids without assigning any reason and shall bear no liability whatsoever consequent upon such a decision.

2.9. INTERPRETATIONS

- Words comprising the singular shall include the plural and vice versa.
- An applicable law shall be construed as reference to such applicable law including its amendments or re-enactments from time to time.
- A time of day shall save as otherwise provided in any agreement or document be construed as a reference to Indian Standard Time.
- Different parts of this contract are to be taken as mutually explanatory and supplementary to each other and if there is any differentiation between or among the parts of this contract, they shall be interpreted in a harmonious manner so as to give effect to each part.

The table of contents and any headings or sub headings in the contract has been inserted for case of reference only and shall not affect the interpretation of this agreement.

SECTION 2
SPECIAL CONDITIONS OF CONTRACT

3. Scope of Work

Under this RCT, the selected vendors shall be required to Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of stand-alone off Grid Solar Photovoltaic Water Pumping Systems (SPWPS) of upto 15 hp capacity in Tamil Nadu, including complete system warranty and its repair and maintenance including insurance coverage of installed systems against natural calamities and theft for 5 Years with State funds and with MNRE, GoI, assistance under Component-'B' of PM-KUSUM scheme. As per MNRE specifications and applicable BIS standards, bidder shall follow all provisions of the Scheme Guidelines as amended from time to time.

3.1. **Supply and manufacture**

a. The Selected vendor shall be responsible for design, supply, installation and commissioning of SPWPS along with 5 years of repair and maintenance. To ensure timely maintenance of SPWPS, apart from training a local person and making available necessary spare parts and tools in each district, to ensure timely maintenance of the systems the vendor shall have one authorized service center in each operational district and a helpline in English / Tamil language. Helpline number shall be indicated on the pump/ controller at suitable location easily visible to the user.

b. Each pumping system should be marked with Toll Free No. of the installer (Toll Free No. shall be affix on controllers and shall be readable for 5 years) operating in English and Tamil language and specific pump number and same must have been captured by AED's web-based application (as per instruction of AED) at the time of installation at site. During the time of Pre Despatch Inspection (PDI), test report of ordered solar pumping system's test report, warranty certificates and structure certificate as specified in the guidelines and specification issued by MNRE should be provided by the bidder.

c. On getting the consent from the beneficiaries in their favour, the empanelled companies shall conduct site survey either on their own or with AED officials to decide the suitability of irrigation source for operation of solar pumpsets of the required capacity and model. The techno feasibility report shall be signed by the Assistant Engineer (AE) / Junior Engineer (AE) of AED, Farmer and the representative of the company. After ascertaining

of techno feasibility survey, the prospective farmer would be informed to furnish their contribution amount in favour of the selected company to Agricultural Engineering Department.

d. On receipt of farmer's contribution, the work orders / Notice To Proceed (NTP) to be issued by the sub-divisional level Assistant Executive Engineer (AE) of AED to the concerned company, to execute the work in the farmers field. The solar pump installations shall be installed to the farmers as per the technical specifications mentioned in the contract **within 45 days from the date of issue of work orders** and as per PM-KUSUM guidelines by the empanelled company in close supervision of the AED officials.

e. Test reports can be submitted with the bids. However, the bidders can also submit a self-certificate with the bids in lieu of test reports affirming that the test certificates for all the models for which the bids are submitted will be provided by the bidder before signing of agreement with the AED, failing which the bidder will be liable for penalties including encashment of EMD and/ or blacklisting.

3.2. Installation and Commissioning

a) Installation and commissioning of SPWPS shall be done by the vendor as per the details provided by the AED. The vendors shall co-ordinate with AED for repair and maintenance of SPWPS for 5 years.

b) Selected vendors have to submit the consent of beneficiaries in their favor to AED for which AED will issue work order / Notice to Proceed (NTP) and for this, vendor shall complete the installation and commissioning of SPWPS within 45 days from date of issuance of Work order/ NTP.

c) The Work order/NTP will be issued from time to time by the sub divisional officers of AED at various districts.

d) The SPWPS shall be installed to the farmers as per the technical specifications mentioned in the contract and as specified by Bureau of Indian Standards (BIS) and MNRE from time to time within 45 days from the date of issue of work orders/NTP and as per PM-KUSUM guidelines by the empanelled company in close supervision of the AED officials. The ground work for installation of the system shall be commenced by the empanelled company within 15 days from the date of issue of work order. However, the entire work for the total quantity for which work orders/NTP are issued to the company is to be completed within the period of State / MNRE sanction validity.

e) The submersible pumpset of the SPWPS shall be erected at appropriate depth in the bore well / tube well taking in to consideration of the drawdown and water table that may prevail during summer season and depending on the operating head range of the selected model of the pumpset (for which the test certificate has been furnished). It shall be the responsibility of the bidders to provide the required length of the delivery pipe and cable for this SPWPS to be installed at the appropriate depth.

f) The installation data should be punched in the web application platform as mentioned by AED as per the terms and conditions provided by MNRE, GoI.

g) Action plan should be submitted to AED by the vendor including complete details of team, resources, and service centers in each district within 30 days of acceptance of LoA from AED, failing of which, AED have the right to levy penalty to the vendor.

h) Vendors will have to submit installation reports as per given format on weekly basis and Monthly basis to MNRE and AED.

i) Vendor will have to submit the completion reports of installations to AED within one week from 100% completion of work.

j) Selected Vendor shall submit monthly and weekly progress reports to AED. Vendor shall comply with all applicable regulatory and statutory norms. Vendor must obtain approval/ NOC from appropriate Govt. body for implementing the project in each selected village, if it is required.

k) Selected vendor should have finalized suppliers for all materials such as PV Modules, Structure, Pumpsets, Controllers, etc., within 30 days from date of award of contract and unpriced copy of such award letter/ Purchase order shall be submitted to AED as and when called for by AED.

l) Vendor should commission minimum pumpsets per quarter as defined above at Clause 3.2 (b) and 3.2 (d) of Scope of work. Vendor must submit handing over certificates in the format prescribed by MNRE/AED.

m) Each SPWPS is to be provided with the required details as mentioned in the specification and guidelines of the PM-KUSUM scheme.

n) Vendor should submit the prescribed certificate and geo coded photographs of each SPWPS installed which must show complete installation setup along with beneficiary. Also the details shall be fetched to the online portal as directed by AED. These reports can be

also submitted through email/web- portal/mobile application.

o) The selected vendors shall take all necessary permits, approvals and licenses, insurance etc., provide training and such other items and services required to complete the scope of work mentioned above.

p) Time Schedule includes the time required for mobilization as well as testing, rectifications if any, retesting and completion in all respects to the entire satisfaction of Engineer-In Charge designated by AED.

3.3. Technical Requirement and Testing

a. SPWPS installed under this programme should meet technical specification and construction standards as specified by BIS and MNRE from time to time as given in Annexure-A.

b. Only indigenously manufactured solar panels with indigenous solar cells and modules shall be used under the scheme. Further, the motor pumpsets, controller and balance of system should also be manufactured indigenously.

c. In case of any ambiguity in interpretation of any of the provisions of PM-KUSUM Guidelines, the decision of the AED and MNRE shall be final.

d. Systems installed under this programme should follow OM-F.No.283/22/2019- GRID SOLAR of MNRE, Govt. of India Dated: 09.02.2021.

3.4. Operation and Maintenance (O&M), Training, Awareness and Sensitization

a. Selected Vendor should keep necessary spare parts (minimum 2% of allotted quantity of each component of the complete system at the service center) in each district and should ensure proper maintenance of SPWPS to 5 years from date of installation of each SPWPS. Vendor should also ensure to provide local training to local persons regarding proper maintenance of SPWPS. Vendor should submit bi-weekly installation report to AED as per the prescribed format provided during the installation Phase. Reports can be also submitted through e-mail and the format will be provided by AED at the time of the issuance of the Notice to Proceed/Work Order.

b. Any complaint registered / service calls received should be attended at the earliest and the system should be repaired/restored/replaced within 7 days from date of complaint received/informed to the vendor.

c. MNRE officials, AED or its designated agency may inspect the systems during the installation or operational phase. In case the installed systems are not as per the standards, found non-functional on account of poor quality of installation or maintenance or not in-compliance with the guidelines and specification and tender terms and conditions, AED reserves the right to encash the Performance Bank Guarantee (PBG) and/or blacklist the vendor for the period 5 years.

d. If any selected vendor, after getting empanelled does not go forward with acceptance of Letter of Award (LoA), signing of agreement with AED and execution of work after the issuance of NTP/Work order, apart from encashment of EMD or PBG, vendor will be blacklisted for 5 years period from the date of issuance of such notice of blacklisting by the AED.

e. Vendor must submit an Operation and Maintenance manual (O&M) in both English and Tamil language which should be provided with each SPWPS to the beneficiary. The following minimum details must be provided in the manual: -

I. Basic principles of PV pumping system

II. A small write-up (with a block diagram) on SPWPS- its components, PV module,electronics and expected performance

III. A simple single line diagram (SLD) depicting the electrical circuits and control mechanism

IV. Type, model, voltage, number of stages and capacity of the motor pumpset used in the system

V. The make, model and country of origin of each component

VI. Significance of indicators provided in the control panel.

VII. Clear instruction on regular maintenance and trouble shooting of the SPWPS

VIII. Preventive maintenance schedule

IX. Detailed information about warranty coverage

X. Do’s and Don’ts

XI. Name and address of the contact person for repair and maintenance in case of non-functionality.

XII. Description of frequent faults of PV module, pump controller and pumpsets and its remedies

XIII. Minimum 10 hard copies in booklet form to be kept at each service center also to be provided to AED as and when required.

f. Vendors will mandatorily provide Comprehensive Maintenance Contract (CMC) for a period of 5 years from the date of commissioning of the systems including insurance coverage for the installed systems against natural calamities and theft. CMC will include inspection by Vendor at least once in a quarter and submission of quarterly inspection report of the installed pumpsets as per prescribed format. Selected Vendor shall provide a copy of valid insurance certificate of SPWPS to the beneficiary and same shall be renewed every year for CMC period of 5 years.

g. The O&M cost including insurance coverage for 5 years should be inbuilt with system cost.

h. Vendors have to provide the Remote Monitoring System (RMS) with all the SPWPS installed under the scheme. Further, vendor has to maintain the RMS in working condition for the period of 5 years and RMS systems shall push the accurate data of the parameters as specified in the specification and guidelines of the scheme failing which the installation of the system will not be accepted by AED.

i. Vendor shall ensure that the local training, awareness and sensitization campaigns on usage of the SPWPS are conducted.

4. Selection of Beneficiary

The implementation of Scheme is on market mode and demand based. No allocation of specific quantity to a bidder by AED. The scheme will be implemented on farmer's choice. The farmer is free to choose any of the empanelled vendor. However, the following shall be ensured before inclusion of a beneficiary under the Scheme:

1. Beneficiary should not have an electricity connection at the field.
2. The Selected beneficiary shall not have received any similar benefit from the State or the Central Government.
3. Preference shall be given to the farmers using Micro irrigation systems or covered under Micro irrigation schemes or who opt for micro irrigation system.
4. The beneficiary for the programme shall be a farmer who owns farm land, with reliable irrigation source viz. bore well /open well / surface storage tank without electricity connection alone shall be considered for provision of Standalone solar pumpsets under the programme.
5. New Solar Agricultural Pumpsets would not be covered under this component in Dark zones / black zones. However, existing standalone diesel pumpsets can be converted

into standalone solar pumpsets in these areas provided they use micro irrigation techniques to save water.

6. The prospective farmer will furnish application in format along with relevant land documents for proof of ownership of land and irrigation source with relevant photo identification.
7. The farmer availing the Standalone Solar Pumpsets and is an applicant of State DISCOM viz., Tamil Nadu Generation and Distribution Corporation (TANGEDGO), then he/she may be allowed to be retained in the seniority list after getting an undertaking that when his/her turn for free power connection comes under **Normal** priority, the solar pumpsets will be connected to Grid by the farmer.
8. Registration of application for free power connection with TANGEDCO is not required for availing subsidy for Standalone Solar Pumpsets under the scheme.
9. The farmer availing the Standalone Solar pumpsets under the scheme shall connect the solar pumpsets system with the micro irrigation system. An undertaking shall also be furnished with application in this regard.
10. The drawl and transportation of ground water for agricultural and horticultural purposes in the Tamil Nadu State is not allowed within 50 metre from unlined canal and 200 metre from river bed and water bodies. No objection certificate from the appropriate authority of Water Resources Department is required if the drawl and transportation of ground water is lesser than the said limit. The farmer installing the Standalone solar pumpsets within the above said limit, the farmer shall furnish the No objection certificate with the application.

5. Total capacity and types of Pumpsets allowed

The indicative cumulative quantities envisaged under this tender for Standalone Solar Pumpsets is around **2000 SPWPS (which may be phased out for 2 years period 2023-24 and 2024-25)**. The following category of solar powered pumpsets is planned for empanelment under the RCT under the programme:

Pump Capacity	Pump Type	Pump Position	Pump Cooling Category (Select whichever quoted for)	Controller Type
3	AC	Surface	-	Normal (Without USPC)
	DC	Surface	-	Normal (Without USPC)

Pump Capacity	Pump Type	Pump Position	Pump Cooling Category (Select whichever quoted for)	Controller Type
5	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	AC	Surface	-	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Surface	-	Normal (Without USPC)
7.5	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	AC	Surface	-	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Surface	-	Normal (Without USPC)
10	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
12.5	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
15	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)

USPC - Universal Solar Pump Controller

6. Maximum Eligibility for Contracted Capacity Allocation for a Bidder

Following conditions shall be applicable to the Bidders for submission of bids against this RCT:

A Bidder, including its Parent, Affiliate or Ultimate Parent or any Group Company shall submit a single bid offering rates in Tamil Nadu. The evaluation of bids shall be carried out as described in Section-5 of the RCT. The methodology for Allocation of SPWPS is elaborated in Section-5 of the RCT.

7. SPWPS Locations

This scheme proposes to install Off-Grid Standalone Solar Photovoltaic Water Pumping Systems for irrigation in the individual farmers fields/cluster borewells throughout the State.

8. Performance Monitoring

Selected Vendor must ensure working of minimum of 95% of total installed SPWPS at any point of time. Remote monitoring system shall be installed as integrated with the SPWPS controllers rather than having as a separate unit through an integral arrangement and it should be capable of providing accurate live status/parameters on State portal maintained by AED and on central portal maintained by MNRE. Detailed requirements of Remote Monitoring System (RMS) along with minimum performance requirements are brought out as per Annexure-A.

9. Commissioning of Projects

- Selected vendors must submit consent of beneficiaries in their favors to AED for which AED will give Notice To Proceed / Work Order and for this selected vendor shall complete the installation and commissioning of allocated SPWPS within 45 days from issuance of notice to proceed/Work orders in the State.

- Commissioning of the SPWPS shall be carried out by the vendor in line with the detailed procedure as per ***clause 3.2 of section 2*** of this RCT. AED will authorize any individual or committee or organization to witness and validate the installation/commissioning on site(s). Commissioning certificates shall be issued by the AED officials after successful commissioning of allotted SPWPS in the State. MNRE ***authorized representative shall also be allowed for the inspection/ commissioning if required.***

SECTION 3
STANDARD CONDITIONS OF CONTRACT

10. Obtaining RCT Documents

Interested bidders must download the official copy of RCT and other documents after login into the e-procurement portal by using the Login ID and Password provided by the portal during registration. The bidder shall be eligible to submit/upload the bid document only after logging into e-procurement portal and downloading the official copy of RCT. The Bidding documents are available at free of cost.

11. Scope of Work and Other Conditions of the Contract

Refer Clause 3 of the RCT.

12. Earnest MoneyDeposit (EMD)

- Bidder shall submit Earnest Money Deposit (EMD) of 2 % of amount equivalent to the 6 % of the value of total allocation (2000 nos.) as in Section 4 of Qualification Requirement for Bidders in 40.1.s. **Bidders have to submit EMD through online** in the e-procurement portal and valid for 12 months from the last date of bid submission along with their bid, failing which the bid shall be summarily rejected. EMD validity to be extended by another 15 months prior to 15 days to expiry. In case of failure, it may lead to encashment of EMD and blacklisting of Firm/Members for period of 5 years from the date of issue of notice of blacklisting.

- The EMD shall be valid as per the timelines stipulated above. However, shortfall in the EMD validity, if any, up to a period of seven (7) days shall be acceptable. Further, an additional shortfall only in the following cases shall be acceptable: If the Bidder has submitted the EMD with validity as per original bid submission date or as per any revised submission date and if the deadline for submission of bids has been extended further, the Bid Guarantee shall be acceptable provided, the EMD is valid for more than two months from the actual date of bid submission and the Bidder submits the EMD extension for the requisite period within seven days from the date of actual bidsubmission, if required.

- All MSMEs (Micro, Small and Medium Enterprises) notified as per clause 1.10.3 of General Financial Rule (GFR) 2017 and as registered under NSIC / DIC/Udyog Aadhaar are only exempted from submission of EMD. For claiming this exemption, at the time of bid submission, MSMEs must provide valid proof of their being registered as MSME. However, upon empanelment under this RCT, selected MSMEs must submit Performance

Bank Guarantee.

12.1. Forfeiture of EMD

The EMD shall be encashed by AED in following cases:

a. If the Bidder withdraws or varies the bid after due date and time of bid submission and during the validity of bid.

b. In case, the AED issues LoA to the Selected Vendor and if the Selected Vendor does not submit the Performance Bank Guarantee within the stipulated time period (i.e. 15 days from issuance of LoA).

c. If after empanelment of vendors or after issuance of LoA by AED, it is found that the documents furnished by the Bidder as part of response to RCT are misleading or misrepresented in any way.

13. Performance Bank Guarantee

a. Bidders selected by AED based on this RCT shall submit, a Performance Bank Guarantee for a value @ 3% of the amount equivalent to 6 % of the value of the total allocation (2000 nos.) of SPWPS as in Section 4 of Qualification Requirement for Bidders in 40.1.s.

b. It may be noted that Successful Bidders shall submit the Performance Bank Guarantee according to the Format 7.3 with a validity period up to (& including) the date as on 24 months from placement of award by AED. Validity of PBG shall be extended by the vendor for every year for the first five year. Further, AED reserves the right to encash the existing PBG, in case the vendors don't renew/extend the existing PBG atleast 30 days in advance.

c. PBG(s) shall be submitted by selected vendors to AED within 15 days from issuance of Letter of Award (LoA) / Empanelment.

d. The Successful Bidder/Selected Vendor shall furnish the PBG from any of the Scheduled Commercial Banks as listed on the website of Reserve Bank of India (RBI) and amended as on the date of issuance of bank guarantee. Bank Guarantee issued by foreign branch of a Scheduled Commercial Bank is to be endorsed by the Indian branch of the same bank or State Bank of India (SBI).

e. The Bank Guarantees must be executed on non-judicial stamp paper of appropriate value as per Stamp Act relevant to the place of execution.

f. All expenditure towards execution of Bank Guarantees such as stamp duty etc., shall be

borne by the Bidders.

14. Notice to Proceed/ Completion Time

Selected vendors should ensure the completion of work as per Letter of Award (LoA)/ Notice To Proceed (NTP), tender terms and conditions, specifications, and guidelines of the scheme.

1. Successful vendor shall submit the unpriced purchase order copies of solar pumpsets, controllers and solar PV modules to AED for which NTPs issued for the systems to be installed as and when called for by AED within 15 days (Not applicable in case vendor itself is manufacturing all the items). In case unpriced purchase order copies are not submitted within 15 days to AED, as and when called for by AED, AED reserves the right to cancel the contract and award the same quantity to another empanelled vendor.

2. The SPWPS shall be installed to the farmers as per the technical specifications mentioned in the contract and as specified by BIS and MNRE from time to time within 45 days from the date of issue of work orders/NTP and as per PM-KUSUM guidelines by the empanelled company in close supervision of the AED officials. The ground work for installation of the system shall be commenced by the empanelled company within 15 days from the date of issue of work order. However, the entire work for the total quantity for which work orders/NTP are issued to the company is to be completed within the period of State / MNRE sanction validity.

3. In order to achieve the target, suitable numbers of team must be deployed on the field by the selected vendor.

4. Notwithstanding the transfer of ownership of the plant and equipment the responsibility of care and custody thereof together with the risk of loss or damage there to shall remain with the Vendor pursuant to General Conditions of Contract (GCC) hereof until completion of facilities or the part thereof in which such plant and equipment are incorporated.

15. Payment Terms

Stage-1: 90 % of the value of SPWPS installed at site based on: -

1. Submission of evidence in hard copy regarding completion of installation of SPWPS in good condition at site duly verified and acknowledged by AED and Beneficiary.

2. All the relevant warranty and quality (Performance Test Reports) of the lot to be submitted.

3. Submission of Original Supply invoices/bills duly verified by the AED.
4. Submission of software generated installation reports as per prescribed format by AED which shall include following but not limited to consumer details, site survey details, asset inspection and mapping details, Remote monitoring system parameters etc.
5. Proof of distribution of Operation and Maintenance Manual to beneficiary printed in both English and Tamil language.
6. Copy of insurance policy for the installed system handed over to the beneficiary.
7. Submission of handing over certificates of SPWPS in the format as suggested by AED.
8. Performance report for one week after commissioning based on the accurate data of the parameters received from RMS or data logger in case of internet unavailability.
9. An Undertaking with respect to withstand ability of SPWPS to the wind speed of 150 km/hr in all weather conditions.

Stage-II: Balance 10% on completion of one month from date of completion certificate

1. Payment will be made to vendor within 30 days after submission of three copies of invoices to Engineer-in charge, complete in all respect (showing description, quantity, unit rate and total number of systems). However, this is subject to the availability of the accurate performance data/parameter of SPWPS through RMS on State Solar Energy Data Management (SEDM) portal and central portal of PM-KUSUM.
2. AED has the right to seek any additional documents/certificates/information it deems fit prior to releaser of any payment.
3. If the invoices are incomplete in any respect or in case on non-compliance with terms and conditions of letter of award/Notice to Proceed, the payment due date shall start from the submission of all necessary documents.

16. Minimum Paid Up Share Capital to be Held by Project Promoter

The Bidder shall provide complete information in their bid in reference to this RCT about its promoters and upon issuance of LoA, the Successful Bidder/Selected Vendor shall indicate its share holding in the company indicating the controlling.

17. Instructions to Bidders for Structuring of Bid Proposals in Response to RCT

- The bidder including its Parent, Affiliate or Ultimate Parent or any Group Company shall submit single response to RCT. Detailed Instructions to be followed by the bidders for online submission of response to RCT are stated at Annexure – B. Submission of bid proposals by Bidders in response to RCT shall be in the manner described below:

    1) Covering Letter as per **Format 7.1.**

    2) In case of a Bidding Consortium, a Power of Attorney in favour of the Lead Member issued by the other Members of the Consortium shall be provided in original as per format attached herewith as **Format 7.2.**

    3) Board Resolutions, as per prescribed formats enclosed as per **Format 7.4** duly certified by the Company Secretary or the Director of the relevant Bidder, as applicable to the Bidder and mentioned hereunder:

    4) Board Resolution from the Bidding Company or the Lead Member of the Consortium, as the case may be, in favour of the person signing the response to RCT and in the event of selection of the projects, Board Resolution from each of the Consortium Members in favour of the person signing Consortium Agreement.

    5) Board Resolution from the Bidding Company committing 100% (One Hundred Percent) of the equity requirement for the project/ Board Resolutions from each of the Consortium Members together in aggregate committing to 100% (One Hundred Percent) of equity requirement for the Project (in case of Bidding Consortium); and

    6) Board Resolutions from each of the Consortium Members and Lead member contributing such additional amount over and above the percentage limit (specified for the Lead Member and other member in the Consortium Agreement) to the extent becoming necessary towards the total equity share in the Project Company, obligatory on the part of the Consortium pursuant to the terms and conditions in the Consortium Agreement.

    7) In case of a Consortium, the Consortium Agreement between the Members in the Consortium as per **Format 7.5** along with Board resolution from each Member of the Consortium for participating in Consortium.

    8) Format for Financial Requirements as per **Format 7.6** along with the certificate from practicing Chartered Accountant/ Statutory Auditors showing details of computation of the financial credentials of the Bidder.

9) Undertaking regarding no willful default and no major litigation pending as per **Format 7.7.**

10) A disclosure statement as per **Format 7.8/ 7.8A** regarding participation of any related companies in the bidding process.

11) Signed Integrity Pact between AED and the Bidding Company as per **Format 7.9.**

12) Covering letter for the financial bid as per **Format 7.15.**

13) Declaration regarding banning, liquidation, court receivership etc., as per **Format 7.10.**

14) Declaration for the local content as per **Format 7.11.**

15) Declaration for using same make of equipments as per the test certificate as per **Format 7.12.**

16) Declaration for submitting the test certificate as per MNRE technical specifications for solar water pumpsets issued in 2023 as per **Format 7.13.** Certificate regarding compliance of MeitY notification vide file no. 1(10)/2017-CLES dt. 02.07.18 as per **Format 7.14.**

17) Attachments

a. Memorandum of Association, Article of Association of the Bidder needs to be attached along with the bid. The bidder should also highlight the relevant provisionwhich highlights the objects relating to Power/ Energy/ Renewable Energy/ Solar Water Pumping Station/Solar Power plant development/Manufacturer of pumpsets, solar panels and controllers.

b. In case, there is no mention of the above provisions in the MoA/ AoA of the Bidder, the same has to be amended and submitted, if the bidder is selected as Selected Vendor.

c. Certificate of Incorporation of Bidding Company/ all member companies of Bidding Consortium.

d. A certificate of shareholding of the bidding company, its Parent and Ultimate Parent (if any) duly certified by a practicing Chartered Accountant/Company Secretary as on a date within 30 days prior to the last date of bid submission. AED reserves the right to seek additional information relating to shareholding in promoter companies, their parents/ ultimate parents and other group companies to satisfy themselves that RCT conditions have been complied with and the bidder will ensure submission of the same within the required time-lines.

e. Certified copies of annual audited accounts for any three financial years out of the last five financial years, i.e., 2022- 23, 2021-22, 2020-21, 2019-20, and 2018-19 along with certified copies of Balance Sheet, Profit and Loss Account, Schedules and Cash Flow Statement supported with bank statements shall be required to be submitted.

f. Details of all types of securities/instruments which are pending conversion into equity whether optionally or mandatorily.

g. In case of Limited Liability Partnership (LLP) as bidder or member of a consortium, an LLP registration certificate issued by registrar of companies shall also be submitted.

h. In addition, PAN Card and GST registration certificate shall also be submitted.

i. In support of technical Qualification Requirement (QR) criteria, work order copies/Invoices and Completion Certificates shall also be submitted.

j. Bidders must submit following documentary evidence that components/SPWPS systems will be manufactured indigenously.

    1. Declaration as per format 7.11.
    2. List and pictures of manufacturing and testing facilities.
    3. Undertaking that if details provided by bidders are in deviation with provisions of PM-KUSUM Scheme, which may lead to disqualification of bidder.

18. Important Notes and Instructions to Bidders

Wherever information has been sought in specified formats, the Bidders shall fill in the details as per the prescribed formats and shall refrain from any deviations and referring to any other document for providing any information required in the prescribed format.

1. The Bidders shall be shortlisted based on the declarations made by them in relevant schedules of RCT.
2. If the Bidder/Member in a Bidding Consortium conceals any material information or makes a wrong statement or misrepresents facts or makes a misleading statement in its response to RCT, in any manner whatsoever, AED reserves the right to reject such response to RCT and/or cancel the Letter of Award, if issued, and the EMD provided up to that stage shall be encashed. Bidder shall be solely responsible for disqualification based on their declaration in the submission of response to RCT.

3. Response submitted by the Bidder shall become the property of the AED and AED shall have no obligation to return the same to the Bidder.
4. All documents of the response to RCT (including RCT and subsequent Amendments/ Clarifications/Addenda) submitted online must be digitally signed by the person authorized by the Board as per Format 7.4.
5. The response to RCT shall be submitted as mentioned in Clause 15 of the RCT. No change or supplemental information to a response to RCT will be accepted after the scheduled date and time of submission of response to RCT. However, AED reserves the right to seek additional information from the Bidders, if found necessary, during the course of evaluation of the response to RCT.
6. All the information should be submitted in English language only. In case of bidders or their foreign affiliate having documents in other than English language, then the documents shall be translated in English language by certified translator and submitted. The document shall be attested by Notary public.
7. Bidders shall mention the name of the contact person and complete address and contact details including e-mail address which shall be active for the period of 7 years in their covering letter.
8. Response to RCT that are incomplete, which do not substantially meet the requirement prescribed in this RCT, will be liable for rejection by AED.
9. Response to RCT not submitted in the specified formats will be liable for rejection by AED.
10. Bidders delaying in submission of additional information or clarifications sought will be liable for rejection.
11. Non-submission and/ or submission of incomplete data/ information required under the provisions of RCT shall not be construed as waiver on the part of AED of the obligation of the Bidder to furnish the said data/information unless the waiver is in writing.
12. Only Tamil Nadu courts shall have exclusive jurisdiction in all matters pertaining to this RCT.
13. All the financial transactions to be made with AED including delay charges, and any additional charges (if required), shall attract 18% GST on each transaction, irrespective of the same being mentioned in the RCT.

19. Non-Responsive Bid

- The response to RCT submitted by the bidder along with the documents submitted **online** to AED shall be scrutinized to establish "Responsiveness of the bid". Each bidder's response to RCT shall be checked for compliance with the submission requirements set forth in this RCT.

Any of the following conditions shall cause the Bid to be "non-responsive":

1. Response to RCT not received by the due date and time of bid submission.
2. Any indication of price in any part of response to the RCT, other than in the financial bid.
3. Data filled in the Electronic Form of Financial Bid (Second Envelope), not in line with the instructions mentioned in the same electronic form.
4. In case it is found that the Bidding Company including Ultimate Parent Company/ Parent Company/Affiliate/Group Companies have submitted more than one response to this RCT, then all these bids submitted shall be treated as non-responsiveand rejected.
5. In any of the above cases, the bid shall not be considered for bid opening and evaluation

20. Method of Submission of Response to RCT by the Bidder

1. No documents will be accepted in person.
2. EMD needs to be submitted in online mode.

21. Documents to be submitted Online

1. Detailed instructions to be followed by the Bidders for online submission of response to RCT. The bidders shall strictly follow the instructions mentioned in the electronic form in respective technical bid and financial bid while filling the forms.
2. All documents of the response to RCT submitted online must be digitally signed and uploaded on the e-procurement portal website, which should contain the following:

21.1. Technical Bid (First Envelope)

a. The Bidder shall upload single technical bid containing scanned copies of the following documents duly signed and stamped on each page by the authorized signatory as mentioned below.

b. Formats - 7.1, 7.2 (if applicable), 7.3, 7.4, 7.5 (if applicable), 7.6, 7.7, 7.8/7.8A and 7.9, 7.10, 7.11, 7.12, 7.13 and 7.14 as elaborated in Clause 17 of the RCT.

c. All attachments elaborated in Clause 17 of the RCT, with proper file names.

d. All supporting documents regarding meeting the eligibility criteria.

Note: The Bidder will have to fill the Electronic Form provided at the e-procurement portal as part of Technical Bid.

21.2. Financial Bid (Second Envelope)

a. Bidders shall submit the single Financial Bid containing the scanned copy of following document(s):

1. Covering letter as per **Format 7.15** of the RCT.

2. Duly signed and stamped strictly as per price bid **Format 7.16** of the RCT.

b. Bidding Parameter:

1. A single fixed price per line item as a bidding parameter: Under this RCT, the bidding parameter shall be the Price quoted by the Bidder i.e., a fixed price per line item (exclusive of GST) in INR.

2. The above fixed price shall include all costs related to the Scope of Work as per the RCT and Obligations of the Successful Bidder/Selected Vendor. The Bidder shall quote for the entire facilities on a “single responsibility” basis such that the fixed price covers all the obligations in respect of Design, Supply, Erection, Testing and Commissioning including Warranty, Operation and Maintenance (5 years), insurance (5 years) **exclusive of taxes/GST**.

3. The price shall remain firm and fixed as per the price validity mentioned in clause 22 of this RCT and shall be binding on the Selected Vendor irrespective of actual cost of execution of the Project. No escalation on the price will be granted for any reason whatsoever. The Selected Vendor shall not be entitled to claim any additional charges, even though it may be necessary to extend the completion period for any reasons whatsoever.

4. The bidder may quote for all the pump capacity and type or for selected capacity and type opted by the bidder in the item wise Bill of Quantity for indigenously manufactured solar cells (It is optional to quote for non indigenously manufactured Solar cells). Only a single price bid for each line item (i.e., type of pump), quoted by the bidders, shall have to be filled online e-Procurement portal. The instructions mentioned in the Financial Bid Electronic Form have to be strictly followed without any deviation, else the bid shall be considered as non-responsive.

22. Validity of the Response to RCT

22.1 Bid Validity

The Bidder shall submit the response to RCT which shall remain valid up to the date as on 12 months from the last date of bid submission ("Bid Validity"). AED reserves the right to reject any response to RCT which does not meet the aforementioned validity requirement.

