



# **Madhya Pradesh Urja Vikas Nigam Limited**

**(A Govt. of MP Undertaking- ISO 9001:2008 Certified)**

Invites

Request for Selection (RFS)

for

**Empanelment of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off-Grid Solar Photovoltaic Water Pumping Systems (SPWPS) of different capacities (HP) anywhere in Madhya Pradesh State, including complete system warranty, insurance and its repair and maintenance for 5 Years under Component-B of PM-KUSUM scheme of MNRE**

**No. F/UVN/2023-24/SLP/02-37/ 3538**

**Date: 11/12/ 2023**

## **Issued by:**

**Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)**

**Urja Bhawan, Shivaji Nagar, Link Road No. 2, 5 No. Stop, Bhopal (M.P.)-462016**

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## Disclaimer

1. Though adequate care has been taken while preparing the RFS 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 of Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL) immediately. If no intimation is received from any bidder till pre-bid meeting, it shall be considered that the document is complete in all respect and has been received/acknowledged by the bidder(s).
2. Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL) reserves the right to modify, amend or supplement this document.
3. This RFS document has been prepared in good faith, and on best endeavour basis. Neither MPUVNL nor their employees or advisors or consultants 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.
4. In case of any discrepancy in the documents uploaded by MPUVNL on the websites of MPUVNL and/or at MP E-Tenders Portal (URL: <https://mptenders.gov.in/>), documents at MP E-Tender portal will prevail.



## **Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)**

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**RFS No. F/UVN/2023-24/SLP/02-37/ 3538**

**Date: 11/12/ 2023**

### **Notice inviting RFS**

MPUVNL, invites Bids from the Bidders to participate through this Request for Selection (RFS) For Empanelment of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off-Grid Solar Photovoltaic Water Pumping Systems (SPWPS) of different capacities (HP) anywhere in Madhya Pradesh State, including complete system warranty , Insurance and its repair and maintenance for 5 Years under Component-B of PM-KUSUM scheme of MNRE.

Bid documents which include eligibility criteria technical specifications, various conditions of agreements, formats etc. can be viewed from website of nodal agency (<http://www.mprenewable.nic.in>) website and can be downloaded from <https://mptenders.gov.in/nicgep/app>. The RFS document will be available from **12<sup>th</sup> December 2023**.

**I/c Superintending Engineer**

## BID Information sheet

(A)	<b>NAME OF WORK/ BRIEF SCOPE OF WORK/ JOB</b>	Empanelment of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off Grid Solar Photovoltaic Water Pumping Systems (SPWPS) of different capacities (HP) anywhere in Madhya Pradesh State, including complete system warranty, Insurance and its repair & maintenance for 5 Years under Component-B of PM-KUSUM scheme of MNRE
(B)	<b>RfS NO. &amp; DATE</b>	RFS No. F/UVN/2023-24/SLP/02-37/3538 Dated 11/12/ 2023
(C)	<b>TYPE OF BIDDING SYSTEM</b>	Two envelop BID System
(D)	<b>TYPE OF RfS/ TENDER</b>	E-Tender
(E)	<b>COMPLETION/ CONTRACT PERIOD</b>	As mentioned in RFS Document
(F)	<b>BID PROCESSING FEE</b>	Each Bidder shall pay RFS/Tender Fee of Rupees 10,000/-(Rupees Ten Thousand only) plus applicable GST through online mode at <b><i>mptenders.gov.in</i></b> . This Tender Fee is exclusive of portal charges or payment gateway charges and applicable GST and additional charges (if any) beyond the Tender Fee shall also be borne by the Bidder.
(G)	<b>EARNEST MONEY DEPOSIT (EMD)</b>	Amount: As per clause 13 of section III of this RFS to be submitted in the form of Bank Guarantee along with the Response to RFS.
(H)	<b>PERFORMANCE BANK GUARANTEE</b>	Amount: As per clause 14 of section III of this RFS to be submitted in the form of Bank Guarantee, along with the Response to RFS.
(I)	<b>PRE-BID MEETING</b>	<b>Virtual / Physical mode,</b> <b>Date:</b> Refer Key dates and schedule <b>Time:</b> Refer Key dates and schedule  Bidder has to mandatorily submit pre-bid queries in prescribed format as per

		<p>excel sheet provided as per <b>Annexure-C</b></p> <p>Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)          Urja Bhawan, Shivaji Nagar, Link Road No. 2, 5 No. Stop, Bhopal (M.P.)-462016          Telephone No.: +91-755-2575670, 2556566          E Mail: solarpump.mpuvnl@gmail.com</p>
<b>(J)</b>	<b>OFFLINE &amp; ONLINE BID- SUBMISSION DEADLINE</b>	<p>As per information in MP Tenders Portal (URL <a href="https://mptenders.gov.in/">https://mptenders.gov.in/</a>)</p>
<b>(K)</b>	<b>TECHNO-COMMERCIAL BID OPENING</b>	<p>As per information on MP Tenders Portal (URL <a href="https://mptenders.gov.in/">https://mptenders.gov.in/</a>)</p>
<b>(L)</b>	<b>e-REVERSE AUCTION (e-RA)</b>	Not Applicable
<b>(M)</b>	<b>NAME, DESIGNATION, ADDRESS AND OTHER DETAILS</b>	<p><b>Dr. Surendra Bajpai</b>          Nodal Officer,          Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)          Urja Bhawan, Shivaji Nagar, Link Road No. 2, 5 No. Stop, Bhopal (M.P.)-462016          Telephone No.: +91-755-2575670, 2556566          Mail- <a href="mailto:emc1.mpuvn@gmail.com">emc1.mpuvn@gmail.com</a>,  <a href="mailto:solarpump.mpuvnl@gmail.com">solarpump.mpuvnl@gmail.com</a></p>

- Bids must be submitted strictly in accordance with Section-2 and 3 of the RfS.
- Bidders are required to quote strictly as per terms and conditions of the RfS documents and not to stipulate any deviations/ exceptions.
- Any bidder, who meets the Qualifying Requirement and wishes to quote against this RfS, may download the complete RfS document along with its amendment(s) and clarifications if any, from [www.mprenewable.nic.in](http://www.mprenewable.nic.in) and at [mptenders.gov.in](http://mptenders.gov.in). and submit their online Bid complete in all respect as per terms & conditions of RfS Document on or before the due date of bid submission. In case of any discrepancy in the documents uploaded by MPUVNL on the websites of MPUVNL and/or at MP E-Tenders Portal (URL: <https://mptenders.gov.in/>), documents at MP E-Tender portal will prevail.
- Clarification(s)/ Corrigendum(s) if any shall also be available on the above referred websites.

- **VERY IMPORTANT INSTRUCTION TO BIDDERS (please read with extra care)**

Irrespective of anything written elsewhere in this RFS and its amendments, following shall be noted and acted upon by Bidders:

- MNRE guidelines for component-B of PM KUSUM scheme dated 19.07.2019 and amendments/ updates thereof till date of bid submission (hereinafter, "**KUSUM-B Guidelines**") shall be undisputed law and binding on all concerned. Any difference between relevant aspects/ provisions written in this RFS and KUSUM-B Guidelines, the provisions or implications as per KUSUM-B Guidelines shall prevail. Therefore, Bidders are strongly advised to read provisions of this RFS in sync with KUSUM-B Guidelines and submit bid accordingly factoring all necessary techno-commercial elements as appropriate. In this respect, it is categorically and unequivocally stated that MPUVNL, its staff or its consultants shall not be accountable or responsible in any manner, whatsoever, for any implication on Bidder or the bid process itself.
- Bidder are unequivocally recommended and categorically desired to follow latest specification, testing procedure and test report formats of the SPV Water Pumping system issued by MNRE vide OM dated 22.03.2023 and/or its amendments/ updates/ orders from time to time, as relevant as on date of bid submission (hereinafter, "**Technical Considerations**"). Any difference between relevant aspects/ provisions written in this RFS and Technical Considerations, the provisions or implications as per Technical Considerations shall prevail. Therefore, Bidders are strongly advised to read provisions of this RFS in sync with above specifications, procedures and formats and submit bid accordingly factoring all necessary techno-commercial elements as appropriate. In this respect, it is categorically and unequivocally stated that MPUVNL, its staff or its consultants shall not be accountable or responsible in any manner, whatsoever, for any implication on Bidder or the bid process itself.
- Notwithstanding anything written/ referred otherwise in RFS, latest **KUSUM-B Guidelines** and **Technical Considerations** issued by MNRE, as relevant and applicable as on date of bid submission, shall only be followed and be binding on bidders/ selected vendors. Bidders shall be solely accountable and responsible to ensure their bid response is aligned accordingly, without any answerability of officers/ consultants/ staff of MPUVNL towards all/any implications on bidders/ selected vendors.

- Though Bidders shall be solely accountable and responsible to keep themselves updated in respect of KUSUM-B Guidelines as well all relevant orders and Technical Considerations, some relevant links are provided hereinbelow for ease of reference ( <https://pmkusum.mnre.gov.in/landing.html> & <https://mnre.gov.in> ). However, this does not absolve Bidders of their primary and sole accountability to follow correct and relevant sources of information pertaining to KUSUM-B Guidelines, orders and Technical Considerations issued by MNRE as on date of bid submission.

- **KEY DATES AND SCHEDULE OF TENDER**

Unless modified through appropriate corrigendum or otherwise, bidders are advised to adhere to following dates and schedule. Also, bidders are advised to keep following [mptenders.gov.in](http://mptenders.gov.in) or/ and website of MPUVNL or any changes key dates.

Sl. no.	Tender stage	Date	Time (Hrs.)
1.	Purchase of RFS start date	12.12.2023	23:00
2.	Last date of submission of comments/ clarifications on RFS and its annexures	21.12.2023	15:00
3.	Online pre bid meeting	26.12.2023	13:00
4.	Online bid submission start date	01.01.2024	18:00
5.	Online bid submission end date	10.01.2024	22:00
6.	Off-line submission of necessary documents as per RFS	11.01.2024	17:00
7.	Technical bid opening date	15.01.2024	11:00
8.	Financial bid opening date	19.01.2024	15:00

Bidders are requested to remain updated for any notices/ amendments/ clarifications etc. to the RfS document through the websites [www.mprenewable.nic.in](http://www.mprenewable.nic.in) and/or at [mptenders.gov.in](http://mptenders.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 on [www.mprenewable.nic.in](http://www.mprenewable.nic.in) and/or at [mptenders.gov.in](http://mptenders.gov.in).

## **Section-1: Introduction and Invitation for BIDS**

### **1. Background Information**

#### **1.1 About MPUVNL**

Madhya Pradesh Urja Vikas Nigam Limited (hereinafter called “MPUVNL / MPUVN”) is a State Nodal Agency (SIA) under Ministry of New and Renewable Energy, Govt. of India. As SIA, it functions under the guidelines of Ministry of New & Renewable Energy (MNRE). One of the main objectives of MPUVN is to discharge functions as implementing and facilitating arm for projects and schemes under ambit of MNRE and for development, promotion and commercialization of solar energy technologies in the state.

### **2. Invitation for Bids**

1. A Single Stage, Two-Envelope Bidding Procedure will be adopted and will proceed as detailed in the RfS Documents. Bidding will be conducted through the competitive bidding procedures as per the provisions of Sections 2 and 3 of the RfS.
2. Interested bidders have to necessarily register themselves on the portal <https://www.mptenders.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. All required documents and formalities for registering on MP tenders portal are mentioned in the subsequent RfS documents.
3. Interested bidders may obtain further information regarding this Invitation for Bids from <https://www.mptenders.gov.in> or [www.mprenewable.nic.in](http://www.mprenewable.nic.in).
4. For proper uploading of the bids on the MP tenders portal, shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed in the portal. MPUVNL 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.
5. Bidders should submit their bid proposal complete in all aspect on or before last date and time of Bid Submission as mentioned in the Bid Information Sheet and Corrigendum (if any).
6. Bidder shall submit its proposal along with non-refundable Bid Processing Fees along with Earnest Money Deposit (EMD) complete in all respect as per



the Bid Information Sheet. Techno-Commercial bids will be opened as per the Bid Information Sheet in online presence of authorized representatives of bidders who wish to be present online. Bid proposals received without the Bid Processing Fees and/or Earnest Money Deposit (EMD) will be rejected out rightly . In the event of any date indicated being declared a holiday, the next working day shall become operative for the respective purpose mentioned herein.

7. RfS documents which include Eligibility Criteria, Technical Specifications, various Conditions of Contract, and Formats etc. can be downloaded from the MP Tenders Portal or MPUVNL's Website [www.mprenewable.nic.in](http://www.mprenewable.nic.in). It is mandatory to download official copy of the RfS Document from MP Tenders Portal to participate in the Tender. Any amendment(s) / corrigendum(s) / clarification(s) with respect to this RfS shall be uploaded on [www.mprenewable.nic.in](http://www.mprenewable.nic.in) and at [mptenders.gov.in](http://mptenders.gov.in). The Bidder should regularly check for any Amendment(s) / Corrigendum(s) / Clarification(s) on the above-mentioned website.
8. MPUVNL 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.

## **2.1 INTERPRETATIONS**

1. Words comprising the singular shall include the plural & vice versa.
2. An applicable law shall be construed as reference to such applicable law including its amendments or re-enactments from time to time.
3. A time of day shall same as otherwise provided in any agreement or document be construed as a reference to Indian Standard Time.
4. 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.
5. The table of contents and any headings or sub headings in the contract has been inserted for case of reference only & shall not affect the interpretation of this agreement.
6. MD of MPUVNL will have authority to take appropriate decision in line with guidelines or directions of MNRE from time to time in matters pertaining to implementation of KUSUM-B scheme in Madhya Pradesh.

7. MD of MPUVNL will have authority to interpret and take appropriate decision in matters pertaining to timelines or situations posing challenge in execution of awarded Projects under KUSUM-B scheme in the State.

## **Section-2 Special Conditions of Contract**

### **3. Scope of Work**

Under this RfS, 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 different capacity (HP) anywhere in Madhya Pradesh State, including complete system warranty, Insurance and its repair and maintenance for 5 Years under Component- 'B' of PM-KUSUM scheme of MNRE and 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/beneficiary and making available necessary spare parts & tools in each operational region, to ensure timely maintenance of the systems the vendor shall have one authorized service centre in each operational district region and a helpline in local language in State. Helpline number shall be indicated on the pump/ controller or at suitable location easily visible to the user.
- b. Each pumping system should be marked with Toll Free No. of the installer/ vendor (Toll Free No. shall be affix on controllers and shall be readable for 5 years) operating in English and Hindi or Regional language of state and specific pump number and same must have been captured by MPUVNL's web-based application (as per instruction of MPUVNL) at the time of installation at site.
- c. 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 along with signing of agreement with MPUVNL, failing which the bidder will be liable for penalties including encashment of EMD for that size of pump as prescribed in this RFS.

#### **3.2 Installation and Commissioning**

- a. Installation and commissioning of SPWPS shall be done by the vendor as per the details provided by MPUVNL. The vendors shall co-ordinate with MPUVNL and beneficiary for repair and maintenance of SPWPS for 5 years.
- b. Selected vendors have to submit monthly (or as decided by MPUVNL) consent

of beneficiaries in their favour to MPUVNL for which MPUVNL will issue Notice to Proceed (NTP) and for this, vendor shall complete the installation and commissioning of SPWPS within 120 days from date of issuance of NTP.

- c. Selected Vendor should conduct site survey and submit Progress report on fortnight basis as per the requirement of MPUVNL /MNRE via Email & PM-KUSUM App released by MNRE.
- d. Selected Vendor should submit an action plan to MPUVNL, which should include complete details of team, resources, and service centres within 30 days of acceptance of letter inviting consent for agreement (LICA) from MPUVNL, failing of which MPUVNL have the right to levy penalty.
- e. Vendors will have to submit installation reports as per given format on weekly / Monthly basis or as desired by MPUVNL. These reports can be also submitted through e-mail.
- f. Vendor will have to submit the completion reports to MPUVNL within one week from 100% completion of work as per work order . These reports can be also submitted through e-mail.
- g. Selected Vendor shall submit monthly and quarterly progress reports to MPUVNL.
- h. 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 site.
- i. Selected vendor should finalize sub-contractor (where ever necessary) and issue purchase order for all materials such as PV Modules, Structure, Pump, Controllers, etc. within 30 days from date of NTP and unpriced copy of such award letter/Purchase order will be submitted within 30 days from date of issuance of NTP. (Not applicable for item(s) if vendor itself is manufacturing – Self certificate in this regard to be submitted within 30 days from the date of NTP)
- j. Vendor must submit handing over certificates in the format prescribed by MPUVNL.
- k. Each SPWPS is to be provided with the required details as mentioned in the specification and guidelines of the PM-KUSUM scheme.
- l. Vendor should submit the prescribed certificate and photographs of each SPWPS installed which must show complete installation setup along with beneficiary pump number etc. These reports can be also submitted through

email/web- portal/mobile application.

- m. The selected vendors shall take all necessary permits, approvals and licenses, insurance etc., provide training and other services required to complete the scope of work mentioned above.
- n. 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 MPUVNL.

### **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 issued vide MNRE /OM /F.No. 41/3/2018-SPV Division/Dt. 22-03-2023 or/and its amendment/ replacement as relevant. Any reference to Annexure-A in RFS or tender formats shall carry same meaning and import as relevant everywhere.
- b. Only indigenously manufactured solar panels with indigenous solar cells and modules are to be used in this tender. Further, the motor-pump-set, controller and balance of system should also be manufactured indigenously.
- c. In case of any ambiguity in interpretation of any of the provisions of **KUSUM-B Guidelines** and **Technical Considerations** (as defined above) the decision of the MNRE shall be final. However, in other matters related to RFS, interpretation and decision of MPUVNL shall be final and binding.
- d. Systems installed under this programme should be follow OM-F.No.283/22/2019- GRID SOLAR of MNRE, Govt. of India dated 09.02.2021 or its updates/ amendments as relevant.

### **3.4 Operation & 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 centre) at each operational district service centre and should ensure proper maintenance of SPWPS up to 5 years from date of installation of each SPWPS. Vendor should also ensure to provide training to local persons regarding proper maintenance of SPWPS.
- b. Any complaint registered/service calls received should be attended at the earliest and the system should be repaired/restored/replaced within 3 days from date of complaint received/informed to the vendor.

- c. MNRE officials, MPUVNL or its designated agency may inspect the systems during the installation, operational or contractual phase. In case the installed systems are not as per the standards / found non-functional on account of poor quality of installation or maintenance / not in-compliance with the KUSUM-B Guidelines, Technical Considerations, specification and/or tender terms & conditions, MPUVNL can reject the system and vendor will have to meet all the expenses towards removing / rectification of the same. Further, if vendor does not perform the corrective action in stipulated time frame, MPUVNL also reserves the right to encash the PBG and/or blacklist the vendor.
- d. In Case, if any vendor,
- i. Declared as L1, after issuance of LICA, does not go forward for signing of agreement with MPUVNL  
And / Or
  - ii. Does not take up execution of work after the issuance of NTP(s),  
In this case, apart from encashment of EMD, vendor may also be blacklisted by the MPUVNL.
- e. Vendor must submit O&M manual in both English and local language to each beneficiary of SPWPS. Vendor must submit a soft copy of the same to MPUVNL. The following minimum details must be provided in the manual: -
- i. Basic principles of PV 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 number, voltage and capacity of the motor used in the system
  - v. The make model number and country of origin of each component
  - vi. Significance of indicators
  - vii. Clear instruction on regular maintenance and troubleshooting of the SPWPS
  - viii. Preventive maintenance schedule
  - ix. Detailed information about warranty coverage
  - x. Dos 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 and pump and its remedies
  - xiii. Minimum 10 hard copies in booklet form to be kept service centres and also be provided to MPUVNL as and when required.
- f. The O&M (CMC) cost for 5 years should be inbuilt with system cost / bid value.
  - g. Vendors will mandatorily provide 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 pumps 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, till 5 years from the date of installation (i.e., till CMC period).
  - h. Vendors have to provide the Remote Monitoring System (RMS) as per Annexure-B (RMS Communication and Security Architecture- PM KUSUM National Portal) of the RfS 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 as per Annexure-B (RMS Communication and Security Architecture- PM KUSUM National Portal), failing which the installation of the system will not be accepted by MPUVNL.
  - 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 demand based. However, the following shall be ensured before inclusion of a beneficiary under the Scheme:

- 1. Beneficiary should not have an electricity connection at the farm.
- 2. Installation of the new pumps not allowed in the notified areas issued by the Central Ground Water Board.
- 3. Priority to be given to small and marginal farmers.
- 4. Preference be given to the farmers using Micro irrigation systems or covered under Micro irrigation schemes or who opt for micro irrigation system.

## 5. Total quantity and types of Pumps allowed

The tentative cumulative quantities envisaged under this tender for Standalone Solar Pumps under PM-KUSUM is around 10,000 SPWPS. The following types of pump manufacturers are planned for empanelment under the RfS:

Pump Capacity (HP)	Pump Type	Pump Position	Controller Type
1	DC	Surface	Normal (Without USPC)
	DC	Submersible	Normal (Without USPC)
2	DC	Surface	Normal (Without USPC)
	DC	Submersible	Normal (Without USPC)
3	DC	Submersible	Normal (Without USPC)
	DC	Submersible	with USPC
5	DC	Submersible	Normal (Without USPC)
	DC	Submersible	with USPC
7.5	AC	Submersible	Normal (Without USPC)
	DC	Submersible	Normal (Without USPC)
	AC	Submersible	with USPC
	DC	Submersible	with USPC

## 6. Maximum Eligibility for Tendered Capacity Allocation for a Bidder

Following conditions shall be applicable to the Bidders for submission of bids against this RfS (A Bidder shall submit bid offering rates for desired category/ies of pumps).

- 6.1 Empanelment of Vendors shall be aligned to amendments to Para (5) of II(a) of KUSUM-B Guidelines issued vide MNRE OM no. 32/645/2017-SPV Division 19 August 2019 and its further amendments, if any relevant, at the time of bid submission date, which shall be as following:

*All eligible bidders shortlisted on the basis of technical and financial criteria stipulated in bidding document and under the price bracket of (L1+10% of L1) will be empanelled on acceptance of L1 price and have equal opportunity*



*to work in market mode. However, in case the number of such bidders empanelled within price bracket of (L1+10% of L1) are less than 5, the price bracket shall extended to (L1+15% of L1), so that enough number of bidders are empanelled for better competition. The selection of beneficiaries and implementation of scheme would be the responsibility of the MPUVNL.*

6.2 The evaluation of bids shall be carried out as described in Section-5 of the RfS. The methodology for work order / NTP of SPWPS is elaborated in Section-5 of the RfS.

## **7. SPWPS Locations**

This scheme proposes to install Solar Photovoltaic Water Pumping systems across the Madhya Pradesh 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 (RMS) shall be installed and 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 MPUVNL and on central portal maintained by MNRE. Detailed requirements of Remote Monitoring System along with minimum performance requirements are brought out as per Annexure-A.

## **9. Commissioning of Projects**

Selected vendors must submit monthly/timely (as decided by MPUVNL) consent of beneficiaries in their favours to MPUVNL for which MPUVNL will give notice to proceed (NTP) and for this selected vendor shall complete the installation and commissioning of allocated SPWPS within 120 days from issuance of notice to proceed.

9.1 Commissioning of the SPWPS shall be carried out by the vendor in line with the detailed procedure as per clause 3.2 of section II of this RfS. MPUVNL may authorize any individual or committee or organization to witness and validate the installation/commissioning on site(s). Commissioning certificates shall be duly signed by Beneficiary, MPUVNL Representative and Vendor's Representative after successful commissioning of allotted SPWPS. MPUVNL/MNRE authorized representative may also be allowed for the inspection/ commissioning if required.

## **Section-3 Standard Conditions of Contract**

### **10. Obtaining RfS Documents**

Interested bidders must download the official copy of RfS & other documents after login into the [mptenders.gov.in](http://mptenders.gov.in) portal by using the Login ID & Password provided by tender portal during registration (Refer the RfS). The bidder shall be eligible to submit/upload the bid document only after logging into the [mptenders.gov.in](http://mptenders.gov.in) and downloading the official copy of RfS.

### **11. Bid Processing Fees**

Prospective Bidders interested to participate in the bidding process are required to submit their bid proposals in response to this RfS document along with a non-refundable processing fee as mentioned in the Bid Information Sheet.

Bids submitted without Bid Processing Fee and/or Bank Guarantee against Earnest Money Deposit (EMD), including partial submission of any one of the respective amounts, may be liable for rejection by MPUVNL.

### **12. Scope of Work and Other Conditions of the Contract**

Refer Clause 3 and its sub-clauses of the RfS.

### **13. Bank Guarantee against Earnest Money Deposit (EMD)**

13.1 Bidder shall submit Earnest Money Deposit (EMD) in the form of Bank Guarantee of 2 % of amount equivalent to the 6 % of the value of total cumulative tender quantity or 25 numbers of SPWPS, whichever is higher, subject to a maximum of 1000 pumps. Bidders have to submit EMD according to Format 7.3A/ Format 7.3B and valid for 12 months from the last date of bid submission along with the 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 & blacklisting of Firm/Members for period of 5 years from the date of issue of notice of blacklisting. The Bank Guarantees towards EMD must be issued in the name of the Bidding Company/ Lead Member of Bidding Consortium. In the event of encashment of EMD, the encashed amount shall include all applicable taxes.

13.2 The Bidder shall furnish the Bank Guarantees towards EMD 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.

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 bid submission, if required.

13.3 MPUVNL has agreed to accept the EMD in the form of an unconditional and irrevocable Bank Guarantee instead of the cash deposit with the clear position intimated to the bidder that the EMD Bank Guarantee shall be en-cashable for being appropriated by MPUVNL in terms of the guarantee as in the case of appropriation of the cash deposit lying with MPUVNL.

13.4 The Bank Guarantee (BG) or amendment to be submitted against EMD shall be effective only when the BG issuance message is transmitted by the issuing bank through SFMS. The Bank Guarantee must include SFMS (Structural Financial Management System) as per MPUNL Bank Details which is as follows:

(a)	Account Name holder	:	M P Urja Vikas Nigam Ltd.
(b)	Bank Name	:	ICICI Bank Ltd.
(c)	Branch	:	Urja Bhawan, Shivaji Nagar Bhopal
(d)	Account No	:	656501700049
(e)	IFSC code	:	ICIC0006565
(f)	MICR Code	:	462229012

13.5 Forfeiture of EMD:

The BG towards EMD shall be encashed by MPUVNL 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 MPUVNL issues NTP 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 NTP);
- c. If after empanelment of vendors or after issuance of LICA by MPUVNL, it is found that the documents furnished by the Bidder as part of response to RfS are misleading or misrepresented in any way.

