

**36. ALLOCATION OF TARGETS AND AREA OF WORK**

The allocation of quantities shall be done as following for all category of pumps :

L-1	1000 or assessed capacity which-ever is less.
L-2 to L-3	750 or assessed capacity which-ever is less.
L-4 to L-5	500 or assessed capacity which-ever is less.
L-6 & Others	Balance un-allocated quantity shall be allocated to the balance bidders being considered for allocation of target in ratio of their assessed capacity or maximum 400 whichever is less in first allocation.

- a) However, the increase or decrease of these allocations shall be decided at sole discretion of CREDA, which shall be final, binding and conclusive on the bidders.
- b) In first allocation only 10,000 pumps will be allocated as per above formula including L-1 to L-5. Rest of the allocation will be distributed as per the performance of eligible bidders in the past.
- c) Allocation can be further extended as per discretion of CREDA, in interest of expeditious work completion.
- d) CREDA reserves all rights for allocation of works anywhere in Chhattisgarh.
- e) Review of the progress of installation of pump allocated to Tenderers shall be done time to time by CREDA and if the progress of installation is found unsatisfactory, the allocation of entire remaining uninstalled pumps or their part of can be re-allocated to other Tenderer as per discretion of CREDA.

**37. BID REJECTION -**

**If financial bid of a bidder has been opened on the basis of technical bid of a bidder which has been determined to be substantially responsive to the bidding document and in latter stage it is found that bidder does not meet the eligibility criteria or the technical bid is found substantially non-responsive, CREDA reserves rights to reject such bid of a bidder any time.**

**We (on behalf of Eligible SI/Tenderer) have read all the above stated details & accept to comply with it in total.**

**(Name, Signature & Seal of the SI)**

## SECTION - 3

### SCOPE OF WORK

General Scope of Work for this tender shall be in accordance with the Guidelines of Market Mode of CREDA. The scope in brief will be as follows-

1. Survey of Sites, designing, supply, installation & commissioning of SPV Pumps of various capacities as per design and specifications approved by CREDA& MNRE on turnkey basis. Tenderer shall have to take approval of the engineering documents, Bill of Materials and samples from CREDA prior to commencement of the work. Five years unconditional onsite warrantee for manufacturing defects shall be required for each of the system after successful commissioning and proper handing over.
2. The scope of work shall also include the followings :
  - i. Survey of Sites, estimation of yield of bore well/water source, Right Selection of Pump Size & Type, Submission of site clearance certificate and yield report where the SPV Pumps are to be installed. A layout plan of the site should also be submitted clearly indicating the identified location for installation of SPV Modules, Structures and other components shall be installed. Sanction order shall be issued only after receipt of satisfactory reports suitable for system installation. SI shall furnish all necessary information to beneficiary for SPV Pump, Rates, Subsidy, Beneficiary Contribution, Processing Fee, Warrantee, Do & Don'ts etc., so as to avoid further misunderstandings and disputes.
  - ii. Collection of Beneficiary Share and Processing Fee (Fixed by Government)
  - iii. Submission of Application Form in CREDA in prescribed manner along with necessary documents and processing fee.
  - iv. Detailed planning of time bound smooth execution of project.
  - v. Design, supply, installation & commissioning of SPV Pumps of required capacities and type as per design and specifications approved by CREDA& MNRE, on turnkey basis.
  - vi. Minimum 1 test report of complete system with certified solar panel, solar pump and controller shall be submitted before payment.
  - vii. Performance Guarantee Test: Successful performance guarantee test to demonstrate the rated capacity of SPV Pump as per CREDA's norms shall have to be conducted by SI in presence of representatives of CREDA, if required.
  - viii. Providing User Manuals and Warrantee Cards to beneficiaries.
  - ix. SI shall have to submit JCCs within **60 days** of Installation and Commissioning of SPV Pumps in District Office of CREDA.
  - x. Unconditional onsite warrantee for manufacturing defects for Five years faultless operation, assure inventory for maintenance.
  - xi. SI/Supplier has to provide quarterly monitoring report of actual ground conditions for every installation.
  - xii. Providing Prompt Service Facilities to customers/beneficiaries.
  - xiii. Risk liability of all personnel associated with implementation and realization of the project.
  - xiv. Training of at least two persons nominated by user, on the various aspects of operation and maintenance of the offered system after commissioning of the system.
  - xv. The eligible SI shall maintain sufficient inventory of the spares to ensure that the system can be made functional within **7 days** from the communication of breakdown of the system during currency of the warrantee period.