22.2 Price Validity

The price quoted shall remain fixed and valid upto 24 months from the date of issue of Letter of Award by AED and any extended period as mutually agreed upon.

23. Bid Preparation Cost

The Bidder shall be responsible for all the costs associated with the preparation of the response to RCT and participation in discussions and attending pre-bid meeting(s) etc. AED shall not be responsible in any way for such costs, regardless of the conduct or outcome of the bid process.

24. Clarifications/ Pre-Bid Meeting/ Enquiries/ Amendments

- Clarifications/ Doubts, if any, on RCT document may be e-mailed and/ or through e-procurement portal / aedcewrm@gmail.com or aedcesolar@gmail.com. AED will make effort to respond to the same in the Pre-Bid Meeting to be held as mentioned in the Bid Information Sheet. A compiled list of such questionnaire and AED response will be uploaded in the e-procurement https://tntenders.gov.in.
- If necessary, amendments, clarifications, elaborations shall be issued by AED which will be notified on AED and e-procurement portal web site. No separate reply/ intimation will be given for the above, elsewhere.
- A Pre-Bid Meeting shall be held as mentioned in the Bid Information Sheet.
- Enquiries/ Clarifications up to award of contract may be sought by the Bidder from AED through e-mail to aedcewrm@gmail.com or aedcesolar@gmail.com.

25. Right of AED to Reject a Bid

- AED reserves the right to reject any or all of the responses to RCT or cancel the RCT or annul the bidding process for any project at any stage without assigning any reasons whatsoever and without thereby any liability. In the event of the tender being cancelled at any stage, the EMD submitted by the Bidders shall be returned to the respective Bidders (if applicable).

26. Post Award Compliances

- Timely completion of all the milestones will be the sole responsibility of Vendor. AED/Client Organization shall not be liable for issuing any intimations/reminders to Vendor for timely completion of milestones and/or submission of compliance documents.
- Any checklist shared with Vendor by Client Organization for compliance of above mentioned milestones to be considered for the purpose of facilitation only. Any additional documents required as per the conditions of RCT must be timely submitted by the Vendor.

27. Adjudicator

- Adjudicator under the contract shall be appointed by the Appointing Authority of AED. If the bidder does not accept the Adjudicator proposed by AED, it should so state in its bid form and make a counter proposal of an adjudicator.

28. Arbitration

- Arbitration shall be carried out as per Arbitration Act 1996 and its subsequent amendment. The Contract shall be governed by and interpreted in accordance with the laws in force in India. The Tamil Nadu Courts where programme is to be implemented shall have exclusive jurisdiction in all matters arising under the contract.

29. Force Majeure

1. **Definition**

- **"Force Majeure Event"** means any act or event that prevents the affected Party from performing its obligation in accordance with the Agreement, if such act or event is beyond the reasonable control of the affected Party and such Party had been unable to overcome such act or event with the exercise of due diligence (including the expenditure of reasonable sums). Subject to the foregoing conditions, "Force Majeure Event" shall include without limitation the following acts or events: (i) natural phenomena, such as storms, hurricanes, floods, lightning, volcanic eruptions and earthquakes; (ii) explosions or fires arising from lighting or other causes unrelated to the acts or omissions of the Party seeking to be excused from performance; (iii) acts of war or public disorders, civil disturbances, riots, insurrection,

sabotage, pandemic, epidemic, terrorist acts, or rebellion. A Force Majeure Event shall not be based on the economic hardship of either Party. In case of any damage because of force majeure event, the System shall be repaired/commissioned in line with the penal provisions of Scheme guideline/RCT.

2. Excused Performance

- Except as otherwise specifically provided in the Agreement, neither Party shall be considered in breach of the Agreement or liable for any delay or failure to comply with the Agreement (other than the failure to pay the amounts due hereunder), if and to the extent that such delay or failure is attributable to the occurrence of a Force Majeure Event; provided that the Party claiming relief under this Clause 29 shall immediately (i) notify the other Party in writing of the existence of the Force Majeure Event, (ii) exercise all reasonable efforts necessary to minimize delay caused by such Force Majeure Event, (iii) notify the other Party in writing of the cessation or termination of said Force Majeure Event and (iv) resume performance of its obligations hereunder as soon as practicable thereafter; provided, however, that AED will not be excused from making any payments and paying any unpaid amounts due in respect of Vendor to AED prior to the Force Majeure Event performance interruption.

3. Termination as a Consequence of Force Majeure Event

- If a Force Majeure Event shall have occurred that has affected the Vendor's performance of its obligations hereunder and that has continued for a continuous period of one hundred eighty (180) days, then AED shall be entitled to terminate the Agreement upon ninety (90) days' prior written notice to the Vendor. If at the end of such ninety (90) day period such Force Majeure Event shall still continue, the Agreement shall automatically terminate. Upon such termination for a Force Majeure Event, neither Party shall have any liability to the other (other than any such liabilities that have accrued prior to such termination).

30. Vendor's Indemnity

- The Vendor agrees that it shall indemnify and hold harmless AED/MNRE and its members, officers, employees and to any lawful visitors (collectively, the "AED/MNRE" Indemnified Parties") from and against any and all Losses incurred by the AED/MNRE Indemnified Parties to the extent arising from or out of the following any claim for or arising out of any injury to or death of any Person or loss or damage to property of any person to the extent arising out of the Vendor's negligence or willful misconduct. The Vendor shall not, however,

be required to reimburse or indemnify any AED/MNRE Indemnified Party for any Loss to the extent such Loss is due to the negligence or willful misconduct of any "AED/MNRE" Indemnified Party.

31. Insurance

1. Insurance

- The Goods supplied under the Contract shall be fully insured in Indian Rupees against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery. For delivery of goods at site, the insurance shall be obtained by the Contractor, for an amount not less than the Contract Price of the goods from "warehouse to warehouse" (final destinations) on "All Risks" basis including War risks and strikes.

- The Comprehensive insurance of Solar Photo Voltaic Water Pumping System shall be provided for natural calamities, theft, burglary, & damage, etc. during 5 years warranty period. The empanelled bidder shall file insurance claim and shall be responsible to bring the insurance claim to a final settlement. The farmer and the empanelled bidder shall be jointly responsible for collection and submission of documents for the processing of the insurance claim. The insurance policy taken for the individual farmer shall be handed over to the beneficiary under intimation to AED at the time of processing of payment for the completed installations. The empanelled company shall do renewal of insurance certificate every year up to 5 years as per insurance clause.

- In case of an incident covered under insurance, bidder must replace the lost/damaged part within 10 days from the date of intimation, failing which the rectification/replacement (keeping the same configuration in consideration) will be done by AED at the risk and cost the vendor, after rectification/ replacement the warranty clause will remain compliable as per tender conditions.

2. Penalty

Sl. No.	Default	Penalty
1.	Failure to Accept Letter of Award (LoA)	EMD shall be encashed and/or bidder blacklisted for 5 years.
2.	Failure to submit the PBG.	EMD shall be encashed and/or bidder blacklisted for 5 years.
3.	Failure to sign the contract agreement after submission of PBG	PBG shall be encashed and / or bidder blacklisted for 5 years.

Sl. No.	Default	Penalty
4.	In case of any non-execution or delay in the execution of the order or delay in maintenance beyond the stipulated time schedule decided including any extension permitted in writing.	AED reserves the right to recover from the bidder a sum equivalent to 0.5 % of the value of the delayed SPWPS installation or on the unexecuted portion of the work for each week of the delay and part thereof subject to a maximum of 10 % of the total value of the contract. The amount will be adjusted by AED in release of payment to the concerned vendor and or recovered from the PBG amount. Further, AED may also blacklist the Empanelled firm for 5 years, if the firm does not fulfill the contractual obligations.

32. Transportation, Demurrage, Wharfage, etc.

- Contractor/Selected Vendor is required under the Contract to transport the Goods to place of destination defined as Site. Transport to such place of destination in India including insurance, as shall be specified in the Contract, shall be arranged by the Contractor/Selected Vendor, and the related cost shall be included in the Contract Price

- Subsequent to an order being placed against bidder's quotation, received in response to this 'enquiry', if it is found that the materials supplied are not of the right quality or not in accordance with our specifications (required by us) or received in damaged or broken conditions, not satisfactory owing to any reason of which we shall be the sole judge, AED shall be entitled to reject the materials, cancel the contract and buy our requirement from the open market / other sources and recover the loss, if any, from the supplier reserving to ourselves the right to forfeit the PBG, furnished by the supplier against the contract. The supplier will make his own arrangements to remove the rejected material within a fortnight of instruction to do so. Thereafter material will lie entirely at the supplier's risk and responsibility and storage charges, along with any other charges applicable, will be recoverable from the supplier.

- AED reserve the right to accept or reject any quotation in full or in part without assigning any reason thereof. AED also reserve the right to split and place order on more than one supplier.

33. Liquidated damages

- In case of any delay in the execution of the order or delay in maintenance beyond the stipulated time schedule decided including any extension permitted in writing, AED reserves the right to recover from **the bidder a sum equivalent to 0.5 % of the value of the**

delayed SPWPS installation or on the unexecuted portion of the work for each weekof the delay and part thereof subject to a maximum of 10 % of the total value of the contract.

- Alternatively, AED reserves the right to purchase of the material and completion of theworks including maintenance from elsewhere at the sole risk and cost of the successful bidder/ contractor and recover all such extra cost incurred by AED in procuring the material from resources available including encashment of the bank guarantee or any other sources etc. Further, if any extra cost is incurred by AED due to delay in work completion by the party beyond the completion time as per Work order, the same shall berecovered from the party's Invoice / PBG etc.

- Alternatively, AED shall cancel the order completely or partly without prejudice to his right under the alternatives mentioned above.

34. Statutory Compliance/ Certification regarding Cyber Security Products

- A certificate as per format 7.14 is to be submitted by the bidders that the items offered meet the definition of domestically manufactured/produced Cyber Security Products as per MeitY notification vide File no. 1(10)/2017-CLES dated: 02.07.2018 The above certificate shall be on Company's letterhead and signed by Statutory Auditor or Cost Auditor of the Company. 'Cyber Security Products means a product or appliance or software manufactured/ produced for the purpose of protecting, information, equipment, devices computer, computer resource, communication device, and information stored therein from unauthorized access, use, disclosure, disruption, modification or destruction'.

35. Warranty and Maintenance

1. The complete Solar Photovoltaic Water Pumping System and display board / Name Plate shall be warranted and maintained for 5 years from thedate of installation.

2. The SPV modules must be warranted for output wattage, which should not be less than 90% of the rated wattage at the end of 10 years and 80% of the rated wattage at the end of 25 years.

3. The maintenance service provided shall ensure proper functioning of the system as a whole. All preventive/routine maintenance and breakdown/corrective maintenance required for ensuring maximum uptime shall have to be provided by the Contractor.

4. Successful bidder, on whom letter of award is placed, is to ensure all safety guidelines, rules and regulations, labour laws etc. Successful bidder indemnifies AED for anyaccident,

injury met by its labour, employee or any other person working for him. Any compensation sought by its labour, employee or any other person working for him shall be paid by successful bidder as per settlement solely. Local representative of bidder should meet AED officials of each block and should submit the details of service visits /maintenance taken up to AED on monthly basis.

36. Declaration of Local Content

1. Bidder shall submit a certificate stating the percentage of local content as per the format 7.11 of RCT Document. The certificate shall be from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content. It is mandatory to mention UDIN No in the certificate.

   NOTE: False declarations will be in breach of the code of integrity under Rule 175(1)(i)(h) of the General Financial rules for which a bidder or its successors can be debarred for up to 2 years as per Rule 151(iii) of the General Financial rules along with such other actions as may be permissible under law. Only those bidders who comply with the minimum local content requirement as mentioned above shall be eligible to bid.

37. Price basis

- Price basis of the price quoted shall be on F.O.R (Freight on Road) destination basis for site. Price mentioned in the quotation must be firm. Hence prices in Letter of Award shall be firm and not subject to escalation till the execution of the complete order and its subsequent amendments accepted by the bidder even though the completion / execution of the order may take longer time than the delivery period specified and accepted in the Letter of Award.\

38. Roles and Responsibilities of AED

The AED will be responsible for the following activities:

- Issue of Letter of Award to the empanelled vendors.
- Oversee installation of systems.
- Inspection of installed systems and online submission of completion reports to MNRE along with availability of the accurate data of the parameters of the SPWPS on the central portal of the MNRE.

- Submission of utilization certificates and audited statement of expenditure through EAT module and disbursement of MNRE CFA.
- Online submission of monthly and quarterly progress reports. Ensure project completion within the given timelines and compliance of MNREGuidelines and Standards.
- Online and offline maintenance for records.
- Real time monitoring through dedicated web-portal which will be maintained by AED.
- Performance monitoring of installed system through third party.
- Ensure compliance of CMC and training of locals by the vendors.
- Carrying out publicity of the scheme so as to increase awareness, for which purpose advice of MNRE may also be adopted apart from its own publicity.
- Any other activity to ensure successful implementation of the programme.

SECTION 4
QUALIFICATION REQUIRMENTS FOR BIDDERS

Short listing of Bidders will be based on the following Criteria:

39. General Eligibility Criteria

Bidders participating in the RCT will be required to meet the following eligibility criteria (as applicable).

1. The Bidder shall be a Company or a Limited Liability Partnership or registered proprietorship firm as defined.
2. Bidding Consortium of two companies with one of the Companies as the Lead Member. Consortium as per Consortium Agreement (Format 7.5) can submit bids under this RCT.
3. A foreign company cannot participate on a standalone basis or as a member of consortium under this RCT.
4. In line with the Office Memorandum (O.M.) issued by the Department of Expenditure, Ministry of Finance, Government of India vide No. 6/18/2019-PPD dated 23.07.2020 and subsequent amendments and clarifications thereto, the Bidder shall meet the following criteria for its bid to be considered for evaluation under the RCT:
5. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority (as defined in the OM as referred above).
6. “Bidder” in this reference, means any person or firm or company, including any member of a consortium, every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in this tender.
7. “Bidder from a country which shares a land border with India” for the purpose of this clause, means:
    a. An entity incorporated, established or registered in such a country; or
    b. A subsidiary of an entity incorporated, established or registered in such a country;or
    c. An entity substantially controlled through entities incorporated, established or

registered in such a country; or

d. An entity whose beneficial owner is situated in such a country; or

e. An Indian (or other) agent of such an entity; or

f. A natural person who is a citizen of such a country; or

g. A consortium where any member of the consortium falls under any of the above.

h. In support of the above, the Bidder shall be required to submit necessary Undertaking,as per format 7.8/7.8A of the RCT.

i. Other provisions of the referred OM dated 23.07.2020, except Sl. No.11 of the OM, will also be applicable for this tender. Any interpretation of the above clauses will be made in line with the referred OM, including subsequent amendments and clarifications thereto.

8. The Bidder should not be under any liquidation, court receivership or similar proceedings on due date of submission of bid.

9. The Bidder or any of its Affiliates should not be a willful defaulter to any lender, and that there is no major litigation pending or threatened against the Bidder or any of its Affiliates which are of a nature that could cast a doubt on the ability or the suitability of the Bidder to undertake the Project. The Bidder shall submit an undertaking to this effect as per format 7.7 of this RCT.

10. Registered Proprietorship firms (Governed by the Indian Partnership Act, 1932 or equivalent law/act of respective state) are also allowed as the manufacture of modules, pumpsets, and controllers or as a System Integrator (SI) to participate under this RCT as per the conditions stipulated under this RCT.

40. Technical Eligibility Criteria

Under this RCT, it is proposed to promote only commercially established and operational technologies to minimize the technology risk and to achieve timely commissioning of the Projects. The Bidder is required to undertake to furnish evidence of meeting the above criteria in line with provisions of the RCT. The undertaking shall be submitted as per enclosed Format 7.8.

40.1. The bidder should be, either of the following:

1. Manufacturer of Solar PV Module or
2. Manufacturer of Solar Pump or
3. Manufacturer of Solar Pump Controller using indigenous technology or
4. Engineering Procurement and Construction (EPC) / System Integrator (SI) of 'similar works' in Joint venture with Solar PV Module Manufacturer or Solar Pump Manufacturer or Manufacturer of Solar Pump Controller using indigenous technology.

Note : **Similar Works' means – Having direct experience in Design, Supply, Erection, Testing, Installation and Commissioning of 120 Nos. standalone (off-grid) solar PV based water pumpsets in any Govt. Dept./PSU/SNA of any state or Central Govt. in India in last 5 years from the last date of bid submission.**

5. In case Bidder wishes to participate in as a Joint Venture, following conditions are additionally applicable: -

a. The term Bidder used hereinafter would therefore apply to both a single entity and a Consortium/ Joint Venture.

b. Both members should be a registered as an MSE to claim the benefits provided to the MSE.

c. A consortium of maximum two (2) members is allowed in this RCT including one as lead bidder.

d. Lead Bidder accepts primary responsibility for providing a robust and quality product meeting technical specifications of tender. Declaration regarding the lead member shall be provided in the Format 7.5.

e. However, both the members of the Joint Venture shall be jointly and severally liable for compliance of the conditions of the tender and the PM-KUSUM Guidelines including amendments and other Orders/ directions issued by MNRE related to implementation of the Scheme.

f. Any member of the Joint Venture participating in the tender shall not be permitted to participate either in individual capacity or as a member of any other Consortium/Joint

Venture in the same tender. Submission or participation in more than one bid will cause disqualification of all the proposals submitted by the bidder.

g. All formalities in respect of submission of tender shall be done only in the name of 'Lead Member' and not in the name of Joint Venture. However, name and other details of both the members of Consortium/ Joint Venture Firm should be clearly mentioned in the Bid/Response.

h. A copy of Memorandum of Understanding (MOU) executed between the members of Joint Venture shall be submitted along with the tender. The complete details of the members of the Joint Venture Firm, their share and responsibility in the Joint Venture etc., particularly with reference to financial, technical and other obligations shall be furnished in the MOU.

i. Once the offer/ bid is submitted, the bid shall not be modified / altered/ terminated during the period of execution including any extension thereafter by AED/MNRE or validity of any letter of award awarded to the said Consortium/Joint Venture Firm. In case, the tenderer fails to observe/comply with this stipulation, the full Security Deposit/ Performance Bank Guarantee (PBG) shall be liable to be forfeited.

j. A duly notarized agreement of Joint Venture Firm shall be executed between the 'Lead Member' and Consortium/Joint Venture Partner. This Agreement should be submitted in original with your offer/ bid.

k. Authorized Member of Joint Venture Firm: 'Lead Member' shall be authorized on behalf of Joint Venture Firm to deal with the tender/AED, sign the agreement or enter into contract in respect of the said tender, to receive payment and such activities in respect of the said tender/ contract. All notices/ correspondences with respect to the contract would be sent only to this 'Lead Member' of Joint Venture Firm.

l. Duration of work and Joint Venture Agreement shall be valid during the entire execution period/ validity of letter of award and any extension thereafter/ currency of the contract including the period of extension, if any and 5-year maintenance contract.

m. Any change in constitution of Joint Venture Firm shall not be allowed.

n. On award of any contract to the Joint Venture Firm, a single Performa i.e., Bank Guarantee shall be submitted by the lead bidder as per tender conditions. All the Guarantees like Security Deposit, Earnest Money Deposit and Performance Bank Guarantee, for Mobilization Advance etc., shall be accepted only in the name of 'Lead

Member' and splitting of guarantees among the members of Joint Venture shall not be permitted.

o. Members of the Joint Venture Firm shall be jointly and severally liable to the AED/MNRE for execution of the project/ Work/ Assignment etc. The Joint Venture members shall also be liable jointly and severally for the loss, damages caused to the AED/MNRE during the course of execution of any awarded contract or due to non execution of the contract or part thereof. Governing Laws for Consortium/ Joint Venture Firm: The Joint Venture Agreement in all respect be governed by and interpreted in accordance with Indian Laws.

p. In case a group of MSMEs registered with National Small Industries Corporation (NSIC) (under single point registration scheme) form a Joint Venture under NSIC, the Consortium needs to provide an authorization letter from NSIC accepting the terms and conditions of tender (except for those terms and conditions in which NSIC consortia are given special status as per Government of India Policy for the Government Purchase Programme) and also provide details of Consortium members, their manufacturing capacities, the share-out of quantities with schedule of supplies as per AED tender schedule. Further, NSIC consortium mandatorily submit their service tax, pan card and other relevant documents.

q. In case of Consortium of NSIC, the lead members/ partners in the consortium shall not separately participate as independent bidder or as members of any other consortium in this bidding process. All bids in contravention of this shall be rejected.

r. Under this tender, only bid from one NSIC Consortium will be accepted.

s. All correspondence by AED will be done with 'Lead member' only.

In addition to above manufacturers of Pumpset/Controller/Module should have supply experience as per table below:

Sl. No.	State	Quantity (Nos.)	Technical Qualification Requirement		Bank Guarantee	
			For Solar Pumpsets/Controller (number of solar pumpsets installed/Controller installed or supplied) @ 6 % of total quantity	For Solar PVModules (Experience in kWp) @ 4800 Wp per pump for 5 hp pump	EMD requirements in INR (as in clause 12 of section 3)	PBG requirementsin INR (as in clause 13 of section 3)
1	Tamil Nadu	2000*	120	576	8,40,000	12,60,000

***Note:** Total quantity of SWPS is tentative as it is rate contract and it may increase or decrease,

subject to availability of fund and requirement of AED.

40.2. Detailed technical parameters of the Pumpsets to be met by Vendors is at Annexure-A. The Bidders shall strictly comply with the technical parameters detailed in the Annexure-A. Further, the provisions as contained in the O.M. dated 10.03.2021 issued by MNRE on the subject "Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirement of Compulsory Registration) Order, 2019-Implementation- Reg." and its subsequent amendments and clarifications issued until the bid submission deadline, shall be applicable for this RCT. The modules used in the Project under this RCT should have been included in the List-I under the above Order, valid as on the date of invoicing of such modules.

41. Financial Eligibility Criteria

41.1. Net-Worth

a. The Net Worth of the Bidder should as per the table below, as on the last date of previous Financial Year, i.e., FY 2022-23.

b. The net worth to be considered for the above purpose will be the cumulative net-worth of the Bidding Company or Consortium, together with the Net Worth of those Affiliates of the Bidder(s) that undertake to contribute the required equity funding and PBG in case the Bidder(s) fail to do so in accordance with the RCT.

c. Net Worth to be considered for this clause shall be the total Net Worth as calculated in accordance with the Companies Act, 2013 and any further amendments thereto.

AND

41.2. Minimum Average Annual Turnover

a. The Bidder shall demonstrate a Minimum Average Annual Turnover (MAAT) as per the table below, during any three financial years out of the last five financial year, i.e., 2018-19, 2019-20, 2020-21, 2021-22, 2022-23

b. It is hereby clarified that "Other Income" as indicated in the annual accounts of the Bidder shall not be considered for arriving at the annual turnover.

41.3. Liquidity

a. **The Bidder shall demonstrate Working Capital or Line of Credit for the last Financial Year, 2022-23, as per the table below.**

Sl.No.	State	Quantity (Nos.)	MAAT/ Annual Turn Over Requirement (in lakhs INR) in last Three years of last five years	Profitability	Net Worth
1	Tamil Nadu	2000*	420	Profitable in at least two of the last four Years	Not less than paid up capital in last FY 2022-23

***Note: Total quantity of Solar Pumpset is tentative as it is rate contract, and it may increase or decrease, subject to availability of fund and requirement of AED.**

41.4. The Bidder may seek qualification on the basis of financial capability of its Affiliate(s) for the purpose of meeting the qualification requirements as per Clauses 41.1, 41.2 and 41.3 above. In case of the Bidder being a Bidding Consortium, any Member may seek qualification on the basis of financial capability of its Affiliate. In this case, a Bidder can use the credential of only a single affiliate to meet all the financial eligibility criteria. In such cases, the Bidder shall be required to submit Board Resolutions from the respective Affiliate, undertaking to contribute the required equity funding and Performance Bank Guarantees in case the Bidder(s) fail to do so in accordance with the RCT. In case of non-availability of the Board Resolution as required above, a letter from the CEO/ Managing Director of the respective Affiliate, undertaking the above, shall be required to be submitted and the requisite Board Resolution from the Affiliate shall be required to be submitted.

41.5. For the purposes of meeting financial requirements, only latest unconsolidated audited annual accounts shall be used. However, audited consolidated annual accounts of the Bidder may be used for the purpose of financial requirements provided the Bidder has at least twenty six percent (26%) equity in each Company whose accounts are merged in the audited consolidated account.

41.6. A Company/Consortium would be required to submit annual audited accounts for the last Financial Year 2022-23, or as on the day at least 7 days prior to the bid submission deadline, along with net worth, annual turnover, working capital certificate (if applicable) from a practicing Chartered Accountant/Statutory Auditor to demonstrate fulfillment of the criteria.

Note: In case of bidder seeking eligibility using credential of foreign Parent/Ultimate Parent/Affiliate entity, in the event the Bidder is unable to furnish the audited annual

accounts for the previous financial year as per the prevalent norm in the respective country, the Bidder shall submit the annual audited accounts of the last financial year for which the audited accounts are available. This, however, would be acceptable, subject to the condition that the last date of response to this RCT falls on or within the deadline for completion of audit of annual accounts of companies, as stipulated by the laws/rules of the respective country, and the Bidder shall submit the corresponding documentary evidence against the same. In case the annual accounts or provisional accounts as on the day at least 7 days prior to the bid submission deadline, are submitted in a language other than English, a certified English translation from an approved translator shall be required to be submitted by the Bidder.

41.7**.** For meeting the above financial eligibility criteria, if the data is provided by the Bidder in a foreign currency, equivalent Indian Rupees of Net Worth and other financial parameters will be calculated by the Bidder using Reserve Bank of India's reference rates prevailing on the date of closing of the accounts for the respective financial year. In case of any currency for which RBI reference rate is not available, Bidders shall convert such currency into USD as per the exchange rates certified by their banker prevailing on the relevant date and used for such conversion. After such conversion, Bidder shall follow the procedure/ submit document as elaborated in Clause 40.1 above.

41.8. In case the response to RCT is submitted by a Consortium, then the financial eligibility requirement to be met by each Member of the Consortium shall be computed in proportion to the equity commitment made by each member in the Project Company.

For example, if two companies A and B form a Consortium with equity participation in 70:30 ratio and submit their bid for a capacity of 10 MW, then, total Net-Worth to be met by the Consortium is Rs. 320 Lakhs x 10 MW = Rs. 32 Crores. Minimum requirement of Net-Worth to be met by Member A would be Rs. 22.4 Crores and the one to be met by Member B would be Rs. 9.60 Crores. Similar methodology shall be followed for computation of other requirements.

Note: Wherever applicable, audited accounts for the last FY, 2022-23 will be required to be submitted for meeting the qualification

SECTION 5

BID EVALUATION AND SELECTION OF PROJECTS

42. Bid Evaluation

- Bid evaluation will be carried out considering the information furnished by Bidders as per provisions of this RCT. The detailed evaluation procedure and selection of bidders are described in subsequent clauses in this Section.

43. Techno-Commercial Evaluation of Bidders (Step 1)

1. Bid opening (online) will be done only after the deadline for submission in the e-procurement portal.

2. RCT documents will not be received manually. It is online only.

3. Subject to Clause 18 of the RCT, AED will examine all the documents submitted by the Bidders in the e-procurement portal and ascertain meeting of eligibility conditions prescribed in the RCT. During the examination of the bids, AED may seek clarifications/additional documents to the documents submitted etc., from the Bidders if required to satisfy themselves for meeting the eligibility conditions by the Bidders. Bidders shall be required to respond to any clarifications/additional documents sought by AED within 4 (four) days from the date of such intimation from AED. All correspondence in this regard shall be made through e-mail/e-procurement portal only. It shall be the responsibility of the Bidder to ensure that the e-mail id of the authorized signatory of the Bidder is functional. The Bidder may provide an additional email id of the authorized signatory in the covering letter. No reminders in this case shall be sent. It shall be the sole responsibility of the Bidders to remove all the discrepancies and furnish additional documents as requested. AED shall not be responsible for rejection of any bid on account of the above.

4. The response to RCT submitted by the Bidder shall be evaluated to establish Techno-Commercial eligibility as per the RCT.

5. On completion of Techno-Commercial bid evaluation, if it is found, only one or two Bidder(s) is/are eligible for the next stage, opening of the financial bid of the Bidder(s) will be at the discretion of AED. Thereafter, AED will take appropriate action as deemed fit.

44. Financial Bid Evaluation (Step 2)

1. In this step financial evaluations of the Techno-Commercially Qualified Bids shall be done based onthe “Fixed Price”, quoted by the Bidder for each line item (i.e., type of pump) as per price bid format as attached in excel file (Item wise BoQ) to the RCT (i.e., type of pump) in the Electronic Form of Financial Bid.
2. Financial bids (containing Fixed Price) of only those bidders shall be opened whosetechnical bids are found to be qualified as per the RCT.
3. For each line item (i.e., type of pump) the Bidder including its Parent, Affiliate or Ultimate Parent or any Group Company will have to submit a single bid (single application) quoting a Fixed Price in Indian Rupee for all the line items applied for. **The Price has to be quoted in Indian Rupee up to two places of decimal only**. If it is quoted with more than two digits after decimal, digits after first two decimal places shall be ignored. (For e.g., if the quoted price is INR 47,800.455, then it shall beconsidered as INR 47,800.45).
4. In this step, evaluation will be carried out for the each line item (i.e., type of pump), separately within the maximum capacities as mentioned in Item wise BoQ (Price bid format) to the RCT, based on the price quoted by Bidders.
5. The details of category of Solar Powered Pumpsets to be installed in Tamil Nadu through the RCT under the programme is given below:

Pump Capacity	Pump Type	Pump Position	Pump Cooling Category (Select whichever quoted for)	Controller Type
3	AC	Surface	-	Normal (Without USPC)
	DC	Surface	-	Normal (Without USPC)
5	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	AC	Surface	-	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Surface	-	Normal (Without USPC)
7.5	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	AC	Surface	-	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Surface	-	Normal (Without USPC)

Pump Capacity	Pump Type	Pump Position	Pump Cooling Category (Select whichever quoted for)	Controller Type
10	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
12.5	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)
15	AC	Submersible	Water Filled	Normal (Without USPC)
	AC	Submersible	Oil Filled	Normal (Without USPC)
	DC	Submersible	Water Filled	Normal (Without USPC)
	DC	Submersible	Oil Filled	Normal (Without USPC)

6. For each line item (i.e., type of pump), based on the fixed Price quoted by the bidders, AED shall arrange the bids in the ascending order i.e., L1, L2, L3, etc. (L1 being the lowest quote). If the fixed price (exclusive of GST (in INR) on F.O.R Destination Basis) quoted is same for two or more Bidders, then all the Bidders with same price shall be considered of equal rank/standing in the order.

45. L-1 Matching and Selection of Selected Vendors

1. For each line item (i.e., type of pump), the Bidder quoting the lowest price (L1 price) will be identified and shall be declared as the Selected Vendor. In case of multiple Bidders quoting the L1 price, all such Bidders ("L1 Bidders") will be declared as Selected Vendors.

2. For each line item (i.e., type of pump), option to match L1 price will be initially extended to all bidders falling under L1+25% and in case number of bidders in this range is less than five the same will be further extended to other bidders in the ascending orders of price bid quoted by them till atleast five bidders agreed for L1 matching or at the discretion of AED all bidders may be given option to match L1 price.

3. For each line item, the Bidders other than the L1 Bidder(s) will be given a period of 7 days to match the L1 price. In case a Bidder wishes to match the L1 price, such matching shall be communicated to AED only through e-mail. The 7-day period shall commence from the date on which the L1 price is intimated to all the eligible Bidders (through e-mail), and will

culminate at 11:59:59 PM of the 7th day after such intimation by AED. For example, in case AED intimates the L1 price on 05.10.2023, the above deadline for L1 matching shall expire at 11:59:59 PM on 12.10.2023. Any communication after the expiry of the above deadline will not be entertained, and decision taken by AED in this regard shall be final and binding on all parties.

Note: In all cases, matching of Prices will be on individual line items within the price bid table on total landed cost (including GST) for complete scope of work.

4. The implementation of Scheme is on market mode and demand based. No allocation of specific quantity to a bidder by AED. The scheme will be implemented on farmer's choice. The farmer is free to choose any of the empanelled vendor.

5. Further, in case a Vendor is not able to supply quantity allocated to them as per scheduled timelines, AED reserves the right to shift the part/full quantity to another Vendor, who has matched the price.

46. Validity of discovered prices

- In order to allow AED sufficient time to implement SPWPS based on the prices discovered under this tender, all prices discovered under this tender has a validity period of 24 months, which will be announced by AED. Within this period, empanelled vendors have no right of refusalto complete the allocated work.

47. Recommendation and Issuance of (Letter of Award) LoAs

- At the end of selection process, AED will communicate to MNRE on the prices discovered and empanelment of Vendors. The LoAs will be issued to the Selected Vendors by AED.