13.6 EMD of Selected Vendor shall be released after submission of PBG after NTP for cumulative minimum 25 solar pumps is issued.

Alternately, Selected Vendor will have option to give PBG for minimum 25 pumps

at the time first NTP and get EMD released. In this case, calculation of PBG shall be done at the rate of discovered price for 5 HP DC pumps.

- 13.7 The BG(s) against EMD submitted by bidders, in case the bidder is not empanelled or qualify, shall be returned within 15 days of empanelment.

#### **14. Performance Bank Guarantee (PBG)**

Bidders selected by MPUVNL based on this RfS shall submit to the MPUVNL, a Performance Guarantee for a value @ 3% of the amount of each work order / NTP of SPWPS (Refer Point 13.6 above for details). It may be noted that Successful Bidders shall submit the Performance Guarantee according to the Format 7.3 C with a validity period up to (& including) the date as on 24 months from placement of NTP by MPUVNL. Validity of PBG shall be extended by the vendor for every year for the first five years, with 1 year grace period, from the date of commissioning. Further, MPUVNL reserves the right to encash the existing PBG, in case the vendors doesn't renew/extend the existing PBG at-least 30 days in advance.

**Note:** For the purpose of this RFS, NTP and work order shall be read/ treated interchangeably.

- 14.1 PBG(s) shall be submitted by selected vendors to MPUVNL within 15 days from issuance of NTP.
- 14.2 All Performance Bank Guarantees (PBGs) shall be submitted separately for each work order/NTP. The PBGs will be issued in favour MPUVNL.
- 14.3 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.
- 14.4 The Bank Guarantees must be executed as per Stamp Act relevant to the place of execution.
- 14.5 All expenditure towards execution of Bank Guarantees such as stamp duty etc. shall be borne by the Bidders.
- 14.6 Not Used

#### **15. 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.

- 15.1 The implementation work should start within 15 days from the date of Notice to Proceed from MPUVNL.
- 15.2 Successful vendor shall submit the unpriced purchase order copies of solar pump

sets, controllers and solar PV modules to MPUVNL within 30 days from the date of notification of NTP (Not applicable for item(s) if vendor itself is manufacturing – Self certificate in this regard to be submitted within 30 days from the date of notification of NTP). In case unpriced purchase order copies are not submitted within stipulated time (within 30 days) to MPUVNL, MPUVNL may cancel the contract and award the same quantity to another empanelled vendor.

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

15.4 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 too shall remain with the Vendor pursuant to GCC hereof until completion of facilities in which such plant and equipment are incorporated.

## **16. Payment Terms**

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

- Signing of contract agreement between MPUVNL and Vendor.
- Submission of detailed work plan (Project Execution Plan) with timeline for the lot supplied duly approved by the MPUVNL's representative.
- Submission of evidence in hard copy regarding completion of installation of SPWPS in good condition at site as per RFS, duly verified and acknowledged by Engineer-In Charge/MPUVNL and Beneficiary.
- All the relevant warranty and quality (Performance Test Reports) of the lot to be submitted.
- Submission of Original Supply invoices/bills duly verified by the MPUVNL.
- Invoice will be submitted as per applicable GST norms and payment of invoices shall be made only after invoice reflected on GST portal of MPUVNL
- Payment of invoices shall be made after all statutory deductions as applicable After installation of the solar pump, vendor will submit Geo Tagged photographs (In case of internet unavailability self-certified photographs shall be submitted) with joint Commissioning report.
- Submission of installation reports as per prescribed format by MPUVNL which shall include but not limited to consumer details, site survey details, asset inspection and mapping details, Remote monitoring system parameters etc.
- Proof of conducting training programs to locals and distribution of O&M Manual to beneficiary printed in both English and local language.

- Submission of handing over certificates of SPWPS in the format as suggested by MPUVNL.
- 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. However, this is subject to the availability of the accurate performance data / parameter of SPWPS through RMS on State portal and central portal of PM-KUSUM (SEDM).
- An Undertaking with respect to withstand ability of SPWPS to the wind speed of 150 km/hr in all weather conditions.
- Geo location photographs of pump submitted along with Invoices (In case of internet unavailability self-certified photographs shall be submitted).
- A certificate from any license holder contractor/supervisor, certifying that the electrical wiring carried out is in accordance with the norms of electrical safety standards.

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

- Payment shall 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 portal and central portal of PM-KUSUM (SEDM).

*\*If the invoices are incomplete in any respect or in case on non-compliance with terms and conditions of Notice to Proceed (NTP), the payment due date shall start from the submission of all necessary documents.*

*\*\*MPUVNL has the right to seek any additional documents /certificates /information it deems fit prior to release of any payment.*

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

17.1 The Bidder shall provide complete information in their bid in reference to this RfS about its promoters and upon issuance of LICA, the Successful Bidder/Selected Vendor shall indicate its shareholding in the company indicating the controlling.

**18. Instructions to Bidders for Structuring of Bid Proposals in Response to RfS**

The bidder including its Parent, Affiliate or Ultimate Parent or any Group Company shall submit single response to RfS. Detailed Instructions to be followed by the bidders for online submission of response to RfS are as provided in RfS.

Submission of bid proposals by Bidders in response to RfS shall be in the manner described below:

- i. Covering Letter as per Format 7.1.
- ii. 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 hereto as Format 7.2.
- iii. Bank Guarantee-against Earnest Money Deposit (EMD) as per Format 7.3 A/7.3 B.
- iv. 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:
  - a. 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 RfS 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.
  - b. 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
  - c. 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.
- v. 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.
- vi. 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.
- vii. Undertaking regarding no wilful default and no major litigation pending as per

- Format 7.7.
- viii. A disclosure statement as per Format 7.8/ 7.8A regarding participation of any related companies in the bidding process.
  - ix. Signed Integrity Pact between MPUVNL and the Bidding Company as per Format 7.9.
  - x. Covering letter for the financial bid as per Format 7.10.
  - xi. Declaration regarding banning, liquidation, court receivership etc. as per Format 7.11.
  - xii. Declaration for the local content as per Format 7.12.
  - xiii. Declaration for using same make of equipment's as per the test certificate as per Format 7.13
  - xiv. Declaration for submitting the test certificate as per MNRE technical specifications for solar water pump sets issued in 2019as per Format 7.14 and/or its subsequent amendments.
  - xv. Certificate regarding compliance of MeitY notification vide file no. 1(10)/2017-CLES dt. 02.07.18 as per Format 7.15 and/or its subsequent amendments.
  - xvi. Attachments
    1. Memorandum of Association, Article of Association of the Bidder needs to be attached along with the bid. The bidder should also highlight the relevant provision which highlights the objects relating to Power/ Energy/ Renewable Energy/ Solar Water Pumping Station/Solar Power plant development/Manufacturer of pump- sets, solar panels and controllers.
      - 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.
      - If the selected vendor wishes to execute the project through a Special Purpose Vehicle (SPV), the MoA/ AoA of the SPV highlighting the relevant provision which highlights the objects relating to Power/ Energy/ Renewable Energy/ Solar Water Pumping Station/Solar Power plant development/Manufacturer of pump-sets, solar panels and controllers has to be submitted.
    2. Certificate of Incorporation of Bidding Company/ all member companies of Bidding Consortium.



3. 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. MPUVNL 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 RfS conditions have been complied with and the bidder will ensure submission of the same within the required time-lines.
4. 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 & Loss Account, Schedules and Cash Flow Statement, supported with bank statement as on the date at least 7 days prior to the due date of bid submission (if applicable), shall be required to be submitted.
5. Details of all types of securities/instruments which are pending conversion into equity whether optionally or mandatorily.
6. In case of LLP as bidder or member of a consortium, an LLP registration certificate issued by registrar of companies shall also be submitted.
7. In addition, PAN Card and GST registration certificate shall also be submitted.
8. In support of technical QR criteria, work order copies/Invoices and Completion Certificates shall also be submitted.
9. Bidders must submit following documentary evidence that components/SPWPS systems will be manufactured indigenously
  - a. Declaration as per format 7.12.
  - b. List and pictures of manufacturing and testing facilities.
  - c. Undertaking that if details provided by bidders are in deviation with provisions of PM-KUSUM Scheme, which may lead to disqualification of bidder.
  - d. At the time of payment post installation of systems, Vendors must submit copy of excise invoice(s) of the manufacturing unit(s) of Solar PV Module, Pumps, and Controllers.

## **19. Important Notes and Instructions to Bidders**

- 19.1 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.

- 19.2 The Bidders shall be shortlisted based on the information /declarations made by them in relevant schedules of RfS.
- 19.3 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 RfS, in any manner whatsoever, MPUVNL reserves the right to reject such response to RfS and/or cancel the LoA/ Agreement/ NTP, if issued, and the Bank Guarantee up to that stage shall be encashed. Bidder shall be solely responsible for disqualification based on their declaration in the submission of response to RfS.
- 19.4 Response submitted by the Bidder shall become the property of the MPUVNL and MPUVNL shall have no obligation to return the same to the Bidder.
- 19.5 All documents of the response to RfS (including RfS and subsequent Amendments/ Clarifications/Addenda) submitted online must be digitally signed by the person authorized by the Board as per Format 7.4.
- 19.6 The response to RfS shall be submitted as mentioned in Clause 18 & 21 of the RfS. No change or supplemental information to a response to RfS will be accepted after the scheduled date and time of submission of response to RfS. However, MPUVNL reserves the right to seek additional information from the Bidders, if found necessary, during the course of evaluation of the response to RfS.
- 19.7 Not used
- 19.8 All the information should be submitted in English language only.
- 19.9 Bidders shall mention the name of the contact person and complete address and contact details including email address, which shall be active for the period of 07 years in their covering letter. In case of any changes in above, formal prior intimation to MPUVNL shall be ensured by such entities.
- 19.10 Response to RfS that are incomplete, which do not substantially meet the requirements prescribed in this RfS, will be liable for rejection by MPUVNL.
- 19.11 Response to RfS not submitted in the specified formats will be liable for rejection by MPUVNL.
- 19.12 Bidders delaying in submission of additional information or clarifications sought will be liable for rejection.
- 19.13 Non-submission and/ or submission of incomplete data/ information required

under the provisions of RfS shall not be construed as waiver on the part of MPUVNL of the obligation of the Bidder to furnish the said data/information unless the waiver is in writing.

19.14 Only Bhopal Courts shall have exclusive jurisdiction in all matters pertaining to this RfS.

19.15 All the financial transactions to be made with MPUVNL including delay charges, and any additional charges (if required), shall attract GST as applicable on each transaction, irrespective of the same being mentioned in the RfS (if any).

## **20. Non-Responsive Bid**

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

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

- a. Non-submission of the requisite Bid Processing Fee & EMD as mentioned in the Bid Information Sheet.
- b. Response to RfS not received by the due date and time of bid submission.
- c. Incomplete response / documents received against this RfS.
- d. Any indication of price in any part of response to the RfS, other than in the financial bid.
- e. Data filled in the Electronic Form of Financial Bid (Second Envelope), not in line with the instructions mentioned in the same electronic form.
- f. 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 RfS, then all these bids submitted shall be treated as non-responsive and rejected.

In any of the above cases, the bid shall not be considered for bid opening and evaluation process.

## **21. Method of Submission of Response to RfS by the Bidder**

### **21.1 Documents to be Submitted Online/Offline**

The bidder has to mandatorily submit a copy of all necessary formats/ documents/ experience proof/ certificates as relevant and desired under this RfS online. Additionally, original of following documents shall be submitted offline:

- i. Bank Guarantee towards EMD as mentioned in the Bid Information Sheet (as

per Format 7.3A/ 7.3B). (In Original)

ii. Receipt of Bid Processing Fees

**No documents will be accepted after the due date and time of bid submission. Copy of Bank Guarantee(s) against EMD needs to be submitted in online and original copy to be mandatorily submitted offline mode.**

The bidders will be required to submit the bank guarantee against EMD either in person or through post, at the office of MPUVNL on or before the closing date of bid submission.

**Note:** In all cases, the Bank Guarantee against EMD shall be issued on or before the bid submission deadline. These instruments issued after the expiry of the deadline will be summarily rejected.

The bidding envelope shall contain the following sticker :

<b>RFS Document for Empanelment of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off Grid Solar Photovoltaic Water Pumping Systems (SPWPS) of different capacities (HP) anywhere in Madhya Pradesh State, including complete system warranty , insurance and its repair and maintenance for 5Years under Component-B of PM-KUSUM scheme of MNRE</b>	
<i>Cumulative Capacity of the projects applied for</i>	<i>Nos.</i>
<i>No. of Projects Bid for</i>	
<i>RfS Reference No.</i>	MPUVNL/ _____ dated _____
<i>Submitted by</i>	<i>(Enter Full name and address of the Bidder)</i>
<i>Organization ID (OID) on e- procurement portal</i>	<i>(Enter the OID through which the Bid has been submitted online on e-procurement portal)</i>
<i>Authorized Signatory</i>	<i>(Signature of the Authorized Signatory) (Name of the Authorized Signatory)</i> <i>(Stamp of the Bidder)</i>
<i>Bid Submitted to</i>	<b>I/c Superintending Engineer</b> Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL), Urja Bhawan, Shivaji Nagar, Link Road No. 2, 5 No. Stop, Bhopal (M.P.)-462016

## 21.2 Documents to be Submitted Online

Detailed instructions to be followed by the Bidders for online submission of response to RfS as stated at Clause 52 of this RfS. The bidders shall strictly follow the instructions mentioned in the electronic form in respective technical bid and financial bid while filling the forms.

**If the Bidder has submitted its bid online and fails to submit the Bank Guarantee for requisite amount offline before the due date and time of bid submission, then the same shall be treated as an incomplete bid, Cost of RfS document and Processing fee submitted at this stage will be confiscated and the EMD(s) shall be returned and the submitted bid will stand cancelled.**

All documents of the response to RfS submitted online must be digitally signed and uploaded on the website, <https://mptenders.gov.in>. which should contain the following:

#### **I. Technical Bid (First Envelope)**

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.

- a. Formats - 7.1, 7.2 (if applicable), 7.3 A/7.3 B, 7.4, 7.5 (if applicable), 7.6, 7.7,7.8/7.8A and 7.9, 7.11, 7.12, 7.13, 7.14, 7.15, 7.18 and 7.19 as elaborated in Clause 18 of the RfS.
- b. All attachments elaborated in Clause 18 of the RfS,: Attachments, with proper file names.
- c. All supporting documents regarding meeting the eligibility criteria.
- d. Scanned Copies of NEFT/RTGS details towards Bid Processing Fee & Bank Guarantee towards EMD as mentioned in Bid Information Sheet.

**The Bidder will have to fill the Electronic Form provided at the mp tenders portal as part of Technical Bid.**

#### **II. Financial Bid (Second Envelope) – To be Submitted Online Only**

- a) Bidders shall submit the single Financial Bid containing the scanned copy of following document(s):
  - i. Covering letter as per **Format 7.10** of the RfS
  - ii. Duly signed and stamped strictly as per price bid **Format 7.16** of the RfS.

##### **b) Bidding Parameter:**

- i. A single fixed price per line item as a bidding parameter: Under this RfS, the bidding parameter shall be the Price quoted by the Bidder i.e., a fixed price per line item (inclusive of all , duties, insurance and other taxes Except GST ) in INR.

- ii. The above fixed price shall include all costs related to the Scope of Work as per the RfS 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 & Maintenance (05 years-CMC), (inclusive of all, duties, insurance and any other taxes Except GST )
- iii. The price shall remain firm and fixed 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.
- iv. The fixed price for each line item shall be inclusive of all, duties, insurance and any other taxes Except GST . The prices quoted by the firm shall be complete in all respect.
- v. **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 mp tenders 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.**
- vi. **Important Note:**
  - a) The Bidding envelope shall be properly sealed with the signature of the Authorized Signatory running across the sealing of the envelope.
  - b) In case the Bidder submits the online documents on mp tender portal within the bid submission deadlines and fails to submit the offline documents in the office of MPUVNL within the bid submission deadlines, the online bid of the Bidder shall not be opened and appropriate process of mp tenders shall be followed in such matters. Similarly, bids submitted offline but without any online submission on mp tender portal shall not be opened and the EMD shall be returned to the respective bidder.

## 22. **Validity of the Response to RfS**

The Bidder shall submit the response to RfS which shall remain valid up to 6 months from the last date of bid submission (“Bid Validity”). MPUVNL reserves the right to reject any response to RfS which does not meet the afore mentioned

validity requirement.

### **23. Bid Preparation Cost**

The Bidder shall be responsible for all the costs associated with the preparation of the response to RfS and participation in discussions and attending pre-bid meeting(s) etc. MPUVNL 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**

- 24.1 Clarifications/ Doubts, if any, on RfS document may be emailed and/ or through mptenders portal. The format for submission of clarifications is available on the portal.
- 24.2 MPUVNL 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 MPUVNL's response will be uploaded in the <http://mptenders.gov.in> and [www.mprenewable.gov.in](http://www.mprenewable.gov.in) If necessary, amendments, clarifications, elaborations shall be issued by MPUVNL which will be notified on above web sites. No separate reply/intimation will be given for the above, elsewhere.
- 24.3 A Pre-Bid Meeting shall be held as mentioned in the Bid Information Sheet (link / Venue to be notified later on MPUVNL's website).
- 24.4 Enquiries/ Clarifications up to pre-bid meeting may be sought by the Bidder from following point of contacts in MPUVNL.

<u>Name of the Authorized Person of MPUVNL:</u>	<u>Contact Details:</u>
Shri A. B Gupta	Email: <a href="mailto:solarpump.mpuvnl@gmail.com">solarpump.mpuvnl@gmail.com</a> Mobile: 9425648843
Shri Kamlesh Gehlot	Email: <a href="mailto:solarpump.mpuvnl@gmail.com">solarpump.mpuvnl@gmail.com</a> Mobile: 9179185394

### **25. Right of MPUVNL to Reject a Bid**

MPUVNL reserves the right to reject any or all of the responses to RfS or cancel the RfS 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 EMD submitted by the Bidders shall be returned to

the respective Bidders.

## **26. Post Award Compliances**

Timely completion of all the milestones will be the sole responsibility of Vendor. MPUVNL 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 MPUVNL for compliance of above- mentioned milestones to be considered for the purpose of facilitation only. Any additional documents required as per the conditions of RfS must be timely submitted by the Vendor.

## **27. Adjudicator**

Adjudicator under the contract shall be appointed by the Appointing Authority of MPUVNL. If the bidder does not accept the Adjudicator proposed by MPUVNL, 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 Courts of respective cluster where programme is to be implemented shall have exclusive jurisdiction in all matters arising under the contract.

## **29. Force Majeure**

### **29.1 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, epidemic, terrorist acts, or rebellion. A Force Majeure Event shall not be based on the economic hardship of either Party.



## 29.2 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 MPUVNL shall not be excused from making any payments and paying any unpaid amounts due in respect of Vendor to MPUVNL prior to the Force Majeure Event performance interruption.

## 29.3 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 MPUVNL 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 MPUVNL and its members, officers, employees, students, casual laborers, persons permitted to run any business or service, such as canteens, stores, photocopy units, banks, post office, courier service, hospital and to any lawful visitors (collectively, the "MPUVNL Indemnified Parties") from and against any and all Losses incurred by the MPUVNL 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 wilful misconduct. The Vendor shall not, however, be required to reimburse or indemnify any MPUVNL Indemnified Party for any Loss to the extent such Loss is due to the negligence or wilful misconduct of any MPUVNL Indemnified Party.

### 31. Insurance and Penalties

#### A. 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 insurance of Solar Photo Voltaic Water Pumping System shall be provided for natural calamities, theft/ burglary 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 MPUVNL 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 7 days from the date of intimation, failing which the rectification/replacement (keeping the same configuration in consideration) may be done by MPUVNL at the risk and cost of bidder after rectification/ replacement the warranty clause will remain compliant as per tender conditions.

#### B. Penalty

S. No.	Default	Penalty
1.	Failure to Accept Letter of Award (LoA)	EMD shall be encashed and/or bidder may be blacklisted for 5 years.
2.	2.1 Failure to sign the Agreement (In case of L1 Bidder) and/ or, 2.2 submission of the PBG (Applicable for empaneled bidders).	EMD shall be encashed and/or bidder may be blacklisted for 5 years.
3.	In case of any non-execution or delay in the execution of the work order / NTP or delay in	MPUVNL reserves the right to recover from the bidder a sum equivalent to 0.5 % of the value of the delayed

	maintenance beyond the stipulated time schedule decided including any extension permitted in writing.	SPWPS installation or on the unexecuted portion of the work/ maintenance under CMC for each week of the delay and part thereof subject to a maximum of 10 % of the total value of the work order / NTP. The amount will be recovered by MPUVNL in release of payment to the concerned vendor and from the PBG amount. Further, MPUVNL may also blacklist the Empanelled Vendors for 5 years.													
4.	In case of failure to present test certificate/ report against any model of a particular category/ pump size	<table border="1"> <thead> <tr> <th>Pump size (HP)</th> <th>Penalty (INR lakh)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.46</td> </tr> <tr> <td>2</td> <td>3.04</td> </tr> <tr> <td>3</td> <td>13.65</td> </tr> <tr> <td>5</td> <td>13.78</td> </tr> <tr> <td>7.5</td> <td>1.14</td> </tr> </tbody> </table>		Pump size (HP)	Penalty (INR lakh)	1	0.46	2	3.04	3	13.65	5	13.78	7.5	1.14
Pump size (HP)	Penalty (INR lakh)														
1	0.46														
2	3.04														
3	13.65														
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7.5	1.14														

### 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 MP 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 MPUVNL shall be the sole judge, MPUVNL 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 security deposit, 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. MPUVNL reserve the right to accept or reject any quotation in full or in part without assigning any reason thereof. We 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, MPUVNL's 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 work order / NTP.

Alternatively, MPUVNL's reserves the right to purchase of the material and completion of the works including maintenance from elsewhere at the sole risk and cost of the successful bidder/ contractor and recover all such extra cost incurred by MPUVNL 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 MPUVNL's due to delay in work completion by the party beyond the completion time as per NTP/LOA, the same shall be recovered from the party's Invoice/BG/PBG etc.

Alternatively, MPUVNL may 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 7.15 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 dt. 02.07.18. 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**

The complete Solar Photovoltaic Water Pumping System and display board / Name Plate (MPUVNL will provide the details) shall be warranted and maintained for 05 years from the date of installation. 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.

Successful bidder, on whom letter of award/ NTP is placed, is to ensure all safety guidelines, rules and regulations, labour laws etc. Successful bidder indemnifies MPUVNL for any accident, 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.

### **36. Declaration of Local Content**

Bidder shall submit a certificate stating the percentage of local content as per the format 7.12 of RfS 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. Role of MPUVNL**

Apart from discovery of rates, role of MPUVNL under this RfS is Empanelment of Vendors for Design, Manufacture, Supply, Transport, Installation, Testing and Commissioning of Off Grid Solar Photovoltaic Water Pumping Systems (SPWPS) of different capacities (HP) in Madhya Pradesh State, including complete system warranty and its repair and maintenance for 5 Years under Component-B of PM-KUSUM scheme of MNRE.

### **38. Price basis**

Price basis of the price quoted shall be on F.O.R (Freight on Road) destination basis

for site and inclusive of All, duties, insurance and any other taxes Except GST) . Price mentioned in the quotation must be firm. Hence prices in Letter of Award/ Agreement/ NTP 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/ NTP.

- i. An Abnormally Low/ high Bid is one where the Bid price, in combination with other elements of the Bid, appears so low/ high that it raises material concerns as to the capability of the Bidder to perform the Contract for the offered Bid Price.
- ii. In the event of identification of a potentially Abnormally Low/ high Bid, MPUVNL shall seek written clarifications from the Bidder, including detailed price analyses of its Bid price in correlation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the bidding document.
- iii. After evaluation of the price analyses, in the event that MPUVNL determines that the Bidder has failed to demonstrate its reasonable capability to deliver the contract for the offered tender price, MPUVNL shall reject the Bid and forfeit the EMD.

### **39. Roles and Responsibilities of Implementation Agency**

The Implementing Agencies will be responsible for the following activities:

- i. Demand aggregation for solar Agriculture pumps through online portal or offline application.
- ii. Prepare proposal and submit to MNRE for sanction.
- iii. Oversee installation of systems.
- iv. 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.
- v. Submission of utilization certificates and audited statement of expenditure through EAT module and disbursement of MNRE CFA.
- vi. Online submission of monthly and quarterly progress reports.
- vii. Ensure project completion within the given timelines and compliance of MNRE Guidelines and Standards.
- viii. Online and offline maintenance for records.

- ix. Real time monitoring through dedicated web-portal which will be maintained by MPUVNL.
- x. Performance monitoring of installed system through third party
- xi. Ensure compliance of CMC and training of locals by the vendors.
- xii. 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.
- xiii. Any other activity to ensure successful implementation of the programme.

#### **Section-4 Qualification Requirement for Bidders**

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

#### **40. General Eligibility Criteria**

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

- 40.1 The Bidder shall be a Company / Partnership firm/ Registered Proprietorship firms/ Limited Liability Partnership as defined.
- 40.2 Bidding Consortium of two entities with one of the entities as the Lead Member as per Consortium Agreement (Format 7.5) can submit bids under this RfS.
- 40.3 A foreign entity cannot participate on a standalone basis or as a member of consortium under this RfS.
- 40.4 In line with the O.M. issued by the Department of Expenditure, Ministry of Finance, 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 RfS (hereinafter, "foreign entity"):
  - i. 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).
  - ii. "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 herein before, including any agency branch or office controlled by such person, participating in this tender.
  - iii. "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 RfS.
- i. Other provisions of the referred OM dated 23.07.2020, except Sl. 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.

40.5 Not used.

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

40.7 A Bidder which has been selected as Selected Vendor based on this RfS can also execute the Project through a Special Purpose Vehicle (SPV) i.e., a Project Company especially incorporated/acquired as a subsidiary Company of the Selected Vendor for setting up of the Project, with at least 51% shareholding in the SPV which has to be registered under the Indian Companies Act, 2013. However, allowing any additional time period for formation of SPV will be at sole discretion of competent authority of MPUVNL on merit of a case..

40.8 Any consortium, if selected as Selected Vendor for the purpose of supply of SWPS to MPUVNL, may incorporate a Project company with equity participation by the Members in line with consortium agreement (to be submitted along with the response to RfS) i.e., the Project Company incorporated shall have the same shareholding pattern as that indicated in the Consortium Agreement given at the time of submission of response to RfS. However, allowing any additional time period for formation of SPV will be at

sole discretion of competent authority of MPUVNL on merit of a case.