- xvi.** The eligible SI shall run the system on trial basis and shall closely monitor the performance of the system before handing over the system and ensure water discharge as per MNRE specifications. CREDA shall examine the water discharge and ascertain if the discharge is adequate with reference to the capacity of the SPV Pump.
- xvii.** System Integrators shall have to establish their service stations in the allocated area and shall have to keep sufficient quantity of spares and man power to ensure proper service network for taking care of smooth functioning of SPV Pumps installed by them. SI shall provide toll free/Mobile number of service centre to register complaints.

## SECTION - 4

### SPECIFICATION FOR SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS

#### 1. SCOPE -

This specification covers design qualifications and performance specifications for Centrifugal Solar Photo Voltaic (SPV) Water Pumping Systems to be installed on a suitable bore-well, open well, water reservoir, water stream, etc., and specifies the minimum standards to be followed under New Scheme for Farmers launched by Government of India on 08.03.2019.

#### 2. TERMINOLOGY -

In addition to the terminology specified in 3 of IS 5120 and IEC 62253, the following shall also apply.

- a) **Static Water Depth**— It is the depth of water level below the ground level when the pump is not in operation.
- b) **Draw-Down**— It is the elevation difference between the depth of static water level and the consistent standing water level in tube well during operation of pump set.
- c) **Submergence**— It is the minimum height of water level after drawdown above the pump suction casing.
- d) **Manometric Suction Lift**— Manometric suction lift is the vacuum gauge/suction manometer reading in meter of water column when pump operates at suction lift.
- e) **Static Suction Lift**— Static suction lift/head is the vertical distance between sump water level and center of pump inlet.
- f) **Daily Water Output**— It is the total water output on a clear sunny day with three times tracking SPV panel, 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).
- g) **Wire to Water Efficiency**— It is the combined system efficiency of SPV Converter/Controller with Inbuilt MPPT mechanism, Pump set and piping.
- h) **SPV 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
- i) **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 -

##### A. General -

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 pump set using pump controller. A SPV Water Pumping system typically consists of *Pump Set*. Pump set may be of any one of the following types -

- i) Mono-block pump set;
- ii) Open well submersible pump;
- iii) Submersible pump;

**B. Motor -**

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

- i) AC Induction Motor.
- ii) DC Motor [PMSM/BLDC/SRM (with brush or brushless)].
- iii) Provision for remote monitoring for the pumps must be made in the pump controller through an integral arrangement having following basic functions:
  - Controller must be assigned with a unique serial number and its live status must be observed remotely on online portal through login credentials.
  - Live status must indicate whether controller is ON/OFF.
  - The parameter i.e. the water output, water flow rate, in fault condition, array input voltage/current, power and motor frequency should be logged at an interval of 10 minutes
  - Controller must have a back up to store the data locally ( at least for 1 year)

**C. Solar Photo Voltaic (SPV) Array -**

1. **SPV** arrays contains specified number of same capacity, type and specification modules connected in series or parallel to obtain the required voltage or current output. The SPV water pumping system should be operated with a PV array minimum capacity in the range of **900 Watts peak to 9000 Watts peak**, measured under Standard Test Conditions (STC). Sufficient number of modules in series and parallel could be used to obtain the required voltage or current output. The power output of individual PV modules used in the PV array, under STC, should be a minimum of 300 Watts peak, with adequate provision for measurement tolerances. Use of PV modules with higher power output is preferred.
2. Modules supplied with the SPV water pumping systems shall have certificate as per IS14286/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. Modules must qualify to IS/IEC 61730 Part I and II for safety qualification testing and shall be compliant to Domestic Component Requirement (DCR) as per MNRE.
4. The minimum module efficiency should be minimum 15 percent and fill factor shall be more than 70 percent.
5. Modules must qualify to IEC TS 62804-1:2015 for the detection of potential-induced e-gradation - Part 1: Crystalline silicon (Mandatory in case the SPV array voltage is more than 600 VDC)
6. The name plate shall conform the IS 14286/IEC61215
7. Module to Module wattage mismatch in the SPV array mismatch shall be within ( $\pm$ ) 3 percent.
8. Variation in overall SPV array wattage from the specified wattages shall be within zero percent to +10 percent.
9. The PV 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.

**10. IDENTIFICATION AND TRACEABILITY –**

Each PV module must use a RF identification tag (RFID), which must contain the following information:

- (i) Name of the manufacturer of PV Module
- (ii) Name of the Manufacturer of Solar cells
- (iii) Month and year of the manufacture (separately for solar cell and module)
- (iv) Country of origin (separately for solar cells and module)
- (v) I-V curve for the module
- (vi) Peak Wattage,  $I_m$ ,  $V_m$  and FF for the module
- (vii) Unique Serial No and Model No of the module
- (viii) Date and year of obtaining IEC PV module qualification certificate
- (ix) Name of the test lab issuing IEC certificate
- (x) Other relevant information on traceability of solar cells and module as per ISO 9000 series.