- In case of a Consortium being selected as the Selected Vendor, the LoA shall be issued to the Lead Member of the Consortium.

- Each Selected Vendor shall acknowledge the LoA and return duplicate copy with signature of the authorized signatory of the Selected Vendor to AED within 15(Fifteen) days of issue of LoA, failing which it will be deemed to have been accepted by the Bidder.

- If the Selected Vendor, to whom the LoA has been issued does not fulfill any of the conditions specified in Bid document, then AED reserves the right to annul/cancel the award of the LoA of such Selected Vendor also imposing the penalty such as encashment of BG or/and Blacklisting.

- In all cases, AED decision regarding selection of Bidder based on price or annulment of tender process shall be final and binding on all participating bidders.

48. Inspection and Audit by the Government/MNRE

- All materials / equipments manufactured by the bidder/consortium of bidders against the Letter of Award shall be subject to inspection, check and/or test by the AED/MNRE or his authorized representative at all stages and place, before, during and after the manufacture. All these tests shall be carried out in the as per technical specifications and bidder shall submit the relevant test reports at the time of bid submission to AED. If upon delivery the material/equipment does not meet the specification, the materials/equipments shall be rejected and returned to the bidder for repairs/modification etc., or for replacement and AED shall also impose the penalty or/and blacklist the vendor. In such cases all expenses including the to-and-fro freight, repacking charges, any other costs etc., shall be to the account of the Vendor.

49. Debarment from Participating in AED's Future Tenders

- AED reserves the right to carry out the performance review of each Bidder from the time of submission of Bid. In case it is observed that a bidder has not fulfilled its obligations in meeting the various timelines envisaged, in addition to the other provisions of the RCT, such Bidders shall be debarred from participating in AED's any future tender for a period as decided by the competent authority of AED.

SECTION 6
DEFINITIONS OF TERMS

50. Following terms used in the documents will carry the meaning and interpretations as described below

1. "ACT" or "ELECTRICITY ACT, 2003" shall mean the Electricity Act, 2003 and include any modifications, amendments and substitution from time to time.

2. "AFFILIATE" shall mean a company that, directly or indirectly, controls, or is controlled by, or is under common control with, a company developing a Project or a Member in a Consortium developing the Project and control means ownership, directly or indirectly, of more than 50% (fifty percent) of the voting shares of such company or right to appoint majority Directors.

3. "BIS" shall mean specifications of Bureau of Indian Standards.

4. "BID" or "PROPOSAL" shall mean the documents submitted by the Bidder towards meeting the techno-commercial and financial qualifying requirements, along with the price bid submitted by the Bidder and submissions during the e-Reverse Auctions, if applicable, as part of its response to the RCT issued by AED.

5. "BIDDER" shall mean Bidding Company or a Bidding Consortium submitting the Bid. Any reference to the Bidder includes Bidding Company/ Bidding Consortium, Member of a Bidding Consortium including its successors, executors and permitted assigns and Lead Member of the Bidding Consortium jointly and severally, as the context may require.

6. "BIDDING CONSORTIUM" or "CONSORTIUM" shall refer to a group of Companies that collectively submit the response in accordance with the provisions of this RCT under a Consortium Agreement.

7. "CEA" shall mean Central Electricity Authority.

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

9. For Bidders incorporated in countries other than India, "Chartered Accountant" shall mean a person or a firm practicing in the respective country and designated/ registered

under the corresponding Statutes/ laws of the respective country.

10. "COMPANY" shall mean a body corporate incorporated in India under the Companies Act, 2013 or any law in India prior thereto relating to Companies, as applicable.

11. "CONTRACT YEAR" shall mean the period beginning from the Effective Date of the Contract Agreement and ending on the immediately succeeding 31st March and thereafter each period of 12 months beginning on 1st April and ending on 31st March provided that:

    - in the financial year in which the Scheduled Commissioning Date would occur, the Contract Year shall end on the date immediately before the Scheduled Commissioning Date and a new Contract Year shall commence once again from the Scheduled Commissioning Date and end on the immediately succeeding 31st March, and thereafter each period of 12 (Twelve) Months commencing on 1st April and ending on 31st March, and Provided further that the last Contract Year of this Agreement shall end on the last dayof the Term of this Agreement.

12. CONTROL" shall mean the ownership, directly or indirectly, of more than 50% (fifty percent) of the voting shares of such Company or right to appoint majority Directors.

13. "CONTROLLING SHARE HOLDING" shall mean more than 50% of the voting rights and paid up share capital in the Company/ Consortium.

14. "DAY" shall mean calendar day.

15. "EQUITY" shall mean Net Worth as defined in Companies Act, 2013.

16. "GROUP COMPANY" of a Company means

    i. a Company which, directly or indirectly, holds 10% (Ten Percent) or more of the sharecapital of the Company or;
    ii. a Company in which the Company, directly or indirectly, holds 10% (Ten Percent) or more of the share capital of such Company or;
    iii. a Company in which the Company, directly or indirectly, has the power to direct or cause to be directed the management and policies of such Company whether through the ownership of securities or agreement or any other arrangement or otherwise or;
    iv. a Company which, directly or indirectly, has the power to direct or cause to

be directedthe management and policies of the Company whether through the ownership of securities or agreement or any other arrangement or otherwise or;

v. a Company which is under common control with the Company, and control means ownership by one Company of at least 10% (Ten Percent) of the share capital of the other Company or power to direct or cause to be directed the management and policies of such Company whether through the ownership of securities or agreement or any other arrangement or otherwise;

Provided that a financial institution, scheduled bank, foreign institutional investor, Non-Banking Financial Company, and any mutual fund, pension funds and sovereign funds shall not be deemed to be Group Company, and its shareholding and the power to direct or cause to be directed the management and policies of a Company shall not be considered for the purposes of this definition unless it is the Project Company or a Member of the Consortium developing the Project.

17. **"**IEC" shall mean specifications of International Electro-Technical Commission.

18. "JOINT CONTROL" shall mean a situation where a company has multiple promoters (but none of the shareholders has more than 50% of voting rights and paid-up share capital).

19. "LEAD MEMBER OF THE BIDDING CONSORTIUM" or "LEAD MEMBER": There shall be only one Lead Member, having the shareholding of not less 51% in the Bidding Consortium.

20. "LETTER OF AWARD" or "LoA" shall mean the letter issued by State Implementing Agency (AED) to the selected vendor for award of the cumulative SPWPScapacity.

21. "LIMITED LIABILITY PARTNERSHIP" or "LLP" shall mean a Company governed by Limited Liability Partnership Act 2008 or as amended.

22. "MEMBER IN A BIDDING CONSORTIUM" or "MEMBER" shall mean each Company in a Bidding Consortium. In case of a Technology Partner being a member in the Consortium, it has to be a Company.

23. "MONTH" shall mean calendar month.

24. “NET-WORTH” shall mean the Net-Worth as defined section 2 of the Companies Act, 2013.

25. “O&M/ AMC” shall mean Operation & Maintenance/ Annual Maintenance Contract of the supplied equipments.

26. “PAID-UP SHARE CAPITAL” shall mean the paid-up share capital as defined in Section 2 of the Companies Act, 2013.

27. “PARENT” shall mean a Company, which holds more than 50% voting rights and paid up share capital, either directly or indirectly in the Project Company or a Member in a Consortium developing the Project.

28. “PROJECT” shall mean Solar Photovoltaic Water Pumping Systems (SPWPS).

29. “PROJECT INSTALLATION” The Project (SPWPS) will be considered as installed if all equipment as per rated project capacity has been installed.

30. “RCT” or “RCT DOCUMENT” or “BIDDING DOCUMENT(S)” or “TENDER DOCUMENTS” shall mean the “Request for Selection” document issued by AED including standard Power Purchase Agreement along with subsequent clarifications andamendments thereof.

31. “AED” shall mean Agricultural Engineering Department.

32. “TOE” shall mean Tender Opening Event.

33. “ULTIMATE PARENT” shall mean a Company, which owns more than 50% (Fifty Percent) voting rights and paid up share capital, either directly or indirectly in the Parent and Affiliates.

34. “VENDOR” or “SUCCESSFUL BIDDER” or “SELECTED VENDOR**”** shall mean the Bidding Company or a Bidding Consortium participating in the bid and having been selected and allocated a Project capacity by AED (through a competitive bidding process) {in case of the Selected Vendor/Bidding Consortium itself executing the Project}.

35. **“WEEK”** shall mean calendar week.

SECTION 7
SAMPLE FORMS & FORMATS FOR BID SUBMISSION

The following formats are required to be submitted as part of the RCT. These formats are designed to demonstrate the Bidder's compliance with the Qualification Requirements set forth in Section 4 and other submission requirements specified in the RCT.

Format 7.1

COVERING LETTER

(The Covering Letter should be submitted on the Letter Head of the Bidding Company/Lead Member of Consortium)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidding Company/ Lead Member ofConsortium*)

_____

_____

Tel.#:
Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No. 487, Anna Salai, Nandanam,
Chennai – 600035.

Sub: Response to RCT No. …….. dated …….. for .....(Insert title of the RCT)

Dear Sir/Madam,

I / We, the undersigned..... *[Insert name of the 'Bidder']* having read, examined and understood in detail the RCT including Qualification Requirements in particular, hereby submit our response to RCT. I / We confirm that in response to the aforesaid RCT, neither we nor any of our Ultimate Parent Company/ Parent Company/ Affiliate/ Group Company has submitted response to RCT other than this response to RCT, directly or indirectly, in response to the aforesaid RCT (as mentioned in Format 7.8 under Disclosure) **OR I /** We confirm that in the response to the aforesaid RCT, we have a Group Company who owns more than 10% share but

less than 26% share holdings in the bidding company as well as other companies who may participate in this RCT, and accordingly, we have submitted requisite undertaking as per Format 7.8A in this regard {strike out whichever not applicable}.

I / We are submitting our response to the RCT as:

Type of Bidder	Applicability (Yes/No)
Pump/ Pumpset Manufacturer	
Solar PV Module Manufacturer	
Solar Pumpset Controller Manufacturer	
Joint Venture	

In case of Joint Venture:

Lead Bidder	Non-Lead Bidder
SI / EPC / Pumpset Manufacturer/ Solar PV ModuleManufacturer/ Solar Pump Controller Manufacturer	SI / EPC/ Pumpset Manufacturer/ Solar PV ModuleManufacturer/ Solar Pumpset Controller Manufacturer

I / We are submitting application for the installation of SPWPS as follows

Sl. No.	State	Participation	Capacity of Pumpsets quoted for
1	Tamil Nadu		

1. I / We give our unconditional acceptance to the RCT, dated..... *[Insert date in dd/mm/yyyy]*, issued by AED. In token of our acceptance to the RCT along with the amendments and clarifications issued by AED, the same have been digitally signed by us and enclosed with the response to RCT. Further, we confirm that the SPWPS shall be installed within the deadline as per panel provisions of scheme guidelines and RCT.

2. Earnest Money Deposit (EMD): - (Please read Clause 12 carefully before filling)

3. I / We have submitted EMD of INR ……. (Insert Amount), through online e-procurement portal …… [Insert name of bank providing bank guarantee] and valid up to… ..... in terms of Clause 12 of this RCT. (Strike off whichever is not applicable)

4. I / We hereby declare that in the event our bid get selected and we are not able to submit

Bank Guarantee of the requisite value(s) towards PBG, within due time as mentioned in Clauses 12 of this RCT, AED shall have the right to encash the EMD/PBG submitted by us and return the balance amount (if any) for the value of EMD pertaining to unsuccessful capacity.

5. I / We have submitted our response to RCT strictly as per Section 7 (Sample Forms and Formats) of this RCT, without any deviations, conditions and without mentioning any assumptions or notes in the said Formats.

6. Acceptance: -

I / We hereby unconditionally and irrevocably agree and accept that the decision made by AED in respect of any matter regarding or arising out of the RCT shall be binding on us. I / We hereby expressly waive and withdraw any deviations and all claims in respect of this process.

I / We also unconditionally and irrevocably agree and accept that the decision made by AED in respect of award of SPWPS in line with the provisions of the RCT, shall be binding on us.

7. **Familiarity with Relevant Indian Laws & Regulations: -**

   I / We confirm that we have studied the provisions of the relevant Indian Laws and Regulations as required to enable us to submit this response to RCT, in the event of our selection as Selected Vendor.

8. I / We are submitting our response to the RCT with formats duly signed as desired by you in the RCT online for your consideration.

9. It is confirmed that our response to the RCT is consistent with all the requirements of submission as stated in the RCT, including all clarifications and amendments and subsequent communications from AED.

10. The information submitted in our response to the RCT is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our response to the RCT.

11. I / We confirm that all the terms and conditions of our Bid are valid up to _ (*Insert date in dd/mm/yyyy*) for acceptance [i.e., a period upto the date as on 12 months from the last date of submission of response to RCT].

1. Contact Person

Details of the representative to be contacted by AED are furnished as under:
Name
Designation
Company
Address
Phone No.
Mobile No.
Fax Nos.
E-mail address:

I/ We have neither made any statement nor provided any information in this Bid, which to the best of our knowledge is materially inaccurate or misleading. Further, all the confirmations, declarations and representations made in our Bid are true and accurate. In case this is found to be incorrect after our selection as Selected Vendor, we agree that the same would be treated as our event of default.

Dated the_____day of_____, 20….

Thanking you,

We remain, Yours faithfully,

Name, Designation, Seal and Signature of Authorized Person in whose name Power of Attorney/ Board Resolution/ Declaration.

Format 7.2

FORMAT FOR POWER OF ATTORNEY

(Applicable Only in case of Consortiums)

(To be provided by each of the other members of the Consortium in favor of the Lead Member)

(*To be stamped in accordance with Stamp Act, the Non-Judicial Stamp Paper of Appropriate Value***)**

KNOW ALL MEN BY THESE PRESENTS THAT M/s……having its registered office at ……..……and M/s……..having its registered office at …..(Insert names and registered offices of all Members of the Consortium) the Members of Consortium have formed a Bidding Consortium named ……. (Insert name of the Consortium if finalized) (hereinafter called the 'Consortium') vide Consortium Agreement dated…… and having agreed to appoint M/s……..…as the Lead Member of the said Consortium do hereby constitute, nominate and appoint M/s……..a company incorporated under the laws of ……..……and having its Registered/ Head Office at……..…….as our duly constituted lawful Attorney (hereinafter called as Lead Member) to exercise all or any of the powers for and on behalf of the Consortium in regard to submission of the response to RCT No……..

I / We also authorize the said Lead Member to undertake the following acts:

a. To submit on behalf of Consortium Members response to RCT.
b. To do any other act or submit any information and document related to the above response to RCT Bid.

It is expressly understood that in the event of the Consortium being selected as Selected Vendor, this Power of Attorney shall remain valid, binding and irrevocable until 5 years from installation.

I / We as the Member of the Consortium agree and undertake to ratify and confirm all whatsoever the said Attorney/ Lead Member has done on behalf of the Consortium Members pursuant to this Power of Attorney and the same shall bind us and deemed to have been done by us.

IN WITNESS WHEREOF M/s , as the Member of the Consortium have executed these presents on this……. day of under the Common Seal of our company.

For and on behalf of Consortium Member
M/s…….
---------- (Signature of person authorized by the board)
(Name
Designation
Place
Date:) Accepted

- -

(Signature, Name, Designation and Address
of the person authorized by the board of the

Lead Member)Attested

- - - - - - - - - - - - - -

(Signature of the executant)

- - - - - - - - - - - - - - - - - - -

(Signature & stamp of Notary of the place of execution)

Place:..... Date: .....

Lead Member in the Consortium shall have the controlling shareholding in the Company as defined in Section-6, Definition of Terms of the RCT.

Format 7.3

FORMAT FOR PERFORMANCE BANK GUARANTEE (PBG)

(To be submitted separately for each Project)

(*To be stamped in accordance with Stamp Act, the Non-Judicial Stamp Paper of Appropriate Value*)

Reference: …….
Bank Guarantee No.: .....…
Date: .....……..

In consideration of the___[*Insert name of the Bidder*] (hereinafter referred to as 'selected Vendor') submitting the response to RCT inter alia for …… [*Insert title of the* RCT] for the Tamil Nadu declared in Format 7.1, in response to the RCT dated…… issued by Agricultural Engineering Department (hereinafter referred to as AED) and AED considering such response to the RCT of…… [*Insert name of the Bidder*] (which expression shall unless repugnant to the context or meaning thereof include its executers, administrators, successors and assignees) issuing Letterof Award No._to_____(*Insert Name of selected Vendor*)as per terms of RCT.

As per the terms of the RCT, the_____[*Insert name & address of Bank*] hereby agrees unequivocally, irrevocably and unconditionally to pay to AED at_[*Insert Name of the Place from the address of the AED*] forthwith on demand in writing from AED or any Officer authorized by it in this behalf, any amount up to and not exceeding Indian Rupees [Total Value] only, on behalf of M/s---------- [*Insert name of the selected Vendor*].

This guarantee shall be valid and binding on this Bank up to and including and shall not be terminable by notice or any change in the constitution of the Bank or the term of contractor by any other reasons whatsoever and our liability hereunder shall not be impaired or discharged by any extension of time or variations or alternations made, given, or agreed with or without our knowledge or consent, by or between parties to the respective agreement.

Our liability under this Guarantee is restricted to INR___(Indian Rupees_____Only). Our Guarantee shall remain in force until…… AED shall be entitled to invoke this Guarantee till ……. The Guarantor Bank hereby agrees and acknowledges that AED shall have a right to invoke this BANK GUARANTEE in part or in full, as it may deem fit.

The Guarantor Bank hereby expressly agrees that it shall not require any proof in addition to the written demand by AED, made in any format, raised at the above-mentioned address of theGuarantor Bank, to make the said payment to AED. The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection by [*Insert name of the selected Vendor*] and/ or any other person.

The Guarantor Bank shall not require AED to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourseagainst AED in respect of any payment made hereunder. This BANK GUARANTEE shall be interpreted in accordance with the laws of India and the courts at _____shall have exclusive jurisdiction.

The Guarantor Bank represents that this BANK GUARANTEE has been established in such form and with such content that it is fully enforceable in accordance with its terms as against the Guarantor Bank in the manner provided herein. This BANK GUARANTEE shall not be affected in any manner by reason of merger, amalgamation, restructuring or any other change in the constitution of the Guarantor Bank.

This BANK GUARANTEE shall be a primary obligation of the Guarantor Bank and accordingly AED shall not be obliged before enforcing this BANK GUARANTEE to take any action in any court or arbitral proceedings against the selected Vendor, to make any claim against or any demand on the selected Vendor or to give any notice to the selected Vendor or to enforce any security held by AED or to exercise, levy or enforce any distress, diligence or other process against the selected Vendor.

The Guarantor Bank acknowledges that this BANK GUARANTEE is not personal to AED and may be assigned, in whole or in part, (whether absolutely or by way of security) by AED to anyentity to whom AED is entitled to assign its rights and obligations.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to INR (Indian Rupees_____Only) and itshall remain in force until We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if AED serves upon us a written claim or demand.

Signature:_____
Name:_____
Power of Attorney No.:_____ For_____*[Insert Name and Address of the Bank*] ___
Contact Details of the Bank:

E-mail ID of the Bank:
Banker's Stamp and Full Address.

Dated this_____day of____, 20__

Witness:

1. …….

2. …….
Signature
Name and Address
2. …….

Signature
Name and Address

Notes:

1. The Stamp Paper should be in the name of the Executing Bank and of appropriate value.
2. The Performance Bank Guarantee shall be executed by any of the Scheduled Commercial Banks as listed on the website of Reserve Bank of India (RBI) and amended as on the date of issuance of Bank Guarantee. Bank Guarantee issued by foreign branch of a Scheduled Commercial Bank is to be endorsed by the Indian branch of the same bank or State Bank of India (SBI).

Format 7.4

FORMAT FOR BOARD RESOLUTIONS

The Board, after discussion, at the duly convened Meeting on ..... [*Insert date*], with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956 or Companies Act 2013, as applicable, passed the following Resolution:

1. **RESOLVED THAT** Mr./ Ms.---------- , be and is hereby authorized to do on our behalf, all such acts, deeds and things necessary in connection with or incidental to our response to RCT vide RCT No._____for_____(insert title of the RCT), including signing and submission of all documents and providing information/ response to RCT to Agricultural Engineering Department (AED), representing us in all matters before AED, and generally dealing with AED in all matters in connection with our bid for the said Project. (***To be provided by the Bidding Company or the Lead Member of the Consortium***)
2. **FURTHER RESOLVED THAT** pursuant to the provisions of the Companies Act, 1956 or Companies Act, 2013, as applicable and compliance thereof and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to invest total equity in the Project. (***To be provided by the Bidding Company***)

   [Note: In the event the Bidder is a Bidding Consortium, in place of the above resolution at Sl. No. 2, the following resolutions are to be provided]
3. **FURTHER RESOLVED THAT** pursuant to the provisions of the Companies Act, 1956 or Companies Act, 2013, as applicable and compliance thereof and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to invest (-----%) equity [*Insert the % equity commitment as specified in Consortium Agreement*] in the Project. (**To be provided by each Member of the Bidding Consortium including Lead Member such that total equity is 100%**) **FURTHER RESOLVED THAT** approval of the Board be and is hereby accorded to participate in consortium with M/s ---------- [*Insert the name of other Members in the Consortium*] and Mr/ Ms……., be and is hereby authorized to execute the Consortium Agreement. (***To be provided by each Member of the Bidding Consortium including Lead Member***)

And

FURTHER RESOLVED THAT approval of the Board be and is hereby accorded to contribute such additional amount over and above the percentage limit (specified for the Lead Member in the Consortium Agreement) to the extent becoming necessary towards the total equity share in the Project Company, obligatory on the part of the Consortium pursuant to the terms and conditions contained in the Consortium Agreement dated executed by the Consortium as per the provisions of the RCT. [***To be passed by the Lead Member of the Bidding Consortium***]

Certified True Copy

(Signature, Name and Stamp of Company Secretary)

Notes:

1) This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary/ Director.
2) The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.
3) This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act, 1956 or Companies Act, 2013 as applicable may be suitably modified to refer to the law applicable to the entity submitting the resolution. However, in such case, the foreign entity shall submit an unqualified opinion issued by the legal counsel of such foreign entity, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing Company and the authorizations granted therein are true and valid.

Format 7.5

FORMAT FOR CONSORTIUM AGREEMENT

(*To be stamped in accordance with Stamp Act, the Non-Judicial Stamp Paper of Appropriate Value*)

THIS Consortium Agreement ("Agreement") executed on this_____Day of_____ TwoThousand _____ between M/s_____[*Insert name of Lead Member*] a Company incorporated under the laws of_ and having its Registered Office at__(hereinafter called the "**Member-1**", which expression shall include its successors, executors and permitted assigns) and M/s ___ a Company incorporated under the laws of _____ and having its Registered Office at _____ (hereinafter called the "**Member-2**", which expression shall include its successors, executors and permitted assigns), M/s_____ a Company incorporated under the laws of_____and having its Registered Office at _____ (hereinafter called the "**Member)**", which expression shall include its successors, executors and permitted assigns), [*The Bidding Consortium should list the details of all the Consortium Members*] for the purpose of submitting response to RCT and execution of Power Purchase Agreement (in case of award), against RCT No._____ dated_____issued by Agricultural Engineering Department (AED) a Government Department of Tamil Nadu, and having its Registered Office at No.487, Anna Salai, Nandanam, Chennai- 600035.

WHEREAS, each Member individually shall be referred to as the "Member" and all of the Members shall be collectively referred to as the "Members" in this Agreement.

WHEREAS AED desires to install SPWPS under RCT for_____(insert title of the RCT); WHEREAS, AED had invited response to RCT vide its Request for Selection (RCT) dated_____

WHEREAS the RCT stipulates that in case response to RCT is being submitted by a Bidding Consortium, the Members of the Consortium will have to submit a legally enforceable Consortium Agreement in a format specified by AED wherein the Consortium Members have to commit equity investment of a specific percentage for the SPWPS.

NOW THEREFORE, THIS AGREEMENT WITNESSTH AS UNDER:

In consideration of the above premises and agreements all the Members in this Bidding Consortium do hereby mutually agree as follows:

1. I / We, the Members of the Consortium and Members to the Agreement do hereby unequivocally agree that Member-1 (M/s_____), shall act as the Lead Member as defined in the RCT for self and agent for and on behalf of Member-2--------, Member-n and to submit the response to the RCT.

2. The Lead Member is hereby authorized by the Members of the Consortium and Members to the Agreement to bind the Consortium and receive instructions for and on their behalf.
3. Not withstanding anything contrary contained in this Agreement, the Lead Member shall always be liable for the equity investment obligations of all the Consortium Members i.e. for both its own liability as well as the liability of other Members.
4. The Lead Member shall be liable and responsible for ensuring the individual and collective commitment of each of the Members of the Consortium in discharging all of their respective equity obligations. Each Member further undertakes to be individually liable for the performance of its part of the obligations without in any way limiting the scope of collective liability envisaged in this Agreement.
5. Subject to the terms of this Agreement, the share of each Member of the Consortium in the issued equity share capital of the Vendor is/shall be in the following proportion:

Name	**Percentage**
Member 1	---
Member 2	---
Total	100%

6. In case of any breach of any equity investment commitment by any of the Consortium Members, the Lead Member shall be liable for the consequences thereof.
7. Except as specified in the Agreement, it is agreed that sharing of responsibilities as aforesaid and equity investment obligations thereto shall not in any way be a limitation of responsibility of the Lead Member under these presents.
8. It is further specifically agreed that the financial liability for equity contribution of the Lead Member shall not be limited in any way so as to restrict or limit its liabilities. The Lead Member shall be liable irrespective of its scope of work or financial commitments.
9. This Agreement shall be construed and interpreted in accordance with the Laws of India and courts at Tamil Nadu alone shall have the exclusive jurisdiction in all matters relating thereto and arising there under.
10. It is hereby further agreed that in case of being selected as the Selected Vendor, the Members do hereby agree that they shall furnish the Performance Guarantee in favour of AED in terms of the RCT.

11. It is further expressly agreed that the Agreement shall be irrevocable and shall form an integral part of the Contract Agreement and shall remain valid until the expiration or early termination of the Contract Agreement in terms thereof, unless expressly agreed to the contrary by AED.
12. The Lead Member is authorized and shall be fully responsible for the accuracy and veracity of the representations and information submitted by the Members respectively from time to time in the response to RCT.
13. It is hereby expressly understood between the Members that no Member at any given point of time, may assign or delegate its rights, duties or obligations under the Contract Agreement except with prior written consent of AED.
14. This Agreement
    a. has been duly executed and delivered on behalf of each Member hereto and constitutes the legal, valid, binding and enforceable obligation of each such Member;
    b. sets forth the entire understanding of the Members here to with respect to the subject matter hereof; and
    c. may not be amended or modified except in writing signed by each of the Members and with prior written consent of AED.
15. All the terms used in capitals in this Agreement but not defined herein shall have the meaning as per the RCT.

IN WITNESS WHEREOF, the Members have, through their authorized representatives, executed these present on the Day, Month and Year first mentioned above.

For M/s.....[Member 1]

- -

(Signature, Name & Designation of the person authorized vide Board Resolution Dated_____)

Witnesses:

1) Signature----------	2) Signature ----------
Name:	Name:
Address	Address:

For M/s.....[Member 2]

- -

(Signature, Name & Designation of the person authorized vide Board Resolution Dated _____)

Witnesses:

1) Signature ---------- 2) Signature ----------

Name: Name:

Address: Address:

Signature and stamp of Notary of the place of execution

Format 7.6

FORMAT FOR FINANCIAL REQUIREMENT

(This should be submitted on the Letter Head of the Bidding Company/ Lead Member of Consortium)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidding Company/ Lead Member of Consortium*)

_____

Tel.#:
Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam,
Chennai-600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

I / We certify that the Bidding Company/Member in a Bidding Consortium is meeting the financial eligibility requirements as per the provisions of the RCT. Accordingly, the Bidder, with the support of its Affiliates, (strike out if not applicable) is fulfilling the minimum Net Worth criteria, by demonstrating a Net Worth of Rs…….. Cr. (…….in words) as on the last date of Financial Year 2022-23.

This Net Worth has been calculated in accordance with instructions provided in Clause 41 ofthe RCT.

Exhibit (i): Applicable in case of Bidding Company

For the above calculations, we have considered the Net Worth by Bidding Company and/ or its Affiliate(s) as per following details:

Name of Bidding Company	Name of Affiliate(s) whose net worth is to be considered	Relationship with Bidding Company*	Net Worth (inRs. Crore)
Company 1			

Name of Bidding Company	Name of Affiliate(s) whose net worth is to be considered	Relationship with Bidding Company*	Net Worth (inRs. Crore)
Total			

**The column for "Relationship with Bidding Company" is to be filled only in case the financial capability of Affiliate has been used for meeting Qualification Requirements. Further, documentary evidence to establish the relationship, duly certified by a practicing company secretary/ chartered accountant is required to be attached with the format.*

Exhibit (ii): Applicable in case of Bidding Consortium
(To be filled by each Member in a Bidding Consortium separately)Name of Member: [*Insert name of the Member*]

Net Worth Requirement to be met by Member in Proportion to the Equity Commitment: INR ---------- Crore (Equity Commitment (%) * Rs. [ ] Crore)

For the above calculations, we have considered Net Worth by Member in Bidding Consortiumand/ or its Affiliate(s) per following details:

Name of Consortium Member Company	Name of Affiliate(s) whose net worth is to be considered	Relationship with Bidding Company* (Ifany)	Net Worth (in Rs. Crore)	Equity Commitment (in %age) in Bidding Consortium	Committed Net Worth (in Rs. Crore)
Company 1					

Total					

** The column for "Relationship with Bidding Company" is to be filled only in case the financial capability of Affiliate has been used for meeting Qualification Requirements. Further, documentary evidence to establish the relationship, duly certified by a practicing company secretary/chartered accountant is required to be attached with the format*

Further, we certify that the Bidding Company/ Member in the Bidding Consortium, with the support of its Affiliates, (strike out if not applicable) is fulfilling the Minimum Average Annual Turnover Criteria, by demonstrating a MAAT of INR_____(_____in words) for the last three Financial Years, namely_____,_____and_____.

Exhibit (i): Applicable in case of Bidding Company

For the above calculations, I / We have considered the MAAT by Bidding Company and/ or itsAffiliate(s) as per following details:

Name of Bidding Company	Name of Affiliate(s) whose MAAT is to be considered	Relationship with Bidding Company*	MAAT (in Rs. Crore)FY 2019-20	MAAT (in Rs. Crore)FY 2020-21	MAAT (in Rs.Crore) FY 2021-22
Company 1					
Total					

**The column for "Relationship with Bidding Company" is to be filled only in case the financial capability of Affiliate has been used for meeting Qualification Requirements. Further, documentary evidence to establish the relationship, duly certified by a practicing company secretary/chartered accountant is required to be attached with the format.*

Exhibit (ii): Applicable in case of Bidding Consortium

(To be filled by each Member in a Bidding Consortium separately) Name of Member: [*Insert name of the Member*]

MAAT requirement to be met by Member in Proportion to the Equity Commitment: INR ----------Crore (Equity Commitment (%) * Rs. [ ] Crore)

For the above calculations, I / We have considered MAAT by Member in Bidding Consortium and/ or its Affiliate(s) as per following details:

Name of Consortium Member Company	Name of Affiliate(s) whose MAAT isto be considered	Relationship with Bidding Company* (If Any)	MAAT (in Rs. Crore) FY 2020-21	MAAT (in Rs. Crore) FY 2021-22	MAAT (inRs. Crore) FY 2022-23	Equity Commitmen (in%age) in Bidding Consortium	Proportionate MAAT (in Rs. Crore)
Company 1							

Total							

** The column for "Relationship with Bidding Company" is to be filled only in case the financial capability of Affiliate has been used for meeting Qualification Requirements. Further, documentary evidence to establish the relationship, duly certified by a practicing company secretary/chartered accountant is required to be attached with the format*

Further, I / We certify that the Bidding Company/ Member in the Bidding Consortium, with the support of its Affiliates, (strike out if not applicable) is fulfilling the minimum Liquidity Criteria by demonstrating a Working Capital of INR_____(in words) as on the end of Financial Year 2022-23. (Strike out if not applicable)

Exhibit (i): Applicable in case of Bidding Company

For the above calculations, I / We have considered Working Capital by Bidding Company and/ orits Affiliate(s) as per following details:

Name of Bidding Company	Name of Affiliate(s) whose Working Capital is to be considered	Relationshp with Bidding Company*	Working Capital (in Rs. Crore)
Company 1			
Total			

**The column for "Relationship with Bidding Company" is to be filled only in case the financial capability of Affiliate has been used for meeting Qualification Requirements. Further, documentary evidence to establish the relationship, duly certified by a practicing company secretary/chartered accountant is required to be attached with the format.*

Exhibit (ii): Applicable in case of Bidding Consortium
(To be filled by each Member in a Bidding Consortium separately)

Name of Member: [*Insert name of the Member*]

Working Capital requirement to be met by Member in Proportion to the Equity Commitment: INR ----------Crore (Equity Commitment (%) * Rs. [ ] Crore)

For the above calculations, I / We have considered Working Capital by Member in BiddingConsortium and/ or its Affiliate(s) as per following details:

Name of Consortium Member Company	Name of Affiliate(s) whose Working Capital is to be considered	Relationship with Bidding Company* (If Any)	Working Capital (in Rs. Crore)	Equity Commitment (in %age) in Bidding Consortium	Proportionate Working Capital (in Rs. Crore)
Company 1					

Total					

** The column for "Relationship with Bidding Company" is to be filled only in case the financial capability of Affiliate has been used for meeting Qualification Requirements. Further, documentary*

evidence to establish the relationship, duly certified by a practicing company secretary/chartered accountant is required to be attached with the format

(Signature & Name of the Authorized Signatory) **(Signature and Stamp of CA)**
Membership No.
Regn. No. of the CA's Firm:

Date:

Note: (i) Along with the above format, in a separate sheet on the letterhead of the Chartered Accountant's Firm, provide details of computation of Net Worth and Annual Turnover duly certified by the Chartered Accountant.