40.9 The Bidder or any of its Affiliates should not be a wilful 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 RfS.

40.10 Not used.

#### **41. Technical Eligibility Criteria**

41.1 Under this RfS, 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 RfS. The undertaking shall be submitted as per enclosed Format 7.8.

41.2 The bidder should be, either of the following:

- i. Manufacturer of Solar PV Module having experience of 'Similar Works'.  
or
- ii. Manufacturer of Solar Pump having experience of 'Similar Works'. or
- iii. Manufacturer of Solar Pump Controller using indigenous technology having experience of 'Similar Works'. or
- iv. EPC/SI of experience in 'similar works' in Joint venture with Solar PV Module Manufacturer or Solar Pump Manufacturer or Manufacturer of Solar Pump Controller using indigenous technology, only.
- v. In case Bidder wishes to participate in as a Joint Venture, following conditions are additionally applicable: -
  1. The term Bidder used hereinafter would therefore apply to both a single entity and a Consortium/ Joint Venture.
  2. A consortium of maximum two (02) members is allowed in this RfS including one as lead bidder.
  3. 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 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.

4. 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.
5. 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 & other details of both the members of Consortium/Joint Venture Firm should be clearly mentioned in the Bid/Response.
6. 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.
7. Once the offer/ bid is submitted, the bid shall not be modified / altered/ terminated. During the period of execution including any extension thereafter by MPUVNL or validity of any LOA/NTP 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.
8. 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 offer/ bid.
9. Authorized Member of Joint Venture Firm: 'Lead Member' shall be authorized on behalf of Joint Venture Firm to deal with the tender/MPUVNL, 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.

10. Required processing fee shall be submitted by the 'Lead Member'. Submission of processing fee by the 'Lead Member' it should be deemed as processing fee submitted by the Joint Venture Firm.
11. Duration of work and Joint Venture Agreement shall be valid during the entire execution period/ validity of LoA/NTP and any extension thereafter/ currency of the contract including the period of extension, if any and 5-year maintenance contract.
12. Any change in constitution of Joint Venture Firm shall not be allowed, till 5 years CMC period.
13. 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, Performance Guarantee, and Bank Guarantee 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.
14. Members of the Joint Venture Firm shall be jointly and severally liable to the MPUVNL 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 MPUVNL 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.
15. 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.
16. Under this tender, only bid from one NSIC Consortium will be accepted.
17. All correspondence by MPUVNL will be done with 'Lead member' only.

**Note: 'Similar Works' means - Experience in Design, Supply, Erection, Testing, Installation and Commissioning of 600 Nos. standalone (off-grid) solar PV based water pump sets in any Govt. Dept./PSU/SNA of any state or**

**Central Govt. in India in last 7 years from the last date of bid submission.**

Name of State	Total SWPs Quantity (Nos.)	EMD requirement in lakh INR (i.e. @2% of 6% of cumulative tender quantity )	Technical QR	
			For Solar Pumps / Controller manufacturer (Number of solar pumps pump/Controller supplied)	For Solar PV Modules manufacturer (Experience in kWp)
Madhya Pradesh	10000*	32.040	600	2880

**Note\*:** Total quantity of SWPS is tentative as it is rate contract, and it may increase or decrease, subject to availability of fund & requirement of MPUVNL.

41.3 Detailed technical parameters of the SWPS 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 RfS. The modules used in the Project under this RfS should have been included in the List-I under the above Order, valid as on the date of invoicing of such modules.

41.4 Copy of Factory License Indian Factories Act, 1948 or any document to establish factory in running operations under the and GST registration Certificate, supporting the fact of the bidder being engaged in the business field mentioned shall be submitted. If factory license does not specify that business field, a separate Government issued document shall be submitted in support of the bidder being engaged in the business field mentioned.

## **42. Financial Eligibility Criteria**

### **42.1 Net-Worth**

- i. 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

- ii. 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 RfS.
- iii. 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

#### 42.2 Minimum Average Annual Turnover

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 years, i.e., 2022-23 2021-22, 2020-21, 2019-20 and 2018-19. 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.

#### 42.3 Liquidity

Name of State	SWPs Quantity (Nos.)	MAAT/ Annual Turn Over Requirement (in lakhs INR) in last three years	Profitability	Net Worth
Madhya Pradesh	10000*	1602	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 pump is tentative as it is rate contract, and it may increase or decrease, subject to availability of fund & requirement of MPUVNL.

- 42.4 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 42.1, 42.2 and 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/POI in case the Bidder(s) fail to do so in accordance with the RfS. 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.

42.5 For the purposes of meeting financial requirements, unconsolidated audited annual accounts for any three financial years out of the last five financial years 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.

42.6 A Company/Consortium would be required to submit annual audited accounts for the last FY, 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 fulfilment 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 RfS 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.

42.7 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 42.6 above.

- 42.8 In case the response to RfS is submitted by a Consortium/Joint Venture, then the financial requirement is required to be met by the Consortium/Joint Venture members on an aggregate basis.
- 42.9 **Note:** Wherever applicable, audited accounts for the latest FY, 2022-23 will be required to be submitted for meeting the qualification requirements.



## **Section-5 Bid Evaluation and Selection of Projects**

### **43. Bid Evaluation**

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

### **44. Techno-Commercial Evaluation of Bidders (Step 1)**

- 44.1 Bid opening (online) and evaluation will be done only after the deadline as per key dates mentioned in RfS. In case of the above deadline being a holiday, the bids will be opened on the next working day.
- 44.2 Documents (as mentioned in the previous clause) received after the bid submission deadline as specified by MPUVNL, shall be rejected and returned unopened, if super- scribed properly with address, to the bidder.
- 44.3 Subject to Clause 18 of the RfS, MPUVNL will examine all the documents submitted by the Bidders and ascertain meeting of eligibility conditions prescribed in the RfS. During the examination of the bids, MPUVNL 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 MPUVNL within 07 (seven) days from the date of such intimation from MPUVNL. All correspondence in this regard shall be made through email/mp tender portal only. It shall be the responsibility of the Bidder to ensure that the email 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. MPUVNL shall not be responsible for rejection of any bid on account of the above.
- 44.4 The response to RfS submitted by the Bidder shall be scrutinized to establish Techno- Commercial eligibility as per the RfS.

### **45. Financial Bid Evaluation (Step 2)**

- 45.1 In this step evaluations of Techno-Commercially Qualified Bids shall be done based on the "Fixed Price", quoted by the Bidder for each line item (i.e., type of pump) as per price bid format 7.16 to the RfS (i.e., type of pump) in the Electronic Form of Financial Bid (online only).
- 45.2 Second Envelope (containing Fixed Price) of only those bidders shall be

opened (Online) whose technical bids are found to be qualified as per the RfS.

45.3 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 be considered as INR 47,800.45).

45.4 In this step, evaluation will be carried out for each line item (i.e., type of pump), separately within the maximum capacities to the RfS, based on the price quoted by Bidders.

45.5 Madhya Pradesh State has following types of pumps as per table below:

Pump Capacity (HP)	Pump Type	Pump Position	Controller Type
1	DC	Surface	Normal (Without USPC)
	DC	Submersible	Normal (Without USPC)
2	DC	Surface	Normal (Without USPC)
	DC	Submersible	Normal (Without USPC)\
3	DC	Submersible	Normal (Without USPC)
	DC	Submersible	with USPC
5	DC	Submersible	Normal (Without USPC)
	DC	Submersible	with USPC
7.5	AC	Submersible	Normal (Without USPC)
	DC	Submersible	Normal (Without USPC)
	AC	Submersible	with USPC
	DC	Submersible	with USPC

- 45.6 On completion of Techno-Commercial bid evaluation, if it is found that for each Category of pump, 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 MPUVNL. Thereafter, MPUVNL will take appropriate action as deemed fit.
- 45.7 Bidder has an option to quote for all SWPs category for the ones they wish to quote for. Bidder has to mandatorily submit declaration for pump category they wish to quote for (i.e., Format 7.1), subject to fulfilment of cumulative qualifying requirements of quoted pump category.
- 45.8 For each line item (i.e., type of pump), based on the fixed Price quoted by the bidders, MPUVNL shall arrange the bids in the ascending order i.e., L1, L2, L3, etc. (L1 being the lowest quote).

If the fixed price (inclusive of all duties, insurance and any other taxes but excluding GST) 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.

#### **46. L-1 Matching and Selection of Selected Vendors**

- 46.1 All eligible bidders shortlisted on the basis of technical and financial criteria stipulated in bidding document and under the price bracket of (L1+10% of L1) will be empanelled on acceptance of L1 price and have equal opportunity to work in market mode. However, in case the number of such bidders empanelled within price bracket of (L1+10% of L1) are less than 5, the price bracket shall be extended to (L1+15% of L1), so that enough number of bidders are empanelled for better competition. The selection of beneficiaries and implementation of scheme would be the responsibility of the MPUVNL
- 46.2 Not used
- 46.3 Not used.

**Note:** In all cases, matching of Prices will be on individual line items (for a particular category) within the price bid table on total cost (on F.O.R basis, exclusive of GST) for complete scope of work.

- 46.4 MPUVNL reserves the right for the variation of allocated SWPs quantity.
- 46.5 Further, in case a Vendor is not able to supply quantity allocated through NTP to them as per scheduled timelines, MPUVNL reserves the right to shift the part/full quantity to another Vendor, who has matched the price.

**47. Validity of discovered prices for each category**

In order to allow Vendors sufficient time to implement SPWPS based on the prices discovered under this tender, all prices discovered under this tender will remain valid for 15 months from the date of opening the price bids, which will be announced by MPUVNL. Within this 15-month period, empanelled vendors have no right of refusal to complete the allocated work. This validity may further be extended by MPUVNL on same terms and conditions, if mutually agreed, for 6 months at a time, subject to maximum two such extensions.

**48. Recommendation and Issuance of LICAs**

At the end of selection process, MPUVNL will issue the announcement of prices discovered and empanelment of Vendors after submission of desired documents against LICA. The LoAs will be issued to the Selected Vendors, identified by MPUVNL (*definition of Selected Vendor- one who accepts LICA and submits consent with all desired documents, including test reports, and declared eligible by MPUVNL*).

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 MPUVNL 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 fulfil any of the conditions, except those not within reasonable control of such Selected Bidders, specified in Bid document, then MPUVNL 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 any other action as necessary.

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

**49. Inspection and Audit by the Government/MPUVNL**

All materials/equipment's manufactured by the bidder/consortium of bidders against the LoA/NTP shall be subject to inspection, check and/or test by the MPUVNL/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 MPUVNL. 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 SIAs, failing which the bidder will be liable for penalties including encashment of EMD and/ or blacklisting.

If upon delivery the material/equipment does not meet the specification, the materials/equipment shall be rejected and returned to the bidder for repairs/modification etc. or for replacement and MPUVNL may 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.

## **50. Debarment from Participating in MPUVNL's Future Tenders**

- 50.1 MPUVNL 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 RfS, such Bidders may be debarred from participating in MPUVNL's any future tender for a period as decided by the competent authority of MPUVNL.

## Section-6 Definitions of Terms

### 51. Definitions of Terms

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

- 51.1 **“ACT” or “ELECTRICITY ACT, 2003”** shall mean the Electricity Act, 2003 and include any modifications, amendments and substitution from time to time.
- 51.2 **“AFFILIATE”** shall mean a company that, directly or indirectly,
- i. controls, or
  - ii. is controlled by, or
  - iii. 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.
- 51.3 **“B.I.S.”** shall mean specifications of Bureau of Indian Standards (BIS).
- 51.4 **“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 as part of its response to the RfS issued by MPUVNL.
- 51.5 **“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.
- 51.6 **“BIDDING CONSORTIUM” or “CONSORTIUM”** shall refer to a group of entities (two maximum) that collectively submit the response in accordance with the provisions of this RfS under a Consortium Agreement.
- 51.7 **“CEA”** shall mean Central Electricity Authority.
- 51.8 **“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.

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.

- 51.9 "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.
- 51.10 "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:
- i. 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
  - ii. Provided further that the last Contract Year of this Agreement shall end on the last day of the Term of this Agreement.
- 51.11 "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.
- 51.12 "CONTROLLING SHAREHOLDING" shall mean more than 50% of the voting rights and paid up share capital in the Company/ Consortium.
- 51.13 "DAY" shall mean calendar day.
- 51.14 "EQUITY" shall mean Net Worth as defined in Companies Act, 2013.
- 51.15 "GROUP COMPANY" of a Company means
- i. a Company which, directly or indirectly, holds 10% (Ten Percent) or more of the share capital 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 directed the 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.

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

51.17 "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).

51.18 "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.

51.19 "LETTER OF AWARD" or "LoA" shall mean the letter issued by State Implementing Agency (MPUVNL) to the Selected Vendor for award (consent from beneficiaries) of the SPWPS.

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

51.21 "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.

51.22 "MONTH" shall mean calendar month.

51.23 "NET-WORTH" shall mean the Net-Worth as defined section 2 of the Companies Act, 2013.

51.24 "O&M/AMC" shall mean Operation & Maintenance/ Annual Maintenance Contract of the supplied equipment's.

51.25 "PAID-UP SHARE CAPITAL" shall mean the paid-up share capital as defined in



Section 2 of the Companies Act, 2013.

51.26 "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.

51.27 "PROJECT" shall mean Solar Photovoltaic Water Pumping Systems (SPWPS).

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

51.29 "RfS" or "RfS DOCUMENT" or "BIDDING DOCUMENT(S)" or "TENDER DOCUMENTS" shall mean this "Request for Selection" document issued by MPUVNL along with subsequent clarifications and amendments thereof.

51.30 "MPUVNL" shall mean Madhya Pradesh Urja Vikas Nigam Limited.

51.31 "TOE" shall mean Tender Opening Event.

51.32 "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.

51.33 "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 one who accepts LICA and submits consent with all desired documents, including test reports, and declared eligible by MPUVNL .

51.34 "WEEK" shall mean calendar week.

## **52. Important instructions to Bidders:**

### **52.1 Instructions to the bidder on e-tendering portal:**

- a) For participation in e-tendering module, it is mandatory for Bidders to enrol on the e-Procurement module of the MP Tenders Portal (URL: <https://mptenders.gov.in/nicgep/app>) by clicking on the link "Online bidder Enrolment" on the MP TENDERS Portal. Cost of Enrolment and renewal is dependent on the Government Order (GO) prevailing at that period of time.
- b) As part of the enrolment process, the Bidders will be required to choose a unique username and assign a password for their accounts.
- c) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the MP Tenders Portal.

- d) Upon enrolment, the Bidders will be required to register their valid Digital Signature Certificate (Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.
- e) Only one valid DSC should be registered by a Bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse
- f) Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.
- g) For further information regarding issue of Digital Signature Certificate, the Bidders are requested to visit MP tenders website (<https://mptenders.gov.in/nicgep/app>). Please note that it may take up to 3 to 5 working days for issue of Digital Signature Certificate. Nodal Agency will not be responsible for delay in issue of Digital Signature Certificate.
- h) Tender documents can be downloaded from website free of cost. Bidders need to submit the Bid Processing Fee at the time of online submission of the bid.
- i) Service and gateway charges shall be borne by the Bidders.
- j) The Browser should be Java enabled. Java Runtime Environment (JRE) should be installed in the client system. This can be downloaded from the download links of the eProcurement System.
- k) If Bidder is participating for the first time in e- tendering, then it is advised to fulfil all formalities, such as registration, obtaining Digital Signature Certificate, etc. well in advance.
- l) For further information regarding issue of Digital Signature Certificate, the Bidders are requested to visit website <https://mptenders.gov.in/nicgep/app>. Please note that it may take up to 3 to 5 working Days for issue of Digital Signature Certificate. Nodal Agency will not be responsible for delay in issue of Digital Signature Certificate.
- m) Bidders are requested to regularly visit MP tenders-tendering website for any clarification and / or extension of due date.
- n) Bidder must positively complete online e-tendering procedure at <https://mptenders.gov.in/nicgep/app>.
- o) Nodal Agency shall not be responsible in any way for delay /difficulties /inaccessibility of the downloading facility from the website for any reason whatever.

- p) Whosoever on behalf of the Bidder is submitting the tender by his Digital Signature Certificate, shall invariably upload the scanned copy of the authority letter, as well as submit the copy of the same in physical form with the offer of particular Bid.
- q) Bid Security/EMD Payment:
- Token Bid Security/EMD Payment should be paid online through MP Tenders portal Only.
  - **For Start-ups (Instructions to be followed on MP Tenders portal), if applicable:**  
On the “EMD exemption” page,
    - i) Bidder will receive a prompt stating “Are you exempted from EMD/Bid Security payment: Yes/No”; select “Yes”
    - ii) Bidders will receive a prompt stating “If yes, provide the exemption type: Percentage/Amount”; select “Percentage”.
    - iii) In the “Percentage/Amount” field, fill in “100”.
    - iv) Then upload the scanned copy of DPIIT certificate as mentioned under clause no. 3.4.4 of this RFS the “Upload EMD exemption document” heading.
- r) After the final submission of bid, Bidder should ensure that he has received the acknowledgment slip and should keep this slip until opening of the Bid. If acknowledgment slip is not generated, it means the Bid is not submitted.
- s) The Bidders shall have to submit their Financial Bid and other required relevant documents/ certificates, if any, online only (duly encrypted bids) as per time schedule (Key dates) as mentioned in Clause **Error! Reference source not found.** The Technical Bid should be submitted online and shall contain signed copy of RFS along with Annexures, formats, relevant document/ certificates etc. duly sealed and signed and uploaded.
- t) For any type of clarification, Bidders can visit <https://mptenders.gov.in/nicgep/app> and can call at 24\*7 help desk contact no. 0120-4001 002/005 which is also mentioned in the website. Bidder can also send email to “support-eproc@nic.in”.
- u) On the online MP Tenders portal, start-ups registered with DPIIT should opt for exemption of payment of Bid Security (EMD). In such cases, appropriate proof shall be uploaded while opting for exemption on the portal i.e. DPIIT recognition certification for start-up. Refer point no. q b) as above for start-ups. A Bidder shall not have a conflict of interest. Bidder(s) shall be disqualified in the Category (ies) where it has conflict

of interest. In a particular Category, the Bidder may be considered to have conflict of interest with one or more parties in this bidding process, if:

- A Bidder submits more than one Bid in the bidding process, either individually [including bid submitted as authorised representative on behalf of one or more Bidder(s)] or as Member of consortium.
- They have a relationship with each other, directly or through common third parties, that puts them in position to have access to information about or influence on the Bid of another Bidder or influence the decisions of Nodal Agency regarding this bidding process.

## **SECTION 7. SAMPLE FORMS & FORMATS FOR BID SUBMISSION**

The following formats are required to be submitted as part of the RfS. 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 RfS.

### **53. ALL FORMANTS FOR BID SUBMISSION**

#### **Format 7.1: Covering letter**

##### **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 of Consortium)

Tel.#: \_\_\_\_\_

Fax#: \_\_\_\_\_

E-mail address# \_\_\_\_\_

**To**

**The Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. .... dated ..... for  
the RfS)

(Insert title of

Dear Sir/ Madam,

We, the undersigned [Insert name of the 'Bidder'] having read, examined and understood in detail the RfS including Qualification Requirements in particular, hereby submit our response to RfS.

We confirm that in response to the aforesaid RfS, neither we nor any of our Ultimate Parent Company/ Parent Company/ Affiliate/ Group Company has submitted response to RfS other than this response to RfS, directly or indirectly, in response to the aforesaid RfS (as mentioned in Format 7.8 under Disclosure) **OR** We confirm that in the response to the aforesaid RfS, we have a Group Company who owns more than 10% but less than 26% in the bidding company as well as other companies who may participate in this RfS, and accordingly, we have submitted requisite undertaking as per Format 7.8A in this regard {strike out whichever not applicable}.

We are submitting our response to the RfS as:

<b>Type of Bidder</b>	<b>Applicability (Yes/No)</b>
Pump/ Pump set Manufacturer	
Solar PV Module Manufacturer	
Solar Pump Controller Manufacturer	
Joint Venture	

In case of Joint Venture:

<b>Lead Bidder</b>	<b>Non-Lead Bidder</b>
EPC/ Pump Manufacturer/ Solar PV Module Manufacturer/ Solar Pump Controller Manufacturer	EPC/ Pump Manufacturer/ Solar PV Module Manufacturer/ Solar Pump Controller Manufacturer

We are submitting application for the installation of SPWPS(s) in following SWPs Category: -

<b>S. No.</b>	<b>Category of Pump Quoted for</b>	<b>Controller Type</b>	<b>Participation (Yes/No)</b> No/Blank cell will be assumed as No Only
1.	1 HP DC Surface	Normal (Without USPC)	
2.	1 HP DC Submersible	Normal (Without USPC)	
3.	2 HP DC Surface	Normal (Without USPC)	
4.	2 HP DC Submersible	Normal (Without USPC)	
5.	3 HP DC Submersible	Normal (Without USPC)	
6.	3 HP DC Submersible	with USPC	
7.	5 HP DC Submersible	Normal (Without USPC)	
8.	5 HP DC Submersible	with USPC	
9.	7.5 HP AC Submersible	Normal (Without USPC)	
10.	7.5 HP DC Submersible	Normal (Without USPC)	
11.	7.5 HP AC Submersible	with USPC	
12.	7.5 HP DC Submersible	with USPC	

1. We give our unconditional acceptance to the RfS, dated *[Insert date in dd/mm/yyyy]*, issued by MPUVNL. In token of our acceptance to the RfS along with the amendments and clarifications issued by MPUVNL, the same have been digitally signed by us and enclosed with the response to RfS. Further, we confirm that the

SPWPS shall be installed within the deadline as per panel provisions of scheme guidelines and RfS.

2. Earnest Money Deposit (EMD): - (Please read Clause 13 carefully before filling)

We have enclosed EMD of INR ..... (Insert Amount), in the form of Bank Guarantee no. .... [Insert bank guarantee] dated ..... [Insert date of bank guarantee] as per Format 7.3A/7.3B from ..... [Insert name of bank providing bank guarantee] and valid up to... in terms of Clause 13 of this RfS. (Strike off whichever is not applicable)

3. We hereby declare that in the event our bid gets selected and we are not able to submit Bank Guarantee of the requisite value(s) towards PBG, within due time as mentioned in Clauses 13 & 14 of this RfS, MPUVNL shall have the right to encash the EMD submitted by us.

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

5. Acceptance: -

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

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

6. Familiarity with Relevant Indian Laws & Regulations: -

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 RfS, in the event of our selection as Selected Vendor.

7. In case of our selection as the Selected Vendor under the scheme and the Project (SPWPS) being executed by a Special Purpose Vehicle (SPV) incorporated by us which shall be our subsidiary, we shall infuse necessary equity to the requirements of RfS.

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

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

10. The information submitted in our response to the RfS 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 RfS.

11. 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 RfS].

**12. Contact Person**

Details of the representative to be contacted by MPUVNL are furnished as under:

Name : .....  
Designation : .....  
Company : .....  
Address : .....  
Phone Nos. : .....  
Mobile Nos. : .....  
Fax Nos. : .....  
E-mail address: .....

13. 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: Power of Attorney**

**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 RfS No. \_\_\_\_\_

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

- i) To submit on behalf of Consortium Members response to RfS.
- ii) To do any other act or submit any information and document related to the above response to RfS 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 05 years from installation.

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 RfS.

**Format 7.3A: BG for EMD**

**FORMAT FOR BANK GUARANTEE TOWARDS EARNEST MONEY DEPOSIT  
(EMD)**

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

Reference: .....

List No.: .....

Date: .....

In consideration of the \_\_\_\_\_ [Insert name of the Bidder] (hereinafter referred to as 'Bidder') submitting the response to RfS inter alia for \_\_\_\_\_ [Insert title of the RfS] for pump category declared in Format 7.1, in response to the RfS No. \_\_\_\_\_ dated \_\_\_\_\_ issued by Madhya Pradesh Urja Vikas Nigam Limited (hereinafter referred to as MPUVNL) and MPUVNL considering such response to the RfS of ..... [Insert the name of the Bidder] as per the terms of the RfS, the \_\_\_\_\_ [Insert name & address of bank] hereby agrees unequivocally, irrevocably and unconditionally to pay to MPUVNL at [Insert Name of the Place from the address of MPUVNL] forthwith without demur on demand in writing from MPUVNL or any Officer authorized by it in this behalf, any amount upto and not exceeding Rupees [Insert amount not less than that derived on the basis of 2% of the amount equivalent to the 6% of the value of total pump allocation or 25 nos. of SPWPS, whichever is higher], only, on behalf of M/s \_\_\_\_\_ [Insert name of the Bidder].

This guarantee shall be valid and binding on this Bank up to and including \_\_\_\_\_ [insert date of validity in accordance with Clause 13 of this RfS] and shall not be terminable by notice or any change in the constitution of the Bank or the term of contract or 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 \_\_\_\_\_ [insert date of validity in accordance with Clause 13 of this RfS]. MPUVNL shall be entitled to invoke this Guarantee till \_\_\_\_\_ [insert date of validity in accordance with Clause 13 of this RfS].

The Guarantor Bank hereby agrees and acknowledges that the MPUVNL 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 MPUVNL, made in any format, raised at the above-mentioned address of the Guarantor Bank, in order to make the said payment to MPUVNL.

The Guarantor Bank shall make payment hereunder on first demand without restriction or conditions and notwithstanding any objection by \_\_\_\_\_ [Insert name of the Bidder] and/ or any other person. The Guarantor Bank shall not require MPUVNL to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against MPUVNL in respect of any payment made hereunder.

This BANK GUARANTEE shall be interpreted in accordance with the laws of India and the courts at Bhopal 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 MPUVNL shall not be obliged before enforcing this BANK GUARANTEE to take any action in any court or arbitral proceedings against the Bidder, to make any claim against or any demand on the Bidder or to give any notice to the Bidder or to enforce any security held by MPUVNL or to exercise, levy or enforce any distress, diligence or other process against the Bidder.

This BANK GUARANTEE shall be effective only when the Bank Guarantee issuance message is transmitted by the issuing Bank through SFMS and a confirmation in this regard is received by MPUVNL.

Notwithstanding anything contained hereinabove, our liability under this Guarantee is restricted to INR \_\_\_\_\_ (Indian Rupees \_\_\_\_\_ Only) and it shall remain in force until \_\_\_\_\_ [Date to be inserted on the basis of Clause 11 of this RfS].

