



SOLAR WATER PUMP



User Manual

NEW AND RENEWABLE ENERGY DEPARTMENT, HARYANA
HARYANA RENEWABLE ENERGY DEVELOPMENT AGENCY (HAREDA)



Dear Farmer,

I congratulate you to the family of proud owners of solar pumps. By installing a Solar Pump for irrigation in your field, you have not only taken initiative to use solar energy for farming but have also contributed in making the environment clean for yourself and future generations. On behalf of the MNRE, GoI and Haryana Government, I again congratulate you.

Haryana is an agrarian State. About 84% of its land area is irrigated as against national average of about 48%. Extensive farm operations in the State have resulted in more than 6,40,000 grid connected tube-well connections, with another about 1,00,000 farmers waiting to get grid connection. In addition, there are about 300,000 diesel pumps. These diesel pumps not only increase the cost of farming but also affect our environment.

Haryana Government is committed to the welfare of farmers and is taking many steps to reduce cost of cultivation thereby enhancing the income of farmers. Solar energy is abundant in Haryana. So, solar pumps for agriculture provide a viable solution for irrigation needs of a farmer.

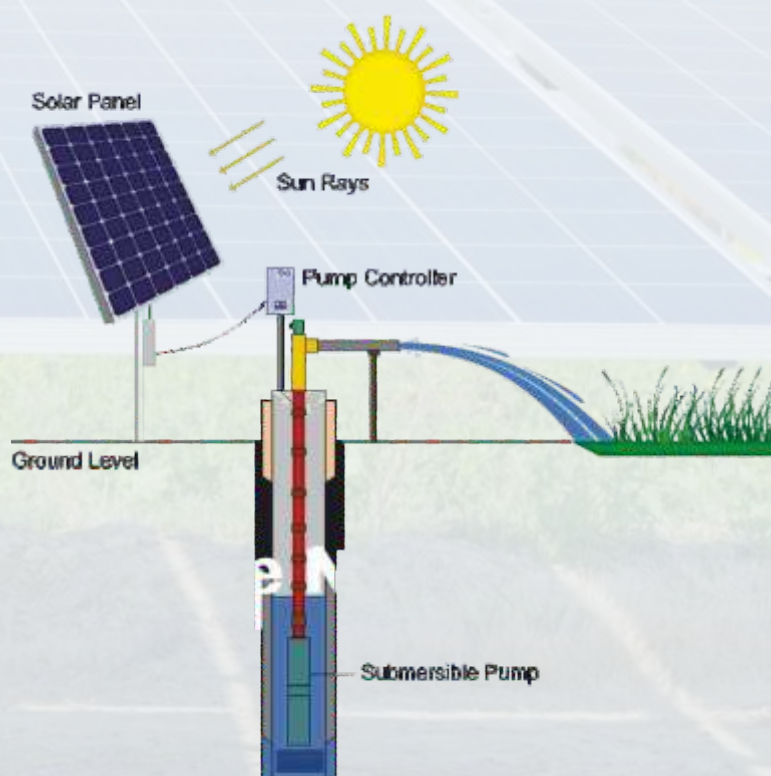
The Ministry of New & Renewable Energy, Govt. of India launched Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM KUSUM) in 2019 for farmers under which 30% financial assistance is provided on installation of Stand-alone Off-Grid Solar Agriculture Pumps. Haryana Government has decided to provide 45% financial assistance for these pumps (Component-B) so that the pumps are available to farmers at only 25% cost of the pump. So, the State Government has decided to install 50,000 solar water pumping systems of 3 HP to 10 HP capacities in the State under this scheme in the year 2019-20 and 2020-21.

By now, you must have understood the benefits of solar pump. It not only provides freedom from power bills and power cuts but also facility of day time irrigation with safety. I hope that you will reap the benefits of solar pump and it will prove to be an asset to you. We hope that you will use the pump for better productivity.

With Best Wishes

Director General
New & Renewable Energy Department,
Haryana & HAREDA

KNOW YOUR SOLAR WATER PUMPING SYSTEM



The SPV water pumping system consists of following major parts:

- i. **PV ARRAY (SPV PANELS):** The Solar PV array 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 **2700 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.
- ii. **MOTOR PUMP-SET (AC/DC):** Pump sets generally comprise of the motor, which drives the operation and the actual pump which moves the water under pressure.