(ii) Certified copies of Balance sheet, Profit & Loss Account, Schedules and Cash Flow Statements are to be enclosed in complete form along with all the Notes to Accounts.

FORMAT 7.7

UNDERTAKING

(To be submitted on the letterhead of the Bidder)

I / We, hereby provide this undertaking to Agricultural Engineering Department, Tamil Nadu in respectto our response to RCT vide RCT No._____dated that M/s----------(insert name of the Bidder), or any of its Affiliates is not a willful defaulter to any lender, and that there is no major litigation pending or threatened against M/s----------(insert name of the Bidder) or any of its Affiliates which are of a naturethat could cast a doubt on the ability or the suitability of the Bidder to undertake the Project.

(Name and Signature of the Authorized Signatory)

Format 7.8

FORMAT FOR DISCLOSURE

(To be submitted on the Letter Head of the Bidding Company/ Each Member of Consortium)

DISCLOSURE

Ref.No._____ Date: _____

From:_____*(Insert name and address of Bidding Company/ Lead Member of Consortium*)

_____

_____

Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam,
Chennai-600 035.

Sub: Response to RCT No._____dated_____for _____

Dear Sir/ Madam,

- I / We hereby declare and confirm that only I / we are participating in the RCT Selection process forthe RCT No.____dated_and that our Parent, Affiliate or Ultimate Parent or any Group Company with which I / we have direct or indirect relationship are not separately participating in this selection process.
- I / We further declare that the above statement is true and correct. We undertake that if at any stage it is found to be incorrect, in addition to actions applicable under the RCT including but not limited to cancellation of our response to this RCT and LoA, we, i.e. M/s_____ (enter name of the bidding company/member in a consortium), including ourParent, Ultimate Parent, and our Affiliates shall be suspended/debarred from participating in any of the upcoming tenders issued by AED for a period of 2 years from the date of default as notified by AED.
- I / We also understand that the above is in addition to the penal consequences that may follow from the relevant laws for the time being in force.
- I / We further declare that we have read the provisions of Clause 39.4 of the RCT, and are

complying with the requirements as per the referred OM dated 23.07.2020 except Sl.11 of the OM, including subsequent amendments and clarifications thereto. Accordingly, we are also enclosing necessary certificates (Annexure to this format) in support of the above compliance under the RCT. We understand that in case of us being selected under this RCT, any of the above certificates is found false, AED shall take appropriate action as deemed necessary.

- I / We further declare that we are fully aware of the binding provisions of the ALMM Order and the Lists(s) there under, while quoting the price in RCT for_____(Enter the name of the RCT).
- I / We further understand that the List-I (Solar PV Modules) of ALMM Order, Annexure-I of the OM, issued by MNRE on 10th March, 2021 will be updated by MNRE from time to time. We also understand that the Modules to be procured for this project, shall be from the List-I of the ALMM Order applicable on the date of invoicing of such modules.
- I / We also further understand and accept that we shall be liable for penal action, including but not limited to blacklisting and invocation of Performance Bank Guarantee, if we are found not complying with the provisions of ALMM Order, including those mentioned above.

Dated the_____ day of_____, 20….

Thanking you, We remain, Yours faithfully,

Name, Designation, Seal and Signature of Authorized Person in whose name Power of Attorney/ Board Resolution/ Declaration.

Format 7.8 A

FORMAT FOR DISCLOSURE

(To be submitted on the Letter Head of the Bidding Company/ Each Member of Consortium)

(To be submitted by all such bidders in which a common Company/companiesdirectly/indirectly own(s) more than 10% but less than 26% shareholding)

DISCLOSURE

Ref.No._____ Date:

_____

From:_____(Insert name and address of Bidding Company/ Lead Member of Consortium)

_____

_____

Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam,
Chennai-600 035.

Sub: Response to RCT No._____dated_____for_____.
Dear Sir/ Madam,

- I / We hereby declare and confirm that in terms of the definitions of the RCT, M/s (enter name of the common shareholder) is our Group Company, and has a direct/indirect shareholding of less than 26% in the bidding company. M/s----------(enter name of the common shareholder) also holds directly/indirectly less than 26% shareholding in other Companies which may participate in this RCT, i.e., RCT No.----------
- I / We undertake that M/s----------(enter name of the above common shareholder) is not a party to the decision-making process for submission of response to this RCT by M/s.---------- (enter name of the bidding company/member in the consortium).
- I / We further undertake that while undertaking any action as part of our response to RCT, we are not complicit with other such bidders participating in this RCT, in which M/s ____ (enter name of the common shareholder) has less than 26% direct/indirect shareholding, if any.
- I/ We further declare that the above statement is true & correct. I / We undertake that if at any

stageit is found to be incorrect, in addition to actions applicable under the RCT including but not limited to cancellation of our response to this RCT and LoA, we, i.e. M/s----------(enter name of the bidding company/member in a consortium), including our Parent, Ultimate Parent, and our Affiliates shall be suspended/debarred from participating in any of the upcoming tenders issued by AED for a period of 2 years from the date of default asnotified by AED.

- I / We also understand that the above is in addition to the penal consequences that may follow from the relevant laws for the time being in force.
- I / We further declare that we have read the provisions of Clause 39.4 of the RCT, and are complying with the requirements as per the referred OM dated 23.07.2020 except Sl. 11 of the OM, including subsequent amendments and clarifications thereto. Accordingly, we are also enclosing necessary certificates (Annexure to this format) in support of the above compliance under the RCT. We understand that in case of us being selected under this RCT, any of the above certificates is found false, AED shall take appropriate action as deemed necessary.
- I / We further declare that we are fully aware of the binding provisions of the ALMM Order and the Lists(s) there under, while quoting the price in RCT for_____(Enter the name of the RCT). We further understand that the List-I (Solar PV Modules) of ALMM Order, Annexure-I of the OM, issued by MNRE on 10th March, 2021 will be updated by MNRE from time to time. We also understand that the Modules to be procured for this project, shall be from the List-I of theALMM Order applicable on the date of invoicing of such modules.
- I / We also further understand and accept that we shall be liable for penal action, including but not limited to blacklisting and invocation of Performance Bank Guarantee, if we are found notcomplying with the provisions of ALMM Order, including those mentioned above.

Dated the_____ day of_____, 20….

Thanking you,
We remain,
Yours faithfully,
Name, Designation, Seal and Signature of Authorized Person in whose name Power of Attorney/ Board Resolution/ Declaration.

Annexure to Format 7.8/7.8A

DECLARATION

RESTRICTION ON PROCUREMENT FROM CERTAIN COUNTRIES:
MoF. OM No 6/18/2019-PPD dated 23.07.2020

(To be submitted on the Letter Head of the Bidding Company/ Each Member of Consortium)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidding Company/Member of Consortium*)

_____

_____

Tel.#:
Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam,
Chennai-600 035.

Sub: Response to the RCT No..... dated ……

Dear Sir/ Madam,

This is with reference to attached order No. OM no. 6/18/2019-PPD dated 23rd July 2020 issuedby Department of Expenditure, MoF, Govt of India.

I / We are hereby submitting the following declaration in this regard:

"I / We have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. Where applicable, evidence of valid registration by the Competent Authority shall be attached]."

I / We further declare that the above statement is true and correct. We are aware that if at any stageit is found to be incorrect, our response to the tender will be rejected.

Dated the_____day of_____, 20….
Thanking you,
We remain,

Yours faithfully,

Name, Designation, Seal and Signature of Authorized Signatory.

Enclosure: OM dated 23.07.2020, as referred above

Format 7.9

(This format is for reference purpose only. The scanned version of the format, duly signed by AED's authorized signatory, is available on the e-Procurement portal as addendum to the RCT. Bidders are required to submit signed and scanned copy of the document available on portal)

INTEGRITY PACT

Between

Agricultural Engineering Department

having its Registered Office at No.487, Anna Salai, Nandanam, Chennai – 600 035,

herein after referred to as

"AED",

and

_____

[Insert the name of the Sole Bidder/all members of the of Joint Venture/Consortium]

having its Registered Office at ----------

(Insert full Address/Lead member address in case of Joint Venture/Consortium)

_____

and

_____

[*Insert the name of all members of the Joint Venture/Consortium, as applicable]*

having its Registered Office at ----------
(Insert full Address/ Lead member address in case of Joint Venture/Consortium)

_____

hereinafter referred to as

"The Bidder/Contractor

Preamble

AED intends to award, under laid-down organizational procedures, contract(s) for *[Insert the name of the tender/package]* ----------Package and NIT Number----------AED values full compliance with all *[Insert Specification Number of the package]* relevant laws and regulations, and the principles of economical use of resources, and of fairness and transparency in its relations with its Bidders/ Contractors.

In order to achieve these goals, AED and the above-named Bidder/Contractor enter into this agreement called '**Integrity Pact'** which will form an integral part of the bid.

It is hereby agreed by and between the parties as under:

Section I - Commitments of AED

(1) AED commits itself to take all measures necessary to prevent corruption and to observethe following principles:

a. No employee of AED, personally or through family members, will in connection with the tender, or the execution of the contract, demand, take a promise for or accept, for him/herself or third person, any material or other benefit which he/she is not legally entitled to.

b. AED will, during the tender process treat all Bidder(s) with equity and fairness. AED will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

c. AED will exclude from evaluation of Bids its such employee(s) who has any personal interest in the Companies/Agencies participating in the Bidding/Tendering process

(2) If Chief Engineer(AE) obtains information on the conduct of any employee of AED which is a criminal offence under the relevant Anti-Corruption Laws of India, or if therebe a substantive suspicion in this regard, he will inform its Chief Vigilance Officer andin addition can initiate disciplinary actions under its Rules.

Section II - Commitments of the Bidder/Contractor

(1) The Bidder/Contractor commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution:

a. The Bidder/Contractor will not, directly or through any other person or firm, offer, promise or give to AED, or to any of AED's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange an advantage during the tender process or the execution of the contract.

b. The Bidder/Contractor shall not enter into any agreement/ arrangement/ understanding/ action in concert, whether or not the same is formal or in writing with other Bidders/Contractors. This applies in particular to agreements pertaining to prices, territorial or geographical allocations of market, specifications, certifications, subsidiary contracts, submission or non- submission of bids, bid rigging or other actions restricting competitiveness or leading to cartelization in the bidding process or

amounting to any other violation under the Competition Laws for the time being in force.

c. The Bidder/Contractor will not commit any criminal offence under the relevant Anti-corruption Laws of India; further, the Bidder/Contractor will not use for illegitimate purposes or for purposes of restrictive competition or personal gain, or pass on to others, any information provided by AED as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d. Bidders will not pass any information provided by Principal as part of business relationship to others and not to commit any offence under PC/ IPC Act

e. The Bidder/Contractor of Indian Nationality shall furnish the name and address of the foreign principals, if any, involved directly or indirectly in the Bidding.

f. The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, or committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and/orwith the execution of the contract.

g. The Bidder/Contractor will not misrepresent facts or furnish false/forged documents/information in order to influence the bidding process or the execution of the contract to the detriment of AED.

(2) The Bidder/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section III- Disqualification from tender process and exclusion from future contracts

a. If the Bidder, before contract award, has committed a serious transgression through a violation of Section II or in any other form such as to put his reliability or credibility as Bidder into question, AED may disqualify the Bidder from the tender process or terminate the contract, if already signed, for such reason.

b. If the Bidder/Contractor has committed a serious transgression through a violation of Section II such as to put his reliability or credibility into question, AED may after following due procedures also exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder/Contractor and the amount of the damage. The exclusion will be imposed for a minimum of 12 months and maximum of 36 months.

c. If the Bidder/Contractor can prove that he has restored/recouped the damage caused by him and has installed a suitable corruption prevention system, AED

may revoke the exclusion prematurely. However, decision of AED in this regard shall be final and binding on the bidder/Contractor.

Section IV - **Liability for violation of Integrity Pact**

a. If AED has disqualified the Bidder from the tender process prior to the award under Section III, AED may forfeit the applicable Earnest Money Deposit under the Bid.

b. If AED has terminated the contract under Section III, AED may forfeit the Contract Performance Security of this contract besides resorting to other remedies under the contract.

Section V- **Previous Transgression**

a. The Bidder shall declare in his Bid that no previous transgressions occurred in the last 3 years with any other Public Sector Undertaking or Government Department that couldjustify his exclusion from the tender process.

b. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section VI - **Equal treatment to all Bidders / Contractors**

a. AED will enter into agreements with identical conditions as this one with all Bidders.

b. AED will disqualify from the tender process any bidder who does not sign this Pact or violate its provisions.

Section VII - Punitive Action against violating Bidders / Contractors

a. If AED obtains knowledge of conduct of a Bidder or a Contractor or his subcontractor or of an employee or a representative or an associate of a Bidder or Contractor or his Subcontractor which constitutes corruption, or if AED has substantive suspicion in this regard, AED will inform the Chief Vigilance Officer (CVO).

b. Nothing mentioned herein above may deem to restrict the right of AED, in case of a suspected violation of Section II, Clause (1) (b) by the Bidders/ contractors to initiate necessary action under the Competition Laws for the time being in force.

Section VIII - Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor after the closure of the contract.

Section IX - Other Provisions

a. This agreement is subject to Indian Law. Place of performance is jurisdiction of AED.

b. Changes and supplements as well as termination notices need to be made in

writing.

c. If the Contractor is a partnership firm or a consortium or Joint Venture, this agreement must be signed by all partners, consortium members and Joint Venture partners.

d. Nothing in this agreement shall affect the rights of the parties available under the General Conditions of Contract (GCC) and Special Conditions of Contract (SCC) which are part of the Bidding Document.

(Signature) _____	(Signature) _____
(For & On behalf of AED)	**(For & On behalf of Bidder/ Partner(s) ofJoint Venture/Consortium/ Contractor)**
(Office Seal)	(Office Seal)
Name:_____	Name:_____
Designation:_____	Designation:_____
Witness 1 :_____	Witness 1 :_____
(Name & Address) _____	(Name & Address) _____
_____	_____
_____	_____
Witness 2 :_____	Witness 2 :_____
(Name & Address) _____	(Name & Address) _____
_____	_____
_____	_____

Format 7.10

DECLARATION REGARDING BANNING, LIQUIDATION, COURT RECEIVERSHIP ETC.

(To be submitted on the Letter Head of the Bidder)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidder)*
Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam, Chennai – 600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

I / We hereby confirm that we are not on the Banning List by AED or Public Sector Project Management due to poor performance or Corrupt/ Fraudulent/ Collusive/ Coercive Practices or any other reason or banned by Government department/ Public Sector on due date of submission of bid.

Further, I / We confirm that neither we nor our allied agency (ies) are on banning list of AED or the Ministry of New and Renewable Energy.

I / We also confirm that I / We are not under any liquidation, court receivership or similar proceedings or bankruptcy.

In case it comes to the notice of AED that I / We have given wrong declaration in this regard, the same shall be dealt as Fraudulent Practices and I / We shall be banned by AED for a period which shall be decided by AED on case-to-case basis, subject to minimum period of banning being 6 months from the date of issuance of banning order.

Further, I / We also confirm that in case there is any change in status of the declaration prior to award of contract, the same will be promptly informed to AED by us.

(Name and Signature of the Authorized Signatory)

Format 7.11

DECLARATION FOR THE LOCAL CONTENT

(To be submitted on the Letter Head of the Bidder)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidder)*

Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam, Chennai – 600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

I / We declare that we will be using indigenously manufactured solar panels with indigenous solar cells and modules. Further, we are agreeing to accept and follow Guidelines for the implementation of the scheme as stipulated by Agricultural Engineering Department and PM-KUSUM scheme issued by MNRE on 22-07-2019 and its subsequent amendment(s).

Further, I / We hereby undertake that We certify that we/our Collaborator/JV Partner are/is are not being under debar list/undergoing debarment period on account of breach of the code of integrity under Rule 175(1)(i)(h) of the General Financial Rules for giving false declarations of local content.

List of imported components used in the manufacturing of solar water pumping system:

S. No.	Item Imported

(Name and Signature of the Authorized Signatory)

Format 7.12

DECLARATION FOR USING SAME MAKE OF EQUIPMENTS AS PER THE TEST CERTIFICATE

(To be submitted on the Letter Head of the Bidder)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidder)*

Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam, Chennai – 600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

I / We are agreeing to accept that the same make of solar panels, pumpsets, VFD/inverter/controller for which the test report is to be submitted to the Implementing agency, as per MNRE solar pump testing procedure 2019 and amendments thereof, will be supplied by us.

In case, if some different make of solar panels, pumpsets, VFD/inverter/controller will be supplied during the implementation or AMC period, I / We will submit the test report for that particular make component(s). I / We also agree that such test reports shall be issued by the National Institute of Solar Energy and any other lab accredited by NABL for testing of solar PV water pumping system as per MNRE specifications and testing procedure.

(Name and Signature of the Authorized Signatory)

Format 7.13

DECLARATION FOR SUBMITTING THE TEST CERTIFICATE AS PER MNRE TECHNICAL SPECIFICATIONS FOR SOLAR WATER PUMPSETS ISSUED IN 2023

(To be submitted on the Letter Head of the Bidder)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidder)*

Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam, Chennai – 600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

I / We are agreeing to accept that the test certificates are to be submitted to AED, test reports as per MNRE technical specifications and testing procedures issued by MNRE, GoI Vide O.M. F.No.41/3/2018-SPV division, dated in 22.03.2023 and amendments thereof, will be submitted by us within 30 days of issuance of Letter of Empanelment by AED. In failure of which our empanelment will stand cancelled, without any prior intimation. These certificates shall be submitted either in original form or attested copy by the issuing test lab.

(Name and Signature of the Authorized Signatory)

Format 7.14

CERTIFICATE REGARDING COMPLIANCE OF MeitY NOTIFICATION VIDEFILE NO. 1(10)/2017-CLES Dated. 02.07.2018

(To be submitted on the Letter Head of the Bidder)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidder)*

Tel.#: Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam, Chennai – 600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

This is to certify that the products/items being offered/ quoted against ref. RCT by M/s…….. meet the definition of domestically manufactured/produced Cyber Security Products as per Para 4 of MeitY notification vide Fileno. 1(10)/2017−CLES dt. 02.07.2018 and the bidder shall strictly abide by all provisions of the subject notification.

(Name and Signature of the Authorized Signatory)

Format 7.15

FORMAT FOR SUBMISSION OF PRICE BID

(The Covering Letter should be submitted on the Letter Head of the Bidder/ Lead Member of Consortium)

Ref. No._____ Date: _____

From:_____*(Insert name and address of Bidder / Lead Member of Consortium*)

_____

_____

Tel.#:
Fax#:
E-mail address#

To
The Chief Engineer (AE),
Agricultural Engineering Department,
No.487, Anna Salai,
Nandanam, Chennai – 600 035.

Sub: Response to RCT No._____dated_____for_____.

Dear Sir/ Madam,

I/ We,----------(*Insert Name of the Bidder*) enclose herewith the Price Bid/Financial Proposal for selection of my/our firm, in line with the Price Bid Schedule enclosed herewith.

I/We agree that this offer shall remain valid for a period of 24 months from the date of issue of Letter of Award (LoA) bids under this RCT and such further period as may be mutually agreed upon.

Dated the_____day of_____, 20….

Thanking you,
We remain,
Yours faithfully,

Name, Designation, Seal and Signature of Authorized Person in whose name Power of Attorney/ Board Resolution/ Declaration.

Notes:

1. *Only a single price bid for each line item (i.e., type of pump), for the cumulative Project capacity quoted by the bidders, shall have to be filled online in the Electronic Form provided at the e procurement portal.*

2. *The instructions mentioned in the Financial Bid Electronic Form have to be strictly followed without any deviation, else the bid shall be considered as non-responsive.*

3. *Price bids requirement shall be quoted as a fixed amount in Indian Rupees only. Conditional proposal shall be summarily rejected.*

4. *Tariff should be in Indian Rupee up to two decimal places only.*

Format 7.16

PRICE BID SCHEDULE

(To be submitted on the Letter Head of the Bidder/ Lead Member of Consortium) The excel file as Price bid format of the RCT shall be used for entering the price bid. Signed and scanned copyof the same will be required to be uploaded on the portal)

Pump Capacity	Pump Type	Pump Position	Pump Cooling Category (Select which ever quoted for)	Controller Type	Unit Cost in Rs. (Exclusive of GST)
For Indigenous Solar Cells Only					
3	AC	Surface	-	Normal (Without USPC)	
	DC	Surface	-	Normal (Without USPC)	
5	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	AC	Surface	-	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Surface	-	Normal (Without USPC)	
7.5	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	AC	Surface	-	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Surface	-	Normal (Without USPC)	
10	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
12.5	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
15	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	

Pump Capacity	Pump Type	Pump Position	Pump Cooling Category (Select which ever quoted for)	Controller Type	Unit Cost in Rs. (Exclusive of GST)
	DC	Submersible	Oil Filled	Normal (Without USPC)	
For Non Indigenous Solar Cells Only (Optional)					
3	AC	Surface	-	Normal (Without USPC)	
	DC	Surface	-	Normal (Without USPC)	
5	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	AC	Surface	-	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Surface	-	Normal (Without USPC)	
7.5	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	AC	Surface	-	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Surface	-	Normal (Without USPC)	
10	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
12.5	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	
15	AC	Submersible	Water Filled	Normal (Without USPC)	
	AC	Submersible	Oil Filled	Normal (Without USPC)	
	DC	Submersible	Water Filled	Normal (Without USPC)	
	DC	Submersible	Oil Filled	Normal (Without USPC)	

Additionally, the filled-out Excel file(s) must also be submitted in envelope-2 of the online bid portal.

Note: *The bidder may quote for all the pump capacity and type or for selected capacity and type, opted by the bidder in the item wise Bill of Quantity for indigenously manufactured solar cells (It is optional to quote for non indigenously manufactured Solar cells). However allotment will be based on available demand in the State. In case of discrepancies between excel and scanned price bid(s), prices mentioned in excel files shall prevail.*

Format 7.17

PRELIMINARY ESTIMATE OF COST OF SPWPS

(To be submitted by all the empanelled bidders before signing of Contract Agreement)

Bidder Name: …….

State Name: ……...

Capacity (HP): ……...

Type (AC/DC): …….

Category (Surface/Submersible): …….

Controller (without USPC): ……

Module Type (with DCR Cell/Non-DCR Cell): ……

Sl. No.	**Particulars**	**Estimated Cost** (In INR) (exclusive of GST)
1.	System Cost	
i.	*Module*	
ii.	*Pump*	
iii.	*Controller*	
iv.	*Module Mounting Structure (MMS)*	
v.	*Balance of System (BoS)*	
2.	Transportation Cost	
3.	Installation Cost	
4.	5-year CMC Cost	
5.	5-year Insurance Cost	
6.	Cost for Remote Monitoring System	
7.	Others (if any)	

Dated the_____day of_____,20….

Thanking you,
We remain,

Yours faithfully,

Name, Designation, Seal and Signature of Authorized Person
in whose name Power of Attorney/ Board Resolution/
Declaration.

Annexure-A (Technical Specification)

SPECIFICATION FOR SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS

1. SCOPE

These specification covers design qualifications and performance specifications for Centrifugal Solar Photo Voltaic (SPV) Water Pumping Systems from 1HP (0.75 kW) to 25 HP (18.75 kW) suitable for bore-well, open well, water reservoir, water stream, etc., and specifies the minimum standards to be followed under MNRE Schemes.

2. TERMINOLOGY

In addition to the terminology specified in IS 5120 and IEC 62253, the following shall also apply.

2.1 Static Water Depth — It is the depth of water level below the ground level when the pump is not in operation.

2.2 Draw-Down — It is the elevation difference between the depth of static water level and the consistent standing water level in the bore-well during the operation of the pumpset.

2.3 Submergence — It is the minimum height of the water level after drawdown above the pump suction casing.

2.4 Manometric Suction Lift — Manometric suction lift is the vacuum gauge/suction manometer reading in the meter of the water column when the pump operates at suction lift.

2.5 Static Suction Lift —Suction lift/head is the vertical distance between sump water level and center of pump inlet.

2.6 Daily Water Output — It is the total water output on a clear sunny day with three times tracking **of** SPV modules, under the "Average Daily Solar Radiation" condition of 7.15 KWh / m^2on the surface of SPV array (i.e., coplanar with the SPV Modules).

2.7 Wire to Water Efficiency — It is the combined system efficiency of SPV Module, Converter/Controller with Inbuilt MPPT mechanism, Motor-Pumpset and piping.

2.8 SPV Pump Controller — Pump Controller converts the DC voltage of the SPV array into a suitable DC or AC, single or multi-phase power and may also include equipment for MPPT, remotemonitoring, and protection devices.

2.9 Maximum Power Point Tracker (MPPT) — MPPT is an algorithm that is included in the pump controller used for extracting maximum available power from SPV array under a given condition. The voltage at which SPV array can produce maximum power is called 'maximum power point' voltage (or peak power voltage).

3. CONSTRUCTIONAL FEATURES

General

3.1.1 SPV Water Pumping System set uses the irradiance available through SPV array. The SPV array produces DC power, which can be utilized to drive a DC or an AC motor-pumpset using pump controller.

3.2 A SPV Water Pumping system typically consists of:

3.2.1. *Motor PumpSet see 3.4.*

3.2.2.*SPV Pump Controller*

Specifications of Controller/Drive for Solar Water Pumping Systems

S.No	Requirement	Specifications
1.	*Controller Power Capacity to drive the Pump*	Controller Power Capacity should be at-least equal to Solar Panels Power Capacity (Wp), not Pump Capacity. Example: For **5 HP** pumps, the pump capacity will be 3750 W as per MNRE Specifications, the solar panel capacity will be at-least 4800 Wp the controller capacity should match the solar panel capacity.
2.	*Point Tracking (MMPT)*	Should track power only and not Voltage at Maximum power point.

3.	*Enclosure*	The Controller with RMS must have **IP65** protection.
4.	*Isolator Switch*	Should be between Solar panels and the controller.
5.	*RMS (GSM/GPRS connectivity)*	Controller shall be integrated with Remote Monitoring System with GSM/GPRS and Geo tagging. GSM/ GPRS Charges are to be included in the Costing till the end the of the Warranty period of the Motor-Pumpset.
6.	Controller display/screen	The various parameters should be present on the SPV Pump Controller display/screen such as:- Pump On/Off status, Array Input DC Voltage, DC/AC output Current & voltage, operating frequency, Latest RMS Latitude, Latest RMS Longitude, Pump Capacity (HP), PV Module Capacity (KW), Pump Status, Current Generation (kW), Today Solar Generation (kWh), Cumulative Solar Generation (kWh), Today Runs Hours (Hrs.), Cumulative Pump Run Hours (Hrs.), Cumulative Water Discharged (Litres), Total Water Discharged (Litres), Peak Power (kW) supplied by the controller to Motor-PumpSet.

3.2.3 Provision for remote monitoring unit for the pumps shall be made in the pump controller using GSM/GPRS Gateway with Geo tagging and through an internal/external arrangement having following basic functions:

a) Controller shall be assigned with a unique serial number and its live status shall be observed remotely on online portal through login credentials;
b) Live status shall indicate whether controller is ON/OFF
c) The parameter that is, the water output, water flow rate (calculated based on parameters), in fault condition; array input voltage/current and power shall be logged at an interval of 10 min;and
d) Controller shall have a back up to store the data locally (at least for 1 year)

3.2.3.1 *Remote Monitoring System (RMS)*

The detailed Specification of RMS is attached at Annexure I.

3.3 Solar Photo Voltaic (SPV) Array

3.3.1.SPV array contains specified number of same capacity, type and specifications modules connected in series or parallel to obtain the required voltage or current output. The SPV water pumping system should be operated with a SPV array of minimum capacity in the range of **900 Wp to 22500 Wp**, measured under Standard Test Conditions (STC). A Sufficient number of modules in series and parallel could be used to obtain the required voltage or current output. The

power output of individual SPV modules used in the SPV array, under STC, should be a minimum of **300 Wp**, with adequate provision for tolerances measurement. Use of SPV modules with higher power output is preferred.

3.3.2. Modules supplied with the SPV water pumping systems shall have a certificate as per IS 14286/IEC 61215 specifications or equivalent National or International /Standards. STC performance data supplied with the modules shall not be more than one year old.

3.3.3 Modules must qualify to IS/IEC 61730 Part I and II for safety qualification testing.

3.3.4. The minimum module efficiency should be minimum 19 percent and fill factor shall be more than 75 percent.

3.3.5 Modules must qualify to IS 170210 (Part 1) for the detection of potential-induced degradation - Part 1: Crystalline silicon (Mandatory in case the SPV array Open Circuit voltage is more than 600 V DC)

3.3.6 In case the SPV water pumping systems are intended for use in coastal areas the solar modules must qualify to IEC/ IS 61701 for salt mist corrosion test.

3.3.7 The name plate of SPV module shall conform to IS 14286/IEC 61215.

3.3.8. Module to Module wattage mismatch in the SPV array shall be within ± 3 percent.

3.3.9. Any array capacity above the minimum array wattage requirement as specified in these specifications for various models of SPV Water Pumping Systems is allowed.

3.3.10 The SPV modules must be warranted for output wattage, which should not be less than 90% of the rated wattage at the end of 10 years and 80% of the rated wattage at the end of 25 years.

3.3.11 The RFID tag shall be placed inside the glass laminate of the SPV modules.

3.4 Motor-Pumpset

3.4.1 The SPV water pumping systems may use any of the following types of motor pump sets:

a) Surface Mono-set.
b) Submersible motor-pumpset.
c) Any other type of the motor-pumpset after approval from Ministry.

3.4.2. Motor

The motors of the motor-pump set may be of the following types: -

d) AC Induction Motor.
e) DC Motor, PMSM/ SRM.

3.4.3 The "Motor-PumpSet" should have a capacity in the range of 1 HP (0.75 kW) to 25 HP (18.75 kW) and should have the following features:

a) The closed coupled or mono block DC/ AC centrifugal motor-pumpset with appropriate mechanical seal(s) which ensures zero leakage.
b) The motor of the capacity ranging from 0.75 kW to 18.75 kW shall be AC/DC. The suctionand delivery head will depend on the site-specific condition of the field; and
c) Submersible pumps could also be used according to the dynamic head of the site at which the pump is to be used.

3.4.4 The pump and all external parts of the motor used in the submersible pump which are in contact with water, should be of stainless steel of grade 304 or higher as per IS 6911and IS 3444. The motor pumpset shall have 60 months guarantee and therefore, it is essential that the construction of the motor and pump shall be made using parts which have a much higher durability and do not need replacement or corrode for at least 60 months of operation after installation. Further for submersible pumps used in coastal areas or bores with higher salinity, stainless steel of grade 316 or a higher grade may be used.

3.4.5. The suction/ delivery pipe shall be of HDPE or uPVC column pipes of appropriate size, electric cables, floating assembly, civil work, and other fittings required to install the Motor-Pumpset. In the case of HDPE pipes the minimum pressure rating of 8 kg/sqcm-PE100 grade for pump sets up to 3 HP, 10 kg/sqcm-PE100 grade for 5 HP pumpset as per IS 10804 and further higher minimum pressure rating for above 5 HP as appropriate shall be used.

3.5 Module Mounting Structures and Tracking System

3.5.1 The SPV modules should be mounted on metallic structures of adequate strength and appropriate design, which can withstand the load of modules and high wind velocities up to 150 km per hour. The raw material used and the process for manufacturing of module mounting structure including welding of joints should conform to applicable IS 822. The module mounting structure should be hot dip galvanized according to IS 4759. Zinc content in working area of the hot dip galvanizing bath should not be less than 99.5% by mass.

3.5.2 To enhance the performance of SPV water pumping systems arrangement for seasonal tilt angle adjustment and three times manual tracking in a day shall be provided. In order to make structure rigid, the gap between Telescopic pattern supports should be minimal, further, for bearing of center load of whole structure only pins should be used instead of threaded bolts.