We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if MPUVNL 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 \_\_\_\_\_

**Format 7.3 B: Not used**

**Not Used**

**Format 7.3 C: PBG format**

**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 RfS inter alia for ..... [Insert title of the RfS] for the category of SWPs declared in Format 7.1, in response to the RfS dated..... issued by Madhya Pradesh Urja Vikas Nigam Limited (hereinafter referred to as MPUVNL) and MPUVNL considering such response to the RfS of ..... [Insert name of the Bidder] (which expression shall unless repugnant to the context or meaning thereof include its executors, administrators, successors and assignees) issuing Letter of Award No. \_\_\_\_\_ to \_\_\_\_\_ (Insert Name of selected Vendor) as per terms of RfS, M/s \_\_\_\_\_ { a Special Purpose Vehicle (SPV) formed for this purpose }, if applicable].

As per the terms of the RfS, the \_\_\_\_\_ [Insert name & address of Bank] hereby agrees unequivocally, irrevocably and unconditionally to pay to MPUVNL at \_\_\_\_\_ [Insert Name of the Place from the address of the MPUVNL] forthwith on demand in writing from MPUVNL or any Officer authorised 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 contract or 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..... MPUVNL shall be entitled to invoke this Guarantee till .....

The Guarantor Bank hereby agrees and acknowledges that MPUVNL 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 MPUVNL, made in any format, raised at the above-mentioned address of the Guarantor Bank, to make the said payment to MPUVNL.

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 MPUVNL to justify the invocation of this BANK GUARANTEE, nor shall the Guarantor Bank have any recourse against MPUVNL 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 MPUVNL 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 MPUVNL 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 MPUVNL and may be assigned, in whole or in part, (whether absolutely or by way of security) by MPUVNL to any entity to whom MPUVNL 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 it shall remain in force until \_\_\_\_\_ We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only if MPUVNL 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. ....

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.



## **Format 7.4: Board resolution**

### **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 RfS vide RfS No. \_\_\_\_\_ for \_\_\_\_\_ (insert title of the RfS), including signing and submission of all documents and providing information/ response to RfS to Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL), representing us in all matters before MPUVNL, and generally dealing with MPUVNL 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]*

**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 RfS. *[To be passed by the Lead Member of the Bidding Consortium]*

**3. NOT USED**

## **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: Consortium agreement

### 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 \_\_\_\_\_ Two Thousand \_\_\_ 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), [The Bidding Consortium should list the details of all the Consortium Members] for the purpose of submitting response to RfS and **execution of contact agreement with MPUVNL** (in case of award), against RfS No. \_\_\_\_\_ dated \_\_\_\_\_ issued by Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL) a Company incorporated under the Companies Act, 2013, and having its Registered Office at Madhya Pradesh Urja Vikas Nigam Ltd Shivaji Nagar, 5 No Stop, Link Rd 2 Bhopal 462016

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 MPUVNL desires to install SPWPS under RfS for \_\_\_\_\_ (insert title of the RfS);

WHEREAS, MPUVNL had invited response to RfS vide its Request for Selection (RfS) dated \_\_\_\_\_

WHEREAS the RfS stipulates that in case response to RfS 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 MPUVNL 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. 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 RfS for self and agent for and on behalf of Member-2, and to submit the response to the RfS.
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. Notwithstanding 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 **will be as under**

Name	Percentage
<b>Member 1</b>	---
<b>Member 2</b>	---
<b>Total</b>	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 Bhopal alone shall have the exclusive jurisdiction in all matters relating thereto and arising thereunder.
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 MPUVNL in terms of the RfS.
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 MPUVNL.
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 RfS.

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 MPUVNL.
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 hereto 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 MPUVNL.
15. All the terms used in capitals in this Agreement but not defined herein shall have the meaning as per the RfS.

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-----

Name:

Addre

ss:

2) Signature -----

-

Name:

Addre

ss:

For M/s \_\_\_\_\_ [Member 2]

-----

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

Witnesses:

1) Signature -----

Name:

Addre

ss:

2) Signature -----

-

Name:

Addre

ss:

---

Signature and stamp of Notary of the place of execution

## **Format 7.6: Financial requirement**

### **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 Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

We certify that the Bidding Company/Member in a Bidding Consortium is meeting the financial eligibility requirements as per the provisions of the RfS. 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 2021-22.

This Net Worth has been calculated in accordance with instructions provided in Clause 42.1 of the RfS.

#### **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:

<b>Name of Bidding Company</b>	<b>Name of Affiliate(s) whose net worth is to be considered</b>	<b>Relationship with Bidding Company*</b>	<b>Net Worth (in Rs. Crore)</b>
<b>Company 1</b>			
<b>Total</b>			

*\*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 Consortium and/ or its Affiliate(s) per following details:

<b>Name of Consortium Member Company</b>	<b>Name of Affiliate(s) whose net worth is to be considered</b>	<b>Relationship with Bidding Company* (If any)</b>	<b>Net Worth (in Rs. Crore)</b>	<b>Equity Commitment (in %age) in Bidding Consortium</b>	<b>Committed Net Worth (in Rs. Crore)</b>
<b>Company 1</b>					
---					
---					
<b>Total</b>					

*\* 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, we have considered the MAAT by Bidding Company and/ or its Affiliate(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					
<b>Total</b>					

\*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, 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 is to be considered	Relationship with Bidding Company* (If Any)	MAAT (in Rs. Crore) FY 2019-20	MAAT (in Rs. Crore) FY 2020-21	MAAT (in Rs. Crore) FY 2021-22	Equity Commitment (in %age) in Bidding Consortium	Proportionate MAAT (in Rs. Crore)
Company 1							
---							
---							

<b>Total</b>					
--------------	--	--	--	--	--

*\* 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 Liquidity Criteria by demonstrating a Working Capital of INR \_\_\_\_\_ (in words) as on the end of Financial Year 2021-22. (Strike out if not applicable)

**Exhibit (i): Applicable in case of Bidding Company**

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

<b>Name of Bidding Company</b>	<b>Name of Affiliate(s) whose Working Capital is to be considered</b>	<b>Relationship with Bidding Company*</b>	<b>Working Capital (in Rs. Crore)</b>
<b>Company 1</b>			
<b>Total</b>			

*\*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, we have considered Working Capital by Member in Bidding Consortium and/ or its Affiliate(s) as per following details:

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

*\* 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: No litigation undertaking**

**UNDERTAKING**

*(To be submitted on the letterhead of the Bidder)*

We, hereby provide this undertaking to Madhya Pradesh Urja Vikas Nigam Limited, in respect to our response to RfS vide RfS 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 nature that 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: Disclosure by bidder/ members of consortium**  
**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 Managing Director,**  
**Madhya Pradesh Urja Vikas Nigam Ltd**  
**Shivaji Nagar, 5 No Stop, Link Rd 2**  
**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated for \_\_\_\_\_

Dear Sir/ Madam,

We hereby declare and confirm that only we are participating in the RfS Selection process for the RfS No. \_\_\_\_\_ dated \_\_\_\_\_ and that our Parent, Affiliate or Ultimate Parent or any Group Company with which we have direct or indirect relationship are not separately participating in this selection process.

We further declare that the above statement is true & correct. We undertake that if at any stage it is found to be incorrect, in addition to actions applicable under the RfS including but not limited to cancellation of our response to this RfS 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 MPUVNL for a period of 5 years from the date of default as notified by MPUVNL.

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.

We further declare that we have read the provisions of Clause 40.4 of the RfS, 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 RfS. We understand that in case of us being selected under this RfS, any of the above certificates is found false, MPUVNL shall take appropriate action as deemed necessary.

We further declare that we are fully aware of the binding provisions of the ALMM Order and the Lists(s) thereunder, while quoting the price in RfS for\_(Enter the name of the RfS).

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.

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: Disclosure for shareholding**

**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/companies directly/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 Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

We hereby declare and confirm that in terms of the definitions of the RfS, 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 RfS, i.e., RfS No. \_\_\_\_\_.

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 RfS by M/s

\_\_\_\_\_ (enter name of the bidding company/member in the consortium). We further undertake that while undertaking any action as part of our response to RfS, we are not complicit with other such bidders participating in this RfS, in which M/s \_\_\_\_\_ (enter name of the common shareholder) has less than 26% direct/indirect shareholding, if any.

We further declare that the above statement is true & correct. We undertake that if at any stage it is found to be incorrect, in addition to actions applicable under the RfS including but not limited to cancellation of our response to this RfS 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 MPUVNL for a period of 5 years from the date of default as notified by MPUVNL.

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.

We further declare that we have read the provisions of Clause 38 of the RfS, 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 RfS. We understand that in case of us being selected under this RfS, any of the above certificates is found false, MPUVNL shall take appropriate action as deemed necessary.

We further declare that we are fully aware of the binding provisions of the ALMM Order and the Lists(s) thereunder, while quoting the price in RfS for\_\_\_\_(Enter the name of the RfS). 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.

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.



**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 Managing Director,  
Madhya Pradesh Urja Vikas Nigam Ltd  
Shivaji Nagar, 5 No Stop, Link Rd 2  
Bhopal 462016**

Sub: Response to the RfS No \_\_\_\_\_ dated .....

Dear Sir/ Madam,

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

We are hereby submitting the following declaration in this regard:

"I 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]."

We further declare that the above statement is true & correct. We are aware that if at any stage it 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

**(On Stamp Paper -----)**

**INTEGRITY PACT**

Between

**Madhya Pradesh Urja Vikas Nigam Limited**

hereinafter referred to as

**"MPUVNL",**

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**

MPUVNL intends to award, under laid-down organizational procedures, contract(s) for \_\_\_\_\_ *[Insert the name of the tender/package]* \_\_\_\_\_

Package and NIB Number \_\_\_\_\_MPUVNL 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, MPUVNL 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 MPUVNL**

- (1) MPUVNL commits itself to take all measures necessary to prevent corruption and to observe the following principles:
  - a) No employee of MPUVNL, 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) MPUVNL will, during the tender process treat all Bidder(s) with equity and fairness. MPUVNL 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.
  - (a) MPUVNL 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 Managing Director obtains information on the conduct of any employee of MPUVNL which is a criminal offence under the relevant Anti-Corruption Laws of India, or if there be a substantive suspicion in this regard, he will inform its Chief Vigilance Officer and in 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 MPUVNL, or to any of MPUVNL'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 MPUVNL 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/or with 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 MPUVNL.
- (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**

- (1) 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, MPUVNL may disqualify the Bidder from the tender process or terminate the contract, if already signed, for such reason.
- (2) 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, MPUVNL 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.
- (3) If the Bidder/Contractor can prove that he has restored/recouped the damage caused by him and has installed a suitable corruption prevention system, MPUVNL may revoke the exclusion prematurely. However, decision of MPUVNL in this regard shall be final and binding on the bidder/Contractor.

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

- (1) If MPUVNL has disqualified the Bidder from the tender process prior to the award under Section III, MPUVNL may forfeit the applicable Bid Security/Earnest Money Deposit under the Bid.
- (2) If MPUVNL has terminated the contract under Section III, MPUVNL may forfeit the Contract Performance Security of this contract besides resorting to other remedies under the contract.

#### **Section V - Previous Transgression**

- (1) 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 could justify his exclusion from the tender process.
- (2) 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**

- (1) MPUVNL will enter into agreements with identical conditions as this one with all Bidders.
- (2) MPUVNL 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**

If MPUVNL 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 MPUVNL has substantive suspicion in this regard, MPUVNL will inform the Chief Vigilance Officer (CVO).

Nothing mentioned hereinabove may deem to restrict the right of MPUVNL, 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 - Independent External Monitor/Monitors**

- (1) MPUVNL has appointed a panel of Independent External Monitors (IEMs) for this Pact with the approval of Central Vigilance Commission (CVC), Government of India, details of which has been indicated in the tender document.
- (2) The IEM is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement. He has right of access to all project documentation. The IEM may examine any complaint received by him and submit a report to Managing Director, MPUVNL, at the earliest. He may also submit a report directly to the CVO and the CVC, in case of suspicion of serious irregularities attracting the provisions of the PC Act. However, for ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter shall be referred to the full panel of IEMs, who would examine the records,

conduct the investigations and submit report to Managing Director, MPUVNL, giving jointfindings.

- (3) The IEM is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Managing Director, MPUVNL.
- (4) The Bidder(s)/Contractor(s) accepts that the IEM has the right to access without restriction to all documentation of MPUVNL related to this contract including that provided by the Contractor/Bidder. The Bidder/Contractor will also grant the IEM, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his documentation. The same is applicable to Subcontractors. The IEM is under contractual obligation to treat the information and documents of the Bidder(s)/Contractor(s)/Subcontractor(s) with confidentiality.
- (5) MPUVNL will provide to the IEM information as sought by him which could have an impact on the contractual relations between MPUVNL and the Bidder/Contractor related to this contract.
- (6) As soon as the IEM notices, or believes to notice, a violation of this agreement, he will so inform the Managing Director, MPUVNL and request the Managing Director, MPUVNL to discontinue or take corrective action, or to take other relevant action. The IEM can in this regard submit non-binding recommendations. Beyond this, the IEM has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action. However, the IEM shall give an opportunity to MPUVNL and the Bidder/Contractor, as deemed fit, to present its case before making its recommendations to MPUVNL.
- (7) The IEM will submit a written report to the Managing Director, MPUVNL within 8 to 10 weeks from the date of reference or intimation to him by MPUVNL and, should the occasion arise, submit proposals for correcting problematic situations.
- (8) If the IEM has reported to the Managing Director, MPUVNL, a substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Managing Director, MPUVNL has not, within the reasonable time taken visible action to proceed against such offence or reported it to the CVO, the Monitor may also transmit this information directly to the CVC, Government of India.
- (9) The word 'IEM' would include both singular and plural.
- (\* *This Section shall be applicable for only those packages wherein the IEMs have been identified in Section – I: Invitation for Bids and/or Clause ITB ... in Section – III: Bid Data Sheets of Conditions of Contract, Section-3 of the RfS.*
- (10) A bidder/Contractor signing the IP shall not approach the Courts while representing the matters to IEMs and he will await till their decision in the matter.

#### **Section IX - Pact Duration**

This Pact begins when both parties have legally signed it. It expires for the Contractor after the closure of the contract and for all other Bidder's six month after the contract has been awarded.

**Section X - Other Provisions**

- (1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the establishment of MPUVNL.
- (2) Changes and supplements as well as termination notices need to be made in writing.
- (3) 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.
- (4) 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.
- (5) Views expressed or suggestions/submissions made by the parties and the recommendations of the *CVO/IEM*<sup>#</sup> in respect of the violation of this agreement, shall not be relied on or introduced as evidence in the arbitral or judicial proceedings (arising out of the arbitral proceedings) by the parties in connection with the disputes/differences arising out of the subject contract.

*# CVO shall be applicable for packages wherein IEM are not identified in the bidding document IEM shall be applicable for packages wherein IEM are identified in the bidding document.*

- (6) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

(Signature) \_\_\_\_\_

**(For & On behalf of MPUVNL)**

(Office Seal)

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Witness 1 : \_\_\_\_\_

(Name & Address) \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

(Signature) \_\_\_\_\_

**(For & On behalf of Bidder/  
Partner(s) of Joint  
Venture/Consortium/ Contractor)**

(Office Seal)

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Witness 1 : \_\_\_\_\_

(Name & Address) \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Wit

Witness 2 : \_\_\_\_\_

\_\_\_\_\_  
(Name & Ad

\_\_\_\_\_  
(Name & Address) \_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



**Format 7.10: Cover letter for financial bid**

**FORMAT FOR SUBMISSION OF FINANCIAL BID**

*(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 of Consortium)*

\_\_\_\_\_

Tel. #:

Fax #:

E-mail address#

**To**  
**The Managing Director,**  
**Madhya Pradesh Urja Vikas Nigam Ltd**  
**Shivaji Nagar, 5 No Stop, Link Rd 2**  
**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

I/ We, \_\_\_\_\_ *(Insert Name of the Bidder)* enclose herewith the Financial Proposal for selection of my/ firm for the SWPs Category declared in Format 7.1, as Bidder for the above.

I/We have applied for SPWPS to be set up in Madhya Pradesh State under this RfS.

I/We agree that this offer shall remain valid for a period upto the date as on 12 months from the due date of submission of the response to RfS 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. *For each line item (i.e., type of pump), there can be only one price applied for by the Bidder. If the bidder quotes two prices or combination thereof for the line item, then the bid shall be considered as non-responsive.*
2. *If the bidder submits the financial bid in the Electronic Form at mp tenders portal not in line with the instructions mentioned therein, then the bid shall be considered as non-responsive.*
3. *Price requirement shall be quoted as a fixed amount in Indian Rupees only. Conditional proposal shall be summarily rejected.*
4. *In the event of any discrepancy between the values entered in figures and in words, the values entered in words shall be considered.*
5. *Price should be in Indian Rupee up to two decimal places only.*

**Format 7.11: No banning declaration**

**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 Managing Director,  
Madhya Pradesh Urja Vikas Nigam Ltd  
Shivaji Nagar, 5 No Stop, Link Rd 2  
Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

We hereby confirm that we are not on the Banning List by MPUVNL 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, we confirm that neither we nor our allied agency(ies) are on banning list of MPUVNL or the Ministry of New & Renewable Energy.

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

In case it comes to the notice of MPUVNL that we have given wrong declaration in this regard, the same shall be dealt as Fraudulent Practices and we shall be banned by MPUVNL for a period which shall be decided by MPUVNL on case-to-case basis, subject to minimum period of banning being 06 months from the date of issuance of banning order.

Further, 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 MPUVNL by us.

**Format 7.12: Local content declaration**

**DECLARATION FOR THE LOCAL CONTENT**

*(To be submitted on the Letter Head of the Bidder/Lead member)*

Ref. No. \_\_\_\_\_

Date: \_\_\_\_\_

From: \_\_\_\_\_ *(Insert name and address of Bidder)*

Tel. #:

Fax #:

E-mail address#

**To**

**The Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

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 PM- KUSUM scheme issued by MNRE on 22-07-2019 and its subsequent amendment(s).

**We are aware that in accordance with order no. F. No. 283/22/2019-GRID SOLAR dated 09.02.2021 issued by MNRE, only class-I Local Suppliers' are eligible to bid under this RfS. Also, we have carefully gone through the above mentioned order to understand the whole process and definitions of various terms (Class-I Local Supplier, Local Content etc.) pertaining to above referred order and its supporting appendix and annexures as amended till date.**

Further, we hereby undertake that I/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 of the bidder/lead member)

**Format 7.13: Same make as test certificate**  
**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 Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

We are agreeing to accept that the same make of solar panels, pumps, VFD/inverter/controller for which the test report is to be submitted to the Implementing agency, as per **MNRE's latest revised solar pump testing procedure issued in 2023** and amendments thereof, will be supplied by us.

In case, if some different make of solar panels, pumps, VFD/inverter/controller will be supplied during the implementation or AMC period, we will submit the test report for that particular make component(s). 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 7.14: Test certificate as per MNRE specifications**  
**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 Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

We are agreeing to accept that the test certificates are to be submitted to the Implementing Agency, reports as per **MNRE's revised** technical specifications and testing procedures issued in **2023(latest)** and amendments thereof, will be submitted by us as per RFS conditions. 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 7.15: MeitY compliance**

**CERTIFICATE REGARDING COMPLIANCE OF MeitY NOTIFICATION VIDE**

**FILE NO. 1(10)/2017-CLESdt. 02.07.18**

*(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 Managing Director,**

**Madhya Pradesh Urja Vikas Nigam Ltd**

**Shivaji Nagar, 5 No Stop, Link Rd 2**

**Bhopal 462016**

Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.

Dear Sir/ Madam,

This is to certify that the products/items being offered/ quoted against ref. RfS by M/s..... meet the definition of domestically manufactured/produced Cyber Security Products as per Para 4 of MeitY notification vide File no. 1(10)/2017-CLES dt. 02.07.18 and amendments thereof and the bidder shall strictly abide by all provisions of the subject notification.

(Name and Signature of the Authorized Signatory)

## **Format 7.16: Price bid**

### **FORMAT FOR SUBMISSION OF PRICE BID**

Price bid shall be submitted as per format/ template provided at **mptenders.gov.in** portal. Any price bid or pricing information submitted in hard copy or with technical bid shall be summarily rejected.

#### **Important 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 Madhya Pradesh E Tender 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.*



**PRICE BID SCHEDULE**

<b>S. No.</b>	<b>Category of Pump Quoted for</b>	<b>Controller Type</b>	<b>Unit Rate (In Rs) (inclusive of all , duties, insurance and any other taxes Except GST )</b>
1.	1 HP DC Surface	Normal (Without USPC)	<i>Sample (To be Filled Online Only)</i>
2.	1 HP DC Submersible	Normal (Without USPC)	
3.	2 HP DC Surface	Normal (Without USPC)	
4.	2 HP DC Submersible	Normal (Without USPC)	
5.	3 HP DC Submersible	Normal (Without USPC)	
6.	3 HP DC Submersible	with USPC	
7.	5 HP DC Submersible	Normal (Without USPC)	
8.	5 HP DC Submersible	with USPC	
9.	7.5 HP AC Submersible	Normal (Without USPC)	
10.	7.5 HP DC Submersible	Normal (Without USPC)	
11.	7.5 HP AC Submersible	with USPC	
12.	7.5 HP DC Submersible	with USPC	

**Format 7.17: Preliminary cost estimate**

**PRELIMINARY ESTIMATE OF COST OF SPWPS**

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

**Bidder Name:** .....

**State Name:** .....

**Capacity (HP):** .....

**Type (AC/DC):** .....

**Category (Surface/Submersible):** .....

**Controller (without USPC/With USPC):** .....

**Module Type (with DCR Cell/Non-DCR Cell):** .....

<b>S. No.</b>	<b>Particulars</b>	<b>Estimated Cost</b> (In Lakhs INR) (exclusive of GST)
1.	System Cost	<p style="text-align: center;"><i>Sample</i> <i>Not to be Submitted with response to bid.</i></p> <p style="text-align: center;"><i>To be submitted by all the empanelled bidders before signing of Contract Agreement with MPUVNL</i></p>
	<i>i. Module</i>	
	<i>ii. Pump</i>	
	<i>iii. Controller</i>	
	<i>iv. Module Mounting Structure (MMS)</i>	
	<i>v. Balance of System (BoS)</i>	
2.	Transportation Cost	
3.	Installation Cost	
4.	5-year EMC Cost	
5.	5-year Insurance Cost	
6.	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.

## Format 7.18: Self certificate for test reports

### DECLARATION (Self - Certification) REGARDING THE DIFFERENT MODELS OF SOLAR WATER PUMPING SYSTEMS SPECIFIED IN THE MNRE SPECIFICATION FOR THE PARTICULAR CATEGORY/TYPE OF THE PUMPS

*(To be provided on the letter head of the bidder or lead member at the time of bid submission)*

Ref No. \_\_\_\_\_

Date: \_\_\_\_\_

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

\_\_\_\_\_

Tel.#:

Fax#:

E-mail address#

To

**The Managing Director,**

**Madhya Pradesh Urja Vikas**

**Nigam Ltd Shivaji Nagar, 5 No**

**Stop, Link Rd 2 Bhopal 462016**

**Sub: Response to RfS No. \_\_\_\_\_ dated \_\_\_\_\_ for \_\_\_\_\_.**

Vide this declaration this is to certify that that M/s..... (Name of the Bidder) has all the models(*e.g. Model-3, Model-4 & Model-5, it is mentioned w.r.t. 3HP-DC-Submersible pump*) of the Solar Water Pumping System as specified in the table, category/type-wise of the pumps as per the MNRE revised specifications issued in 2023 (latest), for which the firm is participating in the bid for the various categories, **and will furnish the required test reports and details of the models specified: Shut Off-Head (meters), Dynamic-Head (meters), Water output (Liters per day), No. of stages in the model, diameter of each stage of the respective model, Diameter of the discharge pipe (in inches) to MPUVNL at the time of signing of agreement with MPUVNL for supply of such pumps.**

#### **Table**

The details of the different models which are to be supplied by the firm:

S. No.	Type /Category of Pump	Controller Type	Model No. as per MNRE specification to be supplied by the firm	Participation (Yes/No) No/Blank cell will be assumed as No Only
1.	1 HP DC Surface	Normal (Without USPC)	Model -1 Shallow Well (Surface) with DC motor pump set (Brushless)	
2.	1 HP DC Submersible	Normal (Without USPC)	Model – 1 Solar Deep Well (Submersible) with DC motor pump set	
3.	2 HP DC Surface	Normal (Without USPC)	Model -2 Shallow Well (Surface) with DC motor pump set	
4.	2 HP DC Submersible	Normal	Model – 2	

		(Without USPC)	Solar Deep Well (Submersible) with DC motor pump set	
5.	3 HP DC Submersible	Normal (Without USPC)	Model – 3 , 4 & 5 Solar Deep Well (Submersible) with DC motor pump set	
6.	3 HP DC Submersible	with USPC	As per MNRE Specifications (Latest) issued in 2023	
7.	5 HP DC Submersible	Normal (Without USPC)	Model – 6 , 7 & 8 Solar Deep Well (Submersible) with DC motor pump set	
8.	5 HP DC Submersible	with USPC	As per MNRE Specifications (Latest) issued in 2023	
9.	7.5 HP AC Submersible	Normal (Without USPC)	Model – 9 , 10 & 11 Solar Deep Well (Submersible) with AC Induction Motor Pump Set	
10 .	7.5 HP DC Submersible	Normal (Without USPC)	Model – 9 , 10 & 11 Solar Deep Well (Submersible) with DC motor pump set	
11 .	7.5 HP AC Submersible	with USPC	As per MNRE Specifications (Latest) issued in 2023	
12 .	7.5 HP DC Submersible	with USPC	As per MNRE Specifications (Latest) issued in 2023	

I, ....., on behalf of M/s..... (Name of the Bidder) am aware, without any doubt, that any deviation of the above information with the information provided to MPUVNL, at the time of signing of agreement would invite penalties such as forfeiture of EMD by MPUVNL and/or blacklisting of firm for the period of 5 years from the date of the issue of the Notice for the blacklisting.

Thanking you,

We

remain,

Yours

faithfully,

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

## **Format 7.19: Contract agreement**

### **DRAFT OF CONTRACT AGREEMENT**

THIS CONTRACT AGREEMENT is made the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_.

BETWEEN

(1) Department of Madhya Pradesh Urja Vikas Nigam Ltd., (M.P.) having its registered office at Urja Bhawan, Link No.02, Shivaji Nagar, Bhopal 462016 (hereinafter called “the Employer”), and

(2) \_\_\_\_\_, a company/ LLP firm/ partnership firm/ sole proprietor incorporated under the laws of India and having its registered office at \_\_\_\_\_, being lead member of JV/ consortium (if applicable) (hereinafter called “the Contractor”).