**The RFID must be inside of module lamination. The module laminate, but must be able to withstand harsh environmental conditions.**

11. The panel should be supplied with CREDA Logo in the form of sticker on the back of SPV panel or duly laminated inside the glass of solar module with the remark "Manufactured for CREDA". Inter connections of solar modules should be through good quality male female joint. Name of manufacturer, Sl.No. of Module & manufacturing year should be clearly fixed inside the glass lamination of every module. Back label should be affixed behind every module which should clearly state the specifications & capacity of the module.
12. All SPV module must be indigenously built and made in India.

**D. MOTOR-PUMP SET**

1. Solar pump must be indigenously built and made in India.
2. The SPV water pumping systems may use any of the following types of motor pump sets -
  - a) Surface pump set
  - b) Submersible pump set
3. The "Motor-Pump Set" should have a capacity in the range of 3 HP to 5 HP and should have the following features -
  - a) The mono block DC/ AC centrifugal motor pump set with the impeller mounted directly on the motor shaft and with appropriate mechanical seals which ensures zero leakage.
  - b) The motor of the capacity ranging from 3 HP to 5 HP should be AC/DC. The suction and delivery head will depend on the site specific condition of the field.
  - c) Submersible pumps could also be used according to the dynamic head of the site at which the pump is to be used.
  - d) Selection of pump at the time of survey must be done appropriately as per site conditions, depth & yield of the bore well.
4. The pump and all external parts of motor used in submersible pump which are in contact with water, should be of stainless steel of grade 304 or higher as required. The motor- pump set should have a 5 years warranty and therefore, it is essential that the construction of the motor and pump should be made using parts which have a much higher durability and do not need replacement or corrode for at least 5 years of operation after installation.

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 case of HDPE pipes the minimum pressure rating of 8 kg/sqcm-PE100 grade for pumps up to 3 HP, 10 kg/sqcm-PE100 grade for 5 HP pumps. UPVC column pipe/HDPE Pipe must be provided as per bore depth.

#### E. **MODULE MOUNTING STRUCTURE (MMS) -**

1. MMS as per drawings (**which is given as annexure "IX"-A<sub>1</sub> to A<sub>52</sub>**) should be installed along with the hot dipped galvanized (minimum **80 microns**) array support structure for mounting of SPV modules at site. The panel frame structure should be capable of withstanding a minimum wind load of **150 Km.** per hour, after grouting and installation. MMS should be sturdy & designed to assist SPV Modules to render maximum discharge. The hardware (fasteners) used for installation of SPV Modules & MMS should be of suitable Stainless Steel (**SS 304**). Each MMS should be grouted on pedestals & Foundation as per drawings. Each module should be fastener by four theft proof nut built. Module Mounting Structure including foundation bolt, other nut & bolt, steel nut & bolts, washer, theft proof nut & bolts, clamps for holding controller etc. for 6,8, & 10 modules should have weight at least 235 Kg., 350Kg., and 375Kg.,  $\pm 5\%$  respectively as per drawing and specification attached in tender document.
  - It is mandatory to install SPV pumps of all category/ configuration of 03HP with 10 nos. of solar modules in 10 module mounting structure as per drawing attached in tender document.
  - It is mandatory to install SPV pumps of all category/ configuration of 05HP with 16 nos. of solar modules in (10+6) or (8+8) module mounting structure as per drawing attached in tender document.
2. Module Mounting Structures should have theft proof arrangements with the use of GI Steel C-channel along with the array support structure for locking arrangement of SPV modules for protecting them from theft. Its size should be with reference to the specifications of the SPV modules such that modules can comfortably slide in the channel while installation. It should not hide any portion of the photovoltaic circuit encapsulated in the lamination of the SPV module, there by un-affecting the efficiency & rating of the SPV modules. Anti-Theft Nut Bolts of SS (with washers) should also be used for better theft proofing along with "C" Channel MMS.
3. To enhance the performance of SPV water pumping systems arrangement for seasonal tilt angle adjustment and three times manual tracking in a day should be provided. In order to make structure rigid, the gap between Telescopic pattern supports should be minimal, further, for bearing of centre load of whole structure only pins should be used instead of threaded bolts.
4. The general hardware for structure fitment should be either SS 304 or 8.8 grade. Modules should be locked with antitheft bolts of SS 304 Grade. Foundation should be as per drawing attached.