3.5.3 The general hardware for structure fitment should be either SS 304 or 8.8 grade as per IS 6911. Modules should be locked with antitheft bolts of SS 304 Grade. Foundation should be as per the site condition, based on the properties of soil. Foundation can be done either with the help of 'J Bolt' (refer to IS 5624 for foundation hardware) or direct pilling, it should be decided as per the site and relevant IS i.e., IS 6403 /IS 456 /IS 4091 /IS 875 should be referred for foundation design.

3.5.4 Details of Module Mounting Structure (MMS) for pumps of capacity 1HP and above with SPV modules of the capacity around 350Wp are attached at Annexure-II. These are indicative of minimum standards and the vendors may install MMS with higher standards, which shall be certified by the recognized civil/mechanical/structural engineering department of any IIT/NIT or IISC. The format of the certificate is placed at Annexure-III.

3.5.5 In case of use of SPV Modules of capacity higher than that specified above, the size and weight of each SPV module will also increase. In such cases, the appropriate changes shall be made in the MMS design so that the stress on the individual structural members do not exceed thestress in the corresponding members in the MMS designs given in Annexure-II.

3.6 SPV Pump Controller

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

3.6.2 The SPV Controller with RMS must have **IP65** protection.

3.6.3 Adequate protections shall be provided in the SPV Controller to protect the solar powered motor-pumpset against the following:

a) Dry running;
b) Open circuit;
c) Accidental Output short circuit;
d) Under voltage;
e) Reverse polarity; and
f) Surge protection to arrest high current surge

3.6.4 A DC switch as per IS/IEC 60947-3 or DC circuit breakers as per IS/IEC 60947-2 suitable for switching DC power ON and OFF shall be provided in the SPV Pump Controller.

3.6.5 All cables used shall be as per IS 694 or IS 9968(Part 1). Suitable size of cable shall be used in sufficient length for inter-connection from the SPV array to SPV Controller and from the SPV Controller to solar powered motor-pumpset. Selection of the cable shall be as per IS 14536.

The various parameters should be present on the SPV Pump Controller display/screen such as:- Pump On/Off status, Array Input DC Voltage, DC/AC output Current & voltage, operating frequency, Latest RMS Latitude, Latest RMS Longitude, Pump Capacity (HP), PV Module Capacity (KW), Pump Status, Current Generation (kW), Today Solar Generation (kWh), Cumulative Solar Generation (kWh), Today Runs Hours (Hrs.), Cumulative Pump Run Hours (Hrs.), Cumulative Water Discharged (Litres), Total Water Discharged (Litres), Peak Power (kW) supplied by the controller to Motor-PumpSet.

3.7 Protections

The system should be provided with all necessary protections like earthing, Lightning, and Surge Protection etc., as described below:

3.7.1 Earthing and Lightning Protection

1) The Earthing shall be done in accordance with the IS 3043 including its amendments and updated versions.
2) The Earthing system should be designed in such a way that it should be able to restrict the potential of each conductor according to the level of insulation applied and magnitude of the current conducted through human body should be less than the value that can cause ventricular fibrillation of heart.
3) Earth connections shall be done in such a way that they are visible for inspection and all the earth electrodes can easily be tested at any point of time.
4) It is recommended to keep the value of resistance of earth electrode less than 5 ohms.
5) All the materials, fittings etc., used for doing earthing shall conform to the Indian standard, wherever exists.
6) The actual value of soil resistivity should be considered while designing the earthing system at the site and for reference, selection criteria of the site, for any type of soil treatment to improve earth electrode resistance etc., the IS 3043 shall be referred.
7) The electrode material should be selected according to the corrosivity of the soil in which it is used, for the relation between resistivity and corrosivity of the soil and method to safeguard the conductor against excessive corrosion, the IS 3043 shall be referred.

8) It is recommended for selection of type and installation of the earth electrode, the provisions of the IS 3043 should be considered. However, the pipe or rod-type earth electrode is preferable.
9) In case of the two-earth electrode or more, the separation among them should be twice the length of the electrode driven in the ground. Except in special conditions (for e.g.- where the soil is hard to dig out), a number of electrodes in parallel are to be preferred over a single long electrode.
10) The provisions given in the IS 3043 should be considered, while selecting or connecting the earthing/protective/grounding conductor from the components to the earth pit.
11) Separate earthing conductor shall be provided for the controller, motor-pumpset and SPV array etc., for its connection to the earthing pit and it should be continuous in nature for electrical conductivity. However, even for the earthing of light current equipment (for example, high voltage testing equipment), the cross-sectional area of the earthing lead shall not be less than 6 mm^2.
12) For the maintenance of the earth electrode and measurement of the Earth electrode resistance the provisions of IS 3043 shall be referred.
13) Motor shall have suitable provision for earthing to facilitate earthing of the motor as per IS 3043 at the time of installation. In case GI pipes are used for the purpose of earthing the motor, an earthing connection may be made to the discharge pipe clamps. However, in case of HDPE/uPVC column pipes, a separate metallic cable from the motor to the control panel shall be provided for earthing purpose, and if a four-core cable is used, then the fourth core that is not connected to the terminals can be used for earthing.
14) Lightning protection shall be provided as per IEC 62305 and IEC 63227 standards including its amendments and updated versions.
15) An external lightning Rod, of height sufficient to meet the requirement of Lightning Protection System (LPS) designed to comply with the class III or higher (Class-I / Class-II), based on the site requirement including the area-specific lightning activity, shall be installed.
16) Arrangement and positioning of the separate air-termination systems (external lightning rod) can be determined using different methods given in the IEC 62305-3. While determining the position following points are to be considered such as: -
    a) The structure to be protected is fully located within the protected volume provided by the air-termination system.
    b) There should be a separation distance between the air-termination system and SPV power supply system to prevent dangerous sparking against parts of the SPV power supply system in case of direct lightning. The separation distances determined in accordance with IEC 62305-3 & IEC 63227 shall preferably be maintained.
    c) The possibility of the SPV modules being shadowed by air-termination systems shall be taken into account and distance from the SPV modules can be calculated using the IEC 63227.

17) A separate earth electrode is required for the dispersion of the lightning current into the ground with suitably low value of the earthing resistance i.e., less than 5 ohm. And the minimum length (l_1) of vertical earth electrodes for lightning protection level III or higher shall be determined according to the IEC 62305-3.
18) The cross-section of the metal sub-structures used for the connection of the lightning arrestor to the earth electrode should be not less than 16 mm^2 Cu or 25 mm^2 Al or GI of equivalent current carrying capacity should be used, which will also depend upon the class of the Lightning protection system.
19) The earth pits given with the SWPS {i.e., Earth pit(s) for the BoS system (other than LA) and Earth Pit for LA} should be made equipotentialy bonded to each other.

3.7.2 Surge Protection Device

1) For SPDs IEC 63227 and its updated versions or amendments should be followed.
2) At the DC Input side of the controller, it should have protection from an External Surge Protection Device of Type-2 or higher (i.e.Type-1) in accordance with the IEC 61643-31.
3) The rated voltage of SPDs on the DC side, depends on the type of protective circuit and the magnitude of the maximum operating voltage of the SPV modules.

3.8 Use of indigenous components

It will be mandatory to use indigenously manufactured SPV modules with indigenous mono/multi-crystalline silicon SPV cells. Further, the motor-pumpset, controller and balance of system should also be manufactured indigenously. The vendor has to declare the list of imported components used in the SPV water pumping system.

4 PERFORMANCE REQUIREMENTS

4.1 Under the "Average Daily Solar Radiation" condition of 7.15 kWh / sq.m. on the surface of PV array (i.e., coplanar with the SPV modules), the minimum water output from a SPV Water Pumping System at different "Total Dynamic Heads" should be as specified below:

For DC Motor PumpSet:

i) 110 litres of water per watt peak of PV array, from a Total Dynamic Head of 10 metres (Suction head, if applicable, minimum of 7 metres static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 12 metres.
ii) 55 litres of water per watt peak of PV array, from a Total Dynamic Head of 20 metres (Suction head, if applicable, minimum of 7-metres static suction lift corrected for

atmospheric pressure and water temperature) and with the shut off head being at least 25 metres.

iii) 38 litres of water per watt peak of PV array, from a Total Dynamic Head of 30 metres and the shut off head being at least 45 metres.

iv) 23 litres of water per watt peak of PV array, from a Total Dynamic Head of 50 metres and the shut off head being at least 70 metres

v) 15 litres of water per watt peak of PV array, from a Total Dynamic Head of 70 metres and the shut off head being at least 100 metres

vi) 10.5 litres of water per watt peak of PV array, from a Total Dynamic Head of 100 metres and the shut off head being at least 150 metres.

vii) 9.5 litres of water per watt peak of PV array, from a Total Dynamic Head of 120 metres and the shut off head being at least 180 metres

viii) 7.5 litres of water per watt peak of PV array, from a Total Dynamic Head of 150 metres and the shut off head being at least 225 metres

ix) 5.5 litres of water per watt peak of PV array, from a Total Dynamic Head of 200 metres and the shut off head being at least 300 metres.

x) 4.5 litres of water per watt peak of PV array, from a Total Dynamic Head of 250 metres and the shut off head being at least 375 metres.

The actual duration of pumping of water on a particular day and the quantity of water pumped could vary depending on the solar intensity, location, season, etc.

Indicative performance specifications for the Shallow and Deep well SPV Water Pumping Systems are attached at Annexure IV.

For AC Induction Motor PumpSet:

i) 99 litres of water per watt peak of PV array, from a Total Dynamic Head of 10 metres (Suction head, if applicable, minimum of 7-metres static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 12 metres.

ii) 49 litres of water per watt peak of PV array, from a Total Dynamic Head of 20 metres (Suction head, if applicable, minimum of 7-metres static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 25 metres.

iii) 35 litres of water per watt peak of PV array, from a Total Dynamic Head of 30 meters and the shut off head being at least 45 metres.

iv) 21 litres of water per watt peak of PV array, from a Total Dynamic Head of 50 metres and the shut off head being at least 70 metres.
v) 14 litres of water per watt peak of PV array, from a Total Dynamic Head of 70 metres and the shut off head being at least 100 metres.
vi) 9 litres of water per watt peak of PV array, from a Total Dynamic Head of 100 metres and the shut off head being at least 150 metres.
vii) 8.5 litres of water per watt peak of PV array, from a Total Dynamic Head of 120 metres and the shut off head being at least 180 metres.
viii) 6.7 litres of water per watt peak of PV array, from a Total Dynamic Head of 150 metres and the shut off head being at least 225 metres.
ix) 5.0 litres of water per watt peak of PV array, from a Total Dynamic Head of 200 metres and the shut off head being at least 300 metres.
x) 4.0 litres of water per watt peak of PV array, from a Total Dynamic Head of 250 meters and the shut off head being at least 375 metres.

The actual duration of pumping of water on a particular day and the quantity of water pumped could vary depending on the solar intensity, location, season, etc.

Indicative performance specifications for the Shallow and Deep well SPV Water Pumping Systems are attached at Annexure V.

5 TESTS FOR HYDRAULIC AND ELECTRICAL PERFORMANCE OF PUMPSET

5.1.The AC motor-pumpset shall be tested independently for hydraulic and electrical performance as per the relevant IS specification including the following test

a) Constructional requirements/features
b) General requirements
c) Design features
d) Insulation resistance test
e) High voltage test
f) Leakage current test

In case of the DC motor-pumpset for (a), (b), (c) declaration will be given by the vendor and for (d), (e), (f) the relevant clause of IS 9283:2013 will be followed for testing until BIS notifies the Standard about it. Once the Standard gets released, then it will be effective for DC motor-pumpset from its Date of notification.

5.2 Testing of SPV Water Pumping System shall be done as per the procedure specified by the MNRE.

6 GUARANTEE OF PERFORMANCE

6.1 The SPV Water Pumping Systems shall be guaranteed for their performance of the nominal volume rate of flow and the nominal head at the guaranteed duty point as specified in 4**.1** under the "Average Daily Solar Radiation" condition of 7.15 kWh/m^2 on the surface of SPV array (i.e., coplanar with the SPV modules. The actual duration of pumping of water on a particular day and the quantity of water pumped could vary depending on the solar intensity, location, season, etc.

6.2 Solar Photo Voltaic Water Pumping Systems shall be guaranteed by the manufacturer against the defects in material and workmanship under normal use and service for a period of at least 60 months from the date of commissioning.

6.3 Sufficient spares for trouble free operation during the guarantee period should be made available as and when required.

7 MARKING AND PARAMETERS TO BE DECLARED BY THE MANUFACTURER

7.1 The motor-pumpset and Controller used in SPV Water Pumping Systems shall be securely marked with the following parameters declared by the manufacturer:

7.1.1 Motor-Pumpset

a) Manufacturer's name, logo or trade-mark;
b) Model, size and SI No of pumpset (To be engraved/laser marked on the motor frame);
c) Motor Rating (kW / HP);
d) Total head (m), at the guaranteed duty point;
e) Capacity (LPD) at guaranteed head;
f) Operating head range (m);
g) Maximum Current (A);
j) Voltage Range (V) and;
k) Type - AC or DC Motor-Pumpset;
l) Solar Photo Voltaic (SPV) Array Rating in Watts peak (W_p);&
m) Country of origin.

Note: -In addition, a metal name plate containing the above details shall be fixed on the Module Mounting Structure for the information of user.

7.1.2 Controller

a) Manufacturer's name, logo or trade-mark;

b) Model Number;
c) Serial Number;
d) Voltage Range(V);
e) Power Range (kW) for Controller;
f) Current rating (A);&
g) Country of origin.

8 OPERATION AND MAINTENANCE MANUAL

8.1 An Operation and Maintenance Manual, in English and Tamil language, should be provided with the solar PV water pumping system. The Manual should have information about solar energy,photovoltaic, modules, DC/AC motor-pumpset, tracking system, mounting structures, electronicsand switches. It should also have clear instructions about mounting of PV module, DO's and DONT's and on regular maintenance and Trouble Shooting of the pumping system. Helpline number, Name and address of the Service Centre and contact number of authorized representative to be contacted in case of failure or complaint should also be provided. A guarantee card for the modules and the motor pumpset should also be provided to the beneficiary.

9 COMPREHENSIVE OPERATION AND MAINTENANCE

i. The Vendor should provide 5 years comprehensive maintenance of the Solar Photovoltaic Water pumping system, which shall include corrective maintenance as well as routine service visits during CMC period.

ii. CMC shall be in line with scheme guidelines and its amendment (if any). Apart from the monitoring, regular periodical maintenance of system has to be done. The report has to be maintained in a prescribed format containing Month, Inspection Date, Action taken against the Defects found in the System and along with signatures of both service Engineer and the farmer/ beneficiary. Maintenance report in digital form to be sent to Scheme implementing agency (SIA) and also uploaded on the portal of SIA whenever such portal or mobile app is made available.

iii. The deputed personnel shall be in a position to check and test all the equipment regularly, so that preventive actions, if any, could be taken well in advance to save any equipment from damage.

iv. Normal and preventive maintenance of the Solar Photovoltaic Water pumping systems such as cleaning of module surface, tightening of all electrical connections, changing of tilt angle of module mounting structure, cleaning and greasing of motor pumpsets, changing filters etc., are also the duties of the deputed personnel during maintenance visits.

v. During the operation and maintenance period of the Solar Photovoltaic Water Pumping Systems, if there is any loss or damage of any component due to miss management or miss handling or due to any other reasons pertaining to the deputed personnel by empaneled vendor, what-so-ever, the supplier shall be responsible for immediate replacement or rectification. The damaged component may be repaired or replaced by a new component.

vi. The maintenance shall include replacement of any component irrespective of whether the defect was a manufacturing defect or due to wear and tear.

LIST OF REFERRED INDIAN STANDARDS

456:2000	Plain and reinforced concrete - Code of practice (Fourth Revision)
811:1987	Specification for cold formed light gauge structural steel sections (Second Revision)
822:1970	Code of procedure for inspection of welds
IS 875: Part 1: 1987	Code of practice for design loads (Other Than Earthquake) for buildings and structures: Part 1 dead loads - Unit weights of building materials and stored materials (Second Revision)
694:2010	Polyvinyl Chloride Insulated Unsheathed--And Sheathed Cables/cords With Rigid And-Flexible Conductor for Rated Voltages-Up To And Including 450/750 V
1079:2017	Hot rolled carbon steel sheet, plate and strip - Specification (Seventh Revision)
1161:2014	Steel tubes for structural purposes - Specification (Fifth Revision)
1239 (Part 1):2004	Steel tubes, tubulars and other wrought steel fittings - Specification: Part 1 steel tubes (Sixth Revision)
2062:2011	Hot rolled medium and high tensile structural steel - Specification (Seventh Revision)
2629:1985	Recommended practice for hot-dip galvanizing of iron and steel (First Revision)
2633:1986	Method for testing uniformity of coating on zinc coated articles (Second Revision)
3043:2018	Code of Practice for Earthing
3444:1999	Corrosion resistant high alloy steel and nickle base castings for general applications-Specification
4091:1979	Code of practice for design and construction of foundations for transmission line towers and poles (First Revision)
4759:1996	Hot - Dip zinc coatings on structural steel and other allied products - Specification (Third Revision)
5120:1977	Technical requirements for rotodynamic special purpose pumps (First revision)
5624:2021	Foundation bolts - Specification (First Revision)
6403:1981	Code of practice for determination of bearing capacity of shallow foundations
6745:1972	Methods for determination of mass of zinc coating on zinc coated iron and steel articles
6911:2017	Stainless steel plate, sheet and strip-Specification
7215:1974	Tolerances for fabrication of steel structures
8034:2018	Submersible pump sets - Specification (third revision)
9079:2018	Monoset pumps for clear, cold water for agricultural and water supply purposes - Specification (third revision)
9283:2013	Motors for submersible pump sets
9968 (Part 1):1988	Specification for elastomer insulated cables: Part 1 for working voltages up to and including 1100 volts (First Revision)

10804(Part I):2018	Recommended pumping systems for agricultural purposes: Part 1 Surface pumps
10804(Part 2):2018	Recommended pumping systems for agricultural purposes: Part 2 Submersible pump set
14220:2018	Open well submersible pump sets - Specification (first revision)
14536:2018	Selection, installation, operation and maintenance of submersible pumpset - Code of practice (First Revision)
IS/IEC61701: 2011	Salt mist corrosion testing of photovoltaic (PV) modules First Revision
IS 17210 (Part 1):	Photovoltaic (PV) Modules — Test Methods for the Detection of Potential-Induced Degradation Part 1 Crystalline Silicon
IS/IEC 60034-1:2004	Rotating Electrical Machines ─ Part 1 Rating and Performance
IS/IEC 61683:1999	Photovoltaic System-Power Conditioners — Procedure for Measuring Efficiency
IEC 62253:2011	Photovoltaic Pumping Systems – Design qualification and performance measurements
IS 14286: 2010 /IEC 61215 : 2005	Crystalline Silicon Terrestrial Photovoltaic (Photo Voltaic (PV)) modules - Design Qualification and Type Approval (First Revision)
17429:2020	Solar Photovoltaic water pumping systems-Testing procedure
IS/IEC 61730-1: 2016	Photovoltaic (PV) Module Safety Qualification Part 1 Requirements for Construction
IS/IEC 61730-2: 2019	Photovoltaic (PV) Module Safety Qualification Part 2 Requirements for Testing
IEC 60068-2-6:2007	Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)
IEC 60068-2-30:2005	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 12h cycle)
IEC 62305-1/2/3/4	Lightning Protection
IEC 63227	Lightning and Surge Voltage Protection for photovoltaic (PV) power supply systems
IEC 61643-31	Low-voltage surge protective devices
IS/IEC 60947: PART 1: 2007	Low - Voltage switchgear and control gear: Part 1 general rules (First Revision)

Note:- The latest editions of the indicated standards shall be considered.

Annexure-I

Specifications for Remote Monitoring System (RMS)

The Remote Monitoring System shall be capable of providing and handling the following:

a. Solar System Performance: DC Voltage, DC current, AC output Current, Power, Drive frequency, Energy, etc.
b. Pump Performance: Running Hours, Water Discharge (Output), etc.
c. RMS Performance: % of Device Connectivity, % of Data Availability, etc.
d. Geo Location: Real time latitude and longitude should be captured with an accuracy of less than 10 m horizontal.
   This is required to ensure that system is not moved from its original location.
e. Events and Notifications: Faults related to Pump Operation, Solar generation, Controller/Drive faults like overload, dry run, short circuit, etc.
f. Consumer Management: Name, Agriculture details, Service No. Contact Details, etc.
g. Asset Management: Ratings, Serial Number, Make, Model Number of Pump, SPV Module and Controller, Geo Location, IMEI number (of communication module) and ICCID (of SIM).
h. Complaint and Ticket Management: Complaint management system is a part of centralized monitoring software platform.
i. Consumer Mobile Application: Generation, Running Hours, Water Discharge, Complaint logging, etc.

Communication Architecture of the RMS should be as mentioned below:

a. Communication Connectivity:

i. **Pump Controller Connectivity:** Communication between RMS and Pump Controller should be on UART/RS485 MODBUS RTU protocol to ensure interoperability irrespective of make and manufacturer.
ii. **Remote Connectivity:** RMS of SWPS should use GSM/GPRS/2G/3G/4G cellular connectivity.
iii. **Local Connectivity:** Ethernet/Bluetooth/Wi-Fi connectivity to configure parameters, notifications, communication interval, set points etc., or to retrieve locally stored data.
iv. **Sensor Connectivity:** RMS should have provision for at least two Analog and Digital inputs with 0.1% accuracy to address the requirement of local sensors connectivity if required by SIA/Consumer for applications such as irradiation, flow meter for water discharge, moisture sensor for micro-irrigation, etc.

As mentioned in specifications, Analog and digital sensor inputs will be required for integration of flow meter for water discharge, moisture sensor for micro irrigation, level sensor for overhead tank

water storage etc. Only provision for Analog and digital inputs with 0.1% accuracy of Full-Scale Range is required. Sensors will not be in scope of bidder.

v. RMS should have provision to give various modes of operations which are as follows:
   i. Remote Mode: - Pump can be made ON/Off using the Mobile App or in case, farmer do not have a smart phone, farmer shall be able to on-off pump through SMS/missed call.
   ii. Auto Mode: - Pump can ON/Off automatically using the sensor data which are installed in the field by the beneficiary. (Cost of sensors will be borne by the beneficiary)
   iii. Timer Mode: - Pump controller shall operate pump as per configured schedule using mobile application i.e.,daily start time and running hours of pump.
   iv. Manual Mode: - Pump can be made to run into manual mode from field.

To save ground water, provision for remote operation is required so that farmer can switch on and off remotely.

b. Communication Modes:
   i. Push Data on Event/Notification: such as pump on, pump off, protection operated, etc.

   ii. Push Data Periodically: important parameters of solar pump (as mentioned above) should be pushed to central server on a configurable interval. **Default interval should be of 15 minutes. However, if required, it should be possible to configure the periodic interval in multiples of 1 minute starting from 1 minute and up to 15 minutes. Further, in case of any abnormalities or events, RMS should push on event immediately.**

   iii. Command on Demand: It should be possible to send commands via GSM or GPRS to RMS either to control pump operations or to update configuration.

c. Communication Protocol: RMS should provide data on MQTT protocol to establish communication with thousands of system.

d. Security:
   i. Communication between RMS and Server should be secured and encrypted using TLS/SSL/X.509 certificate etc.

ii. As a part of IoT protocol, Authentication and Authorization should be implemented using a token/password mechanism

e. Message Format: RMS should provide data in a JSON message format as per requirement of implementing agency.

f. Data Storage: In case of unavailability of cellular network, RMS should store data locally and on availability of network it should push data to the central Server. Local data storage should be possible for one year in case of unavailability of a cellular network. RMUs should have configuration updates over the Air of multiple parameters such as IP, APN, Data logging Interval, Set Points etc., is essential. Software updating should be possible with 2G and even without the presence of SD card. Software updating process and/or failure to update softwareshouldn't disrupt pumping operations.

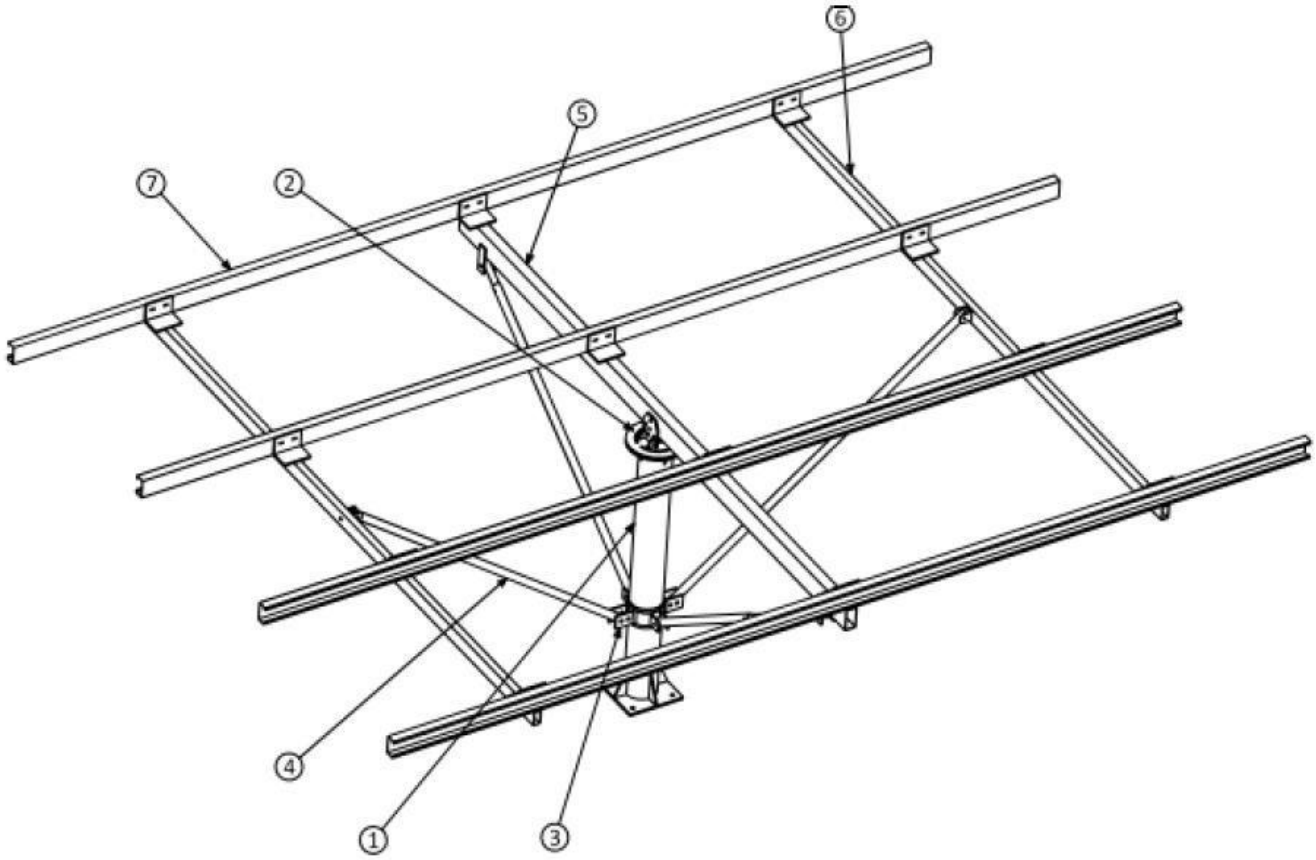
RMS should be connected to the Solar Energy Data Management (SEDM) Platformof the implementing Agency.

g. RMUs should have configuration updates over the Air of multiple parameters such as IP, APN, Data logging Interval, Set Points etc., is essential. Software to be updated through "Programming over the air" on SIA server. Software updating process and/orfailure to update software shouldn't disrupt pumping operations.

Manufacturer should consider Programming Over the Air (POTA) instead of Firmware Over the Air (FOTA) to update configurable parameters such as server IP, URL, Port, APN, Periodic Interval etc.

Annexure-II

SPECIFICATIONS FOR DUAL AXIS MANUAL TRACKING TYPE MODULEMOUNTING STRUCTURE (MMS) FOR SPV WATER PUMPING



Main Parts of MMS for Solar Water Pumping System		
Sl No.	***Part Name***	***Qty./Set***
1	Main Column	1
2	Top Plate	1
3	Clamp with blade	2
4	Supporting pipe	6/8
5	Main tube	1
6	Side tube	2
7	Mounting purlin	4

For hot dip galvanizing of fabricated structure following shall be referred:

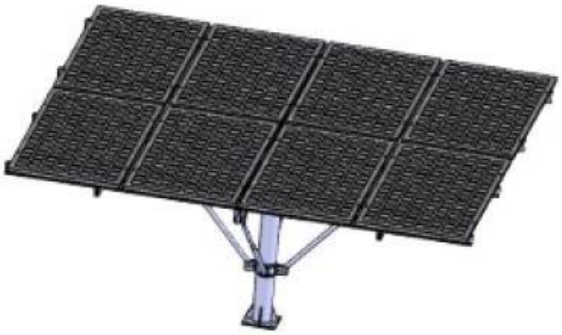
a) Minimum coating required shall be as per IS 4759;
b) Preece test ($CuSO_4$ Dip test) as per IS 2633;
c) Mass of zinc (IS 6745 or IS 4759); and
d) Adhesion test (IS 2629).

B-1 STANDARD MMS FOR 4, 6, 8 AND 10 SOLAR MODULES HAVE BEEN SPECIFIED. THESE STANDARD MMS MAY BE USED IN COMBINATIONS FOR DIFFERENT CAPACITIES OF SOLAR WATER PUMPING SYSTEMS AS FOLLOWS

a) Standard MMS of 4 modules for 1 HP;
b) Standard MMS of 6 modules for 2 HP;
c) Standard MMS of 10 modules or combination of standard MMS of 4 Modules andstandard MMS 6 Modules for 3 HP;
d) Combination of two standard MMS of 8 modules or combination of standard MMS of 10 modules and standard MMS 6 modules for 5 HP; and
e) Combination of three standard MMS of 8 modules or combination of two Standard MMS of 10 Modules and one standard MMS 6 modules for 7.5 HP and so on.

4 MODULE MMS

6 MODULE MMS



8 MODULE MMS

10 MODULE MMS

SPECIFICATIONS OF MAIN PARTS USED IN MMS ARE GIVEN BELOW

B-2.1 Centre Shaft

Centre shaft used in structure shall be of:

a) *For 4, 6 and 8 Modules Structure* —Minimum 139 OD with minimum thickness of 4 mm with base plate minimum 10 mm thickness if used and foundation hardware shall be as per IS 5624.

b) *For 10 Modules Structure* —Minimum 165 OD with minimum thickness of 4 mm with

base plate minimum 20 mm thickness if used and foundation hardware shall be as per IS 5624.

For system without base plate that is, direct pilling is shall be as per the site condition based on the properties of Soil and refer (IS 6403/4091/875/456) for foundation design.

B-2.2 Rafters

The main and secondary rafter used in structure shall be of either SHS or RHS pipe sections.

B-2.3 Purlin

Mounting purlins used in the structure shall be made of cold form steel section as per IS 1079 with minimum thickness of 2 mm.

B-2.4 Provision for Seasonal Tilt

In one structure at least four telescopic supports (three may be used in MMS for 4 modules) either round hollow sections or square hollow section to be provided to support the mounting structure.

B-2.5 Provision for Daily Tracking

Provision for daily tracking shall be provided by the way of providing minimum 8 mm thick metal sheet with precision cut grooves.

B-2.6 Module Locking System

Modules shall be locked with antitheft bolts of SS 304 Grade.

B-2.7 General Hardware for Structure Fitment

Either SS 304 or 8.8 grade hardware shall be used for fitment.

B-2.8 Hot Dip Galvanizing

All structure parts shall be hot dip galvanized according to IS 4759.

B-2.9 Tolerance for Fabrication

Tolerance for fabrication of steel structure shall as per IS 7215.

B-2.10 Welding

Welding shall be done as per IS 822 and grade of welding wire shall be (ER70S-6).

B-2.11 Raw Material Test Certificates (MTC)

MTC of all types of raw material used in dual axis manual tracking type MMS as per appropriate Indian Standard shall be submitted along with dispatch documents.

B-2.12 Tests to be performed on dual axis manual tracking type MMS for solar water pumping system.

B-2.12.1 For ascertaining proper welding of structure part following shall be referred:

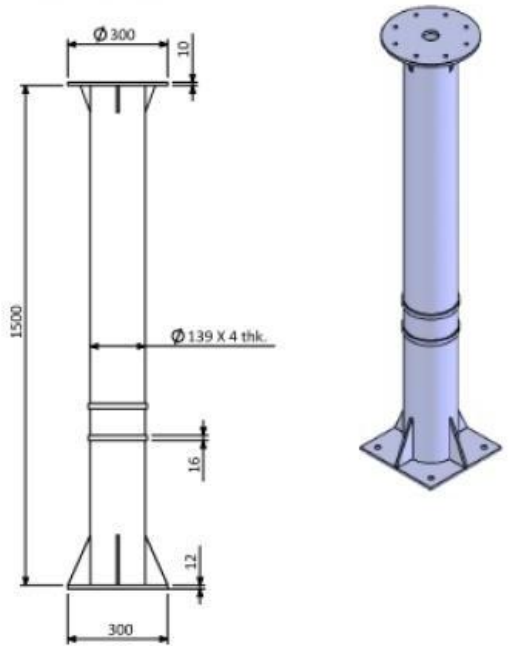
a) Weld wire grade shall be of grade (ER 70 S-6); and
b) D.P. test (pin hole/crack) (IS 822).