WHEREAS the Employer desire to engage the contractor for Design, Manufacture, Supply, Erection, Testing and Commissioning of \_\_\_\_\_nos. of Stand-alone Off Grid Solar Photovoltaic Water Pumping Systems of 1-7.5 HP in Madhya Pradesh including complete system warranty, insurance and its repair and maintenance for 5 Years as per MNRE guidelines, specifications and applicable BIS standards.

NOW IT IS HEREBY AGREED as follows:

#### **Article Documents 1**

##### 1.1 Contract

The following contract documents shall constitute the Contract between the Employer and the Contractor, and each shall be read and construed as an integral part of the Contract:

1. Employer RFS No. \_\_\_\_\_
2. Pre-Bid meeting held on \_\_\_\_\_ at Employer Corporate Office
3. Employer Amendment/Clarification No. 1 dated \_\_\_\_\_
4. Contractor technical offer no. \_\_\_\_\_ opened on \_\_\_\_\_
5. Contractor acceptance on price no. \_\_\_\_\_ dated \_\_\_\_\_
6. Employer LICA No.....dated.....

##### 1.2 Order of Precedence

In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above.

##### 1.3 Definitions

Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions of the Contract.

#### **Article 2. Contract Price and Payment**

##### 2.1 Contract Price

The Employer hereby agrees to pay to the Contract Price as tabulated below:

S. No.	Category of Pump Quoted for	Controller Type	Contract Price, inclusive of all cess, duties, charges, other taxes excluding GST (INR/pump)
1.	1 HP DC Surface	Normal (Without USPC)	
2.	1 HP DC Submersible	Normal (Without USPC)	
3.	2 HP DC Surface	Normal (Without USPC)	
4.	2 HP DC Submersible	Normal (Without USPC)	
5.	3 HP DC Submersible	Normal (Without USPC)	
6.	3 HP DC Submersible	with USPC	
7.	5 HP DC Submersible	Normal (Without USPC)	
8.	5 HP DC Submersible	with USPC	
9.	7.5 HP AC Submersible	Normal (Without USPC)	
10.	7.5 HP DC Submersible	Normal (Without USPC)	
11.	7.5 HP AC Submersible	with USPC	
12.	7.5 HP DC Submersible	with USPC	

(for which you have qualified) Order inclusive of all inland transportation including loading, unloading, transfer of site, P & F charges insurance and other costs incidental to delivery and execution of work as per RFS/ LICA/ LOA/ NTP etc. and exclusive of GST only. Billing to be done from Madhya Pradesh State with local GST.

## 2.2 Terms of Payment

The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in RFS no .....

## Article 3 Effective Date for Determining Time for Completion

### 3.1 Effective Date

Following conditions shall be fulfilled within a period of 30 days from the date of said LICA:

- (a) This Contract Agreement has been duly executed for and on behalf of the Employer and the Contractor;
- (b) Test report has been submitted as per RFS.

(c) Any other documents as desired in LICA

Each party shall use its best efforts to fulfill the above conditions for which it is responsible as soon as practicable.

3.2 If the conditions listed under 3.1 are not fulfilled within 30 days from the date of LICA because of reasons attributable to the Employer, the Contract would become effective only from the date of fulfillment of all the above mentioned conditions and, the Time for Completion and/or other relevant conditions of the Contract.

3.3 However, if any of the conditions listed under 3.1 above are not fulfilled month from the date of Letter of Award because of reasons attributable to the Contractor, the Contract will be effective from the date of Letter of Award. In this case, Contract price and/or time for completion shall not be adjusted.

#### **Article 4.**

It is expressly understood and agreed by and between the Contractor and Employer that the Employer is entering into this Agreement solely on its own behalf and not on behalf of any other person or entity. In particular it is expressly understood and agreed that the Govt. of India is not a party to this Agreement and has no liabilities, obligations or rights hereunder. It is expressly understood and agreed that the Employer is an Independent legal entity with power and authority to enter to contracts solely on its own behalf under the applicable laws of India and the general principles of Contract Law. The Contractor expressly agrees, acknowledges and understands that the Employer is not an Agent, Representative or Delegate of the Govt. of India. It is further understood and agreed that the Govt. of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Contract. Accordingly, the Contractor expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Govt. of India arising out of this contract and covenants not to sue the Govt. of India as to any manner, claim, cause of action or thing what so ever arising of or under this Agreement.

#### **Article 5.**

#### **Appendices**

The Appendices listed in the attached list of Appendices shall be deemed to form and integral part of this Contract Agreement.

Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to the duly executed by their duly authorized representatives the day and year first above written.

Signed by for and on behalf of the Employer	<b>(To be signed only by the authorized signatory to whom authorization is given in Power of Attorney) contractor</b>
---	---

Name and Signature of Witness-1	Name and Signature of Witness-2
Signature:	Signature:
Designation:	Designation:
Address:	Address:

**CONTRACT AGREEMENT**

dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**BETWEEN**

[“Madhya Pradesh Urja Vikas Nigam Ltd., (M.P.) having its registered office at Urja Bhawan, Link No.02, Shivaji Nagar, Bhopal 462016 (M.P.)”]

and

\_\_\_\_\_.

[“the Contractor”]

**APPENDICES**

Appendix 1: Term and Procedures of Payment- AS PER RFS NO. - \_\_\_\_\_ dated \_\_\_\_\_

Appendix 2: Bidder’s response to RFS no. \_\_\_\_\_, including all amendments and submissions

Appendix 3: Insurance – ON VENDOR’s ACCOUNT

Appendix 4: Time Schedule – AS PER RFS NO. \_\_\_\_\_ - \_\_\_\_\_ dated \_\_\_\_\_.

Appendix 5: Bidder’s acceptance to RFS and its amendments

Appendix 6: Scope of Works and Services – AS PER LOA/ NTP NO. \_\_\_\_\_ - \_\_\_\_\_ dated \_\_\_\_\_.

Appendix 7: List of Documents for Approval or Review – AS PER LICA/ LOA No. \_\_\_\_\_ dated \_\_\_\_\_.

Appendix 8: Functional Guarantees: AS PER RFS/ NTP No. \_\_\_\_\_ dated \_\_\_\_\_.



**Annexure – A: Technical specifications as per MNRE**  
**TECHNICAL SPECIFICATIONS OF SOLAR WATER PUMPING SYSTEM**

Attached separately to the RfS

**Annexure – B: RMS specifications**

**RMS SPECIFICATIONS OF SOLAR WATER PUMPING SYSTEM**

Attached separately to the RfS

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F. No. 41/3/2018-SPV Division  
Government of India / भारत सरकार  
Ministry of New & Renewable Energy / नवीन एवं नवीकरणीय ऊर्जा मंत्रालय  
\*\*\*\*\*

Atal Akshay Urja Bhawan (AAUB),  
Lodhi Road, Near CGO Complex  
New Delhi -110003  
Date: 22-03-2023

**Office Memorandum**

Subject: Updated Specification and Testing Procedures for the Solar Photovoltaic (SPV) Water Pumping System and Universal Solar Pump Controller (USPC).

This has reference to the specification and testing procedures for the Solar Photovoltaic (SPV) Water Pumping System and Universal Solar Pump Controller (USPC) issued by this Ministry vide OM of even number dated 02.02.2023. In supersession of the above OM and its enclosures, revised specifications and testing procedures are hereby issued for the information of all concerned, as under:

- i) Specification for the SPV water pumping system. (Annexure-A)
- ii) Testing procedure for the SPV water pumping system. (Annexure-B)
- iii) USPC specification and testing procedure. (Annexure-C)

  
(Shobhit Srivastava)  
Scientist-D

To:  
All concerned.

## **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 (0.75kW) 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 the of pump set.

**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<sup>2</sup> on 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-Pump set 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, remote monitoring, 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

#### 3.1 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-pump set using pump controller.

**3.2 A SPV Water Pumping system** typically consists of:

**3.2.1 Motor Pump Set** see 3.4.

**3.2.2 SPV Pump Controller**

#### Specifications of Controller/Drive for Solar Water Pumping Systems

S.No	Requirement	Specifications
1.	<i>Controller Power Capacity to drive the Pump</i>	Controller Power Capacity should be at-least equal to Solar Panels Power Capacity (Wp), not Pump Capacity. Example: For <b>5HP</b> pumps, the pump capacity will be 3750W as per MNRE Specs, the solar panel capacity will be at-least 4800Wp the controller capacity should match the solar panel capacity.
2.	<i>Point Tracking (MMPT)</i>	Should track power only and not Voltage at Maximum power point.
3.	<i>Enclosure</i>	The Controller with RMS must have <b>IP65</b> protection.
4.	<i>Isolator Switch</i>	Should be between Solar panels and the controller.
5.	<i>RMS (GSM/GPRS connectivity)</i>	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-Pump set.

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-Pump Set.
----	---------------------------	--

**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 10min; 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 22500Wp**, 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  $\pm 3$  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-Pump Set**

**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-pump set.
- c) Any other type of the motor-pump set after approval from Ministry.

### **3.4.2 Motor**

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

- a) AC Induction Motor.
- b) DC Motor, PMSM/ SRM.



**3.4.3** The “Motor-Pump Set” should have a capacity in the range of 1 HP (0.75 kW) to 25 HP (18.75kW) and should have the following features:

- a) The closed coupled or mono block DC/ AC centrifugal motor-pump set with appropriate mechanical seal(s) which ensures zero leakage.
- b) The motor of the capacity ranging from 0.75kW to 18.75kW shall be AC/DC. The suction and 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 6911 and IS 3444. The motor pump set 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-Pump set. 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 pump set 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 piling, 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 the stress 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-pump set 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-pump set. Selection of the cable shall be as per IS 14536.

**3.6.6** 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-Pump Set.

### **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-pump set 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  $6 \text{ mm}^2$ .
- 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 arrester to the earth electrode should be no less than  $16 \text{ mm}^2$  Cu or  $25 \text{ mm}^2$  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 equipotentially 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-pump-set, 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  $7.15 \text{ kWh} / \text{sq.m.}$  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 D.C. Motor Pump Set:**

- i) 110 liters of water per watt peak of PV array, from a Total Dynamic Head of 10 meters (Suction head, if applicable, minimum of 7 meters static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 12 meters.
- ii) 55 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 meters (Suction head, if applicable, minimum of 7-meters static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 25 meters.

- iii) 38 liters 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 meters.
- iv) 23 liters of water per watt peak of PV array, from a Total Dynamic Head of 50 meters and the shut off head being at least 70 meters.
- v) 15 liters of water per watt peak of PV array, from a Total Dynamic Head of 70 meters and the shut off head being at least 100 meters.
- vi) 10.5 liters of water per watt peak of PV array, from a Total Dynamic Head of 100 meters and the shut off head being at least 150 meters.
- vii) 9.5 liters of water per watt peak of PV array, from a Total Dynamic Head of 120 meters and the shut off head being at least 180 meters.
- viii) 7.5 liters of water per watt peak of PV array, from a Total Dynamic Head of 150 meters and the shut off head being at least 225 meters.
- ix) 5.5 liters of water per watt peak of PV array, from a Total Dynamic Head of 200 meters and the shut off head being at least 300 meter.
- x) 4.5 liters 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 meters.

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 A.C. Induction Motor Pump Set:**

- i) 99 liters of water per watt peak of PV array, from a Total Dynamic Head of 10 meters (Suction head, if applicable, minimum of 7-meters static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 12 meters.
- ii) 49 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 meters (Suction head, if applicable, minimum of 7-meters static suction lift corrected for atmospheric pressure and water temperature) and with the shut off head being at least 25 meters.
- iii) 35 liters 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 meters.
- iv) 21 liters of water per watt peak of PV array, from a Total Dynamic Head of 50 meters and the shut off head being at least 70 meters.

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

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-pump set 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-pump set 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-pump set 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<sup>2</sup> 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-pump set and Controller used in SPV Water Pumping Systems shall be securely marked with the following parameters declared by the manufacturer:

### **7.1.1 Motor-Pump set**

- a) Manufacturer's name, logo or trade-mark;
- b) Model, size and SI No of pump-set (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-Pump set;
- 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 the local language, should be provided with the solar PV water pumping system. The Manual should have information about solar energy, photovoltaic, modules, DC/AC motor-pump set, tracking system, mounting structures, electronics and 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 pump set should also be provided to the beneficiary.

## **9 COMPREHENSIVE OPERATION AND MAINTENANCE**

- i. The Contractor 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 & greasing of motor pump sets, 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 1):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.

### 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 10m 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 worn 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.

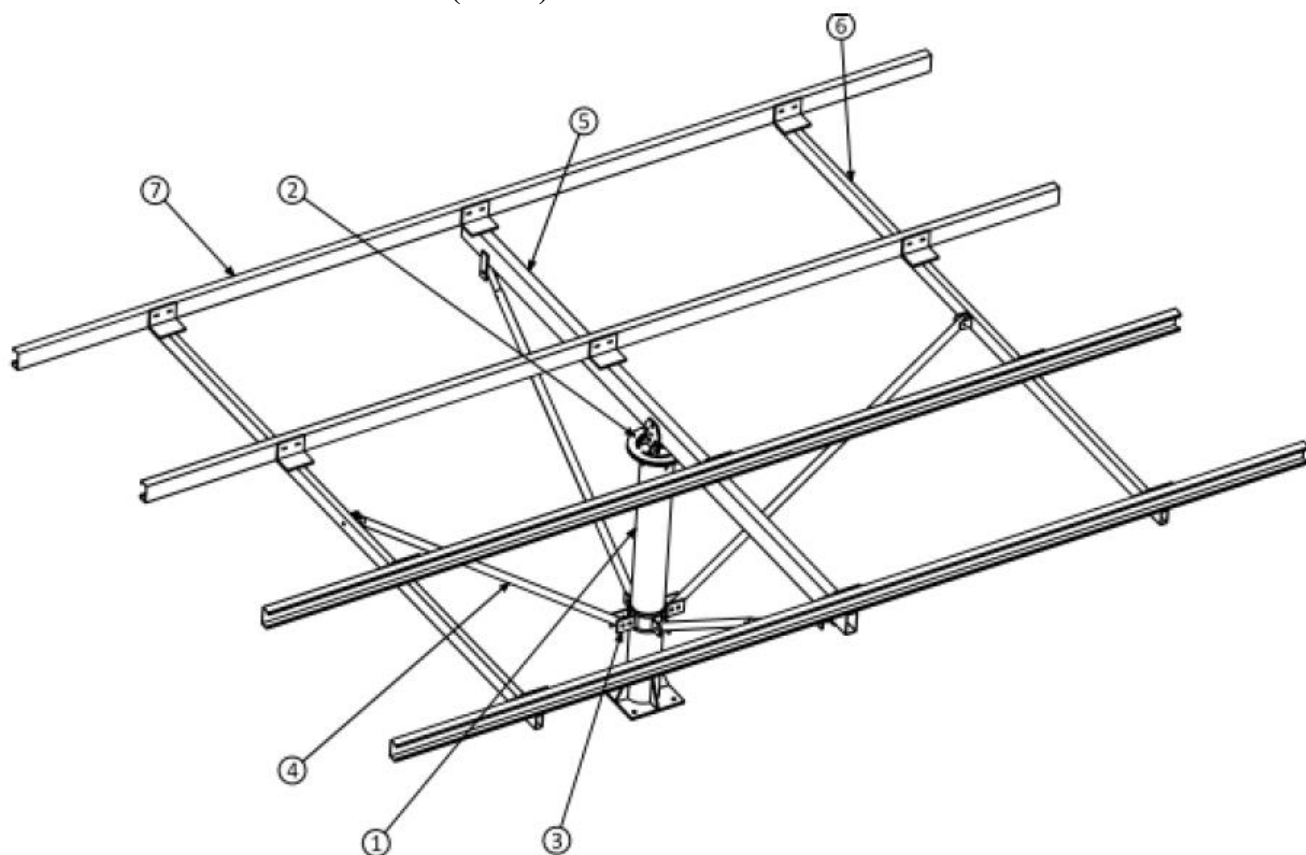
- ii. As a part of IoT protocol, Authentication and Authorization should be implemented using a token/password mechanism
- e. **Message Format:** RMS should provide data in a JSON message format as per requirement of implementing agency.
- f. **Data Storage:** In case of unavailability of cellular network, 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 software shouldn't disrupt pumping operations.

**RMS should be connected to the Solar Energy Data Management Platform of 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/or failure 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.**

**SPECIFICATIONS FOR DUAL AXIS MANUAL TRACKING TYPE MODULE MOUNTING STRUCTURE (MMS) FOR SPV WATER PUMPING SYSTEM**



<b>Main Parts of MMS for Solar Water Pumping System</b>		
<i>Sl No.</i>	<i>Part Name</i>	<i>Qty./Set</i>
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:

- Minimum coating required shall be as per IS 4759;
- Preece test (CuSO<sub>4</sub> Dip test) as per IS 2633;
- Mass of zinc (IS 6745 or IS 4759); and
- 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 and standard 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

**B-2 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 piling 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 2mm.

### **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:

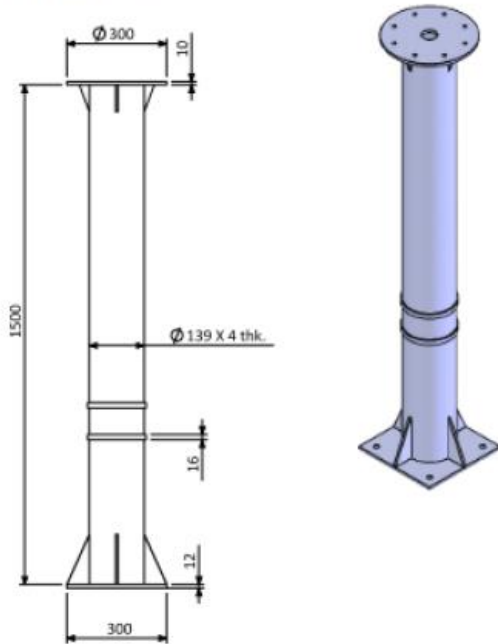
- a) Weld wire grade shall be of grade (ER 70 S-6); and
- b) D.P. test (pin hole/crack) (IS 822).

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

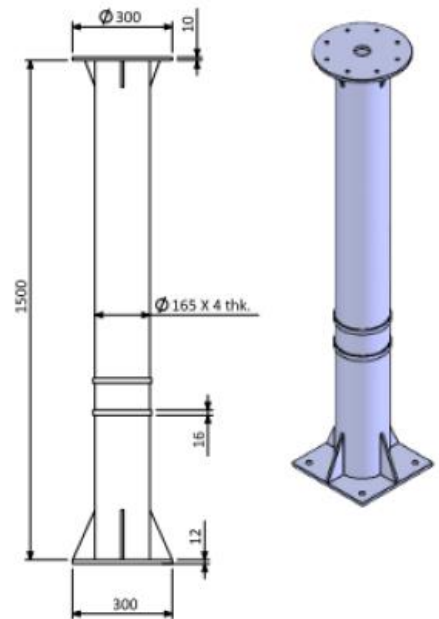
- a) Minimum coating required shall be as per IS 4759;
- b) Testing of galvanized material;
- c) Preece test (CuSO<sub>4</sub> dip test) (IS 2633);
- d) Mass of zinc (IS 6745 or IS 4759); and
- e) Adhesion test (IS 2629).

## Part 1 Main Column

Common for 4, 6 and 8 MMS



For 10 MMS

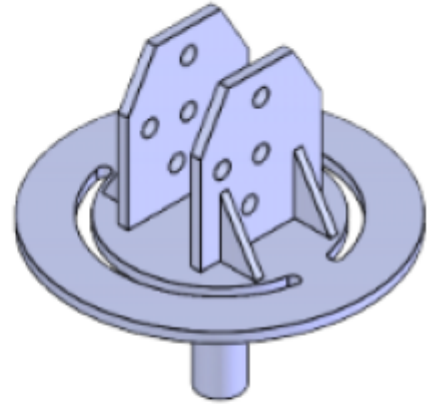
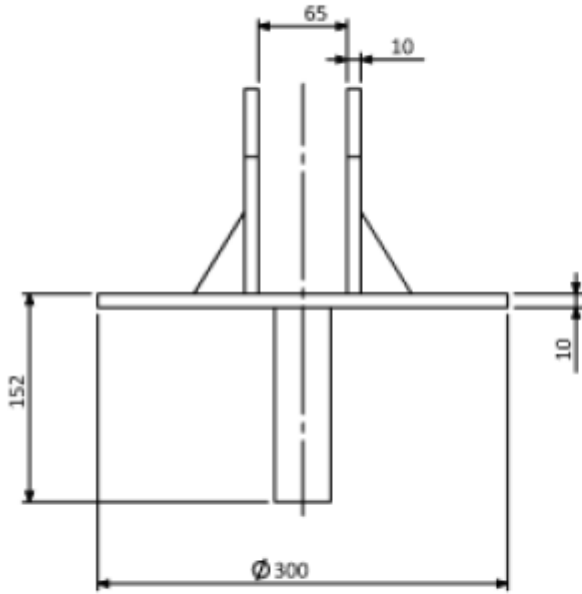


All dimensions are in mm.

Sl No.	Part Name	Cross Section Detail	Length (mm)	Quantity Per Set
<b>1.</b>	<b>MAIN POLE</b>			
	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

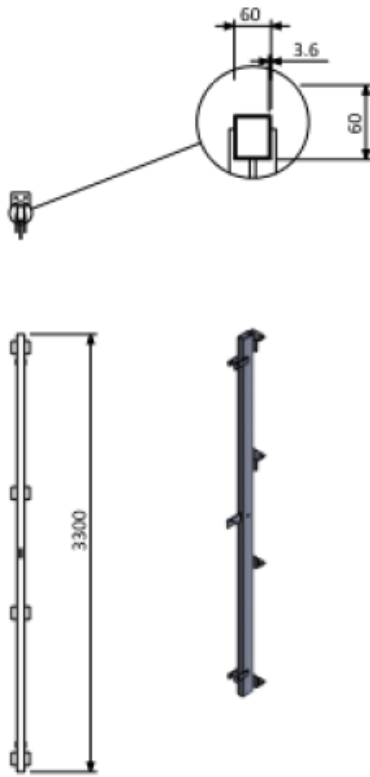


All dimensions are in mm.

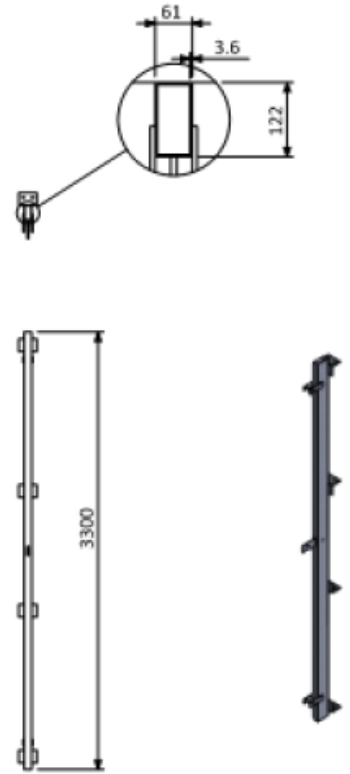
<i>Sl No.</i>	<i>Part Name</i>	<i>Cross Section Detail</i>	<i>Length (mm)</i>	<i>Quantity Per Set</i>
2.	TOP PLATE (Common for all)	300 OD	—	1

## Part 3 Main Tube

Common for 4 and 6 MMS



Common for 8 and 10 MMS



All dimensions are in mm.

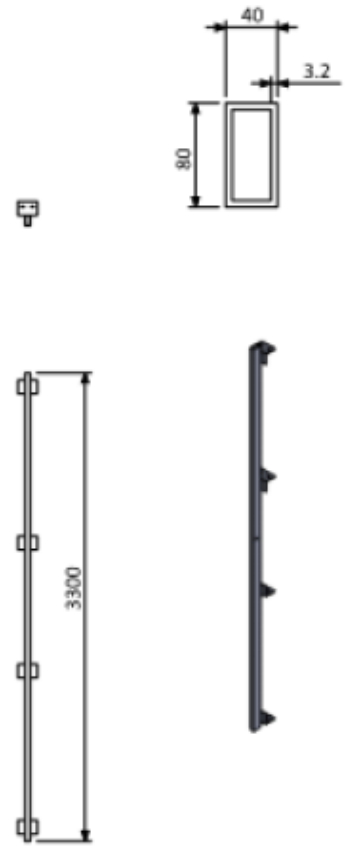
<i>Sl No.</i>	<i>Part Name</i>	<i>Cross Section Detail</i>	<i>Length (mm)</i>	<i>Quantity Per Set</i>
5.	MAINTUBE			
	4 and 6 Modules	60 × 60 × 3.6	3300	1
	8 and 10 Modules	112 × 61 × 3.6	3300	1

## Part 4 Side Tube

Common for 4 and 6 MMS



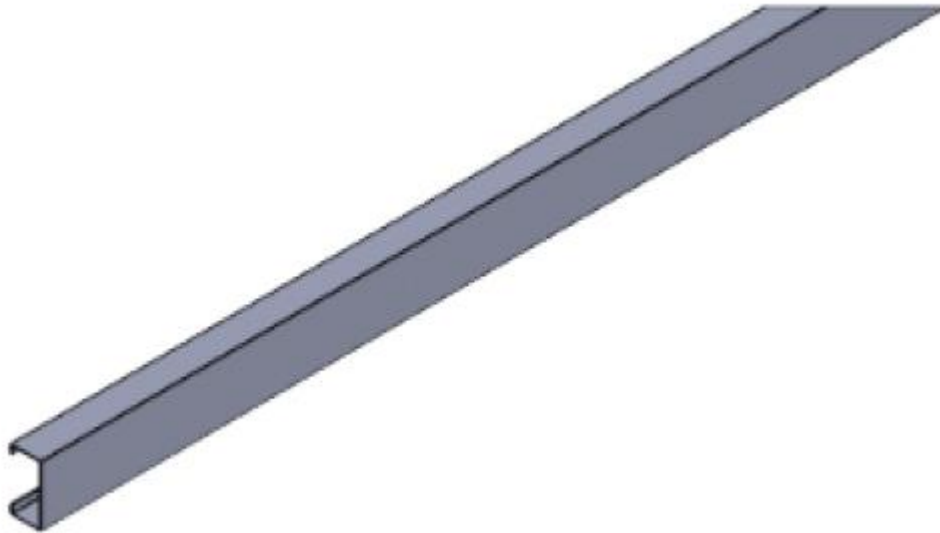
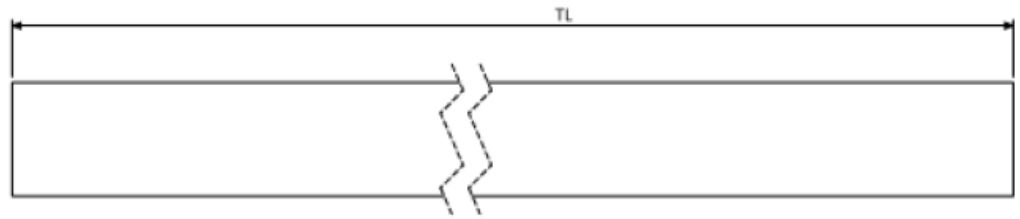
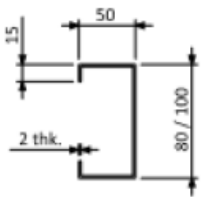
Common for 8 and 10 MMS



All dimensions are in mm.