- a. **AC Motors:** AC Motors require inverters to convert DC to AC. Solar pumping systems use special electronically controlled variable-frequency inverters, which optimises matching between the panel and the pump.
- b. **DC Motor:** The DC Motors with permanent magnet are generally more efficient. DC Motors may be with or without carbon brushes. DC motors with carbon brushes need to be replaced after approximately every 2 years. Brushless designs require electronic commutation. Brushless DC (BLDC) Motors are becoming popular in the solar water pumps. Solar pumps under PMKUSUM have AC Induction Motor or DC Motor.

The SPV water pumping systems may use any of the following types of motor pump sets of capacity 3 HP to 10 HP:

- i. **Surface mounted motor-pump set (mono block pumps) :** Surface pump are suitable for areas where the water level is within 7m below ground level. A surface or centrifugal pump is normally placed at ground level. The pump is suitable for pumping from shallow bore wells, open wells, resereservoirs, lakes & canals. These pumps are designed for high flow rates and low heads
- ii. **Submersible motor-pump set :** A submersible pump is one that is immersed in water in a bore well. Submersible pumps are suited both to deep well and to surface water sources. These pumps are designed for high head and medium flow application. Bore size depends on size of the pump. Normally, 3 inch to 8 inch dia bore is required for pumps of 3 HP to 10 HP size.
- iii. **CONTROLLER :** The Controller is an electronic device which matches the PV power to the motor and regulates the operation of the pump according to the input from the solar PV array.

All cables used are as per IS 694. Suitable size of cable is used in sufficient length for inter-connection between the SPV array to SPV Controller and the SPV Controller to solar powered pump set. Controller is integrated with GSM/GPRS Gateway with Geo tagging.
- iv. **MODULE MOUNTING STRUCTURE (MMS) :** The PV modules are mounted on metallic structures of adequate strength and appropriate design, which can withstand load of modules and high wind velocities up to 150 km per hour. The module mounting structure are hot dip galvanized. The firms may use MMS design of MNRE, GoI or may also get the design of MMS approved from any of the reputed institutes like IITs, NITs etc.





- v. **SUCTION AND DISCHARGE PIPE** : 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 and further higher minimum pressure rating for above 5 HP as appropriate shall be used.
- vi. **EARTHING ARRANGEMENT AND LIGHTENING ARRESTOR** : For safety purpose, earthing and lightening arrestor shall be provided with every SPV Water Pumping System.

OPERATION AND MAINTENANCE INSTRUCTIONS



Daily switch on the pump in the morning at around 7.00 AM (sooner the better) and switch off in the evening after 5.30PM. Switch is provided on the controller. Installation team will provide training on how to switch on and off the pump.

Panels: Clean the panels with water regularly. Cleaning frequency can be once in 15 days or earlier depending on the dust deposition on the panel. Do not use sharp objects (wire mesh or brush) to clean the panels.

Dry running of the pumps should be avoided. If any undue vibration or noise is noticed, the pump and controller should be stopped immediately and the cause for vibration or noise to be checked and rectified.

Frequent starting and stopping should be avoided as each start causes overloading of Motor, controller etc. It reduces the life of the equipment. The delivery valve should be operated gradually to avoid sudden change in flow velocity which can cause water hammer pressures.

The pump controller is to be operated by a trained person only. Take care to avoid the direct sunlight and rain fall.

Cable Maintenance: Routine visual inspection of cables is required to check if any part of the cable is cut or open, in any such case, please use insulation tape to cover it immediately. Inform the call centre if the damage is severe.

Structure: Regular visual inspection of structure is needed to check any loose bolted joint or rust deposit. Tighten the bolts using the right tool.