B-2.12.2 For ascertaining hot dip galvanizing of fabricated structure following shall be referred:

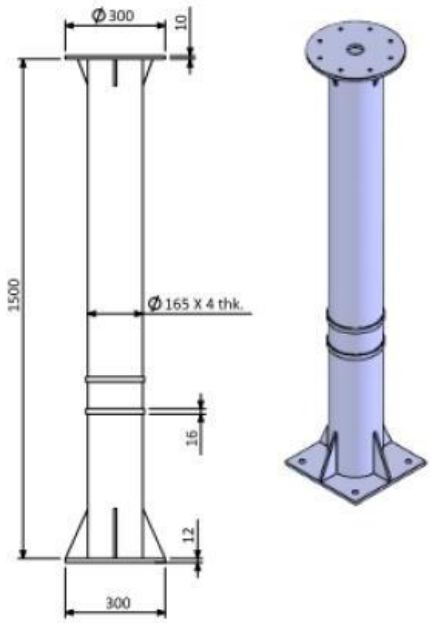
a) Minimum coating required shall be as per IS 4759;
b) Testing of galvanized material;
c) Preece test (CuSO4 dip test) (IS 2633);
d) Mass of zinc (IS 6745 or IS 4759); and
e) Adhesion test (IS 2629).

Part 1 Main Column

Common for 4, 6 and 8 MMS



For 10 MMS

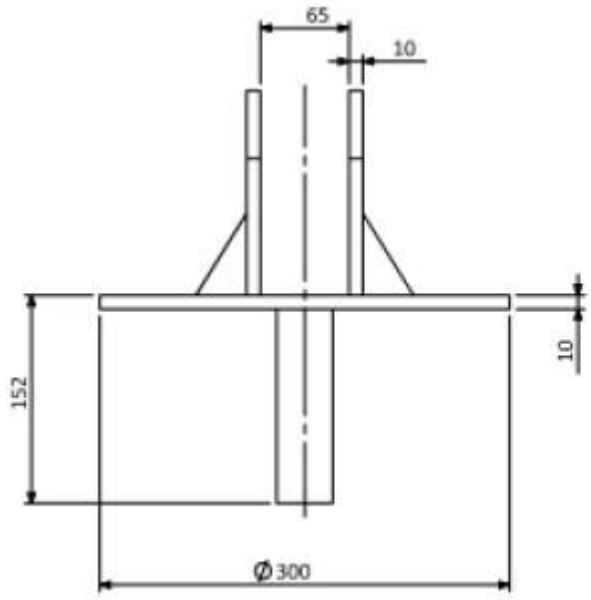


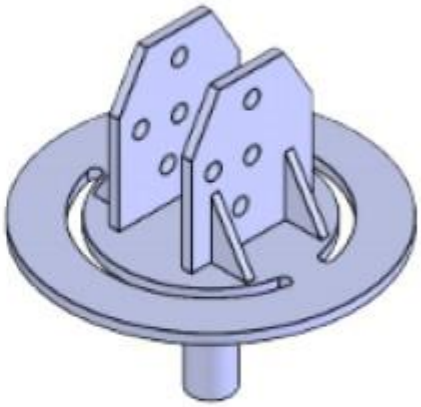
All dimensions are in mm.

Sl No.	*Part Name*	*Cross Section Detail*	*Length (mm)*	*Quantity Per Set*
1.	**MAIN POLE**			
	4, 6 and 8 Modules	139 OD	1500	1
	10 Modules	165 OD	1500	1

Part 2 Top Plate

Common for 4, 6, 8 and 10 MMS



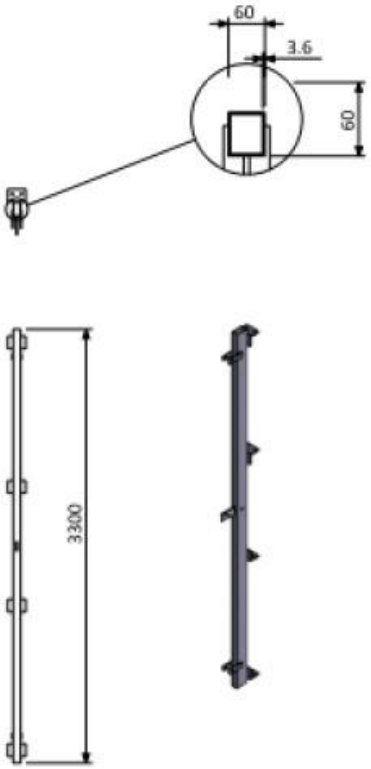


All dimensions are in mm.

Sl No.	*Part Name*	*Cross Section Detail*	*Length (mm)*	*Quantity Per Set*
2.	TOP PLATE (Common for all)	300 OD	—	1

Part 3 Main Tube

Common for 4 and 6 MMS



Common for 8 and 10 MMS

All dimensions are in mm.

Sl No.	***Part Name***	***Cross Section Detail***	***Length (mm)***	***Quantity Per Set***
3.	MAINTUBE			
	4 and 6 Modules	60 × 60 × 3.6	3300	1
	8 and 10 Modules	112 × 61 × 3.6	3300	1

Part 4 Side Tube

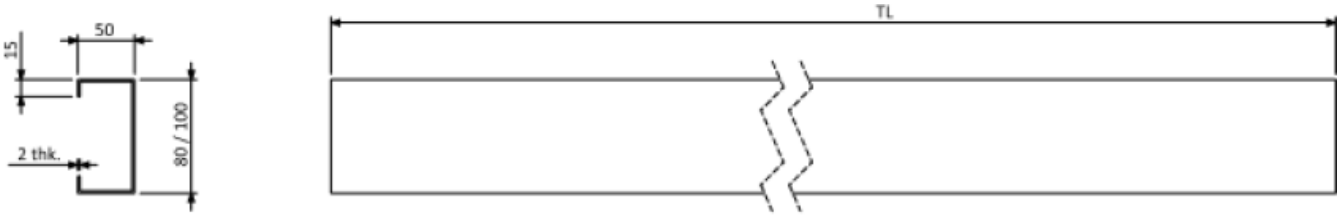
Common for 4 and 6 MMS

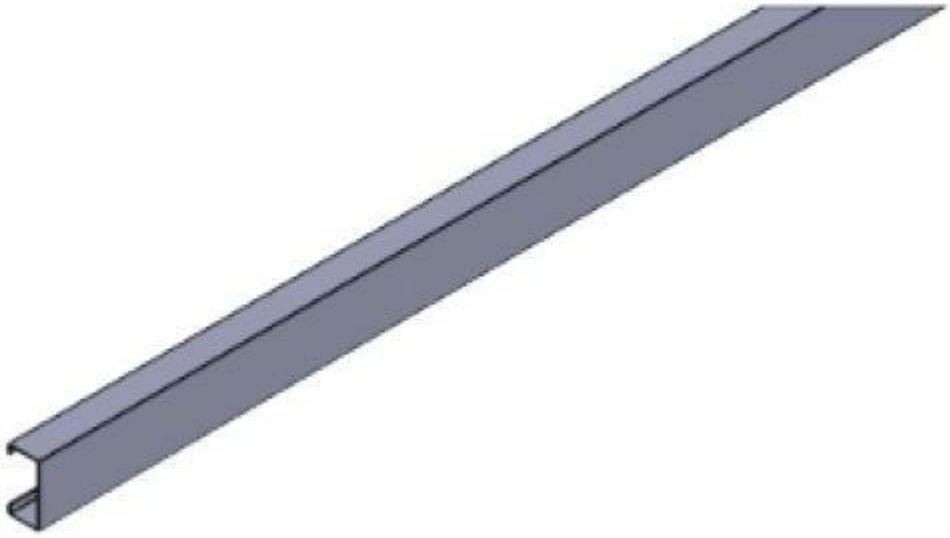
Common for 8 and 10 MMS

All dimensions are in mm.

Sl No.	*Part Name*	*Cross Section Detail*	*Length (mm)*	*Quantity Per Set*
4.	**SIDE TUBE**			
	4 and 6 Modules	50 × 50 × 3.6	3300	2
	8 and 10 Modules	80 × 40 × 3.2	3300	2

Part 5 Purlin



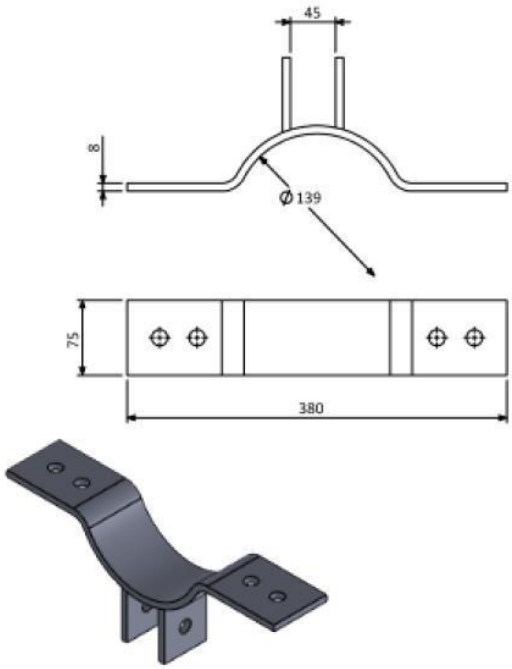


All dimensions are in mm.

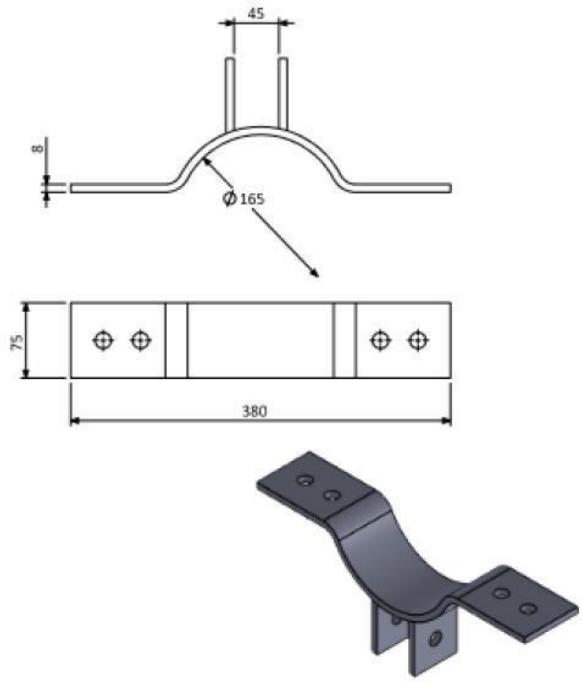
Sl No.	*Part Name*	*Cross Section Detail*	*Length (mm)*	*Quantity Per Set*
5.	**MOUNTING PURLIN**			
	4 Modules	80 × 50 × 15 × 2	2050	4
	6 Modules	80 × 50 × 15 × 2	3100	4
	8 Modules	80 × 50 × 15 × 2	4150	4
	10 Modules	100 × 50 × 15 × 2	5200	4

Part 6 Clamp with Blade

Common for 4, 6 and 8 MMS



For 10 MMS

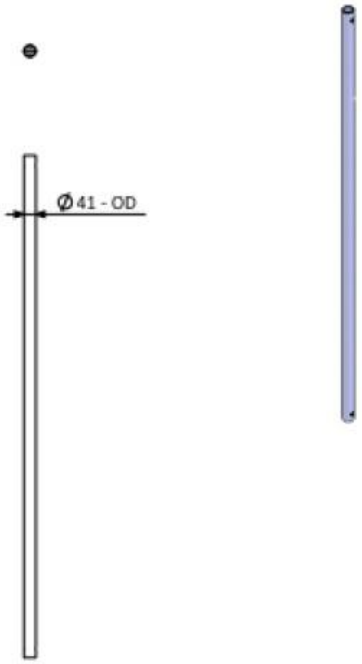


All dimensions are in mm.

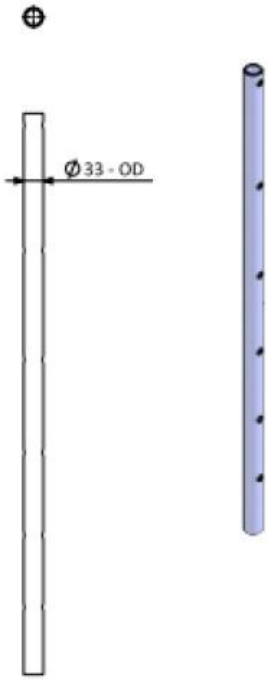
Sl No.	***Part Name***	***Cross Section Detail***	***Length(mm)***	***Quantity Per Set***
6.	**CLAMP WITH BLADE**			
	4, 6 and 8 Modules (For 139 OD Pole)	75 × 8	380	2
	10Modules (For 165 OD Pole)	75 × 8	380	2

Part 7 Supporting Pipes

4A) Supporting Pipe - 4 Nos./Set
Common for 4, 6, 8 and 10 MMS



4B) Supporting Pipe - 2 Nos./Set
Common for 4, 6, 8 and 10 MMS

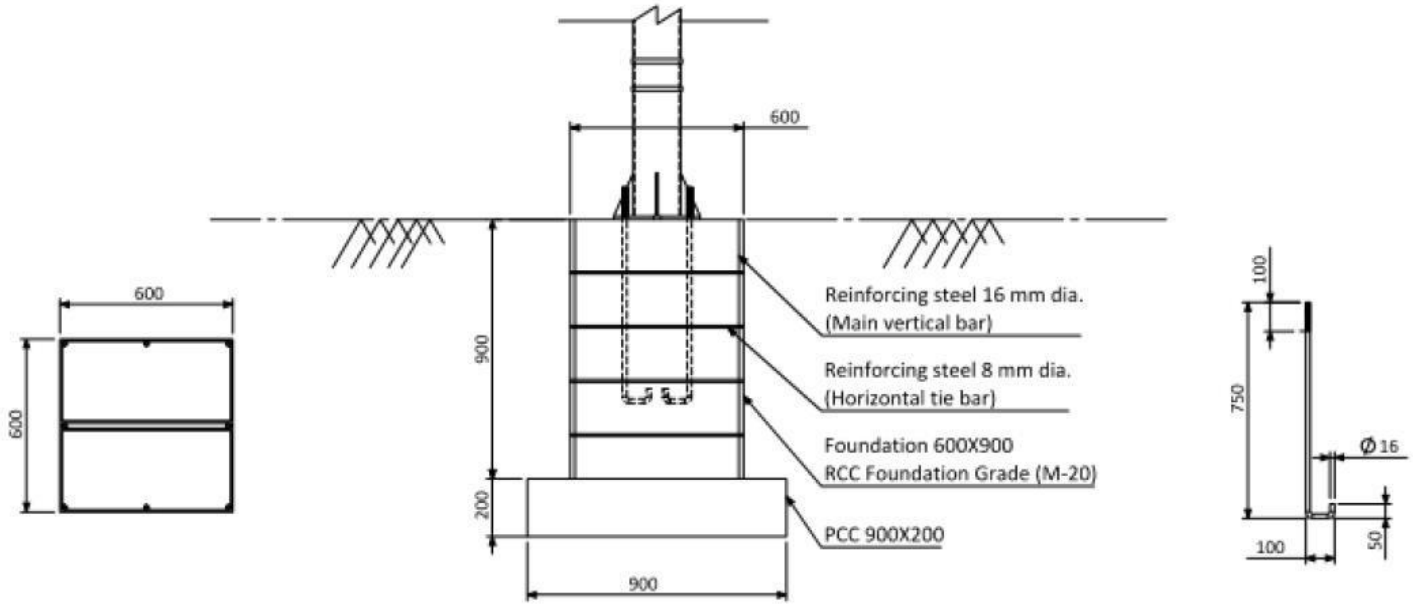


All dimensions are in mm.

Main-Parts of MMS for SPV Water Pumping System

Sl No.	*Part Name*	*Cross Section Detail*	*Length* **(mm)**	*Quantity Per Set*	*Material Grade*
1.	MAIN COLOUMN				
	4, 6 and 8 Modules	139 OD	1500	1	YST – 240 as per IS 1161/IS 1239 and E250 as per IS 1079/IS 2062
	10 Modules	165 OD	1500	1	
2.	TOP PLATE (Common for all)				
	—	300 OD	—	1	YST – 240 as per IS 1161/IS 1239 and E250 as per IS 1079/IS 2062
3.	MAIN TUBE				
	4 and 6 Modules	60×60×3.6	3300	1	YST – 240 as per IS 1161/IS 1239 and E250 as per IS 1079/IS 2062
	8 and 10 Modules	122×61×3.6	3300	1	
4.	SIDE TUBE				
	4 and 6 Modules	50×50×3.6	3300	2	YST – 240 as per IS 1161/IS 1239 and E250 as per IS 1079/IS 2062
	8 and 10Modules	80×40×3.2	3300	2	
5.	MOUNTING PURLIN				
	4 Modules	80×50×15×2	2050	4	E250 as per IS 1079/IS 2062 and IS 811
	6 Modules	80×50×15×2	3100	4	
	8 Modules	80×50×15×2	4150	4	
	10 Modules	100×50×15×2	5200	4	
6.	CLAMP WITH BLADE				
	4, 6 and 8 Modules (for 139 OD pole)	75×8	380	2	As per IS 1079 and E250 as per IS 2062
	10 Modules(for 165 OD pole)	75×8	380	2	
7.	SUPPORTING PIPES				
	4, 6 and 8 Modules	41 OD and 33 OD	—	6	YST – 240 as per IS 1161/IS 1239 and E250 as per IS 1079/IS 2062
	10 Modules	41 OD and 33 OD	—	8	

Foundation Design for 4 and 6 MMS

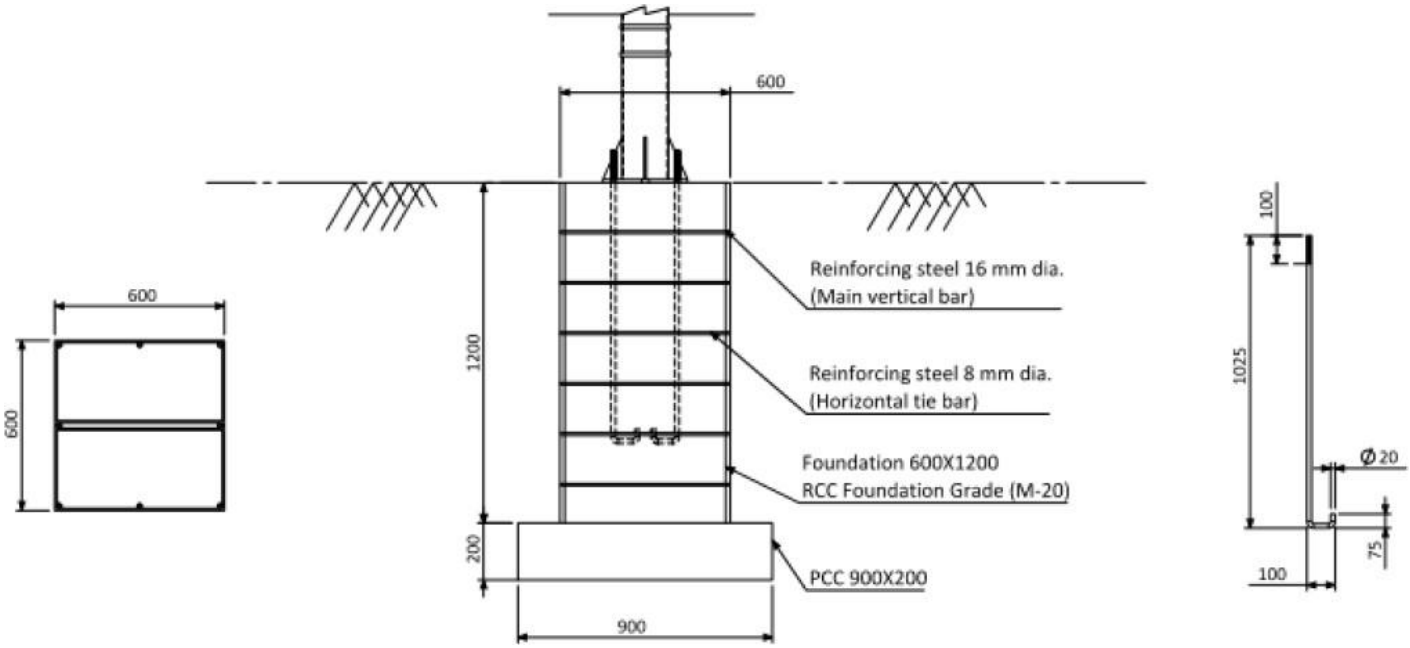


All dimensions are in mm.

BOM For Steel				
TMT Bar **(mm)**	***Length*** **(mm)**	***Unit Weight*** **(kg)**	***Quantity*** **(Pcs.)**	***Total Weight*** **(kg)**
16	1000	1.578	8	12.6
8	2400	0.950	4	3.8
8	1250	0.500	4	2

BOM For RCC and PCC				
Block	***Width*** **(m)**	***Length*** **(m)**	***Height*** **(m)**	***Volume*** **(m^3)**
RCC Column	0.600	0.600	0.900	0.324
PCC	0.900	0.900	0.200	0.162

Foundation Design for 8 MMS

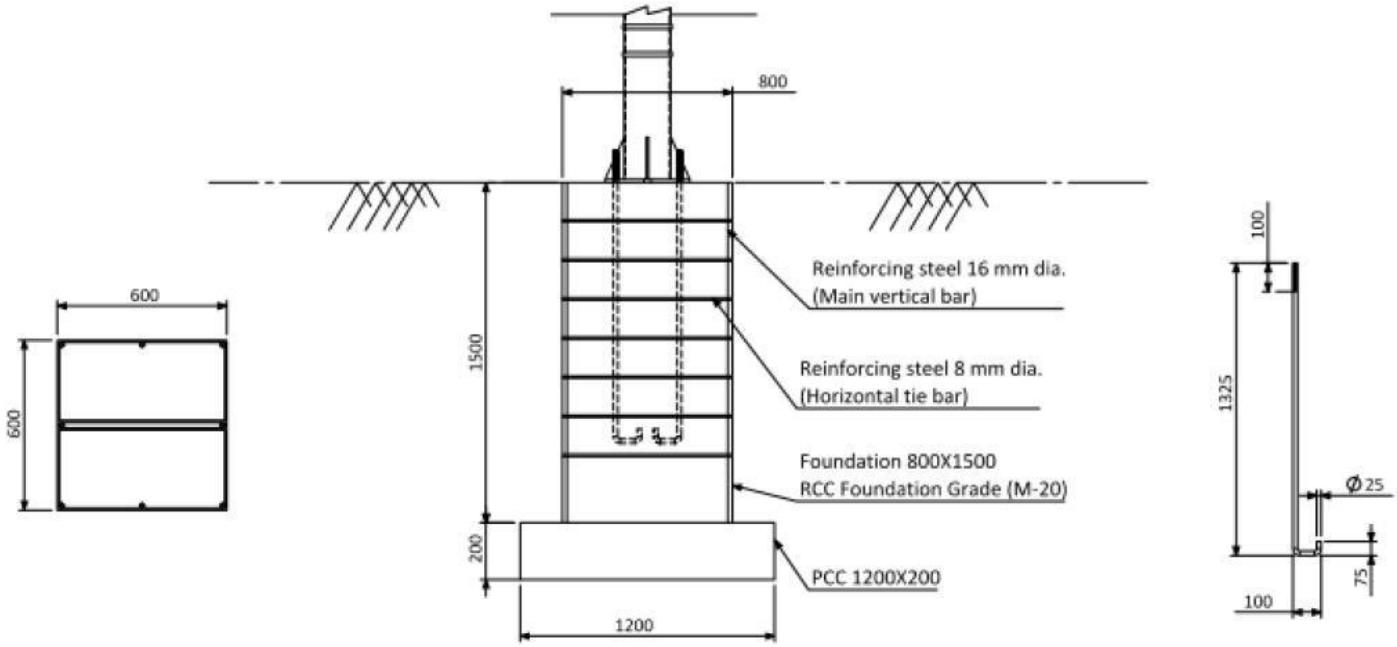


All dimensions are in mm.

BOM For Steel				
***TMT Bar* (mm)**	***TMT Bar* (mm)**	***TMT Bar* (mm)**	***TMT Bar* (mm)**	***TMT Bar* (mm)**
16	1300	2.050	8	16.4
8	2400	0.950	6	5.7
8	1250	0.500	6	3

BOM For RCC and PCC				
Block	***Width* (m)**	***Length* (m)**	***Height* (m)**	***Volume* (m^3)**
RCC Column	0.600	0.600	1.200	0.432
PCC	0.900	0.900	0.200	0.162

Foundation Design for 10 MMS



All dimensions are in mm.

BOM For Steel				
***TMT Bar* (mm)**	***TMT Bar* (mm)**	***TMT Bar* (mm)**	***TMT Bar* (mm)**	***TMT Bar* (mm)**
16	1800	2.500	8	20.0
8	3200	1.250	7	8.75
8	1650	0.650	7	4.55

BOM For RCC and PCC				
Block	***Width* (m)**	***Length* (m)**	***Height* (m)**	***Volume* (m^3)**
RCC Column	0.800	0.800	1.500	0.960
PCC	1.200	1.200	0.200	0.288

Annexure-III

Format of Certificate by the Civil/Mechanical/Structural Engineering Department for MMS

(To be submitted on the letterhead of the Department/College)

This is to certify that the MMS structure drawing along with the foundation ……..(copy enclosed) supplied by……...(Vendor Name) is evaluated at our structural Engineering Department facility at……..(College Name) and it is found superior(in terms of the structural integrity/ load bearing capacity/ stress on the individual structural member) to the MMS structure along with foundation specified in the Specification of Solar Water Pumping System notified by the Ministry of New and Renewable Energy (MNRE) vide **F.No-41/3/2018-SPV Division dated 06.03.2023.**

The following are the changes when compared to the MNRE's MMS suggestive design: -

S.No.	According to the MNRE MMS	According to the vendor MMS

These are the following improvements in the MMS design submitted by the vendor over the MNRE's MMS suggestive design: -

1.
2.

Note:- The lab may attach drawings/calculations wherever needed

Signature of the head (Structural/ Mechanical/ Civil engineering department)

ANNEXURE – IV

Indicative Technical Specifications of Shallow Well (Surface) Solar Pumping Systems with D.C. Motor /PMSM/SRM

Description	**Model-1**	**Model-2**	**Model-3**	**Model-4**	**Model-5**	**Model-6**	**Model-7**	**Model-8**	**Model-9**	**Model-10**	**Model-11**	**Model-12**	**Model-13**
PV array (Wp)	900	1800	2700	2700	4800	4800	4800	6750	6750	6750	9000	9000	9000
Motor Pump-set capacity (HP)	1	2	3	3	5	5	5	7.5	7.5	7.5	10	10	10
Shut Off Dynamic Head (meters)	12	12	12	25	12	25	45	12	25	45	12	25	45
Water output * (Liters per day)	99000 (from a total head of 10 meters)	198000 (from a total head of 10 meters)	297000 (from a total head of 10 meters)	148500 (from a total head of 20 meters)	528000 (from a total head of 10 meters)	264000 (from a total head of 20 meters)	182400 (from a total head of 30 meters)	742500 (from a total head of 10 meters)	371250 (from a total head of 20 meters)	256500 (from a total head of 30 meters)	990000 (from a total head of 10 meters)	495000 (from a total head of 20 meters)	342000 (from a total head of 30 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. Suction head, if applicable, minimum of 7 meters static suction lift corrected for atmospheric pressure and water temperature.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.

ANNEXURE – IV (CONTD.)

Indicative Technical Specifications of Shallow Well (Surface) Pumping Systems with D.C. Motor /PMSM/SRM

Description	**Model-14**	**Model-15**	**Model-16**	**Model-17**	**Model-18**	**Model-19**	**Model-20**	**Model-21**	**Model-22**	**Model-23**	**Model-24**	**Model-25**	**Model-26**
PV array (Wp)	11250	11250	11250	11250	13500	13500	13500	13500	15750	15750	15750	18000	18000
Motor Pump-set capacity (HP)	12.5	12.5	12.5	12.5	15	15	15	15	17.5	17.5	17.5	20	20
Shut Off Dynamic Head (meters)	12	25	45	70	25	45	70	100	45	70	100	45	70
Water output * (Liters per day)	1237500 (from a total head of 10 meters)	618750 (from a total head of 20 meters)	427500 (from a total head of 30 meters)	258750 (from a total head of 50 meters)	742500 (from a total head of 20 meters)	513000 (from a total head of 30 meters)	310500 (from a total head of 50 meters)	202500 (from a total head of 70 meters)	598500 (from a total head of 30 meters)	362250 (from a total head of 50 meters)	236250 (from a total head of 70 meters)	684000 (from a total head of 30 meters)	414000 (from a total head of 50 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. Suction head, if applicable, minimum of 7 meters static suction lift corrected for atmospheric pressure and water temperature.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.

ANNEXURE – IV (CONTD.)

Indicative Technical Specifications of Shallow Well (Surface) Pumping Systems D.C. Motor /PMSM/SRM.

Description	**Model-27**	**Model-28**	**Model-29**	**Model-30**	**Model-31**	**Model-32**	**Model-33**	**Model-34**
PV array (Wp)	18000	18000	20250	20250	20250	22500	22500	22500
Motor Pump-set capacity (HP)	20	20	22.5	22.5	22.5	25	25	25
Shut Off Dynamic Head (meters)	100	150	70	100	150	70	100	150
Water output * (Liters per day)	270000 (from a total head of 70 meters)	189000 (from a total head of 100 meters)	465750 (from a total head of 50 meters)	303750 (from a total head of 70 meters)	212625 (from a total head of 100 meters)	517500 (from a total head of 50 meters)	337500 (from a total head of 70 meters)	236250 (from a total head of 100 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. Suction head, if applicable, minimum of 7 meters static suction lift corrected for atmospheric pressure and water temperature.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.

ANNEXURE – IV (CONTD.)

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems with D.C. Motor /PMSM/SRM.

Description	**Model-1**	**Model-2**	**Model-3**	**Model-4**	**Model-5**	**Model-6**	**Model-7**	**Model-8**	**Model-9**	**Model-10**	**Model-11**	**Model-12**	**Model-13**	**Model-14**
PV array (Wp)	1200	1800	3000	3000	3000	4800	4800	4800	6750	6750	6750	9000	9000	9000
Motor Pump-set capacity (HP)	1	2	3	3	3	5	5	5	7.5	7.5	7.5	10	10	10
Shut Off Dynamic Head (meters)	45	45	45	70	100	70	100	150	70	100	150	70	100	150
Water output * (Liters per day)	45600 (from a total head of 30 meters)	68400 (from a total head of 30 meters)	114000 (from a total head of 30 meters)	69000 (from a total head of 50 meters)	45000 (from a total head of 70 meters)	110400 (from a total head of 50 meters)	72000 (from a total head of 70 meters)	50400 (from a total head of 100 meters)	155250 (from a total head of 50 meters)	101250 (from a total head of 70 meters)	70875 (from a total head of 100 meters)	207000 (from a total head of 50 meters)	135000 (from a total head of 70 meters)	94500 (from a total head of 100 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

ANNEXURE – IV (CONTD.)

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems with D.C. Motor /PMSM/SRM.

Description	**Model-15**	**Model-16**	**Model-17**	**Model-18**	**Model-19**	**Model-20**	**Model-21**	**Model-22**	**Model-23**	**Model-24**	**Model-25**	**Model-26**	**Model-27**	**Model-28**
PV array (Wp)	11250	11250	11250	11250	13500	13500	13500	13500	15750	15750	15750	15750	18000	18000
Motor Pump-set capacity (HP)	12.5	12.5	12.5	12.5	15	15	15	15	17.5	17.5	17.5	17.5	20	20
Shut Off Dynamic Head (meters)	100	150	180	225	100	150	180	225	100	150	180	225	150	180
Water output * (Liters per day)	168750 (from a total head of 70 meters)	118125 (from a total head of 100 meters)	106875 (from a total head of 120 meters)	84375 (from a total head of 150 meters)	202500 (from a total head of 70 meters)	141750 (from a total head of 100 meters)	128250 (from a total head of 120 meters)	101250 (from a total head of 150 meters)	236250 (from a total head of 70 meters)	165375 (from a total head of 100 meters)	149625 (from a total head of 120 meters)	118125 (from a total head of 150 meters)	189000 (from a total head of 100 meters)	171000 (from a total head of 120 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

ANNEXURE – IV (CONTD.)

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems D.C. Motor /PMSM/SRM.