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

### Part 5 Purlin



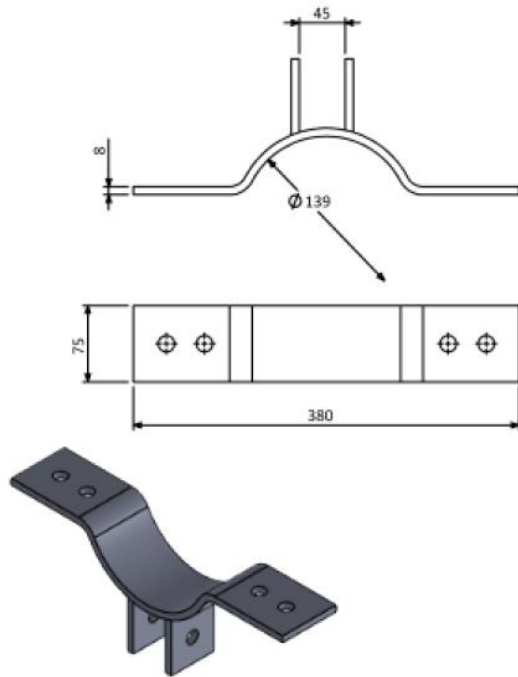
All dimensions are in mm.

<i>Sl No.</i>	<i>Part Name</i>	<i>Cross Section Detail</i>	<i>Length (mm)</i>	<i>Quantity Per Set</i>
<b>7.</b>	<b>MOUNTING PURLIN</b>			
	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

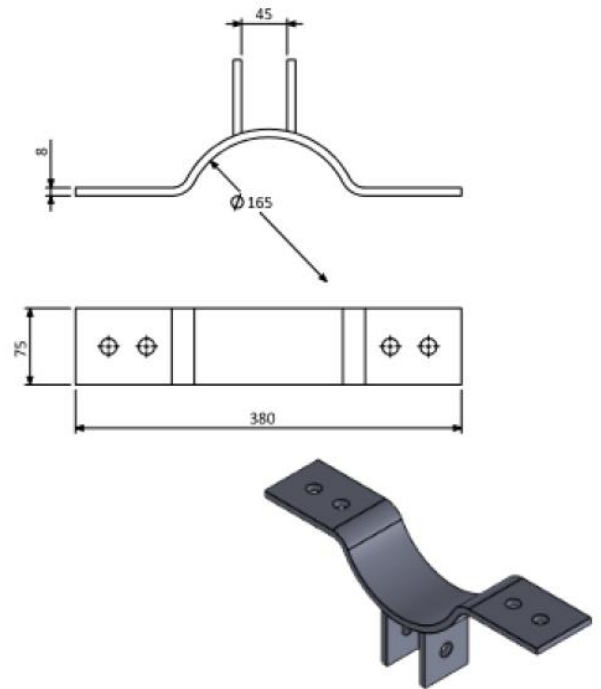


## Part 6 Clamp with Blade

Common for 4, 6 and 8 MMS



For 10 MMS

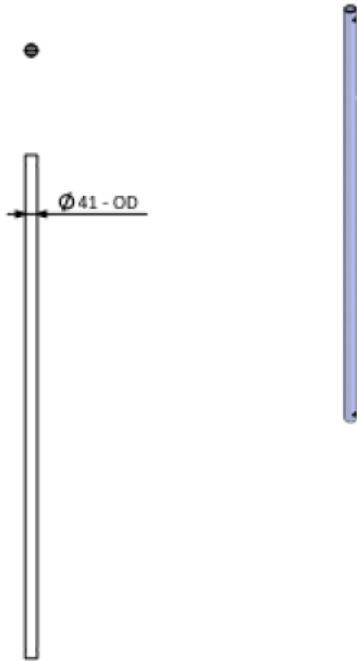


All dimensions are in mm.

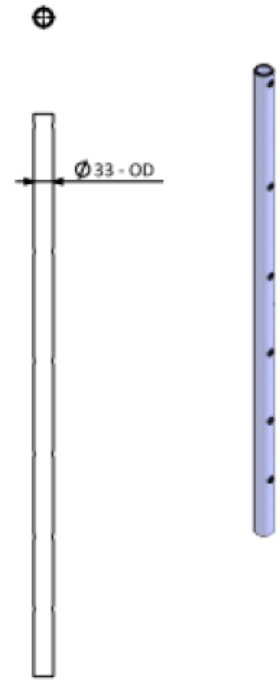
<i>Sl No.</i>	<i>Part Name</i>	<i>Cross Section Detail</i>	<i>Length(mm)</i>	<i>Quantity Per Set</i>
<b>3.</b>	<b>CLAMP WITH BLADE</b>			
	4, 6 and 8 Modules (For 139 OD Pole)	75 × 8	380	2
	10 Modules (For 165 OD Pole)	75 × 8	380	2

## 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

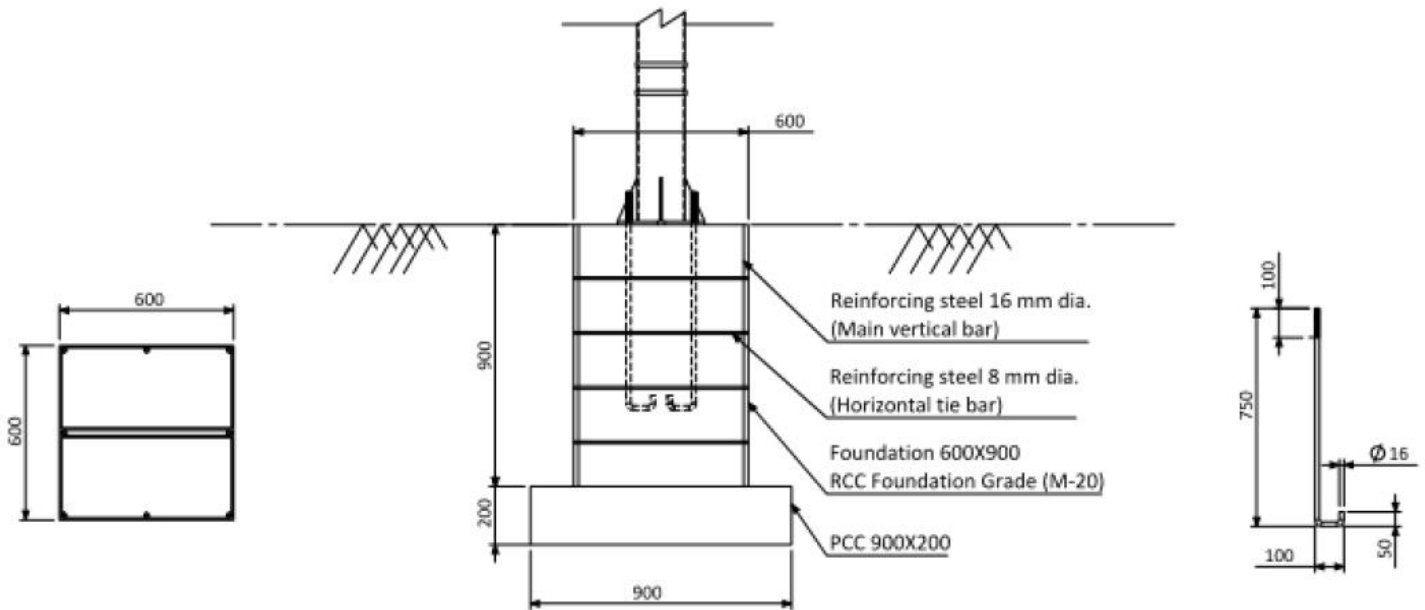


All dimensions are in mm.

### Main-Parts of MMS for SPV Water Pumping System

<i>Sl No.</i>	<i>Part Name</i>	<i>Cross Section Detail</i>	<i>Length (mm)</i>	<i>Quantity Per Set</i>	<i>Material Grade</i>
1.	<b>MAIN COLOUMN</b>				
	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.	<b>TOP PLATE (Common for all)</b>				
	—	300 OD	—	1	YST – 240 as per IS 1161/IS 1239 and E250 as per IS 1079/IS 2062
3.	<b>MAIN TUBE</b>				
	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.	<b>SIDE TUBE</b>				
	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.	<b>MOUNTING PURLIN</b>				
	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.	<b>CLAMP WITH BLADE</b>				
	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.	<b>SUPPORTING PIPES</b>				
	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

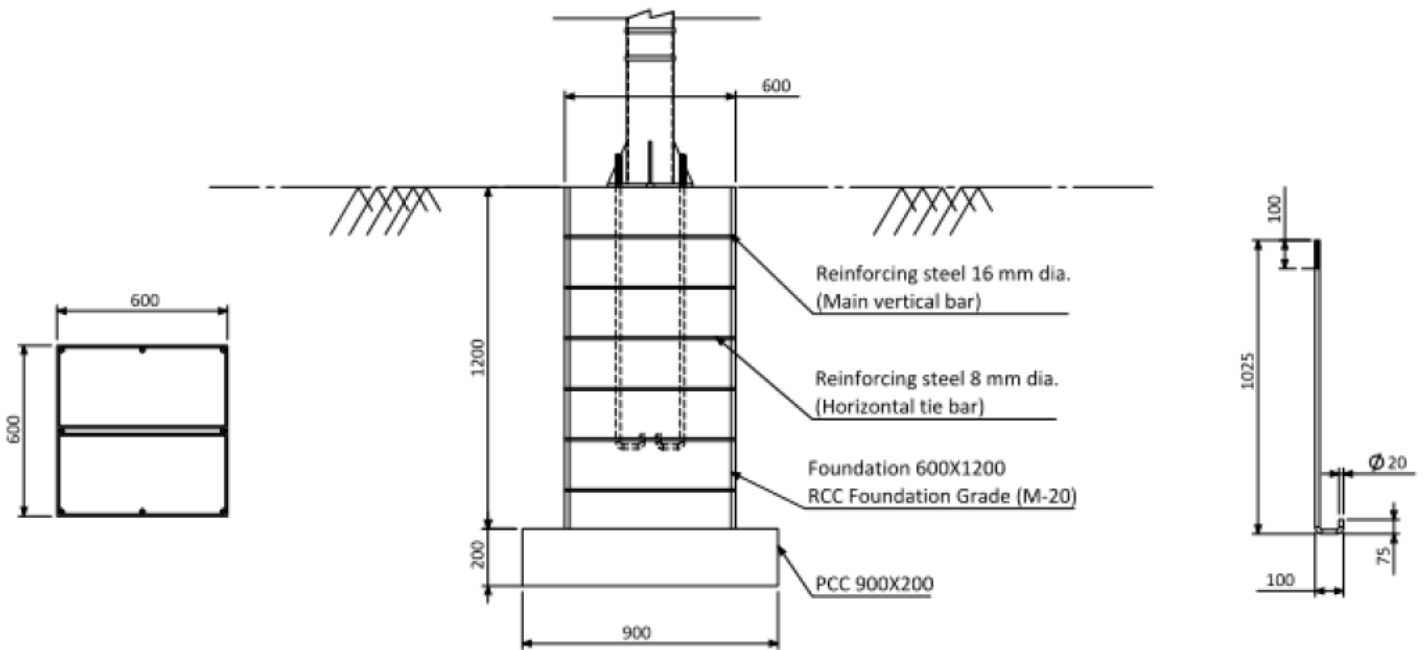


All dimensions are in mm.

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

<b>BOM For RCC and PCC</b>				
<i>Block</i>	<i>Width (m)</i>	<i>Length (m)</i>	<i>Height (m)</i>	<i>Volume (m<sup>3</sup>)</i>
RCC Column	0.600	0.600	0.900	0.324
PCC	0.900	0.900	0.200	0.162

## Foundation Design for 8 MMS

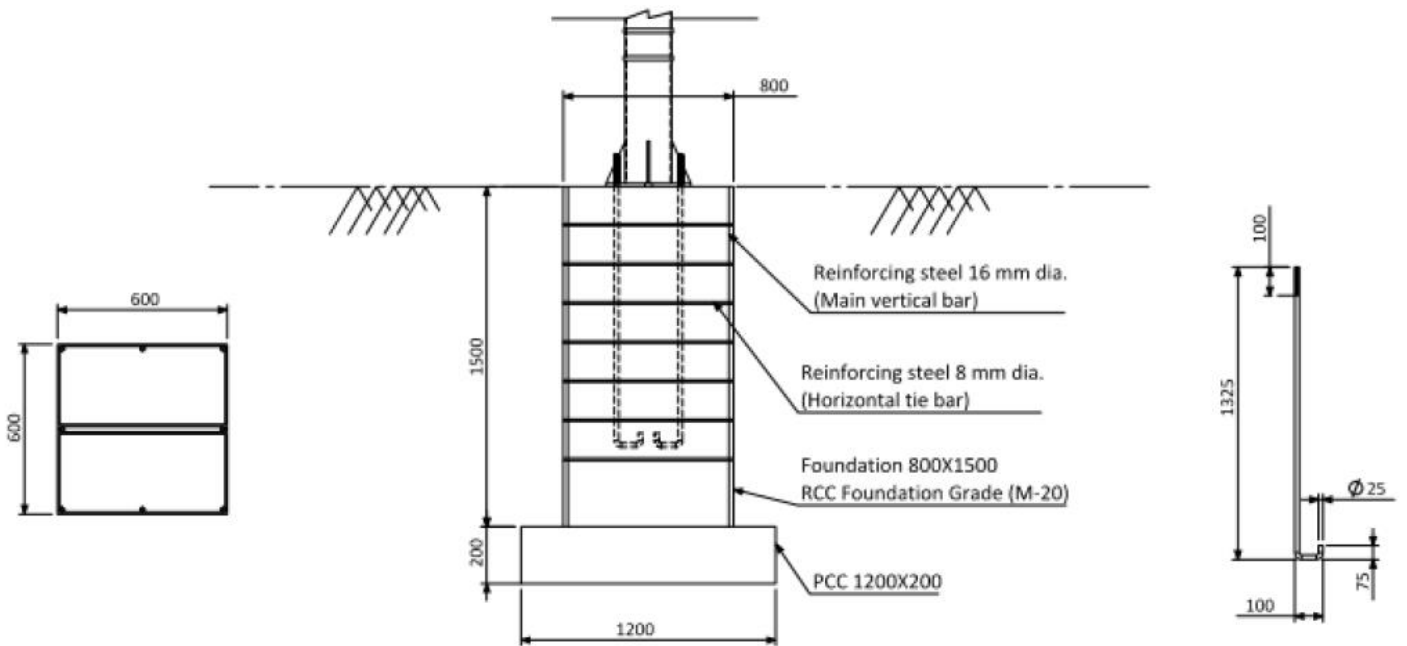


All dimensions are in mm.

<b>BOM For Steel</b>				
<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)
16	1300	2.050	8	16.4
8	2400	0.950	6	5.7
8	1250	0.500	6	3

<b>BOM For RCC and PCC</b>				
<i>Block</i>	<i>Width</i> (m)	<i>Length</i> (m)	<i>Height</i> (m)	<i>Volume</i> (m <sup>3</sup> )
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.

<b>BOM For Steel</b>				
<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)	<i>TMT Bar</i> (mm)
16	1800	2.500	8	20.0
8	3200	1.250	7	8.75
8	1650	0.650	7	4.55

<b>BOM For RCC and PCC</b>				
<i>Block</i>	<i>Width</i> (m)	<i>Length</i> (m)	<i>Height</i> (m)	<i>Volume</i> (m <sup>3</sup> )
RCC Column	0.800	0.800	1.500	0.960
PCC	1.200	1.200	0.200	0.288

**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-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) *	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.
3. 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:

<b>Table 1 – Parameters</b>		
<b>Parameter</b>	<b>Symbol</b>	<b>Unit</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
Array voltage (d.c.)	$V_a$	V
Array current (d.c.)	$I_a$	A
Array open circuit voltage (d.c.)	$V_{oc}$	V
Array short circuit current (d.c.)	$I_{sc}$	A
Array maximum power point voltage(d.c.)	$V_{mpp}$	V
Array maximum power point current (d.c.)	$I_{mpp}$	A
Pressure as measured	$p$	kg/cm <sup>2</sup>
Flow rate	$Q$	lps /lpm /m <sup>3</sup> /h
Motor voltage d.c or a.c	$V_m$	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	$\cos\phi$	-
AC frequency (or d.c switching frequency)	$F$	Hz
Motor speed	$N$	Min <sup>-1</sup>
Radiation	$E_e$	W/m <sup>2</sup>
Temperature	$T$	°C

## 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 precision (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.

<b>Table 2 - Core Parameters to be Measured and Recorded</b>			
<b>Parameter</b>	<b>Symbol</b>	<b>Unit</b>	<b>Measurement Uncertainty</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
SPV Array voltage	$V_a$	V	≤1 percent
SPV Array current	$I_a$	A	≤1 percent
Pressure/head as measured	$p$	Kg/cm <sup>2</sup>	≤2 percent
Flow rate	$Q$	lps	≤2 percent
Solar irradiance	$E_e$	W/m <sup>2</sup>	≤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

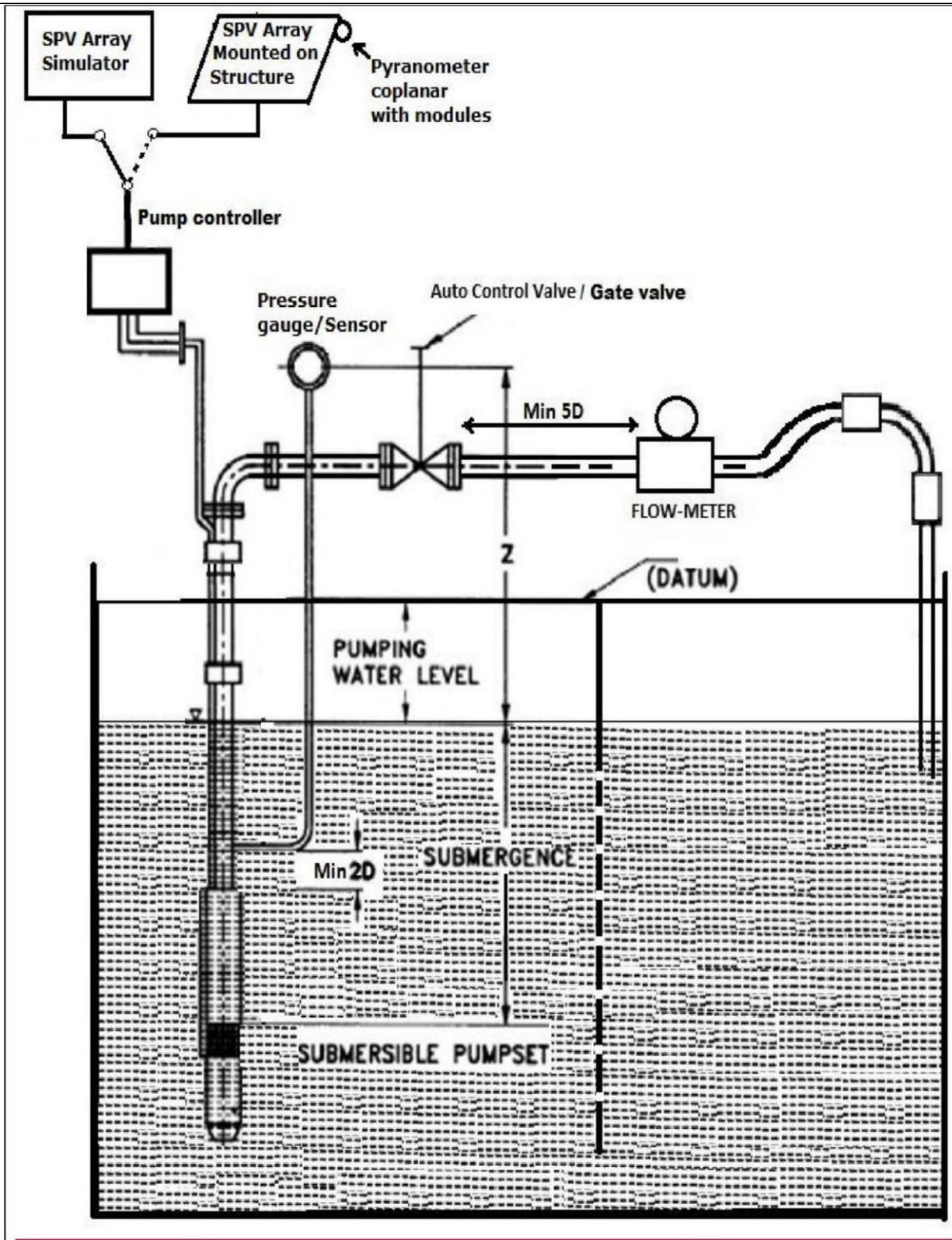
**Refer to the block diagram in Figure 3.**

#### **4.8 Constant Head Requirement**

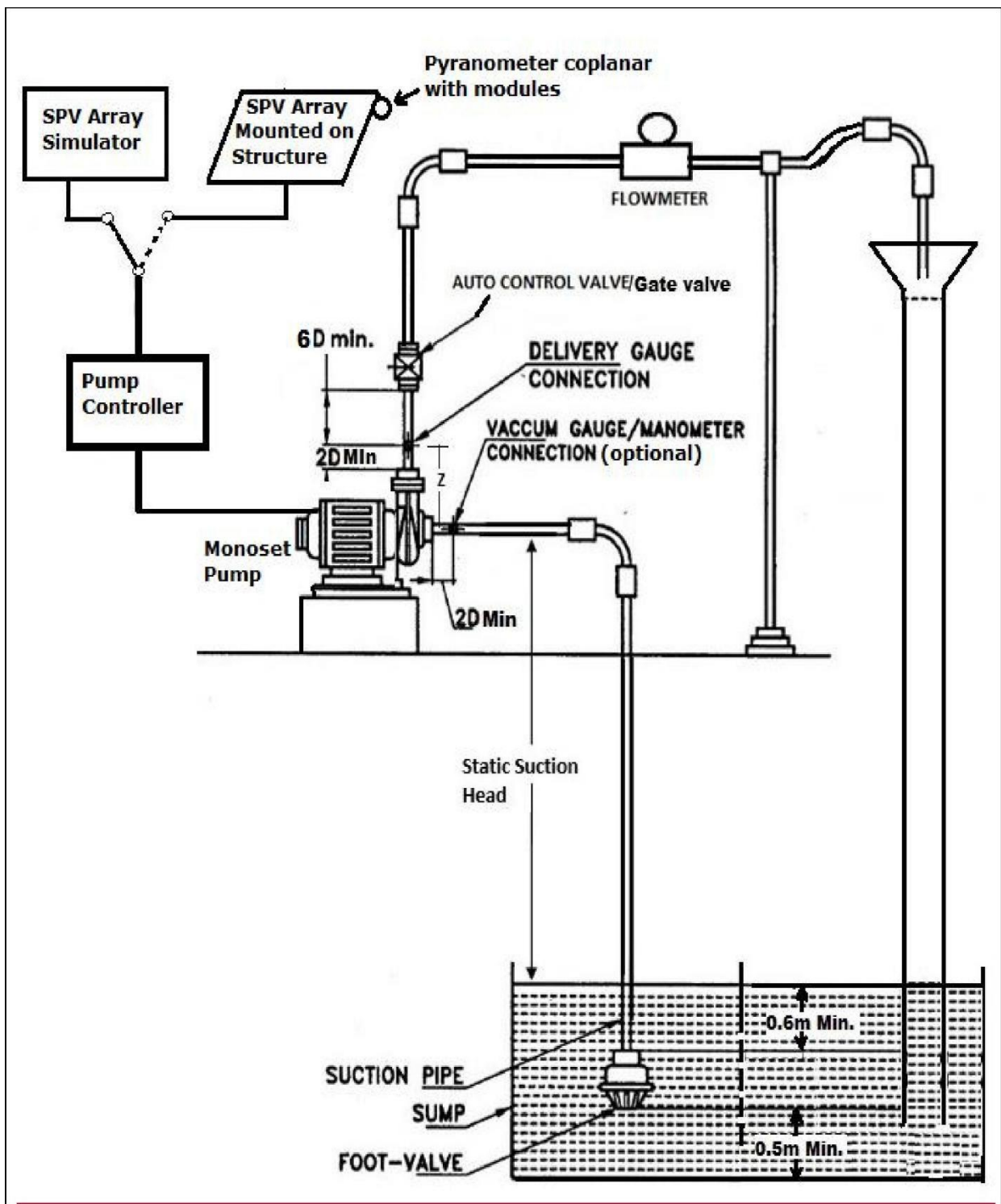
Dynamic head variation during test shall be within limit as specified in column 2 of table 3 and the allowable variation in arithmetic average (from the start of flow point to the end of flow point refer to figure 5) of the dynamic head shall be within value specified in column 4 of table 3. Any data 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			
<i>Clause 4.8</i>			
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