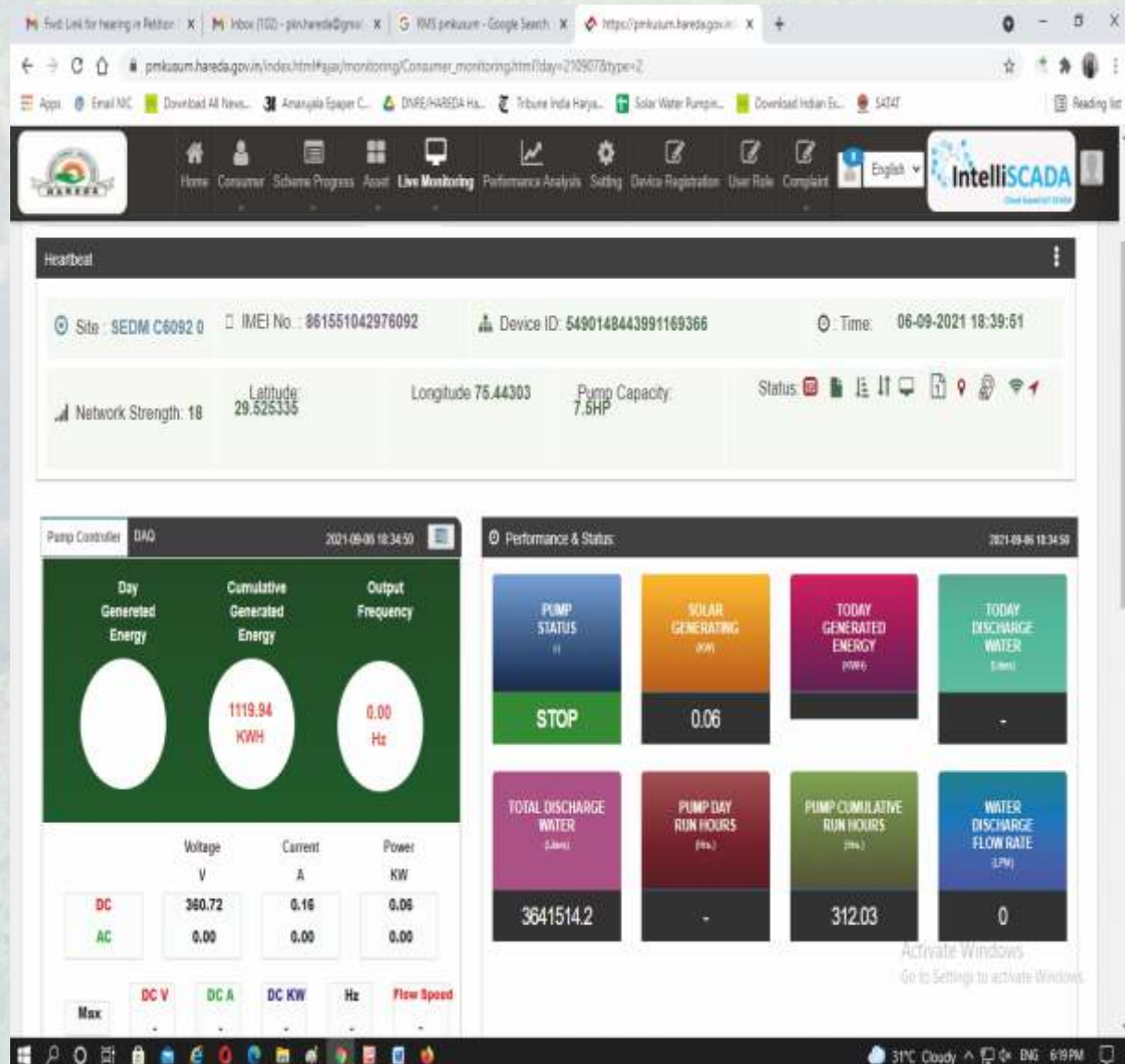
Maintenance of the system must be done only by authorized people from TPS. We suggest once in six months' maintenance contact with TPS.

ONLINE MONITORING ON PMKUSUM PORTAL

REMOTE MONITORING SYSTEM (RMS)

This solar pump has provision of Remote monitoring System (RMS) so that its performance may be monitored from a remote location using mobile technology. You can check the status of your pump on PMKUSUM portal. You will be provided access to this portal when an Mobile App is developed. Presently, it is accessible on PMKUSUM State Portal.

It is used to ascertain the location of the pump, daily water output, the power generated by the PV array, the UP TIME of the pump during the year, Number of days the pump was unused or under breakdown/repairs, pump location.



DO'S AND DON'TS

DO'S

- Check the connections and cables periodically for any damages and report.
- Always operate the controller with dry hands.
- Set the tracker to position shown.
- After sunset, when operating in manual mode, modules must be brought to slow position which is parallel to the earth.
- Check safety rope for damages and replace when needed.
- After any storms / rain check the system for healthy working.
- Controller to be operated by trained people.
- Clean the modules early in the morning or late in the evening when the modules are at normal temperature.
- Keep the controller box locked.
- If the controller or actuator is not working, then, do place a call to the customer service support team of Tata Power Solar.
- Get the annual maintenance contract signed.
- Ensure the lubrication on screw rods (manual tracking) is provided every 3 months for smooth operation.