Description	**Model-29**	**Model-30**	**Model-31**	**Model-32**	**Model-33**	**Model-34**	**Model-35**	**Model-36**	**Model-37**	**Model-38**	**Model-39**
PV array (Wp)	18000	18000	20250	20250	20250	20250	20250	22500	22500	22500	22500
Motor Pump-set capacity (HP)	20	20	22.5	22.5	22.5	22.5	22.5	25	25	25	25
Shut Off Dynamic Head (meters)	225	300	150	180	225	300	375	180	225	300	375
Water output * (Liters per day)	135000 (from a total head of 150 meters)	99000 (from a total head of 200 meters)	212625 (from a total head of 100 meters)	192375 (from a total head of 120 meters)	151875 (from a total head of 150 meters)	111375 (from a total head of 200 meters)	91125 (from a total head of 250 meters)	213750 (from a total head of 120 meters)	168750 (from a total head of 150 meters)	123750 (from a total head of 200 meters)	101250 (from a total head of 250 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

ANNEXURE – V

Indicative Technical Specifications of Shallow Well (Surface) Solar Pumping Systems with A.C. Induction Motor Pump Set

Description	**Model-**	**Model-2**	**Model-3**	**Model-4**	**Model-5**	**Model-6**	**Model-7**	**Model-8**	**Model-9**	**Model-10**	**Model-11**	**Model-12**	**Model-13**
PV array (Wp)	900	1800	2700	2700	4800	4800	4800	6750	6750	6750	9000	9000	9000
Motor Pump-set capacity (HP)	1	2	3	3	5	5	5	7.5	7.5	7.5	10	10	10
Shut Off Dynamic Head (meters)	12	12	12	25	12	25	45	12	25	45	12	25	45
Water output * (Liters per day)	89100 (from a total head of 10 meters)	178200 (from a total head of 10 meters)	267300 (from a total head of 10 meters)	132300 (from a total head of 20 meters)	475200 (from a total head of 10 meters)	235200 (from a total head of 20 meters)	168000 (from a total head of 30 meters)	668250 (from a total head of 10 meters)	330750 (from a total head of 20 meters)	236250 (from a total head of 30 meters)	891000 (from a total head of 10 meters)	441000 (from a total head of 20 meters)	315000 (from a total head of 30 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. Suction head, if applicable, minimum 7 meters static suction lift corrected for atmospheric pressure and water temperature.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4. (i.e. Performance Requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.

ANNEXURE –V (CONTD.)

Indicative Technical Specifications of Shallow Well (Surface) Solar Pumping Systems with A.C. Induction Motor Pump Set

Description	**Model-14**	**Model-15**	**Model-16**	**Model-17**	**Model-18**	**Model-19**	**Model-20**	**Model-21**	**Model-22**	**Model-23**	**Model-24**	**Model-25**	**Model-26**
PV array (Wp)	11250	11250	11250	11250	13500	13500	13500	13500	15750	15750	15750	18000	18000
Motor Pump-set capacity (HP)	12.5	12.5	12.5	12.5	15	15	15	15	17.5	17.5	17.5	20	20
Shut Off Dynamic Head (meters)	12	25	45	70	25	45	70	100	45	70	100	45	70
Water output * (Liters per day)	11,13,750 (from a total head of 10 meters)	5,51,250 (from a total head of 20 meters)	3,93,750 (from a total head of 30 meters)	2,36,250 (from a total head of 50 meters)	6,61,500 (from a total head of 20 meters)	4,72,500 (from a total head of 30 meters)	2,83,500 (from a total head of 50 meters)	1,89,000 (from a total head of 70 meters)	5,51,250 (from a total head of 30 meters)	3,30,750 (from a total head of 50 meters)	2,20,500 (from a total head of 70 meters)	6,30,000 (from a total head of 30 meters)	3,78,000 (from a total head of 50 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. Suction head, if applicable, minimum 7 meters.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.

ANNEXURE – V (CONTD.)

Indicative Technical Specifications of Shallow Well (Surface) Solar Pumping Systems with A.C. Induction Motor Pump Set

Description	**Model-27**	**Model-28**	**Model-29**	**Model-30**	**Model-31**	**Model-32**	**Model-33**	**Model-34**
PV array (Wp)	18000	18000	20250	20250	20250	22500	22500	22500
Motor Pump-set capacity (HP)	20	20	22.5	22.5	22.5	25	25	25
Shut Off Dynamic Head (meters)	100	150	70	100	150	70	100	150
Water output * (Liters per day)	2,52,000 (from a total head of 70 meters)	1,62,000 (from a total head of 100 meters)	4,25,250 (from a total head of 50 meters)	2,83,500 (from a total head of 70 meters)	1,82,250 (from a total head of 100 meters)	4,72,500 (from a total head of 50 meters)	3,15,000 (from a total head of 70 meters)	2,02,500 (from a total head of 100 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. Suction head, if applicable, minimum 7 meters.
2. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
3. If submersible pumps are used in lieu of surface pumps, the water output must match that of the surface pumps as specified in this table.

ANNEXURE – V (CONTD.)

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems with A.C. Induction Motor Pump Set

Description	**Model-1**	**Model-2**	**Model-3**	**Model-4**	**Model-5**	**Model-6**	**Model-7**	**Model-8**	**Model-9**	**Model-10**	**Model-11**	**Model-12**	**Model-13**	**Model-14**
PV array (Wp)	1200	1800	3000	3000	3000	4800	4800	4800	6750	6750	6750	9000	9000	9000
Motor Pump-set capacity (HP)	1	2	3	3	3	5	5	5	7.5	7.5	7.5	10	10	10
Shut Off Dynamic Head (meters)	45	45	45	70	100	70	100	150	70	100	150	70	100	150
Water output * (Liters per day)	42000 (from a total head of 30 meters)	63000 (from a total head of 30 meters)	105000 (from a total head of 30 meters)	63000 (from a total head of 50 meters)	42000 (from a total head of 70 meters)	100800 (from a total head of 50 meters)	67200 (from a total head of 70 meters)	43200 (from a total head of 100 meters)	141750 (from a total head of 50 meters)	94500 (from a total head of 70 meters)	60750 (from a total head of 100 meters)	189000 (from a total head of 50 meters)	126000 (from a total head of 70 meters)	81000 (from a total head of 100 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

ANNEXURE – V (CONTD.)

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems with A.C. Induction Motor Pump Set

Description	**Model-15**	**Model-16**	**Model-17**	**Model-18**	**Model-19**	**Model-20**	**Model-21**	**Model-22**	**Model-23**	**Model-24**	**Model-25**	**Model-26**	**Model-27**	**Model-28**
PV array (Wp)	11250	11250	11250	11250	13500	13500	13500	13500	15750	15750	15750	15750	18000	18000
Motor Pump-set capacity (HP)	12.5	12.5	12.5	12.5	15	15	15	15	17.5	17.5	17.5	17.5	20	20
Shut Off Dynamic Head (meters)	100	150	180	225	100	150	180	225	100	150	180	225	150	180
Water output * (Liters per day)	157500 (from a total head of 70 meters)	101250 (from a total head of 100 meters)	95625 (from a total head of 120 meters)	75375 (from a total head of 150 meters)	189000 (from a total head of 70 meters)	121500 (from a total head of 100 meters)	114750 (from a total head of 120 meters)	90450 (from a total head of 150 meters)	220500 (from a total head of 70 meters)	141750 (from a total head of 100 meters)	133875 (from a total head of 120 meters)	105525 (from a total head of 150 meters)	162000 (from a total head of 100 meters)	153000 (from a total head of 120 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

ANNEXURE – V (CONTD.)

Indicative Technical Specifications of Solar Deep well (submersible) Pumping Systems with A.C. Induction Motor Pump Set

Description	**Model-29**	**Model-30**	**Model-31**	**Model-32**	**Model-33**	**Model-34**	**Model-35**	**Model-36**	**Model-37**	**Model-38**	**Model-39**
PV array (Wp)	18000	18000	20250	20250	20250	20250	20250	22500	22500	22500	22500
Motor Pump-set capacity (HP)	20	20	22.5	22.5	22.5	22.5	22.5	25	25	25	25
Shut Off Dynamic Head (meters)	225	300	150	180	225	300	375	180	225	300	375
Water output * (Liters per day)	120600 (from a total head of 150 meters)	90000 (from a total head of 200 meters)	182250 (from a total head of 100 meters)	172125 (from a total head of 120 meters)	135675 (from a total head of 150 meters)	101250 (from a total head of 200 meters)	81000 (from a total head of 250 meters)	191250 (from a total head of 120 meters)	150750 (from a total head of 150 meters)	112500 (from a total head of 200 meters)	90000 (from a total head of 250 meters)

* Water output figures are on a clear sunny day with three times tracking of SPV panel, under the "Average Daily Solar Radiation" condition of 7.15 kWh/ sq.m. on the surface of PV array (i.e. coplanar with the SPV modules).

Notes:

1. For higher or lower head / PV capacity, or in between various models; water output could be decided as per the clause 4 (i.e. Performance Requirements) specified earlier.
2. If surface pumps are used in lieu of submersible pumps, the water output must match that of the submersible pumps as specified in this table.

Guidelines on
Testing Procedure for Solar Photovoltaic Water Pumping System

1 SCOPE

These Guidelines lays down basis for the testing set up and testing procedures for Solar Photovoltaic (SPV) water pumping system. The SPV water pumping system covered are centrifugal pumps of all types from 1HP (0.75 kW) to 25 HP (18.75 kW).

2 REFERENCE STANDARDS

The Indian and IEC Standards listed at Annex A contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All Standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A. The latest editions of the indicated standards should be considered.

3 DEFINITIONS OF SYSTEMS AND PARAMETERS

3.1 Systems

3.1.1 Stand-Alone Solar PV Water Pumping System

A Solar PV Water Pumping System in stand-alone operation is neither connected to the grid nor to battery bank and is comprised mainly of the following components and equipment:

SPV modules, cabling, controller, motor pump-set, and hydraulic piping. Combination of all these components shall be unique. Any change in combination will be treated as different model of pumping system.

3.1.2 Motor-Pump Set

The Motor-pump set consists of the pump (centrifugal pump) and the driving motor.

3.1.3 Controller

The controller converts the DC power (DC voltage & Current) of the PV array into a high or low DC voltage power, or converts this DC power into single -phase or multi-phase alternating-current power (voltage or alternating current) suitable for driving the motor of Motor-pump set.

NOTE: - The Controller may also include equipment for MPPT, monitoring, metering and for protection purposes.

3.2 Parameters

Following parameter shall be referred during testing of SPV pumping system:

Table 1 – Parameters		
Parameter	**Symbol**	**Unit**
(1)	**(2)**	**(3)**
Array voltage (d.c.)	*Va*	V
Array current (d.c)	I_a	A
Array open circuit voltage (d.c)	*Voc*	V
Array short circuit current (d.c)	*Isc*	A
Array maximum power point voltage(d.c)	*Vmpp*	V
Array maximum power point current (d.c)	*Impp*	A
Pressure as measured	*p*	kg/cm^2
Flow rate	*Q*	lps /lpm /m^3/h
Motor voltage d.c or a.c	*Vm*	V
Motor current d.c or a.c	I_m	A
Motor voltage (multi-phase a.c)	V_{rms}	V
Motor current (multi-phase a.c)	I_{rms}	A
Power factor	*cosØ*	-
AC frequency (or d.c switching frequency)	*F*	Hz
Motor speed	*N*	Min^{-1}
Radiation	E_e	W/m^2
Temperature	*T*	^oC

4 TEST SETUP

4.1 Test Set-Up

Illustration(s) of test set-ups are shown in Figure 1 & Figure 2, and a block diagram of required test set-up is shown in Figure 3. All test set-ups shall conform to applicable model test set-ups referred above and the water level in the sump well, locations of the throttle valve, flow meter and pressure gauge/sensor connections as indicated in the test set-up(s) shall conform to Figure 1, Figure 2 and Figure 3 accordingly.

4.2 Precautions for Test Setup:

Before initiating testing of the SPV pump the following precautions must be followed:

a) In case of a direct coupled pump-set, proper alignment of input pipe, output pipe and the sensors shall be ensured;
b) Air tightness in suction line shall be ensured and the general layout of the system pipe work shall be designed to avoid airlocks;
c) The offset pipe of suction line shall either be horizontal or inclined upward towards the pump and shall never be inclined downward towards the pump to avoid air trapping;
d) For the delivery head, a pressure gauge/sensor shall be connected to the delivery line with tapping as shown in Figures 1 or 2 or 3. The tapping shall be flush with the inside of the pipe and shall have its axis at right angles to the direction of flow. The pipe set up between the pump outlet and the pressure sensor shall be the same diameter as the manufacturer's outlet fitting. Sensor/gauge may be connected to the tapping point through a flexible hose;
e) Preferably, a Digital Pressure sensor/gauges of suitable range need to be used for the measurement of head. Care shall be taken to eliminate any leaks in the connecting pipes and to avoid the trapping of air in the connecting pipe or hose;
f) It is assumed that over the normal operating range of the pump, the pressure drop due to frictional losses between the pump outlet and the pressure sensor will be negligible and the kinetic energy component of the water at the pump outlet will be small compared to the increase in potential energy due to the increased pressure across the pump;
g) For instantaneous performance testing, pressure can be sustained by means of a simple gate valve in which backpressure is sustained by restricting the flow. An automatic control valve(s) may be used to sustain a constant upstream pressure. Pressure may also be sustained by means of a pre-pressurized air chamber operating with a pressure maintaining valve at the outlet. A real water column may also be used;
h) A good quality digital flow meter with electrical output linearly proportional to flow rate shall be connected at the other end of the delivery pipe. The distance between the auto control valve and flow meter shall be more than 5d(d=pipe diameter) meters to ensure the laminar flow of water; and
i) After flow meter the end of the discharge pipe should be beneath the water surface to prevent splashing. This could cause a mixed water / air bubbles fluid entering the pump inlet and affecting its proper operation. If so then a vertical baffle or a similar arrangement shall be inserted in the tank between the pump intake and the return pipe such that water does not make any splash and avoid any bubbles when spread to the bottom of tank to reach the input pump. In this way any small bubbles will be excluded, as they will remain near the surface. Alternatively, a large pipe can be placed around the pump with its top breaking the surface and an arch cut in its base to allow water entry.

4.3 Priming Arrangement

A non-return valve/ foot valve shall be used in suction line, further it may also require suction pipe need to be filled with water for priming purpose in case of surface pumps.

4.4 PV Module Array Structures:

For testing the SPV pump using the actual solar array, outdoor PV array structures with different module mounting capacities (4,6,8,10, etc.) shall be used. The modules are mounted on the structures with a tracking facility to optimize irradiance, power output and accordingly, the total quantity of water pumped in a day.

4.5 Sun Simulator PV Module Tester:

To estimate the wattage of the SPV modules under STC, a high precession (at least class AAA as per IEC 60904-9) sun simulator module tester is required in the pump testing lab. Alternatively, all SPV modules should have STC testing certificate from an NABL accredited test laboratory and the date of testing shall not be later than a year. In the STC testing, if the module is found degraded, the degraded data should be used.

4.6 Simulator (Electrical) Testing

Ideally, the SPV pump should be tested as per the site conditions where it is designed to operate. The details of outdoor testing are discussed in the next sessions. However, for testing under simulated conditions, a programmable Solar PV (SPV) array simulator capable of simulating a given solar PV array configuration (i.e., the number of modules, the type and the series / parallel combination), site radiation and temperature conditions shall be required for laboratory. Measurement equipment with acceptable accuracy and precision shall be used for the detection and data logging of the parameters listed in Table 2.

Table 2 - Core Parameters to be Measured and Recorded

Parameter	**Symbol**	**Unit**	**Measurement Uncertainty**
(1)	**(2)**	**(3)**	**(4)**
SPV Array voltage	*Va*	V	≤1 percent
SPV Array current	*Ia*	A	≤1 percent
Pressure/head as measured	*p*	Kg/cm^2	≤2 percent
Flow rate	*Q*	lps	≤2 percent
Solar irradiance	*Ee*	W/m^2	≤2 percent

4.7 Test Setup

For the performance testing of SPV pumps a sump well with sensors for sensing, monitoring and recording of pump parameters will be required. The details of the resources required are given below:

a) Water tank/sump of required dimensions;
b) SPV modules, Controller, Motor-pump set, cable as per required depth and Other Accessories (Test Sample);

c) Pressure transducer with data logging system;
d) Flow Meter with data logging system;
e) Suction pipe(s) (if applicable);
f) Discharge pipe(s);
g) Pyranometers and Temperature sensors with data logging system;
h) Auto control valves;
i) SPV array Simulator(s) for simulation of module arrays for testing;
j) SPV array for realistic testing;
k) Structure for mounting modules for realistic condition testing; and
l) AAA class Sun simulator for testing of modules performance at STC

Refer to the block diagram in Figure 3.

4.8 Constant Head Requirement

Dynamic head variation during test shall be within limit as specified in column 2 of table 3 and the allowable variation in arithmetic average (from the start of flow point to the end of flow point refer to figure 5) of the dynamic head shall be within value specified in column 4 of table 3. Any data with head variation during the test beyond the limit specified in column 3 of table 3 shall be treated as garbage data and shall not be considered in calculations of daily water output.

Table 3 - Allowable variation in arithmetic average of dynamic head
Clause 4.8

SI. No	Required Dynamic head in (meters)	Allowable variation in dynamic head during test	Allowable variation in arithmetic average of dynamic head
(1)	**(2)**	**(3)**	**(4)**
i.	10	± 15 % = ± 1.5 meter	± 0.5 meter
ii.	20	± 10 % = ± 2 meter	± 0.5 meter
iii.	30	± 10 % = ± 3 meter	± 0.7 meter
iv.	50	± 8 % = ± 4 meter	± 0.8 meter
v.	70	± 7 % = ± 4.9 meter	± 0.8 meter
vi.	100	± 7 % = ± 7 meter	± 1 meter
vii.	120	± 7 % = ± 8.4 meter	± 1 meter
viii.	150	± 7 % = ± 10.5 meter	± 1 meter
ix.	200	± 7 % = ± 14 meter	± 1 meter
x.	250	± 7 % = ± 17.5 meter	± 1 meter

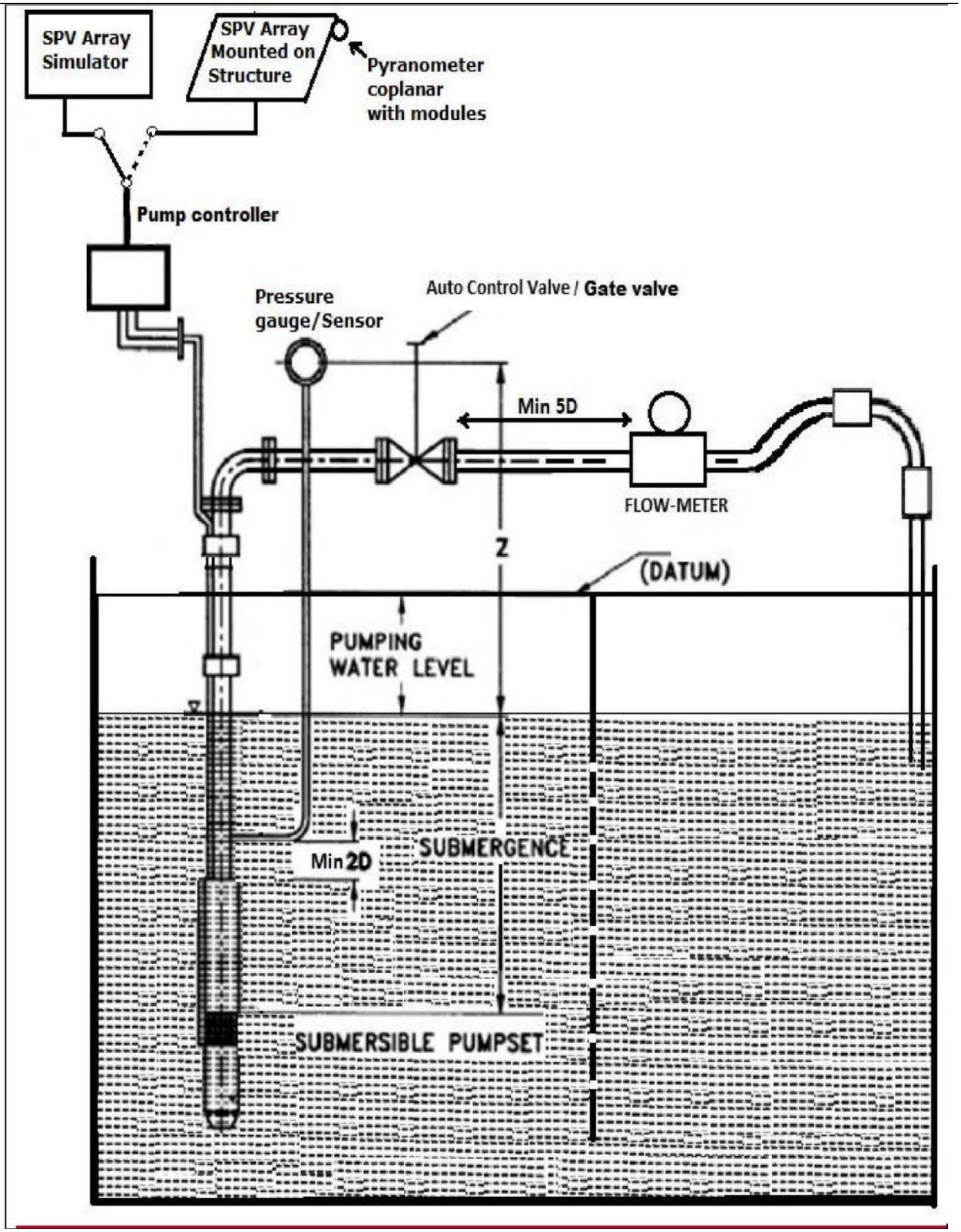


FIGURE 1– TYPICAL TEST SET-UP FOR SUBMERSIBLE SPV WATER PUMP-SET

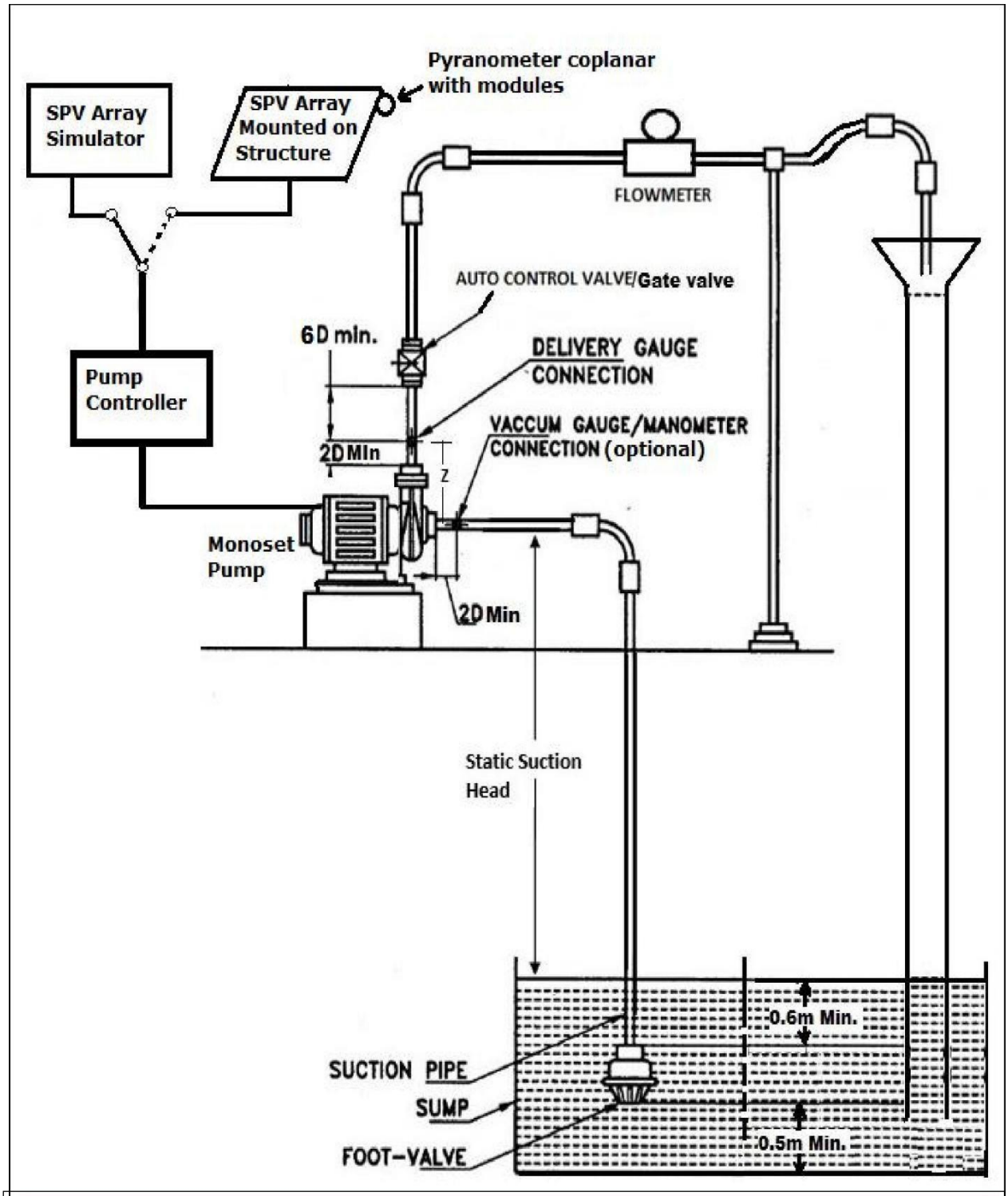


FIGURE 2 – TYPICAL TEST SET-UP FOR SPV SURFACE/MONO-BLOCK WATER PUMP SET

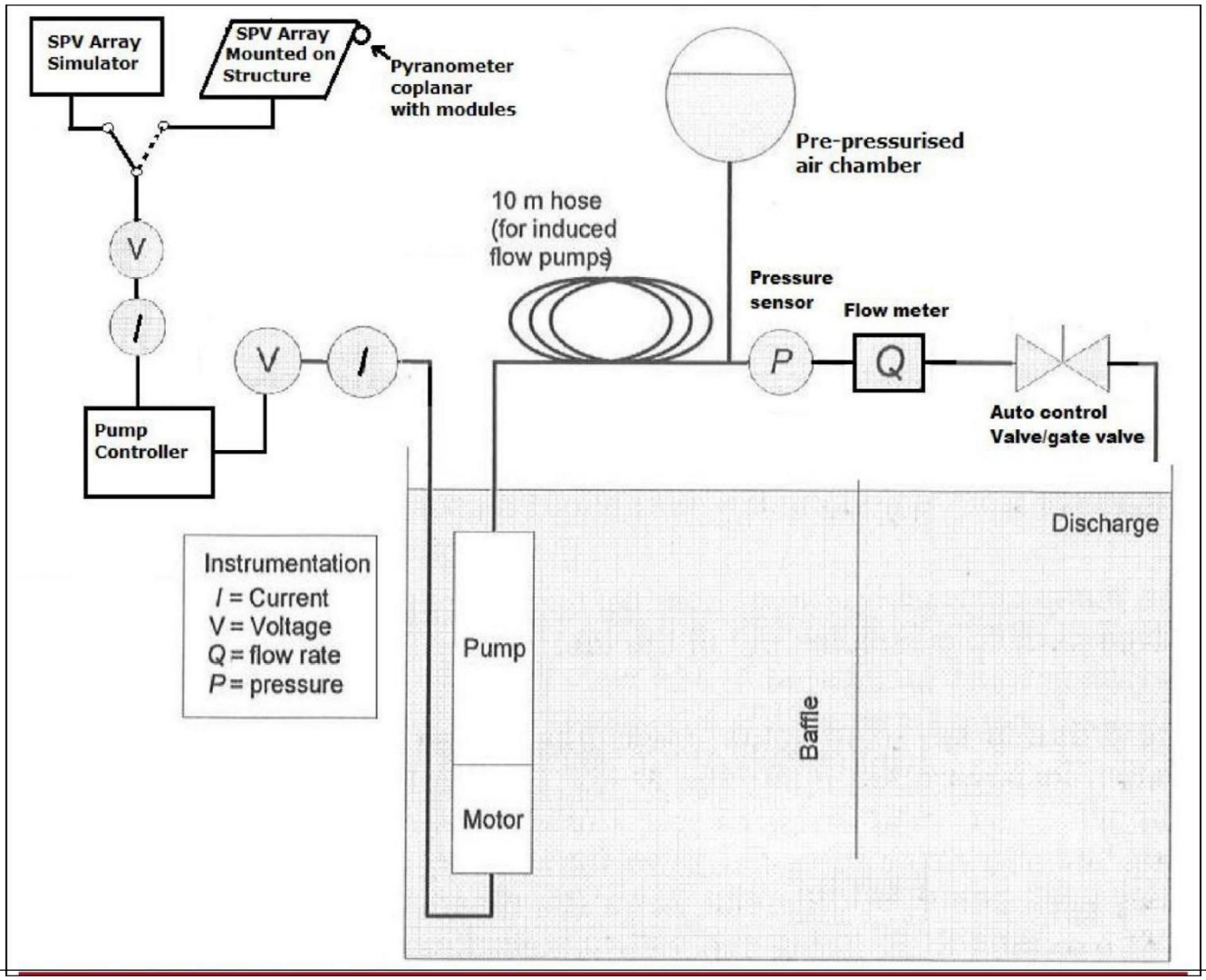


FIGURE 3 – BLOCK DIAGRAM OF TEST SETUP FOR SUBMERSIBLE PUMP-SET

5. TEST PROCEDURE FOR PERFORMANCE EVALUATION OF SPV PUMPING SYSTEM:

There are three major profiles to be completed for comprehensive certification and qualification of a sample SPV water pump as per this standard. Two steps correspond to two simulation profiles, Hot and Cold. The third step corresponds to actual outdoor conditions testing using natural sun radiation. The SPV water pump sample shall attain or exceed the qualification benchmarks set by MNRE for the specified model & design, in all three profiles. Before executing the three profiles testing, it is necessary to conduct the following protections test on the sample:

1. **Dry running:** System shall shut down within one minute/manufacturer specification in dry running condition (when the water level goes below pump inlet).
2. **Open circuit:** System shall not operate if any phase become open circuited, the controller shall be tripped within one minute/manufacturer specified time.
3. **Short circuit:** System should not operate if any two or all three-phase short circuited.

4. **Reverse polarity:** System shall not malfunction if polarity of input power is reverse.
5. **Under Voltage:** System shall not operate if terminal voltage goes below the limit specified by the manufacturer.
6. **Surge Protection:** A surge protection device (SPD) shall be installed on both the inputs and outputs side.

The performance testing of the SPV Pumping System for the three procedures are discussed in the following sections:

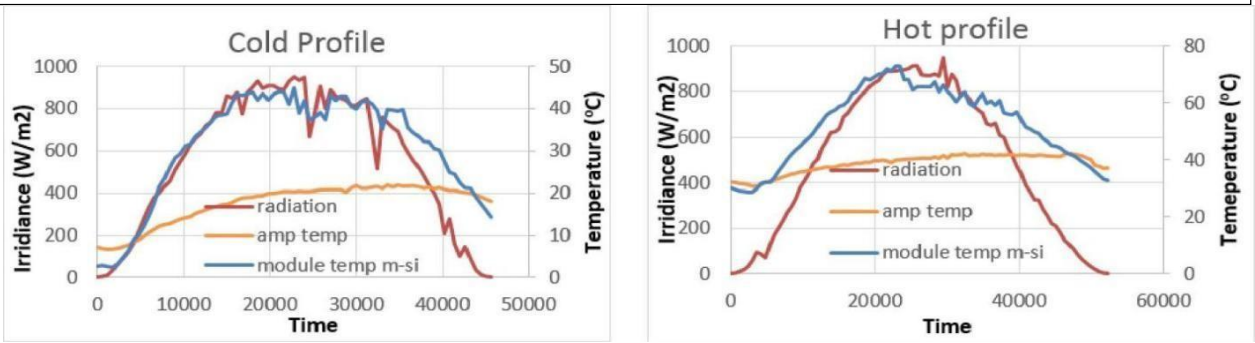
5.1 Simulator Methods:

Simulation methods are the easiest and fastest way of estimating SPV pump performance. However, in these methods actual PV array is not used, instead a PV array simulator is used. Here, a Programmable SPV array simulator capable of generating power output equal to actual SPV array under the given radiation and temperature conditions for a given SPV array configuration (i.e., the number of modules, the type and the series / parallel combination) shall be used. Although any radiation & temperature can be created, for the purpose of testing, two conditions one Hot summer day conditions (hot profile) and the other Winter Day conditions (cold profile) shall be used.

5.2 Hot & Cold Profiles:

The typical Hot & Cold day profiles are shown in Figure 4. These profiles of full-day Solar irradiance and temperature shall be loaded in PV array simulator, sequentially one after the other. The simulator output is connected to the motor & pump through the pump controller and the profiles are run-on a real-time basis. The performance parameters as given in table 2 are collected every minute for the entire duration of run time (per day). The total water output and output in liters /watt STC/ day can be estimated at desired constant head / dynamic head for complete duration of profiles. The temperature coefficient of power shall be derived from the IEC 61215/IS 14286 standard test report for the module supplied with the pump of the same model.