#### F. **SPV Controller**

1. Controller must be indigenously built and made in India.
2. Maximum Power Point Tracker (MPPT) shall be included to optimally use the power available from the SPV array and maximize the water discharge.
3. The SPV Controller must have IP(65) protection or shall be housed in a cabinet having at least IP (65)protection.

4. Adequate protections shall be provided in the SPV Controller to protect the solar powered pump set against the following:
  - a) Dry running;
  - b) Open circuit;
  - c) Accidental output short circuit;
  - d) Under voltage;
  - e) Reverse polarity;
  - f) SPD to arrest high current surge; and
  - g) Lightening arrestor.
5. A good reliable DC Circuit Breaker as per IS/IEC 60947-2 suitable for switching DC power ON and OFF shall be provided in the SPV Controller.
6. All cables used shall be as per IS694. Suitable size of cable shall be used in sufficient length for inter-connection between the SP Varray to SPV Controller and the SPV Controller to solar powered pump set. Selection of the cable shall be as per IS14536.
7. Controller shall have provision for GSM/GPRS Gateway with Geo tagging. GSM/ GPRS Charges to be included in the Costing till the end of Warranty period of the Pump set.

**G. Universal Solar Pump Controller (USPC)-**

**USPC Specifications for Stand-alone applications:**

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 and On Grid 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-fridge / 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 up to 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 UPSC must follow the MNRE specifications for SPV pumping systems.

S.No.	Description	Desired requirement
1	Motor Supply Phases	Three phase R-Y-B
2	Rated motor frequency	48-50Hz
3	Frequency operation	0 to 52Hz
4	Rated motor voltage	415V± 5%
5	Desired motor operation	Constant V by F or constant motor flux control



II. Proposed electrical properties of USPC when operating motors other than motor- pump set:

Sr No.	Description	Desired requirement
1	Characteristic of voltages	Pure sinusoidal or Filtered AC output voltage at motor terminal. No PWM pulses allowed at the motor terminal, as it generates pronounced voltage spikes. The USPC output is intended to use for the traditional induction motors based applications which are design for sinusoidal grid supply.
2	THD of motor terminal voltages	Below 3%
3	THD of motor current (in case of balance/linear motor)	Below 5%
4	Balance supply	Three phases should be balanced and no negative sequence components to be allowed
5	Voltage spikes	Recurring or non-recurring voltage spikes more than 620V (peak of 440V AC supply) is not allowed between any two terminals
6	Alarms and Protections	Output voltage low, Output frequency low/high, Low irradiance/PV power, Current overload, Peak Torque overload

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%
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(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	(Vnominal-50)	Nominal	(Vnominal+50)
2	5 HP	(Vnominal-70)		(Vnominal+70)

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.

