SPECIFICATION FOR SUBMERSIBLE SOLAR PUMP

1. Controller Power Capacity should be at-least equal to Solar Panels
2. The Controller must have IP65 protection or must be housed in a cabinet having at least IP65 protection with Suitable (IP65) or above class - cable glands, outside connectors & other related accessories.
3. Isolator Switch Should be between Solar panels and controller RMS (GSM/GPRS connectivity)
4. Controller shall be integrated with Remote Monitoring System with GSM/GPRS and Geo tagging. GSM/ GPRS Charges to be included in the Costing till the end of Warranty period of the Pump set.
5. RMS should have provision to give various modes of operations which are as follows:
    - Solar System Performance: DC Voltage, DC current, AC output Current, Power, Drive frequency, Energy, etc.
    - Pump Performance: Running Hours, Water Discharge (Output), etc.
    - RMS Performance: %Device Connectivity, %Data Availability, etc.
    - 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.
    - Events and Notifications: Faults related to Pump Operation, Solar generation, Controller/Drive faults like overload, dry run, short circuit, etc.
    - Consumer Management: Name, Agriculture details, Service No. Contact Details, etc.
    - Asset Management: Ratings, Serial Number, Make, Model Number of Pump, Panel and Controller, Geo Location, IMEI number (of communication module) and ICCID (of SIM).
    - Complaint management system is a part of centralized monitoring software platform.
    - Consumer Mobile Application: Generation, Running Hours, Water Discharge, Complaint logging, etc
6. RMS should have provision to give various modes of operations which are as follows:
    - 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 thru SMS/missed call.
    - 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)
    - Timer Mode: - Pump controller shall operate pump as per configured schedule using mobile application i.e. daily start time and running hours of pump. Manual Mode: - Pump can be made to run into manual mode from field.
    - Solar Photo Voltaic (SPV) Array contains specified number of same capacities, type and specification modules connected in series or parallel 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 Wp, with adequate provision for measurement tolerances. Use of PV modules with higher power output is preferred.

7. Modules supplied with the Submersible pup shall have certificate as per IS 14286/IEC 61215 specifications or equivalent National or International/ Standards. Lab certified STC performance data supplied with the modules shall not be more than one year old.
8. Modules must qualify to IS/IEC 61730 Part I and II for safety qualification testing.
9. Modules must qualify to IEC TS 62804-1:2015 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)
10. As the pumps are intended for use in coastal areas the solar modules must qualify to IEC TS 61701:2011 or equivalent for salt mist corrosion test.
11. The name plate shall conform the IS 14286/IEC 61215 or equivalent.
12. 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.
13. The "Motor-Pump Set" should have a capacity of 5kw, 7.5kw and 9.2kw
14. As the submersible pumps are used in coastal areas, 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 of grade 316 or higher grade may be used.
15. The suction/ delivery pipe shall be compatible to HDPE or uPVC column pipes of 63mm
16. The PV modules should be mounted on metallic structures of adequate strength and appropriate
17. The SPV Controller shall be housed in a cabinet having at least IP (65) protection.
18. Adequate protections shall be provided in the SPV Controller to protect the solar
    - powered pump set against the following:
    - Dry running;
    - Open circuit;
    - Output short circuit;
    - Under voltage;
    - Reverse polarity;
19. A DC switch as per IS/IEC 60947-1 or equivalent suitable for switching dc power ON and OFF shall be provided in the Pump Controller.
20. All cables used shall be as per IS 694 or IS 9968. Suitable size of cable shall be used in sufficient length for inter-connection between the SPV array to SPV Controller and the SPV Controller to solar powered pump set. Selection of the cable shall be as per IS 14536.
21. 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 Lat, Latest RMS Long, Pump Capacity (HP), PV Module Capacity (KW), Pump Status, Current Generation (kW), Today Solar

Generation (kWh), Total Solar Generation (kWh), Today Runs Hours (Hrs.), Total Pump Run Hours (Hrs.), Today Water Discharged (Liters), Total Water Discharged (Liters), Peak Power (kW) supplied by the

22. The system should be provided with all necessary protections like earthing, Lightning, and Surge Protection etc., as described below:
    The Earthing shall be done in accordance with the IS 3043 including its amendments and updated versions.
    - The Earthing system should be designed in such a way that its should 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.
    - Earth connections shall be done such that they are visible for inspection and all the earth electrode can easily be tested at any point of time.
    - It is recommended to keep the value of resistance of earth electrode less than 5 ohms.
    - All the materials, fittings etc. used for doing earthing shall conform to the Indian standard, wherever exists.
    - The actual value of soil resistivity should be considered while designing the earthing system at 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.
    - 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 conductor against the excessive corrosion the IS 3043 shall be referred.
    - 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.
    - 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 to a single long electrode.
    - 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.
    - Separate earthing conductor shall be provided for controller, pump, motor and SPV array etc. for its connection to the earthing pit and it should be continuous in nature for electrical conductivity. However, in no case, even for the earthing of light current equipment (for example, high voltage testing equipment), should the cross-sectional area of the earthing lead be less than 6 mm2.
    - For the maintenance of the earth electrode and measurement of the Earth electrode resistance the provisions of IS 3043 shall be referred.

- 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, earthing connection may be made to the discharge pipe clamps. However, in case of HDPE/PVC pipes, a separate metallic cable from the motor to the control panel shall be provided and earthing given as if four-core cable is used, the fourth core not connected to the terminals can be used for earthing.
- Lightning protection shall be provided as per IEC 62305 and IEC 63227 standard including its amendments and updated versions.
- An external lightning Rod, whose height should be more than the highest point in the system with lightning protection system (LPS) designed to comply with class III or higher shall be installed as based on the requirement of the site which in turn depend upon the area-specific lightning activity, etc. parameters.

23. 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
24. The rated voltage of Surge protection on the DC side depends on the type of protective circuit and the magnitude of the maximum operating voltage of the PV modules.
25. The motor pump-set and Controller used in SPV Water Pumping Systems shall be securely marked with the following parameters declared by the manufacturer:
26. Manufacturer's name, logo or trade-mark;
    - Model, size and SI No of pump-set(To be engraved/laser marked on the motor frame);
    - Motor Rating (kW / HP);
    - Total head, m, at the guaranteed duty point;
    - Capacity (LPD) at guaranteed head;
    - Operating head range, m;
    - Maximum Current (A);
    - Voltage Range (V) and;
    - Type - AC or DC Pump set; &
    - Photo Voltaic (PV) Array Rating in Watts peak (Wp)
    - Country of origin
27. An Operation and Maintenance Manual, in English and the local language, should be provided with the solar PV pumping system. The Manual should have information about solar energy, photovoltaic, modules, DC/AC motor pump set, tracking system, mounting structures, lectronics and switches. It should also have clear instructions about mounting of PV module, O's and DONT's and on regular maintenance and Trouble Shooting of the pumping system.

28. Helpline number and Name and address of the Service Centre and contact number of authorized representatives to be contacted in case of failure or complaint should also be provided. A warranty card for the modules and the motor pump set should also be provided to the beneficiary.