FIGURE 4 . TYPICAL SOLAR RADIATION HOT AND COLD PROFILE



Note: Per second data for hot and cold profile may be downloaded from MNRE website using the following link: - https://mnre.gov.in/solar/standard-specs-cost

5.3 Outdoor Condition using sun radiation:

To operate the motor-pump set using the actual PV array, an array as per the Motor-pump set HP capacity is to be designed. The STC wattage of all the SPV modules is measured first, as per IEC 60904-1/ IS 12762-1 or clause number 11.6 of IEC 61215/ clause number 10.6 of IS-14286. The modules will then be installed on the structures, both in series and parallel combinations, as required, are connected and a designed PV module array is created. The array output is connected to the Motor & Pump through the pump controller.

Per day water output test has to be performed at desired constant dynamic head for complete day from dawn to dusk (sunrise to sunset). Irradiance shall be measured at coplanar to modules. Tracking may be done manually or automatically. Total flow shall be corrected at reference Average Daily Solar Radiation of 7.15 kWh/m2 on the surface of SPV array (i.e., coplanar with the SPV Modules). Results of the SPV pumping system obtained under outdoor conditions shall meet the performance requirement of the system.

NOTES: -

1. Handle SPV modules carefully during installation.
2. SPV modules to be free from dirt (sand, bird droppings etc.,) during the test.
3. Install SPV modules in shadow free access-controlled area
4. Tracking shall be minimum three time in a day for maximum performance
5. Pyranometer shall be mounted co-planer with SPV modules.

Recording, measurement & logging of flow for the period of hot profile, cold Profile and Realistic condition needs to be done.

5.4 Remote Monitoring System Verification

Provision for remote monitoring of the installed pumps shall be made in the controllers through an integral arrangement and it shall be capable of providing live status/parameters through online portal.

6 MEASUREMENTS AND APPARATUS

6.1 Solar Radiation Measurement

Solar radiation at co-planar with the Module surface shall be measured using a pyranometer. Response time of the pyranometer should not be more than 15 seconds. The interval between two readings should not be more than one minute for the calculation of average daily solar radiation.

6.2 Measurement of Head

6.2.1 Delivery Head

Digital pressure gauge/sensor shall be used, also a data logging system shall be used for calculation of average head through day. Interval between the two readings shall not be more than one minute for the calculation of average head. Accuracy for pressure sensor shall be within ± 0.5 percent.

6.2.2 Suction Lift

Suction lift shall be kept constant by mean of vertical distance between sump water level to centre of Pump impeller. Correction in suction lift shall be applied as per atmospheric pressure at the testing place and water temperature.

Distance measuring scale or laser-based sensors may also be used for suction lift measurement.

6.3 Measurement of Rate of Flow

A good quality Magnetic flow-meter of minimum 0.5% accuracy class shall be used for flow measurement, data logging system shall be used for calculating cumulative water volume throughout the day. The maximum flow rate of flowmeters should be at least 1.5 times the maximum flow rate of pumps. Instrument can be selected as per 3.2 of IS 11346. Interval between two readings shall not be more than one minute for the calculation of cumulative flow. Accuracy of flowmeters shall be within ± 0.5 percent.

7 CALIBRATIONS OF APPARATUS

All measuring instruments have to be calibrated periodically as per requirement.

8 STEP-WISE TEST PROCEDURE

8.1 Per Day Water Flow Test of Submersible Pumps

a) Install the Pump-set as per Figure 1;
b) Connect Pump-set with controller as per manufacturer instruction;
c) Use Solar PV Array Simulator Or actual output from SPV array, for testing the pump-set at the given profile;
d) Connect controller with SPV array Simulator or with actual SPV array output as per requirement of profile;
e) Input STC performance data of each module in the array, into simulator and invoke the desired profile and run the same;
f) For a realistic condition test, make an array by mounting all SPV modules on structure(s) by connecting modules in series or parallel as per requirement;
g) Start the controller after connecting it with the array or array simulator;

h) Use a head control valve or pre-pressurize tank to keep constant desired dynamic head;
i) Tabulate the readings in Table 2 and the recording interval shall be less than or equal to 1 minute.

8.2 Per Day Water Flow Test of Surface Pumps

a) The pump-set should be installed as demonstrated in Figure 2
b) Maintain height to get desirable static suction lift as per requirement
c) Install foot valve or non-return valve as per manufacturer instructions; and
d) Follow steps (b) to (i) of para No. 8.1

9 OBSERVATIONS

The following observations of the complete day profile shall be recorded in a test record sheet. The following observations shall be used to derive pump characteristics:

a) Instantaneous Solar irradiation (W/m2), pyranometer reading;
b) Delivery gauge/sensor readings;
c) Suction gauge/sensor readings / Distance between water level to impeller eye, (if applicable);
d) Gauge distance correction factor, Z;
e) Calculate cumulative daily solar radiation on surface co-planar with solar modules (kWh/m2);
f) Calculate total water discharge in a day at the desirable constant head (Litre per Day);and
g) Water output per day per watts peak (Litre/Wp).

10 COMPUTATION OF TEST READINGS

10.1 Computation of Total Head for Surface (Mono-set) Pump

Total Head H = HSSL + Hd + Z + [(Vd2-Vs2) /2g)]

HSSL = Total Static suction Lift in meters of water column (measured by calibrated measuring tape or any distance measuring sensors)

Hd = Delivery gauge/sensor reading in meters of water column

Z = Gauge distance correction factor for delivery gauge centre and inlet pipe centre in meters (see figure 3). If the delivery gauge centre is below the inlet pipe centre, Z is subtracted from the delivery gauge reading and if the delivery gauge centre is above inlet pipe centre,Z is added to the delivery gauge reading; the gauge distance correction factor shall never be applied to the suction vacuum gauge or mercury manometer reading irrespective of their positions:

V_d = Velocity at delivery gauge/sensor connection, m/s;

V_s = Velocity at suction gauge/sensor connection, m/s; and
g = Acceleration due to gravity in m/s2.

The Total Static Suction Lift in surface pump (H_{SSL})

H_{SSL} = Height in meter from water level to impeller + Altitude correction in meter + water temperature correction in meter.

10.1.1 Correction for Altitude

Barometric pressure shall be recorded at test place. The difference between atmospheric pressure at the test place and 10.33 mWC (that is atmospheric pressure at MSL) shall be deducted from Static suction lift.

10.1.2 Correction for Water temperature

Static suction lift specified in the below Table shall be increased or reduced as given below when the water temperature is below or above 33°C.

Table 4 - Correction for water temperature

Hourly Average of Water Temperature °C	Vapour pressure mWC	Correction in Static suction lift above and below 33°C water temperature mWC
10	013	+ 0.39
15	0.18	+ 0.34
20	0.24	+ 0.28
25	0.33	+ 0.19
30	0.43	+ 0.09
33	0.52	0.00
35	0.58	- 0.06
40	0.76	- 0.24
45	1.00	- 0.48
50	1.28	- 0.76

Suction lift shall be adjusted minimum 3 time in a day as per average water temperature and barometric pressure, by adjusting water level of tank.

Following formula can also be used on behalf of table

$$4\ y = -0.0007\ x^2 + 0.0130\ x + 0.3079$$

Where
y = Correction in Static suction lift
x = Average water temperature.

10.2 Computation of Total Head for Submersible Pump-sets

Total head H = Hd + Z + [(V_d^2) / 2g] Where:

Hd = Delivery gauge/sensor reading in meters of water column;
Z = Gauge distance correction factor for delivery gauge. Distance between gauge/sensor center to tank water level (refer figure 1).
Vd = Velocity at delivery gauge/sensor connection in m/s;
g = Acceleration due to gravity in m/s^2.

10.3 Total Water Per-Day

Total water output per day shall be calculated by Integration (Sum) of flow rate with respect to time. Integration shall start from the time when pump set achieve desired constant head in morning time (start point refer figure 5) and end at the time when pump set unable to achieve desired constant head in evening time (End point refer figure 5).

In case if Average Daily Solar Radiation found less than requirement then test shall be performed on next sunny day.

10.4 Water Output Per Day Per Watt Peak

Water output per day per watts peak (liter/Wp) = Water output (Liters) per day at specified head / Array STC power in watts-peak

10.5 Cumulative Daily Solar Radiation

Cumulative Solar Radiation (kWh/m2) in a day= Average of instantaneous irradiance reading from Dawn to Dusk (kW/m2) period of time in hours.
This can be obtained through time weight summation of pyranometer readings.

Dawn = Time of sunrise when irradiance become positive from zero value.
Dusk = Time of sunset when irradiance become zero from positive value.

10.6 Mismatch in maximum power at STC among modules of array

The mismatch shall be calculated as under:

$$\%\text{Power mismatch in array} = \frac{(PMax - PMin)}{(PMax + PMin)} \times 100$$

P_{Max} = Maximum power among modules in array, and
P_{Min} = Minimum power among modules in array

10.7 Efficiency of Array

The efficiency of Array = Power output from array / (total area of modules in m2 X Sun radiation in watts/m2)

10.8 Fill Factor of Array

Fill factor of Array = This has to be measured using a PV array tester. This depends on the overall series resistances and shunt resistances of modules in the array.

10.9 Output Voltage of Array

Output Voltage of Array = Sum of voltages of modules in series.
In parallel connected module strings, the lowest voltage generating strings will set the voltage.

10.10 Output Current of Array

Output Current of an Array = Sum of currents of the parallel strings in the array.
The output current of a string is controlled by the lowest current generating module.

10.11 Output Power of Array

Output Power of Array = Sum of power of all modules- mismatch loss.
This can be measured by PV array tester.

11 EXAMPLES:

Total per day flow

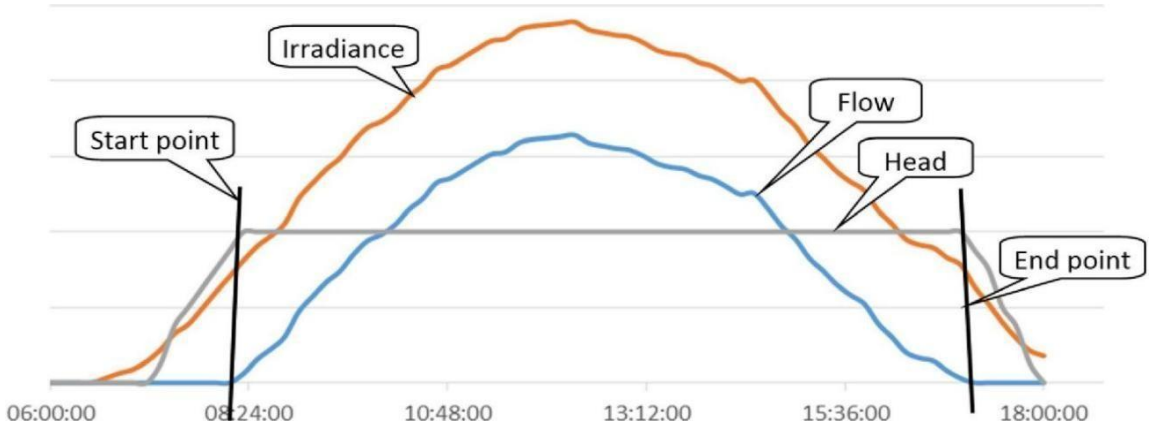


FIGURE 5- TYPICAL GRAPH FOR UNDERSTANDING CALCULATION

If pump achieved constant head at 8:15:30 AM (Start point in figure 5) and in evening Pump unable to keep constant desired head at 17:45:30 PM (End point in figure 5).

Flow rate in lps is recorded from 08:15:30 AM to 17:45:30 PM (start point to end point) If the average calculated is 3.55 lps, then the total flow will be

Total duration of flow = End Time - Start time

= 17:45:30 - 8:15:30

= 9 h: 30 m: 0 s

Total duration from start to end in seconds:

= (9x3600) + (30x60) + (0x1) = 34200seconds

Total discharge per day in liters = Average flow in lps x Total no of seconds

= 3.55 x 34200 = 121410 liters

For a realistic test, correct total flow at reference Average Daily Solar Radiation as specified in MNRE specifications.

12 TEST REPORTS

In order to have uniformity, the test reports issued by the Labs shall use a common format developed by NISE. The test report shall be issued only in the name of applicant and shall clearly indicate that whether the Solar PV water pumping system qualify as per MNRE specifications or not along with the details. A soft copy of test report shall also be provided to the applicant and shall be made available on web-portal of test lab, which may be accessed by the implementing agencies for verifying the authenticity of the report.

13 USE OF OTHER BRAND OF SOLAR MODULES

In case a test lab has tested and issued approval certificate for a particular model of SPV pumping system using a particular brand and a particular Wp of SPV Modules, SPV Modules of other brand may also be used for the purpose for the same model of SPV pumping system without going for re-testing of complete SPV pumping system with other brand (or the higher Wp of same brand) of SPV Module, provided the test lab certifies that the SPV Module of other brand(or originally tested brand) is at least of same wattage capacity and its parameters and characteristics are not inferior to the brand of SPV Module with which the model of SPV pumping system was tested and certified by the testing lab. In addition, the total wattage capacity of the Solar Array with the proposed model of SPV Modules shall be equal or higher than the wattage capacity specified by the MNRE for that model of SPV pumping system. The proposed model of SPV module shall also meet the following conditions:

- Solar Array Maximum voltage Vmpp with new brand module shall be within ±2% of earlier module.
- Modules Efficiency and Fill Factor shall qualify the minimum requirement of MNRE specifications
- Array and module Mismatch shall meet the MNRE specifications.
- SPV module shall follow the quality control order issued by MNRE from time to time.

14 LABS AUTHORISED FOR SOLAR PUMP TESTING

- Any lab accredited by NABL for testing of solar PV water pumping system as per MNRE specifications and testing procedure, and The National Institute of Solar Energy are authorized to issue approval certificate on successful testing of a solar PV water pumping system.

- Soft copy of test report shall be made available to implementing agencies on request basis.

- Logged data for Head, flow & radiation shall be preserved by laboratory at-least for 1 year.

	LIST OF REFFERED STANDARD
IS No.	**Title**
17018-1 : 2018	Solar Photovoltaic Water Pumping System Part 1 Centrifugal Pumps — Specification
14286 : 2010	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules — Design Qualification and Type Approval
3043 : 1987	Code of Practice for Earthing
5120 : 1977	Technical requirements for rotodynamic special purpose pumps (first revision)
11346 : 2003	Tests for Agricultural and Water Supply Pumps — Code of Acceptance
6603 : 2001	Stainless Steel Bars and Flats
6911 : 2017	Stainless steel plate, sheet and strip Stainless steel plate, sheet and strip
7538 : 1996	Three-phase squirrel cage induction motors for centrifugal pumps for agricultural applications
8034 : 2018	Submersible pump sets - Specification (second revision)
9079 : 2018	Electric Monoset pumps for clear, cold water for agricultural and water supply purposes - Specification (second revision)
9283 : 2013	Motors for submersible pump sets
11346 : 2002	Code of acceptance tests for agricultural and water supply pumps (first revision)
14220 : 2018	Open well submersible pump sets — Specification
14582 : 1998	Single-phase small AC electric motors for centrifugal pumps for agricultural applications
ISO 9905 : 1994	Technical specifications for centrifugal pumps — Class I
IEC 60068-2-6 : 2007	Environmental testing – Part 2-6 Tests – Test Fc: Vibration (sinusoidal)
IEC 60068-2-30 : 2005	Environmental testing – Part 2-30 Tests – Test Db: Damp heat, cyclic (12 + 12h cycle)
IEC 60146-1-1 : 2009	Semiconductor converters - General requirements and line commutated converters Part 1-1 Specification of basic requirements
IEC 60364-4-41 : 2005	Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock
IEC 60364-7-712 : 2017	Low voltage electrical installations - Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems
IEC 60529 : 1989	Degrees of protection provided by enclosures (IP Code)
IEC 60947-1 : 2007	Low-voltage switchgear and control gear - Part 1: General rules
IEC 61000-6-2 : 2016	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
IEC 61000-6-3:2006	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
IS/IEC 61683 :1999	Photovoltaic Systems — Power Conditioners — Procedure for Measuring Efficiency

IS/IEC 61730-1 : 2004	Photovoltaic (Photo Voltaic (PV)) Module Safety Qualification Part 1 Requirements for Construction
IS/IEC 61730-2 : 2004	Photovoltaic (Photo Voltaic (PV)) Module Safety Qualification Part 2 Requirements for Testing
IEC 61800-3:2017	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
IEC 62109-1:2010	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
IEC 62305-3:2010	Protection against lightning - Part 3: Physical damage to structures and life hazard
IEC 62458:2010	Sound system equipment – Electro-acoustical transducers - Measurement of large signal parameters
IEC 60904/IS 12762-1	Procedures for the measurement of current-voltage characteristics (*I-V* curves) of photovoltaic (PV) devices in natural or simulated sunlight.

Note: - The latest editions of the indicated standards should be considered.

Technical Specification and Testing Procedure for

Universal Solar Pump Controller (USPC)

1. Preamble:

The Controller for Solar PV pumping system is the heart and brain of the system. The Solar PV pumping system deployed at huge cost to the farmer and the exchequer for the Government is currently utilised only for half of the days in a year (around 150 days per year) on an average. In order to optimally utilize the solar photovoltaic system that generates the electricity throughout the year during sunshine hours, the controller supplied for installation of solar pumping system should be able to perform several other tasks for agricultural and other needs of a farmer. This will increase the productivity of agriculture sector and income of farmer. With the use of USPC the solar system could be used effectively throughout the year.

2. Technical Specification for Stand Alone Application

The USPC with SPV modules and structure can be used for agrarian applications such as water pumping, apple grading and polishing system, wheat (grain) flour grinding machine / aata chakki, cutter/chaff, deep-fridger / cold storage, blower fan for cleaning of grains, heating loads and any other standard voltage (400/415V) three phase motor/equipment of capacity not more than the capacity of Solar PV pumping system. The USPC operation schematic diagram is shown in Fig. 1. Further, the applications are not limited upto the few shown in the figure.

I. Following table gives specifications of electrical supply from USPC for motors other than the solar pumps. For operating the pump the USPC must follow the MNRE specifications for SPV pumping systems.

Sr No.	Description	Desired requirement
1	Motor Supply Phases	Three phase R-Y-B
2	Rated motor frequency	48-50Hz
3	Frequency operation	0 to 52Hz
4	Rated motor voltage	415V ± 5%
5	Desired motor operation	Constant V by F or constant motor flux control

II. Proposed electrical properties of USPC when operating motors other than motor-pump set:

Sr No.	Description	Desired requirement
1	Characteristic of voltages	Pure sinusoidal or Filtered AC output voltage at motor terminal. No PWM pulses allowed at the motor terminal, as it generates pronounced voltage spikes. The USPC output is intended to use for the traditional induction motors based applications which are design for sinusoidal grid supply.
2	THD of motor terminal voltages	Below 3%
3	THD of motor current (in case of balance/linear motor)	Below 5%
4	Balance supply	Three phases should be balanced and no negative sequence components to be allowed
5	Voltage spikes	Recurring or non-recurring voltage spikes more than 620V (peak of 440V AC supply) is not allowed
6	Alarms and Protections	Output voltage low, Output frequency low/high, Low irradiance/PV power, Current overload, Peak Torque

III. Controller should be able to run SPV pumping system as per MNRE specifications as well as any other type of motor of suitable rating, subject to the load characteristics of the equipment in which the motor is used is any of the following:

a) Constant torque loads
b) Constant power loads
c) Quadratic loads
d) Impact loads
e) Hydraulic loads

Subject to the maximum torque being not more than 150% of the rated torque of the motor.

IV. To ensure energy efficiency of solar PV system and to maintain reliability of PV installation against aging effect, module mismatch with time, partial shading, etc., the desired USPC properties and configuration should be as follows:

(a) Static MPPT efficiency of USPC should be equal or more than 98% during operation of 10 to 100% of rated STC PV power, and average MPPT tracking efficiency in the dynamic condition should be greater than 97 % with hot and cold profiles when feeding the water pumping, hydraulic or heating loads, so as to maintain MPPT irrespective of variation in solar energy or irradiance.

(b) USPC efficiency should be as follows for the operation at 80% rated STC power of the PV array:

Sr No.	SPV pumping system capacity	Controller power efficiency should be more than or equal to
1	3 HP	93.00%
2	5 HP	93.00%
3	7.5 HP	94.00%
4	10 HP	94.50%
5	15 HP	94.50%

(c) Considering voltage variation over the year due to variation in temperature, irradiance and effect due to ageing, environmental damages to PV panels with time, USPC should have MPPT channels as an integral part of system (or externally connected part) with wide range of input PV voltage for MPPT tracking of the PV panels. Input voltage range variation should be tested as per manufacturer declaration (min, nominal or 90% of the maximum) or if no declaration is made than at least it should be tested as per the table given below:-

Sr No.	**Motor Pump set capacity**	**Input voltage range**		
		Minimum	**Nominal**	**Maximum**
1	3 HP	(0.85*Vnominal)	Nominal	(1.15*Vnominal)
2	5 HP	(0.85*Vnominal)		(1.15*Vnominal)
3	7.5 HP	(0.85*Vnominal)		(1.15*Vnominal)
4	10 HP	(0.85*Vnominal)		(1.15*Vnominal)
5	15 HP	(0.85*Vnominal)		(1.15*Vnominal)

V. There should be Mode selection located on control panel of the USPC along with display and user should be able to select either to run motor-pump set of any other application. The software/firmware required to operate these applications must get automatically loaded when an appropriate position of the switch is engaged.

VI. USPC must have at least four numbers of three phase output cables to feed power to the applications. The output power cable for specific application should get selected automatically upon selection of applications via keypad or via mobile or via remote control connectivity. The manual selector switch should not be used at the output to manage different loads. This is to ensure the hassle-free operation of applications by farmer with adequate safety.

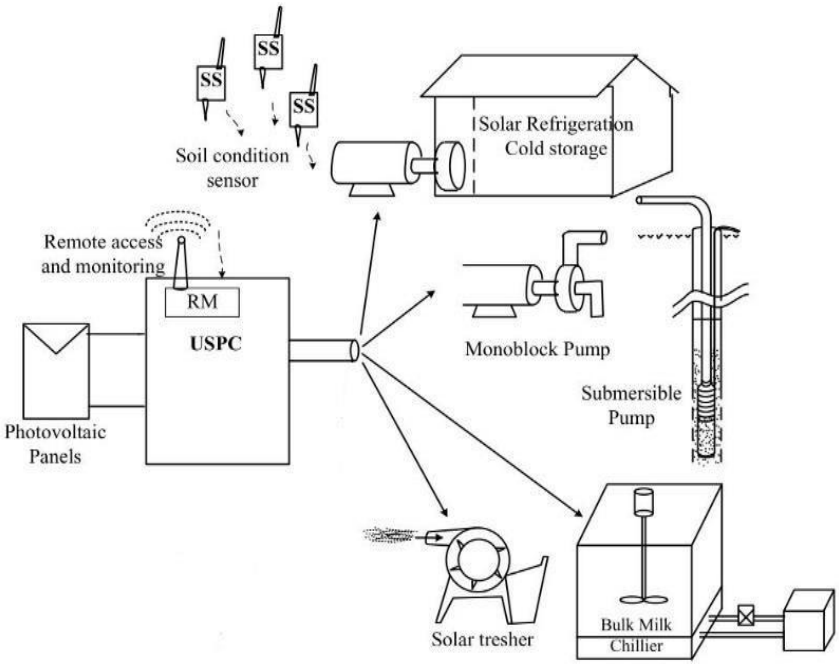


Fig. 1. USPC operation schematic diagram.

VII. USPC based Solar system must be equipped with Remote monitoring and remote fault identification:

(a) Remote monitoring features should be integral part of solar pump controller and should provide time wise remote monitoring of PV voltage, PV Power, Water output, head, when used in solar pump mode. When operated in farm equipment mode, it should show, PV voltage, PV power, motor voltage, motor current and motor frequency.

(b) Cumulative energy generation from PV panels for a month, year and 5 years should be provided.

(c) Remote monitor should show current status of system like On, Off and fault.

(d) Software associated with remote monitoring should also provide location of SPV pumping system.

(e) Controller should have support of sufficient Internal memory/ SD card / memory card to support remote monitoring in case of network failure.

USPC must have IP65 protection.

Testing Procedure for Universal Solar Pump Controller (USPC)

USPC must be tested in two principle modes:

1. As an offgrid solar pump controller: the testing should be as per MNRE specifications and Test procedure.
2. As a controller to operate motorized farm equipment: The testing should be as described below.

To test the USPC in the second mode the test centres must have standard actual mode suitable for 4 loading modes. The input to the USPC must be from a solar PV simulator using the hot and cold profiles issued by MNRE. Following tests may be performed on USPC driving the agrarian load like Atta Chakki, Chaff Cutter and Deep Freezer under test. The USPC must be able to operate these motors of the attached agrarian load, so that they deliver the rated torque and are able to also operate till 150% of the rated torque for 30 seconds.

S. No.	Test Performed	Expected result	Test Lab Observation	Remarks
1	Application description on screen and selection of applications	LCD screen provided on controller need to shows various applications which can be selected by keypad using up-down and enter key		
2	Mode operation of applications (Automatic: through keypad or remote / Manual: control switches)	Universal Solar Agriculture controller should come with multiple outputs which can be permanently connected to the application by selecting appropriate options for example following applications should automatically started by USPC by appropriate mean such as keypad or remote for selection. (i) Water Pumping (ii) Chaff Cutter (iii) Deep fridge/ Cold Storage		

3	Application Specific output (Application specific software)	USPC should have inbuilt individual application specific software to run the agrarian applications other than pumps and output of the controller should be suitable for above mentioned applications	-	
4	Input PV voltage range Minimum – Voc at STC Nominal – Voc at STC Maximum – Voc at STC			
5	USPC Efficiency measurement in Hot and cold profile should be measured as per BS EN 50530/IEC 62891	**Efficiency of the UPSC at minimum .....VOC**		
		Load %	**Charge controller eff (%)**	**Power tracking Efficiency (%)**	**Overall charge controller efficiency (%)**
		10			
		25			
		50			
		75			
		100			
		Efficiency of the UPSC at Nominal .....VOC			
		10			
		25			
		50			
		75			
		100			
		Efficiency of the UPSC at 90 % of Max ..... VOC			
		10			
		25			
		50			
		75			
		100			
		Dynamic MPPT Efficiency			
		Hot Profile			
		Cold Profile			
6	Ripple and distortion at output on full load	Should below 5 % after 25 % loading condition			

7	Measurement of Output voltage waveform	Three phase output with up to 440 V rms pure Sine Wave to be measured at least 4 times between 300W/m2 irradiance and maximum irradiance as per the irradiance profile.	CF value should be provided by lab for voltage and current	
8	Operation at different output from array with all four load types (Array wattage as per MNRE model:	Above..... Watt DC output Should not stop functioning at any load condition. Observation should be recorded.	Power value should be recorded by the lab with all agrarian	Motor current should be recorded (for torque behavior) It must be almost constant
	Example 4800 Wp array) At 40% Power At 50% Power At 75% Power At 100% Power		supported by USPC	irrespective of available DC power from array (motor running condition). This is for Impact loading condition (such as Chaff cutter) current variation need to be
9	Operation at different output from array with all four load types (Array wattage as MNRE model: Example 4800 Wp array) At 10 % Power At 25 % Power At 30 % Power	USPC need to run all the agrarian load in variable frequency at the lower irradiance value The load may be increased beyond 150% of rated torque to determine at what level the motor is stalling and stopping and it must trigger 'torque overload' alert. If it goes beyond 150% of the motor rated torque the USPC must trip indicating an 'overload tripping'.	Motor current should be recorded (for torque behavior) as it is a function of V/F ratio controlled by USPC	
10	Total circuit protection observation	• Soft Startup, • low radiation protection, • overload protection, • Open circuit protection • Reverse polarity protection		

Expected output of individual applications must be specify as per their power rating and SPV capacity, such as:

1. kg/hour grinding of atta chakki, and granularity.
2. Volumetric Iceing of cold storage in x hours.
3. Output in terms of kg/hours for a specific capacity grass-cutter.
4. Output must be quantified in terms of rate of volume or weight as above for any other applications.

All the test labs authorised to conduct testing for off-grid solar pumping system as per MNRE specifications may also conduct testing of USPC as per procedure prescribed above and issue testing certificates.

Annexure - B

SPECIAL INSTRUCTIONS TO BIDDERS FOR e-TENDERING

GENERAL

- The Special Instructions (for e-Tendering) supplement 'Instructions to Bidders', as given in these RCT Documents. Submission of Online Bids is mandatory for this RCT.
- e-Tendering is a new methodology for conducting Public Procurement in a transparent and secured manner. Now, the Government of Tamil Nadu has made e-Tendering mandatory. Suppliers / Vendors will be the biggest beneficiaries of this new system of procurement.
- For conducting electronic tendering, *Agricultural Engineering Department (AED)* has adopted a secured and user friendly e-tender system enabling bidders to Search, View, Download tender document(s) directly from the e-tendering portal of Tamil Nadu https://www.tntenders.gov.in.
- Benefits to Suppliers are outlined on the Home-page of the portal.

INSTRUCTIONS

Tender Bidding Methodology:

Two Cover Systems (Technical Evaluation Followed by Financial Evaluation)

Broad Outline of Activities from Bidder's Perspective:

https://tntenders.gov.in/nicgep/app?page=HelpForContractors&service=page

1. Procure a Class III Digital Signing Certificate (DSC).
2. Register on e-Procurement Portal.
3. View Notice Inviting Tender (NIT) on e-Procurement Portal
4. Download Official Copy of Tender Documents from e-Procurement Portal. Note: Official copy of Tender Documents is distinct from downloading 'Free Copy of Tender Documents. To participate in a tender, it is mandatory to procure official copy of Tender Documents for that tender.

5. Clarification to Tender Documents on e-Procurement Portal
   a) Query to AED (Optional)
   b) View response to queries posted by AED
6. Bid-Submission on e-Procurement Portal
7. Respond to AED Post-TOE (Tender Opening Event) queries

For participating in this tender online, the following instructions are to be read carefully. These instructions are supplemented with more detailed guidelines on the relevant screens of the e-Procurement Portal.

Digital Certificates

For integrity of data and authenticity/ non-repudiation of electronic records, and to be compliant with IT Act 2000, it is necessary for each user to have a Digital Certificate (DC), also referred to as Digital Signature Certificate (DSC), of Class III, issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer **http://www.cca.gov.in**].

Registration

To use the e-Procurement Portal https://www.tntenders.gov.in, vendors need to register on the portal.

Important Note:

1. Interested bidders have to download official copy of the RCT & other documents after login into the e-tendering Portal https://www.tntenders.gov.in. If the official copy of the documents is not downloaded from e-tendering Portal within the specified period of downloading of RCT and other documents, bidder will not be able to participate in the tender.
2. To minimize teething problems during the use of e-tendering Portal (including the Registration process), it is recommended that the user should peruse the instructions given under 'Help for Contractors and Guidelines for Hassle free Bid Submission' located on Home Page

   The entire bid-submission would be online on e-Procurement.

Broad outline of submissions are as follows:

- Submission of Bid-Parts
  - Envelope I (Technical-Bid)
  - Envelope II (Financial-Bid)
- *Submission of digitally signed copy of Tender Documents/ Addendum*

Note: The Bidder should also upload the scanned copies of all the above mentioned originaldocuments as Bid-Annexures during Online Bid-Submission.

Internet Connectivity

- If bidders are unable to access e-tender portal or Bid Documents, the bidders may please check whether they are using proxy to connect to internet or their PC is behind any firewall and may contact their system administrator to enable connectivity. Please note that Port SSL/ 443 should be enabled on proxy/firewall for HTTPS connectivity. Dial-up/ Broad and internet connectivity without Proxy settings is another option

SPECIAL NOTE ON SECURITY AND TRANSPARENCY OF BIDS

- Security related functionality has been rigorously implemented in e-Procurement portal in a multidimensional manner. Starting with 'Acceptance of Registration by the Service Provider', provision for security has been made at various stages in Electronic Tender's software. Specifically, for Bid Submission, some security related aspects are outlined below:
- As part of the Electronic Encrypted® functionality, the contents of both the 'Electronic Forms®' and the 'Main-Bid' are securely encrypted using the private key (DSC) of the Bidder.

CAUTION: All bidders must fill Electronic Forms® for each bid-part sincerely and carefully, and avoid any discrepancy between information given in the Electronic Forms® and thecorresponding Main-Bid. For transparency, the information submitted by a bidder in the Electronic Forms® is made available to other bidders during the Online Public TOE. If it is found during the Online Public TOE that a bidder has not filled in the complete information inthe Electronic Forms®, the TOE officer may make

available for downloading the corresponding Main-Bid of that bidder at the risk of the bidder. In case of any discrepancy between the values mentioned in figures and in words, the value mentioned in words will prevail.