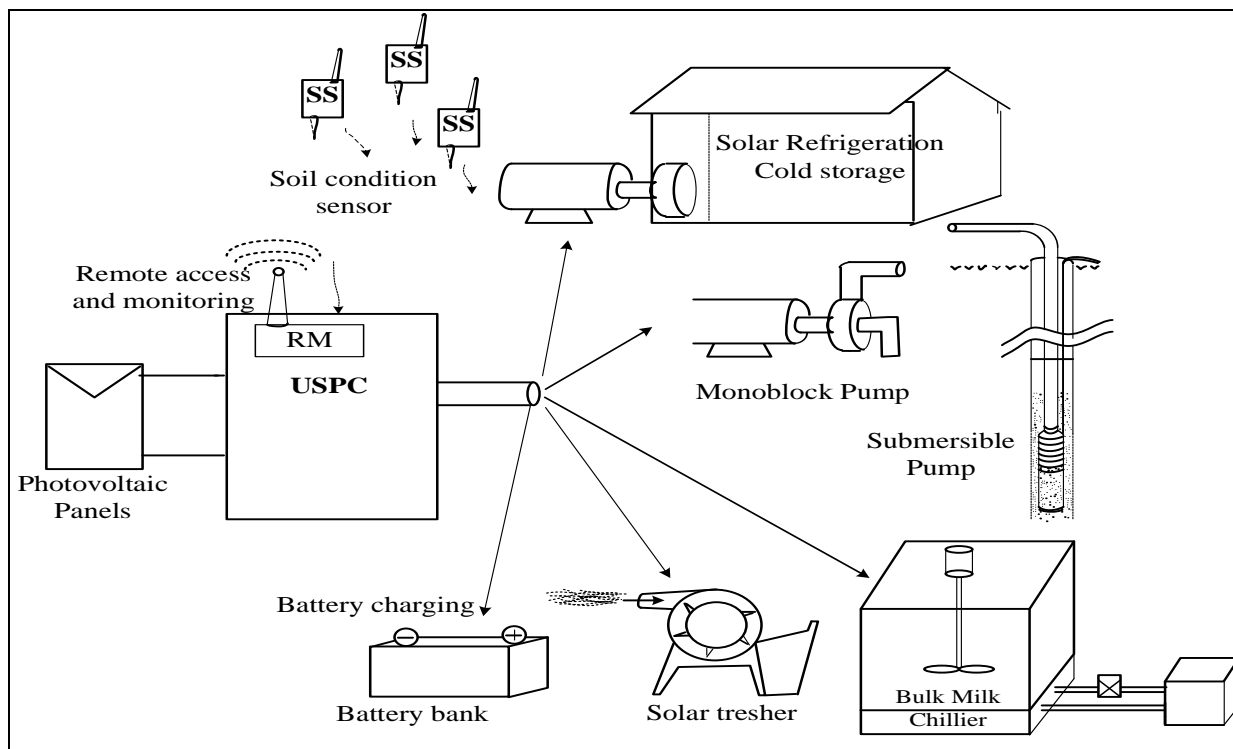


Fig. USPC operation schematic diagram.

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 5years 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 or must be housed in a cabinet having at least IP65 protection. **Separate rates are invited for universal controller & controller suitable for 3, 5 Surface & Submersible pump set in-price bid-II enclosed.**

#### **H. EARTHING ARRANGEMENT**

1. Earthing of the motor shall be done as per IS 9283 in accordance with the relevant provisions of IS 3043. Separate earthing shall be provided for Controller, pump and SPV array.
2. For safety purpose, it shall be ensured during installation that the earthing is capable of taking care of leakage current.
3. In case of UPVC/HDPE pipes used as discharge pipe, a separate non-corrosive, low resistance
4. Conductor from motor earth terminal to control panel earth terminal shall be provided for earthing.
5. A lightning arrestor shall be provided with every SPV Water Pumping System.

#### **I. USE OF INDIGENOUS COMPONENTS**

It will be mandatory to use indigenously manufactured solar modules. The motor-pump-set, controller and balance of system should also be manufactured indigenously. The SI has to declare the list of imported components used in the solar water pumping system.

#### **J. PERFORMANCE REQUIREMENTS**

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

##### **a) For D.C. Motor Pump Set -**

- i) 110 liters of water per watt peak of PV array, from a Total Dynamic Head of 10 meter (Suction head, if applicable, maximum of 7 meter) and with the shut off head being at least 12meter.
- ii) 55 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 meter (Suction head, if applicable, up to a maximum of 7 meters) and with the shut off head being at least 25meter.
- 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 45meter.

- iv) 23 liters of water per watt peak of PV array, from a Total Dynamic Head of 50meter and the shut off head being at least 70meter.
- 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 100meter.
- 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 150meter.

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 given in the Annexure IV.

**b) For A.C. Induction Motor Pump Set -**

- i) 99 liters of water per watt peak of PV array, from a Total Dynamic Head of 10meter (Suction head, if applicable, maximum of 7 meters) and with the shut off head being at least 12meter.
- ii) 49 liters of water per watt peak of PV array, from a Total Dynamic Head of 20 meter (Suction head, if applicable, up to a maximum of 7 meters) and with the shut off head being at least 25meter.
- iii) 35 liters of water per watt peak of PV array, from a Total Dynamic Head of 30meter and the shut off head being at least 45meter.
- iv) 21 liters of water per watt peak of PV array, from a Total Dynamic Head of 50meter and the shut off head being at least 70meter.
- v) 14 liters of water per watt peak of PV array, from a Total Dynamic Head of 70meter and the shut off head being at least 100meter.
- vi) 9 liters of water per watt peak of PV array, from a Total Dynamic Head of 100meter and the shut off head being at least 150meter.

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 given in the Annexure V.

**4. TESTS FOR HYDRAULIC AND ELECTRICAL PERFORMANCE OF PUMPSET -**

- i. The motor-pump set shall be tested independently for hydraulic and electrical performance as per the relevant IS specification including following test -
  - a) Constructional requirements/features
  - b) General requirements
  - c) Design features
  - d) Insulation resistance test
  - e) High voltage test
  - f) Leakage current test
- ii. Testing of SPV Water Pumping Systems shall be done as per procedure specified by the MNRE.