DON'TS

- Do not replace any modules which are of other make or rating.
- Do not open the connections between the modules.
- Junction box must not be operated by an untrained person.
- Do not compare the water discharge at the field of the neighbors as it depends on your bore condition.
- Do not run the pump or the motor dry or outside the borewell.
- Do not install at depth more or less than recommended.
- Do not connect additional pipe length more than specified.
- Do not connect any other loads other than the specified pump motor.
- The modules and the controller system contains dangerously high levels of voltages. Do not open or disassemble.
- There should be no joints in the field run cables.
- Do not disconnect the earthing connection or change earthing connections

FAULT DIAGNOSIS AND SOLUTIONS

| CONDITION | DIAGNOSIS | SOLUTION |
|---|---|--|
| No Water Discharge | The controller may be in OFF position. | Push ON/OFF Button on the controller to start the pump controller |
| Pump Running but no water discharge | This may be caused due to the following: 1) Very high depth of pump installation 2) Dirty or soiled panels or shadows 3) Pipe Broken or Damaged. | 1) Install at correct Depth 2) Clean Panels or Remove Obstruction 3) Reconnect pipe or pipe needs replacement. |
| No Power in the Controller | MCB has tripped or Loose Connections in the Connectors on the Solar Panels or Controller. | MCB is located inside the controller for some models/makes of the controllers. Please call service centre tripping has to be identified. |
| Dry Run Error | No water in the borewell. | Use pump only in borewells with proper water level. |
| Dry Run Error after running the borewell for some time. | Water yield of the borewell may be low. | Use pump only in borewells with proper water yield level. |
| Heating on the Backsider of the controller. | Heating on the fined side (back side) of the controller is a normal phenomenon. Do not block the finned heat sink located behind the controller. | No action required. |
| Over Voltage Error | This error may be due to wrong connection of the PV panels. | Check connection of PV panels as per SLD (Single Line Diagram) given in this manual. |
| Low Water Discharge. | Pump installed at very high or very low depth of borewell. | Install pump for the correct depth of borewell. |
| Low Water Pressure | Pump installed at very high depth of borewell | Install pump for the correct depth of borewell. |
| Pump Vibration | Pump may not have been properly connected to the motor or there is a misalignment in the shaft. | Call Service Center. |

WARRANTY & INSURANCE

WARRANTY

- a. The complete Solar Photovoltaic Water Pumping System and display board / Name Plate (SNA's will provide the details) shall be warranted and maintained for 5 years from the date of installation.
- b. 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.
- c. The supplier has to submit interchangeability certificate for its product supplied for replacement during warranty and maintenance period and even when it is purchased from open market. In case due to change in technology, the supplied product is not available during warranty/ maintenance period than the improved version of product can be used in warranty/ maintenance period with same or improved technical parameters or the combination thereof after written communication of HAREDA at same Cost & terms and conditions.
- d. 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, 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.
- e. Helpline number and 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 warranty card for the modules and the motor pump set should also be provided to the beneficiary.

INSURANCE

The Comprehensive insurance of Solar Photo Voltaic Water Pumping System shall be provided for natural calamities, theft & burglary etc. during 5 years warranty period.

COMPLAINT REDRESSAL

- To ensure, hassle free operation of the pumps, the Solar Pumps are installed with 5 years warrantee and 5 year insurance.
- Every firm is required to operate a Toll Free Complaint No. which is displayed at pump. You can contact this toll free no for complaint.
- Each installer firm has a Service Centre in the district to ensure repair of the pump in 3 days. The details of Service Centre is available on PMKUSUM Portal (pmkusum.hareda.gov.in). You can also contact to this Service Centre for complaint.
- Online complaint requests can be done at PMKUSUM Portal (pmkusum.hareda.gov.in) and Keep a track of your complaint by the Ticket Number.
- You can also contact our Project Officer, New & Renewable Energy Department in O/o Additional deputy Commissioner of your District.
- Even if your problem is not solved, you may contact Director General, HAREDA at mail hareda@chd.nic.in with all details in following format:-

| S.No. | Particulars | Details |
|-------|--|--------------------|
| 1. | Name of the Farmer | |
| 2. | Address | |
| 3. | Saral ID No. | |
| 4. | Mobile No. | |
| 5. | Date of installation | |
| 6. | Supplier Name | |
| 7. | If firm was contacted for this complaint, it's Ticket No. & date | Ticket No. Date |
| 8. | Complaint in brief | |



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