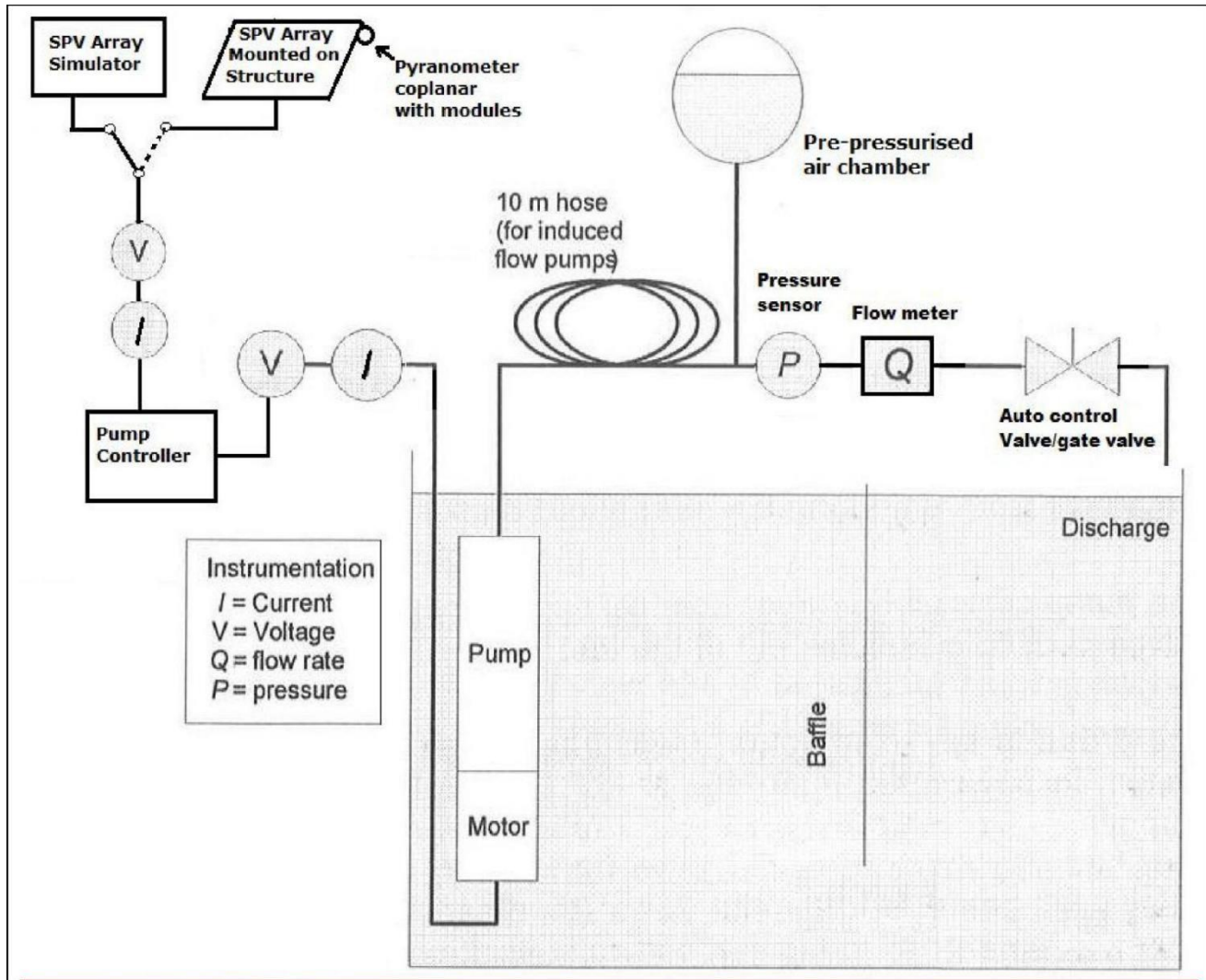




**FIGURE 1– TYPICAL TEST SET-UP FOR SUBMERSIBLE SPV WATER PUMP-SET**



**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/manufacture 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/manufacture 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:

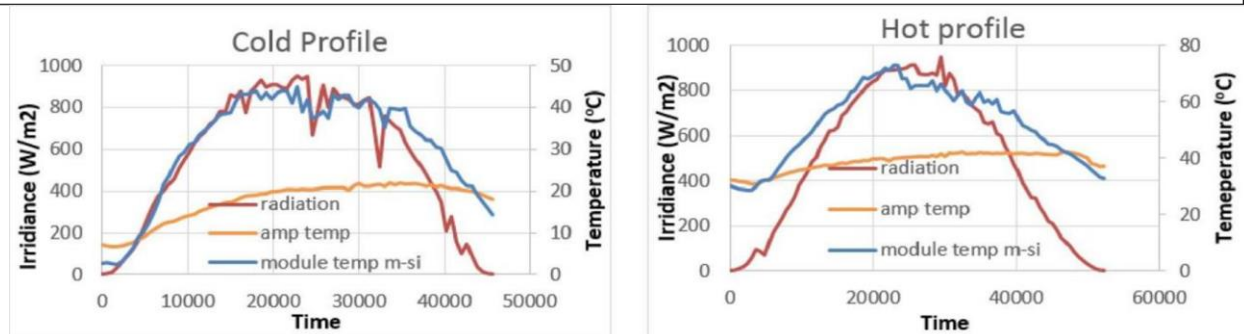
### 5.1 Simulator Methods:

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/m<sup>2</sup> 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  $\pm 0.5$  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  $\pm 0.5$  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/m<sup>2</sup>), 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/m<sup>2</sup>);
- 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

$$\text{Total Head } H = \text{HSSL} + H_d + Z + [(V_d^2 - V_s^2) / 2g]$$

HSSL = Total Static suction Lift in meters of water column (measured by calibrated measuring tape or any distance measuring sensors)

H<sub>d</sub> = 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<sub>d</sub> = Velocity at delivery gauge/sensor connection, m/s;

V<sub>s</sub> = Velocity at suction gauge/sensor connection, m/s; and

$g$  = Acceleration due to gravity in m/s<sup>2</sup>.

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	0.13	+ 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  $H = H_d + Z + [(V_d^2) / 2g]$  Where:

$H_d$  = 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).

$V_d$  = 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/m<sup>2</sup>) in a day= Average of instantaneous irradiance reading from Dawn to Dusk (kW/m<sup>2</sup>) 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:

$$\% \text{Power mismatch in array} = \frac{(P_{Max} - P_{Min})}{(P_{Max} + P_{Min})} \times 100$$

$P_{Max}$  = 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 m<sup>2</sup> X Sun radiation in watts/m<sup>2</sup>)

### **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

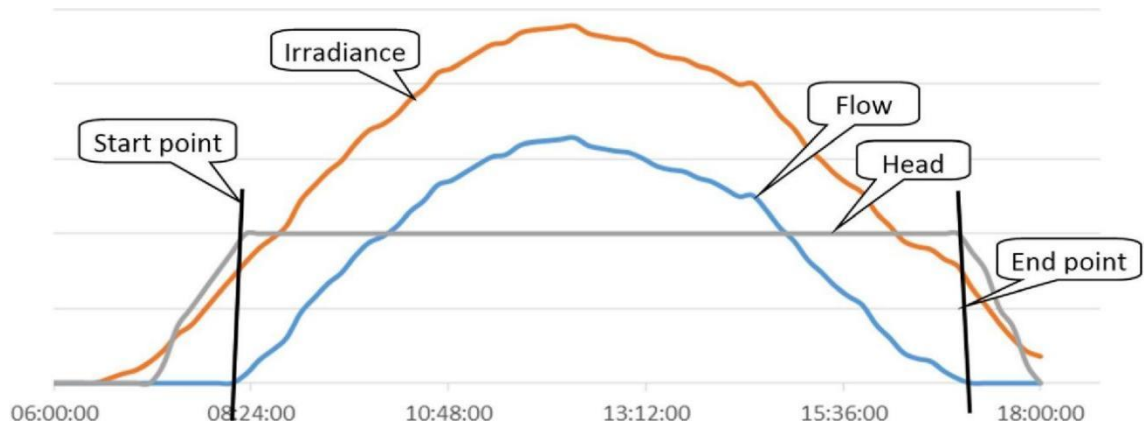


FIGURE 5- TYPICAL GRAPH FOR UNDERSTANDING CALCULATION

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

$$\begin{aligned}\text{Total duration of flow} &= \text{End Time} - \text{Start time} \\ &= 17:45:30 - 8:15:30 \\ &= 9 \text{ h: } 30 \text{ m: } 0 \text{ s}\end{aligned}$$

Total duration from start to end in seconds:

$$= (9 \times 3600) + (30 \times 60) + (0 \times 1) = 34200 \text{ seconds}$$

**Total discharge per day in liters** = Average flow in lps x Total no of seconds

$$= 3.55 \times 34200 = 121410 \text{ liters}$$

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  $V_{mpp}$  with new brand module shall be within  $\pm 2\%$  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.

<b>LIST OF REFFERED STANDARD</b>	
<b>IS No.</b>	<b>Title</b>
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
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-	Photovoltaic (Photo Voltaic (PV)) Module Safety Qualification Part 1

1 : 2004	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>I-V</i> 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 $\pm$ 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:

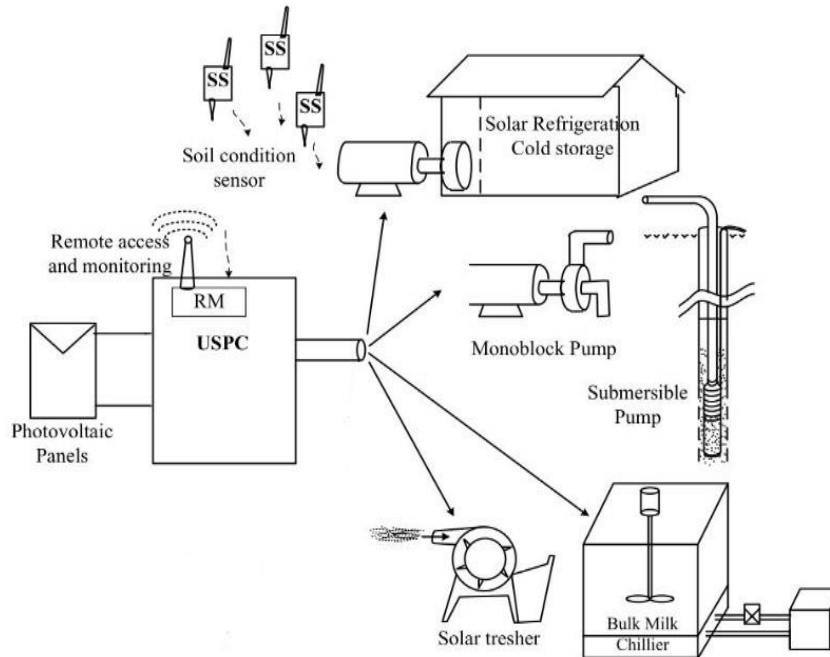
Sr No.	SPV pumping system capacity	Controller power efficiency should be more than or equal to
1	3 HP	93.00%
2	5 HP	93.00%
3	7.5 HP	94.00%
4	10 HP	94.50%
5	15 HP	94.50%

(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	$(0.85 \cdot V_{\text{nominal}})$	Nominal	$(1.15 \cdot V_{\text{nominal}})$
2	5 HP	$(0.85 \cdot V_{\text{nominal}})$		$(1.15 \cdot V_{\text{nominal}})$
3	7.5 HP	$(0.85 \cdot V_{\text{nominal}})$		$(1.15 \cdot V_{\text{nominal}})$
4	10 HP	$(0.85 \cdot V_{\text{nominal}})$		$(1.15 \cdot V_{\text{nominal}})$
5	15 HP	$(0.85 \cdot V_{\text{nominal}})$		$(1.15 \cdot V_{\text{nominal}})$

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 Observation	Lab 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)	<p>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.</p> <p>(i) Water Pumping (ii) Chaff Cutter (iii) Deep fridge/ Cold Storage (iv) Atta Chakki</p> <p>Manual changeover is not allowed.</p>		

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	<b>Efficiency of the UPSC at minimum..... VOC</b>		
		<b>Load %</b>	<b>Charge controller eff (%)</b>	<b>Power tracking Efficiency (%)</b>
		10		
		25		
		50		
		75		
		100		
		<b>Efficiency of the UPSC at Nominal ..... VOC</b>		
		10		
		25		
		50		
		75		
		100		
		<b>Efficiency of the UPSC at 90 % of Max ..... VOC</b>		
		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/m <sup>2</sup> 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	<ul style="list-style-type: none"> <li>• Soft Startup,</li> <li>• low radiation protection,</li> <li>• overload protection,</li> <li>• Open circuit protection</li> <li>• Reverse polarity protection</li> </ul>		

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.



**PSR**  
PROGRAMME

Supporting Structural  
Reforms in the  
Indian Power Sector



# **RMS Communication and Security Architecture- PM KUSUM National Portal**

## Disclaimer

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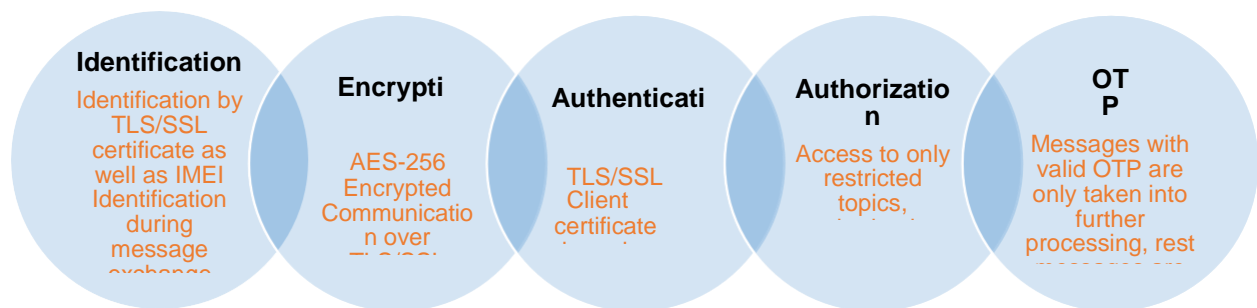
## RMS Communication & Security Architecture

1. Security Architecture (with reference to EESL Tender Annexure 8 – clause 4.d)
2. RMS Registration (with reference to EESL Tender Annexure 8 – clause 4.d)
3. MQTT Topic Structure (with reference to EESL Tender Annexure 8 – clause 4.b,4.c)
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5. Annexure: JSON Formats with parameter keywords, sample values and description
  - a. Annexure: Pump Controller
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### 1. Security Architecture

This section highlights the communication security architecture between RMS/DCU and State SWPS IoT Platform. With this security, architecture, third parties are unable to intercept or “sniff” the encrypted data. This stops ISPs, employers, local network administrators and cybercriminals from being able to perform “packet sniffing” to access what the traffic contains. It also protects against man in the middle (MitM) attacks. This implements Private TLS/SSL VPN to ensure highest level of security.

In additional to this, use of OTP in every message exchange shall help restrict spammers and Bots. Such OTP based mechanism will provide transaction level security which is required for remote operations.



## 2. RMS Registration

This section details how individual RMS/DCU shall be registered and communicate securely with State SWPS IoT Platform.

- Every supplier/vendor must Register all unique IMEI (International Mobile Equipment Identity) of RMS/DCU with State SWPS
- State SWPS will generate individual client certificate for RMS/DCU against unique IMEI registered and share with supplier/vendor through secured web API interface.
- Every supplier/vendor shall be able to access web API with unique credentials shared with them.
- Web API shall return individual client certificate, Device Broker url and “info” topic.
- After installation of client certificate relevant to IMEI of RMS/DCU, RMS/DCU will connect to Device Broker and get authenticated using client certificate and further shall be able to receive additional configuration details such as FTP credential, Message Topic structure etc. after subscribing to default topic.
- After client certificate expiry, RMS will connect to FTP using available credentials and download the renewed certificate

## 3. MQTT Topic Structure

This section defines the different topic structure for communication between RMS/DCU and State SWPS through Device Broker.

RMS/DCU will publish and subscribe to their respective topics only, authorization of topic shall be done against unique credentials.

Application Version	Solution	IMEI	Message Type	Publish/Subscribe
IIOT-1	Standalonesolarpump	{IMEI}	Info	Subscribe
	Gridconnectedsolarpump		OTP	Subscribe
	SolarMW		Heartbeat	Publish
	Ongriidrooftop		Data	Publish
	Offgridrooftop		Ondemand	Subscribe
			Config	Subscribe

Sample Topic structure for Stand-alone Solar Pump shall be: **IIOT-1/Standalonesolarpump/{IMEI}/info**

**Multiple sub-topics will be formed for communication between RMS/DCU and sate SWPS IoT Platform**

- **Info:** Default Topic To exchange RMS/DCU configuration details
- **OTP:** To exchange OTP at every interval of 15/30/60 minutes
- **Heartbeat:** To update RMS/DCU health indicators at frequent configurable intervals.
- **Data:** To exchange data related to RMS/DCU Monitoring parameters in “**push mode**”
  - Push data Periodically
  - Push data on Event/Notification
  - History Missing Data Push Mode: History data will be identified against “**index**”

- **Ondemand:** To exchange data between RMS/DCU and Server in “**Command on Demand**” Mode
  - Each “On Demand” message will have two transactions: Commands, Response.
  - On demand command and response will be tracked against a common “**MSGID**”.
  - On demand message can be used to read and write with two command types
    - Command: “**Read**” - In json received from server replace each key with value from RMS/DCU and send the updated json back to server.
    - Command: “**Write**” - After executing the command based on key-value pair received in json, send the updated json back to server on successful execution.
    - Note: handshaking parameters such as msgid, etc. has to send back to server as is, without modification
- **Config:** To update configurable parameters of Device, which is similar to Ondemand but will be used only for configurable parameters of Device, this implements “**Configuration over the air**”
  - Command: “**Read**” - In json received from server replace each key with value from RMS/DCU and send the updated json back to server.
  - Command: “**Write**” - After executing the command based on key-value pair received in json, send the updated json back to server on successful execution.
  - Note: handshaking parameters such as msgid, etc. has to send back to server as is, without modification

#### 4. Communication Modes

- **Push on Periodic Interval:** In this mode deployed RMS shall transmit data of Multiple devices and sensors on different configurable time intervals such as Inverter or pump controller data at every 5 minutes, Energy Meter data at every 15 minutes, String Combiner Box data at every 10 minutes
- **Push on Event:** RMS shall detect various configurable alarm or event conditions such as Pump On / Off Status, Inverter On/Off Status, Low Water Flow Rate, Fault or Trip status etc. and It shall transmit data immediately to the server
- **On Demand Read:** In this mode, User will send command to RMS to get data as and when required and RMS will send the required data to server immediately
- **On Demand Write:** In case of Remote Operations, Farmer / Consumer shall send On Demand Write Command to the RMS and RMS will send back the acknowledgement with change in parameters after operation is completed
- **Configuration read/write:** Using this mode, user will be able to read and change configurable parameters remotely such as updating periodic interval, alarm limits, server parameters etc.

#### 5. Communication Protocols

- **Field Device Communication:** RMS to Field Devices communication such as Inverter, Pump Controller, Drive, String Combiner box, MFT/MFM, Data Acquisition System shall be established using **MODBUS RTU protocol** supported by all leading manufacturers globally

- **Energy Meter Communication:** RMS to Energy Meter communication such as Bidirectional (Revenue) Meter, Solar Generation (Audit) Meter shall be established using **DLMS/Modbus protocol** supported by all leading meter manufacturers in India
- **RMS to Server Communication - Industrial IoT MQTT Protocol:** RMS to Server Communication shall be established using MQTT protocol which is well accepted IoT protocol across the globe and supported by all leading IT as well as OT companies for Smart Grid, Smart RE and Smart City Applications

## 6. MQTT Message Structure

This section details message structure exchanged between RMS/DCU and state SWPS IoT Platform through Device Broker

keyword	Description	Sample Value
<b>IMEI</b>	Unique Identification of RMS/DCU – required to ensure registered source of data	863287049443888
<b>VD</b>	Virtual device/group – required for grouping parameters based on update interval/subsystems such as inverter/pump controller/meter/string combiner box etc.	2
<b>MSGID</b>	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback	123456789
<b>COMMAND</b>	Read/Write - Applicable only in case of “Ondemand”/”Config” message Type	Read
<b>TIMESTAMP</b>	RTC timestamp of RMS/DCU against all parameters of vd/group (YYYY-MM-DD HH:mm:SS)	2019-08-20 20:15:08
<b>STINTERVAL</b>	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	15
<b>DATE</b>	local storage date – required as a reference to fetch data from local storage (YYYY-MM-DD)	2020-06-15
<b>INDEX</b>	Local storage Index – required as a reference to fetch data from local storage	5
<b>MAXINDEX</b>	Local storage maximum index of local storage date – required to calculate missing index	96
<b>LOAD</b>	Local storage retrieval command & status	0
<b>POTP</b>	Previous One Time Password	12345678
<b>COTP</b>	Current One Time Password, State SWPS Broker will update OTP at interval of 30/60 minutes	12345678
<b>Parameter-1 Parameter-2 Parameter-3 Parameter-1 ..... Parameter-n</b>	Equipment wise Keywords for multiple Parameters.	

Communication Format Annexure

Annexure - 1 (Revision – B) Pump Controller

Message Name	: Periodic Push Pump Controller (1)
Message Format	: JSON
Message Type	: Data
Message Command Flow	: Not Applicable for Data periodic Push
Message response Flow	: RMS -> State SWPS IoT Platform
Message Medium	: GPRS

**Command Message**

Not Applicable	
----------------	--

**Response Message**

Message	Description	Unit												
{														
"VD":1	Virtual Device Index/Group	-												
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group	-												
"MAXINDEX":96	maximum index of local storage date	-												
"INDEX":7,	reference of local storage	-												
"LOAD":0,	Local storage retrieval command & status	-												
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	-												
"MSGID":",	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback	-												
"DATE":200518,	local storage date	YYM MDD												
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU	-												
"ASN_11":"34123450",	<b>Pump Controller Serial No.</b> <table border="1"> <tr> <td>RMS</td> <td>0</td> </tr> <tr> <td>DAQ</td> <td>1-9</td> </tr> <tr> <td>Pump Controller</td> <td>11-19</td> </tr> <tr> <td>Meter</td> <td>21-29</td> </tr> <tr> <td>Inverter</td> <td>31-39</td> </tr> <tr> <td>String Combiner Box</td> <td>41-49</td> </tr> </table>	RMS	0	DAQ	1-9	Pump Controller	11-19	Meter	21-29	Inverter	31-39	String Combiner Box	41-49	-
RMS	0													
DAQ	1-9													
Pump Controller	11-19													
Meter	21-29													
Inverter	31-39													
String Combiner Box	41-49													
"POTP":"341234",	<b>Previous One Time Password</b>	-												
"COTP":"341234",	<b>Current One Time Password</b>	-												
"PMAXFREQ1":"50.00",	<b>Maximum Frequency</b>	Hz												
"PFREQLSP1":"50.00",	<b>Lower Limit Frequency</b>	Hz												
"PFREQHSP1":"50.00",	<b>Upper Limit Frequency</b>	Hz												

<b>"PCNTRMODE1":"1",</b>		<b>Solar Pump Controller Control Mode Status</b>	-
0	Variable Frequency Control Mode		
1	CVT Mode for Solar		
2	MPPT mode for Solar		
<b>"PRUNST1":"2",</b>		<b>Solar Pump Controller Run Status</b>	-
0	Stop		
1	Running		
2	Sleep		
3	Low Speed Protection		
4	Dry Run Protection		
5	Over Current Protection		
6	Minimum Power Protection		
<b>"PREFFREQ1":"50.00",</b>		<b>Solar Pump Controller Reference Frequency</b>	Hz
<b>"POPFREQ1":"50.00",</b>		<b>Solar Pump Controller Output Frequency</b>	Hz
<b>"POPI1":"20.00",</b>		<b>Output Current</b>	A
<b>"POPV1":"230.00",</b>		<b>Output Voltage</b>	V
<b>"POPKW1":"45.00",</b>		<b>Output Active Power</b>	KW
<b>"PDC1V1":"550.00",</b>		<b>DC Input Voltage</b>	DC V
<b>"PDC1I1":"50.00",</b>		<b>DC Current</b>	DC I
<b>"PDCVOC1":"650.00",</b>		<b>DC Open Circuit Voltage</b>	DC V
<b>"PDKWH1":"35.00",</b>		<b>Today Generated Energy</b>	KWH
<b>"PTOTKWH1":"120.00",</b>		<b>Cumulative Generated Energy</b>	KWH
<b>"POPFLW1":"2",</b>		<b>Flow Speed</b>	LPM
<b>"POPDWD1":"120",</b>		<b>Daily Water Discharge</b>	Litres
<b>"POPTOTWD1":"220",</b>		<b>Total Water Discharge</b>	Litres
<b>"PMAXDCV1":"750.00",</b>		<b>Max DC Voltage</b>	DC V
<b>"PMAXDCI1":"40.00",</b>		<b>Max DC Current</b>	DC I
<b>"PMAXKW1":"650.00",</b>		<b>Max Output Active Power</b>	DC KW
<b>"PMAXFLW1":"650",</b>		<b>Max Flow Speed</b>	LPM
<b>"PDHR1":"8.00",</b>		<b>Pump Day Run Hours</b>	Hrs
<b>"PTOTHR1":"8.00",</b>		<b>Pump Cumulative Run Hours</b>	Hrs
}			

Reaction	
Not Applicable	

Communication Format Annexure

Annexure - 2 Energy Meter

Message Name : Periodic Push Meter (1)  
 Message Format : JSON  
 Message Type : Data  
 Message Command Flow : Not Applicable for Data periodic Push  
 Message response Flow : RMS -> State SWPS IoT Platform  
 Message Medium : GPRS

**Command Message**

Not Applicable

**Response Message**

Message	Description												
{													
"VD":2	Virtual Device Index/Group												
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group												
"MAXINDEX":96	maximum index of local storage date												
"INDEX":7,	reference of local storage												
"LOAD":0,	Local storage retrieval command & status												
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)												
"MSGID":"","	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback												
"DATE":200518,	local storage date												
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU												
"ASN_21":12345678,	Asset Serial Number <table border="1"> <tr> <td>RMS</td> <td>0</td> </tr> <tr> <td>DAQ</td> <td>1-9</td> </tr> <tr> <td>Pump Controller</td> <td>11-19</td> </tr> <tr> <td>Meter</td> <td>21-29</td> </tr> <tr> <td>Inverter</td> <td>31-39</td> </tr> <tr> <td>String Combiner Box</td> <td>41-49</td> </tr> </table>	RMS	0	DAQ	1-9	Pump Controller	11-19	Meter	21-29	Inverter	31-39	String Combiner Box	41-49
RMS	0												
DAQ	1-9												
Pump Controller	11-19												
Meter	21-29												
Inverter	31-39												
String Combiner Box	41-49												
"MTDET1":30012302,	Meter Detail												
"POTP":"34123450",	<b>Previous One Time Password</b>												
"COTP":"34123450",	<b>Current One Time Password</b>												
"MTBLDATE1":18,	Billing Date for meter 1												
"DATE1":180606,	Present date for meter1												
"TIME1":105400,	Present time for meter1												
"IR1":20.58,	R Phase Current in Amps												
"IY1":20.65,	Y Phase Current in Amps												
"IB1":20.12,	B Phase Current in Amps												
"VRN1":240.12,	R Phase to Neutral Voltage in Volts												



"VYN1":242.13,	Y Phase to Neutral Voltage in Volts
"VBN1":243.55,	B Phase to Neutral Voltage in Volts
"VRY1":420.18,	Phase to Phase Voltage(R-Y) in Volts
"VYB1":419.38,	Phase to Phase Voltage(Y-B) in Volts
"VBR1": 421.5,	Phase to Phase Voltage(B-R) in Volts
"PFR1":0.98,	R Phase Power Factor
"PFY1":0.97,	Y Phase Power Factor
"PFB1":0.96,	B Phase Power Factor
"FRQ1":50.05,	Grid Frequency
"POWR1":42.578,	R Phase Active Power in KW
"POWY1":42.156,	Y Phase Active Power in KW
"POWB1":42.354,	B Phase Active Power in KW
"POW1":42.185,	Total Active Power in KW
"RPOWR1":22.123,	R Phase Reactive Power in KVAR
"RPOWY1":20.110,	Y Phase Reactive Power in KVAR
"RPOWB1":22.310,	B Phase Reactive Power in KVAR
"RPOW1":65.610,	Total Reactive Power in KVAR
"APOWR1":55.610,	R Phase Apparent Power in KVA
"APOWY1":52.910,	Y Phase Apparent Power in KVA
"APOWB1":53.911,	B Phase Apparent Power in KVA
"APOW1":14.198,	Total Apparent Power in KVA
"KWHNET1":98561.4,	Cumulative Net Energy in KWH
"KWHIMP1":98561.4,	Cumulative Import Energy in KWH
"KWHEXP1":98561.2,	Cumulative Export Energy in KWH
"KVAHNET1":99100.3,	Cumulative Net Energy in KVAH
"KVAHIMP1":99105.1,	Cumulative Import Energy in KWH
"KVAHEXP1":98999.1,	Cumulative Export Energy in KWH
"MDKWIMP1":100.3,	Rising Demand (Import) in KW
"MDKWEXP1":98.6,	Rising Demand (Export) in KW
"POFF1":1020,	Grid Power Failure in Minutes
"TC1":100,	Total Tamper Counts
"PF1":0.99,	Average PF
"LBKWHNET1":98561,	Last Billing Cycle Net Energy in KWH
"LBKWHIMP1":98561,	Last Billing Cycle Import Energy in KWH
"LBKWHEXP1":98561,	Last Billing Cycle Export Energy in KWH
"PMDKVAIMP1":22.50,	Present MD KVA Import
"PMDKVAEXP1":0.00,	Present MD KVA Import
"LBMDKWIMP1":7.07,	Last Billing MD KW Import
"LBMDKWEXP1":0.00,	Last Billing MD KW Export
"LBMDKVAIMP1":7.07,	Last Billing MD KVA Import
"LBMDKVAEXP1":0.00,	Last Billing MD KVA Export
"MDRSTC1":4	MD Reset Count
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure – 3 Inverter

Message Name	: Inverter Periodic Push (INVERTER-1)
Message Format	: JSON
Message Type	: Data
Message Command Flow	: Not Applicable for Data periodic Push
Message response Flow	: RMS -> State SWPS IoT Platform
Message Medium	: GPRS

**Command Message**

<b>Not Applicable</b>	
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**Response Message**

Message	Description												
{													
"VD":5	Virtual Device Index/Group												
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group												
"MAXINDEX":96	maximum index of local storage date												
"INDEX":7,	reference of local storage												
"LOAD":0,	Local storage retrieval command & status												
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)												
"MSGID": "",	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback												
"DATE":200518,	local storage date												
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU												
"ASN_31":"34123450",	<b>Inverter Serial No.</b> <table border="1"> <tr> <td>RMS</td> <td>0</td> </tr> <tr> <td>DAQ</td> <td>1-9</td> </tr> <tr> <td>Pump Controller</td> <td>11-19</td> </tr> <tr> <td>Meter</td> <td>21-29</td> </tr> <tr> <td>Inverter</td> <td>31-39</td> </tr> <tr> <td>String Combiner Box</td> <td>41-49</td> </tr> </table>	RMS	0	DAQ	1-9	Pump Controller	11-19	Meter	21-29	Inverter	31-39	String Combiner Box	41-49
RMS	0												
DAQ	1-9												
Pump Controller	11-19												
Meter	21-29												
Inverter	31-39												
String Combiner Box	41-49												
"POTP":"34123450",	<b>Previous One Time Password</b>												
"COTP":"34123450",	<b>Current One Time Password</b>												
"IST1":1,	<b>Inverter Status</b>												
"IFREQ1":40,	<b>Frequency</b>												
"IPF1":0.8,	<b>Power Factor</b>												
"IDC1V1":500,	<b>DC-1 Voltage</b>												
"IDC1I1":200,	<b>DC-1 Current</b>												
"IDC1KW1":200,	<b>DC-1 Power</b>												
"IDC2V1":243.55,	<b>DC-2 Voltage</b>												

"IDC2I1":420.18,	DC-2 Current
"IDC2KW1":200,	DC-2 Power
"IDC3V1":419.38,	DC-3 Voltage
"IDC3I1":421.8,	DC-3 Current
"IDC3KW1":200,	DC-3 Power
"IDC4V1":0.98,	DC-4 Voltage
"IDC4I1":0.97,	DC-4 Current
"IDC4KW1":200,	DC-4 Power
"IRPHV1":0.96,	R phase voltage
"IRPHI1":50.05,	R phase current
"IRPHKW1":50.05,	R phase Active Power
"IYPHV1":42.578,	Y phase voltage
"IYPHI1":42.156,	Y phase current
"IYPHKW1":50.05,	Y phase Active Power
"IBPHV1":42.354,	B phase voltage
"IBPHI1":42.185,	B phase current
"IBPHKW1":50.05,	B phase Active Power
"IKW1":22.123,	Active Power
"ITKWH1":20.110,	Today Generated Energy
"ITON1":22.310,	Today On Time of Inverter
"ILKWH1":65.610,	Life time Generated Energy
"ILON1":55.610,	Life time running hours
"ITEMP1":52.910,	Inverter Temperature
"IFT1":53.911,	Fault-1
"IFT2":14.198,	Fault-2
"IFT3":98561.4,	Fault-3
"IFT4":98561.4,	Fault-4
"IFT5":98561.2,	Fault-5
"IKVA1":99100.3,	Apparent power
"IKVAR1":99105.1	Reactive power
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure - 4 String Combiner Box

Message Name	: Periodic Push String Combiner Box
Message Format	: JSON
Message Type	: Data
Message Command Flow	: Not Applicable for Data periodic Push
Message response Flow	: RMS -> State SWPS IoT Platform
Message Medium	: GPRS

**Command Message**

Not Applicable	
----------------	--

**Response Message**

Message	Description												
{													
"VD":9	Virtual Device Index/Group												
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group												
"MAXINDEX":96	maximum index of local storage date												
"INDEX":7,	reference of local storage												
"LOAD":0,	Local storage retrieval command & status												
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)												
"MSGID": "",	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback												
"DATE":200518,	local storage date												
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU												
"ASN_41":"34123450",	<b>SJB Serial no</b> <table border="1"> <tr> <td>RMS</td> <td>0</td> </tr> <tr> <td>DAQ</td> <td>1-9</td> </tr> <tr> <td>Pump Controller</td> <td>11-19</td> </tr> <tr> <td>Meter</td> <td>21-29</td> </tr> <tr> <td>Inverter</td> <td>31-39</td> </tr> <tr> <td>String Combiner Box</td> <td>41-49</td> </tr> </table>	RMS	0	DAQ	1-9	Pump Controller	11-19	Meter	21-29	Inverter	31-39	String Combiner Box	41-49
RMS	0												
DAQ	1-9												
Pump Controller	11-19												
Meter	21-29												
Inverter	31-39												
String Combiner Box	41-49												
"POTP":"34123450",	<b>Previous One Time Password</b>												
"COTP":"34123450",	<b>Current One Time Password</b>												
"SI11":"3.00",	<b>SJB1, Channel1 Current</b>												
"SI21":"5.00",	<b>SJB1, Channel2 Current</b>												
"SI31":"5.00",	<b>SJB1, Channel3 Current</b>												
"SI41":"5.00",	<b>SJB1, Channel4 Current</b>												
"SI51":"5.00",	<b>SJB1, Channel5 Current</b>												

"SI61": "5.00",	SJB1, Channel6 Current
"SI71": "5.00",	SJB1, Channel7 Current
"SI81": "5.00",	SJB1, Channel8 Current
"SI91": "5.00",	SJB1, Channel9 Current
"SI101": "5.00",	SJB1, Channel10 Current
"SI111": "5.00",	SJB1, Channel11 Current
"SI121": "5.00",	SJB1, Channel12 Current
"SI131": "5.00",	SJB1, Channel13 Current
"SI141": "5.00",	SJB1, Channel14 Current
"SI151": "5.00",	SJB1, Channel15 Current
"SI161": "5.00",	SJB1, Channel16 Current
"SI171": "5.00",	SJB1, Channel17 Current
"SI181": "5.00",	SJB1, Channel18 Current
"SI191": "5.00",	SJB1, Channel19 Current
"SI201": "5.00",	SJB1, Channel20 Current
"SI211": "5.00",	SJB1, Channel21 Current
"SI221": "5.00",	SJB1, Channel22 Current
"SI231": "5.00",	SJB1, Channel23 Current
"SI241": "5.00",	SJB1, Channel24 Current
"SDCV1": "635.00",	SJB1, DC Voltage
"SDCTOTI1": "40.00",	SJB1, Total DC Current
"SDCTOTKW1": "28.00",	SJB1, Total DC Power
"SDI11": "1.00",	SJB1, Digital Input1
"SDI21": "1.00",	SJB1, Digital Input2
"ST11": "1.00",	SJB1, Temperature1
"ST21": "1.00",	SJB1, Temperature2
"ST31": "1.00"	SJB1, Temperature3
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure – 5 RMS

Message Name : RMS  
 Message Format : JSON  
 Message Type : Heartbeat  
 Message Command Flow : Not Applicable  
 Message response Flow : RMS -> State SWPS IoT Platform  
 Message Medium : GPRS

**Command Message**

<b>Not Applicable</b>	

**Response Message**

Message	Description
{	
"VD":0	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
"MAXINDEX":96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID": "",	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"POTP":"341234",	<b>Previous One Time Password</b>
"COTP":"341234",	<b>Current One Time Password</b>
"GSM":1,	Device connected to GSM network
"SIM":1,	SIM detected (1 - detected)
"NET":1,	Device in Network (1 - in network)
"GPRS":"1",	GPRS connected (1 - connected)
"RSSI":22,	Signal Strength
"SD":"1",	SD card detected (1 - detected)
"ONLINE":1,	Device Online (1- Online)
"GPS":1,	GPS Module Status (1-ON,0-OFF)
"GPSLOC":1,	GPS Location Locked
"RF":1,	RF Module Status (1-ON,0-OFF)
"RTCDATE":180918,	RTC Date
"RTCTIME":175800,	RTC Time
"TEMP":45.5,	Device Temperature

<b>"LAT":19.06,</b>	Latitude from gps
<b>"LONG":72.8777,</b>	Longitude from gps
<b>"SIMSLOT":1,</b>	Sim Slot (Current Sim Slot: 1 or 2)
<b>"SIMCHNGCNT":10,</b>	Total Sim Slot Change Count
<b>"FLASH":1,</b>	Device Flash Status 1: Detected 0: Error
<b>"BATTST":0,</b>	Battery Input Status: 1 if on battery power else 0
<b>"VBATT":5.0,</b>	Battery Voltage
<b>"PST":1</b>	Power Supply (1-Mains, 2-Battery)
<b>}</b>	

Reaction	
<b>Not Applicable</b>	

Communication Format Annexure

Annexure – 6 DAQ System

Message Name	: Periodic Push DAQ System
Message Format	: JSON
Message Type	: Data
Message Command Flow	: Not Applicable for Data periodic Push
Message response Flow	: RMS -> State SWPS IoT Platform
Message Medium	: GPRS

**Command Message**

Not Applicable

**Response Message**

Message	Description
{	
"VD":12	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
"MAXINDEX":96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID": "",	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"POTP":"34123450",	<b>Previous One Time Password</b>
"COTP":"34123450",	<b>Current One Time Password</b>
"AI11":45.5,	Analog Input – 1
"AI21":45.5,	Analog Input – 2
"AI31":45.5,	Analog Input – 3
"AI41":45.5,	Analog Input – 4
"DI11":1,	Digital Input – 1
"DI21":0,	Digital Input – 2
"DI31":1,	Digital Input – 3
"DI41":0,	Digital Input – 4
"DO11":1,	Digital Output – 1
"DO21":1,	Digital Output – 2
"DO31":1,	Digital Output – 3
"DO41":1	Digital Output – 4
}	

**Reaction**

Not Applicable



## Annexure – 7

Message Name : On Demand Read/Write Parameter/Keyword  
 Message Format : JSON  
 Message Type : Config  
 Message Command Flow : Cloud Server-> RMS  
 Message Response Flow : RMS -> Cloud Server  
 Message Medium : GPRS

Command Message	
Message	Description
{	
"timestamp": "2018-09-18 17:58:00",	
"type": "config",	
"cmd": "write",	To write config
"msgid": "130",	Server Auto Generated
"APN1": "www"	APN Value for sim1
"USR1": "string"	sim1 user name
"PASS1": "string"	sim1 password
"APN2": "Internet"	APN Value for sim2
"USR2": "string"	Sim2 user name
"PASS2": "string"	Sim2 password
"RESTART": 1	To restart DCU, 1 : Execute command
"UPDATEINTERVAL": 15	Enter update interval in mins.
"HEARTINTERVAL": 5	Heartbeat Update Interval in mins
"URTCDATE": 200622	DCU RTC Date (YYMMDD) Update
"URTCTIME": 220312	DCU RTC Time (HH:MM:SS) Update - 24 hour format
"UPDATERTC": 1	Update RTC, 1: Execute command, 0 : Successful execution
"GSMSYNC": 1	RTC auto GSM synchronization, 1: to execute command
"DO1": 1	Pump Remote ON/OFF Operation (1-ON, 0-OFF)
"AI1ZERO": 1	Engineering Zero Value (4 mA dc) for AI1 E.G. 0(LPM)

"AI1SPAN":100	Engineering Span Value (20 mA dc) for AI1 E.G. 5000(LPM)
"AI2ZERO":1	Engineering Zero Value (4 mA dc) for AI2
"AI2SPAN":100	Engineering Span Value (20 mA dc) for AI2
"AI3ZERO":1	Engineering Zero Value (4 mA dc) for AI3
"AI3SPAN":100	Engineering Span Value (20 mA dc) for AI3
"AI4ZERO":1	Engineering Zero Value (4 mA dc) for AI4
"AI4SPAN":100	Engineering Span Value (20 mA dc) for AI4
"URL": "rms1.kusumiiot.co"	URL of Broker Server
"PORT":8883	Port of Broker Server
"CID": "d:860906045525646\$standalonesolarpump\$27"	Unique Client id of device
"USERNAME": "860906045525646\$standalonesolarpump\$27"	Username for device authentication
"PASSWORD": "9e0baa73"	Password for device authentication
"FTPPURL": "rms1.kusumiiot.co"	URL for FTP
"FTPUSER": "866191037709301"	Username for FTP
"FTPPASS": "908552f"	Password for FTP
"FTPPORT":22	Port for FTP
"FTPDOWN":1	Download Certificates from ftp 1: To execute command, 0: Command is successfully executed
}	

Response Message	
Message	Description
{	
"timestamp": "2018-09-18 17:58:00",	

"type": "config",	
"cmd": "write",	To write config
"msgid": "130",	Server Auto Generated
"APN1": "www"	APN Value for sim1
"USR1": "string"	sim1 username
"PASS1": "string"	sim1 password
"APN2": "Internet"	APN Value for sim2
"USR2": "string"	Sim2 username
"PASS2": "string"	Sim2 password
"RESTART": 1	To restart DCU, 1: Execute command
"UPDATEINTERVAL": 15	Enter update interval in mins.
"HEARTINTERVAL": 5	Heartbeat Update Interval in mins
"URTCDATE": 200622	DCU RTC Date (YYMMDD) Update
"URTCTIME": 220312	DCU RTC Time (HH:MM: SS) Update - 24 hour format
"UPDATERTC": 1	Update RTC, 1: Execute command, 0 : Successful execution
"GSMSYNC": 1	RTC auto GSM synchronization, 1: to execute command
"DO1": 1	Pump Remote ON/OFF Operation (1-ON, 0-OFF)
"AI1ZERO": 1	Engineering Zero Value (4 mA dc) for AI1 E.G. 0(LPM)
"AI1SPAN": 100	Engineering Span Value (20 mA dc) for AI1 E.G. 5000(LPM)
"AI2ZERO": 1	Engineering Zero Value (4 mA dc) for AI2
"AI2SPAN": 100	Engineering Span Value (20 mA dc) for AI2
"AI3ZERO": 1	Engineering Zero Value (4 mA dc) for AI3

"AI3SPAN":100	Engineering Span Value (20 mA dc) for AI3
"AI4ZERO":1	Engineering Zero Value (4 mA dc) for AI4
"AI4SPAN":100	Engineering Span Value (20 mA dc) for AI4
"URL": "rms1.kusumiiot.co"	URL of Broker Server
"PORT":8883	Port of Broker Server
"CID": "d:860906045525646\$standalonesolarpump\$27"	Unique Client id of device
"USERNAME": "860906045525646\$standalonesolarpump\$27"	Username for device authentication
"PASSWORD": "9e0baa73"	Password for device authentication
"FTPUURL": "rms1.kusumiiot.co"	URL for FTP
"FTPUSER": "866191037709301"	Username for FTP
"FTPPASS": "908552f"	Password for FTP
"FTPPORT":22	Port for FTP
"FTPDOWN":1	Download Certificates from ftp 1: To execute command, 0: Command is successfully executed
}	

Command Message	
Command – B. In case, if some key in command are invalid	
<b>Message</b>	<b>Description</b>
{	
"timestamp": "2018-09-18 17:58:00",	
"type": "config",	
"cmd": "write",	to write config
"msgid": "130",	server auto generated
"APNN1": 2	send value "2"
"USR1": "xyz"	send value "xyz"
}	

Response Message	
Message	Description
{	
"timestamp": "2018-09-18 17:58:00",	
"type": "config",	
"cmd": "write",	to write config
"msgid": "130",	server auto generated
"APNN1": 0	invalid Key, value will be returned '0'
"USR1": "xyz"	actual value received
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure - 8 USPC

Message Name	: Periodic Push USPC
Message Format	: JSON
Message Type	: Data
Message Command Flow	: Not Applicable for Data periodic Push
Message response Flow	: RMS -> State SWPS IoT Platform
Message Medium	: GPRS

**Command Message**

Not Applicable	
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**Response Message**

Message	Description	Unit												
{														
"VD":1	Virtual Device Index/Group	-												
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group	-												
"MAXINDEX":96	maximum index of local storage date	-												
"INDEX":7,	reference of local storage	-												
"LOAD":0,	Local storage retrieval command & status	-												
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	-												
"MSGID":",	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback	-												
"DATE":200518,	local storage date	YYM MDD												
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU	-												
"ASN_11":"34123450",	<b>Pump Controller Serial No.</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>RMS</td> <td>0</td> </tr> <tr> <td>DAQ</td> <td>1-9</td> </tr> <tr> <td>Pump Controller / USPC</td> <td>11-19</td> </tr> <tr> <td>Meter</td> <td>21-29</td> </tr> <tr> <td>Inverter</td> <td>31-39</td> </tr> <tr> <td>String Combiner Box</td> <td>41-49</td> </tr> </table>	RMS	0	DAQ	1-9	Pump Controller / USPC	11-19	Meter	21-29	Inverter	31-39	String Combiner Box	41-49	-
RMS	0													
DAQ	1-9													
Pump Controller / USPC	11-19													
Meter	21-29													
Inverter	31-39													
String Combiner Box	41-49													
"POTP":"341234",	<b>Previous One Time Password</b>	-												
"COTP":"341234",	<b>Current One Time Password</b>	-												
"PMAXFREQ1":"50.00",	<b>Maximum Frequency</b>	Hz												
"PFREQLSP1":"50.00",	<b>Lower Limit Frequency</b>	Hz												
"PFREQHSP1":"50.00",	<b>Upper Limit Frequency</b>	Hz												

<b>"PCNTRMODE1": "1",</b>		<b>Solar Pump Controller Control Mode Status</b>	-
0	Variable Frequency Control Mode		
1	CVT Mode for Solar		
2	MPPT mode for Solar		
<b>"PRUNST1": "2",</b>		<b>Solar Pump Controller Run Status</b>	-
0	Stop		
1	Running		
2	Sleep		
3	Low Speed Protection		
4	Dry Run Protection		
5	Over Current Protection		
6	Minimum Power Protection		
<b>"PREFFREQ1": "50.00",</b>		<b>Solar Pump Controller Reference Frequency</b>	Hz
<b>"POPFREQ1": "50.00",</b>		<b>Solar Pump Controller Output Frequency</b>	Hz
<b>"POPI1": "20.00",</b>		<b>Output Current</b>	A
<b>"POPV1": "230.00",</b>		<b>Output Voltage</b>	V
<b>"POPKW1": "45.00",</b>		<b>Output Active Power</b>	KW
<b>"PDC1V1": "550.00",</b>		<b>DC Input Voltage</b>	DC V
<b>"PDC1I1": "50.00",</b>		<b>DC Current</b>	DC I
<b>"PDCVOC1": "650.00",</b>		<b>DC Open Circuit Voltage</b>	DC V
<b>"PDKWH1": "35.00",</b>		<b>Today Generated Energy</b>	KWH
<b>"PTOTKWH1": "120.00",</b>		<b>Cumulative Generated Energy</b>	KWH
<b>"POPFLW1": "2",</b>		<b>Flow Speed</b>	LPM
<b>"POPDWD1": "120",</b>		<b>Daily Water Discharge</b>	Litres
<b>"POPTOTWD1": "220",</b>		<b>Total Water Discharge</b>	Litres
<b>"PMAXDCV1": "750.00",</b>		<b>Max DC Voltage</b>	DC V
<b>"PMAXDCI1": "40.00",</b>		<b>Max DC Current</b>	DC I
<b>"PMAXKW1": "650.00",</b>		<b>Max Output Active Power</b>	DC KW
<b>"PMAXFLW1": "650",</b>		<b>Max Flow Speed</b>	LPM
<b>"PDHR1": "8.00",</b>		<b>Pump Day Run Hours</b>	Hrs
<b>"PTOTHR1": "8.00",</b>		<b>Pump Cumulative Run Hours</b>	Hrs
<b>"UDKWH1": "35.00",</b>		<b>Channel 1 Today Generated Energy of USPC</b>	KWH
<b>"UTOTKWH1": "120.00",</b>		<b>Channel 1 Cumulative Generated Energy of USPC</b>	KWH
<b>"UDHR1": "4.78",</b>		<b>Channel 1 USPC Day Run Hours</b>	Hrs
<b>"UTOTHR1": "13.94",</b>		<b>Channel 1 USPC Cumulative Run Hours</b>	Hrs
<b>"UOPI1": "20.00",</b>		<b>Channel 1 Output Current</b>	A
<b>"UOPV1": "230.00",</b>		<b>Channel 1 Output Voltage</b>	V
<b>"UOPKW1": "45.00",</b>		<b>Channel 1 Output Active Power</b>	KW
<b>"URUNST1": 1</b>		<b>Channel 1 Run Status : 1 – ON, 0 – OFF</b>	
<b>"UFLTST1": 1</b>		<b>Chanel 1 Fault Status 1 – Fault, 0 – No Fault</b>	
<b>"UDKWH2": "35.00",</b>		<b>Channel 2 Today Generated Energy of USPC</b>	KWH
<b>"UTOTKWH2": "120.00",</b>		<b>Channel 2 Cumulative Generated Energy of USPC</b>	KWH

"UDHR2": "4.78",	Channel 2 USPC Day Run Hours	Hrs
"UTOTHR2": "13.94",	Channel 2 USPC Cumulative Run Hours	Hrs
"UOPI2": "20.00",	Channel 2 Output Current	A
"UOPV2": "230.00",	Channel 2 Output Voltage	V
"UOPKW2": "45.00",	Channel 2 Output Active Power	KW
"URUNST2": 1	Channel 2 Run Status : 1 – ON, 0 – OFF	
"UFLTST2": 1	Channel 2 Fault Status 1 – Fault, 0 – No Fault	
"UDKWH3": "35.00",	Channel 3 Today Generated Energy of USPC	KWH
"UTOTKWH3": "120.00",	Channel 3 Cumulative Generated Energy of USPC	KWH
"UDHR3": "4.78",	Channel 3 USPC Day Run Hours	Hrs
"UTOTHR3": "13.94",	Channel 3 USPC Cumulative Run Hours	Hrs
"UOPI3": "20.00",	Channel 3 Output Current	A
"UOPV3": "230.00",	Channel 3 Output Voltage	V
"UOPKW3": "45.00",	Channel 3 Output Active Power	KW
"URUNST3": 1	Channel 3 Run Status : 1 – ON, 0 – OFF	
"UFLTST3": 1	Channel 3 Fault Status 1 – Fault, 0 – No Fault	
"UDKWH4": "35.00",	Channel 4 Today Generated Energy of USPC	KWH
"UTOTKWH4": "120.00",	Channel 4 Cumulative Generated Energy of USPC	KWH
"UDHR4": "4.78",	Channel 4 USPC Day Run Hours	Hrs
"UTOTHR4": "13.94",	Channel 4 USPC Cumulative Run Hours	Hrs
"UOPI4": "20.00",	Channel 4 Output Current	A
"UOPV4": "230.00",	Channel 4 Output Voltage	V
"UOPKW4": "45.00",	Channel 4 Output Active Power	KW
"URUNST4": 1	Channel 4 Run Status : 1 – ON, 0 – OFF	
"UFLTST4": 1	Channel 4 Fault Status 1 – Fault, 0 – No Fault	
"UDKWH5": "35.00",	Channel 5 Today Generated Energy of USPC	KWH
"UTOTKWH5": "120.00",	Channel 5 Cumulative Generated Energy of USPC	KWH
"UDHR5": "4.78",	Channel 5 USPC Day Run Hours	Hrs
"UTOTHR5": "13.94",	Channel 5 USPC Cumulative Run Hours	Hrs
"UOPI5": "20.00",	Channel 5 Output Current	A
"UOPV5": "230.00",	Channel 5 Output Voltage	V
"UOPKW5": "45.00",	Channel 5 Output Active Power	KW
"URUNST5": 1	Channel 5 Run Status : 1 – ON, 0 – OFF	
"UFLTST5": 1	Channel 5 Fault Status 1 – Fault, 0 – No Fault	

Reaction	
Not Applicable	