

Annexure B
TECHNICAL SPECIFICATIONS FOR 10.00HP & 15 hp SOLAR AC Dual SUBMERSIBLE PUMPS

DEFINITION:

A solar photo-voltaic pump is a water lifting device consisting of the following:

- a) SPV panel/array
- b) Motor pump (AC Submersible)
- c) Optional Power Conditioning Unit (for conversion of DC to AC in case of an AC pump)
- d) Structure for mounting solar modules with a provision for manual tracking and altering the angle of inclination with respect to the horizontal Or fix type.

1. DUTY CYCLE:

- The water requirement should be a minimum of 15 litres of water per watt of PV array capacity used per day from a total depth of 60 metres for both the submersible pumps.
- Fixed structure can be used for mounting structure with additional solar panels to run the pumps during peak sunshine hour without tracking.

2. SPV MODULES:-

- The SPV water-pumping system should be operated with a PV array in the range of 11,390 Watts for 10 hp and 16,000 watts for 15 hp measured under standard test conditions.
- Sufficient number of modules in series and parallel shall be used to obtain the required PV array current, voltage and power output.
- Crystalline high power cells shall be used in the Solar Photovoltaic module. Each solar module shall consist of redundantly interconnected photovoltaic cells and peak power rating shall not be less than 250WP for both 11.3 wp 16.0 Wp submersible pumps.
- To connect the solar modules interconnection cables shall be provided. Photoelectric conversion efficiency of SPV module shall be greater than 13%. Modules shall be made of high transmissivity glass front surface giving high encapsulation gain and silicon rubber edge sealant for module protection and mechanical support.
- All materials used shall have a proven history of reliable and stable operation in external applications. It shall perform satisfactorily during the winter season in Ladakh under extreme weather conditions also.
- The offered module shall be in accordance with the requirements of IEC 61215- Edition II for quality of crystalline silicon solar cell modules, IEC 61730 (Part I and Part II). The bidder shall submit appropriate certificates.
- The rated output power of any supplied module shall not vary more than 3-5% from the average power rating of all modules.
- The module frame shall be made of corrosion resistant materials, which are electrolytically compatible with the structural material used for mounting the module.
- Protective devices against surges at the PV module shall be provided, if required. Low voltage drop bypass and / or blocking diode(s) may also be provided, if required.
- PV modules must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.
- The solar modules shall have suitable encapsulation and sealing arrangements to protect the silicon cells from the environment. The arrangement and the material of encapsulation shall be compatible with the thermal expansion properties of the silicon cells and the module framing arrangement/material. The encapsulation

arrangement shall ensure complete moisture proofing for the entire life of the solar modules.

- Each module shall have low iron tempered glass front for strength and superior light transmission. It shall also have tough multi layered polymer back sheet for environment protection against moisture and provide high voltage electrical insulation.
- The fill factor of modules shall not be less than 0.70.
- Array capacity shall not be less than the designed capacity and number of modules required shall be worked out accordingly.
- Module Junction box (weather resistant) shall be designed for long life outdoor operation in harsh environment.
- The terminal box on the module should have a provision for opening for replacement of the cable if required.

3. **SPECIFICATIONS:**

The specifications for the solar pump system shall observe the specification listed in Table 4.1 & 4.2 below:

TABLE 4.1: TECHNICAL SPECIFICATIONS for 10 hp pump

S.NO.	Model No.	10 Hp Submersible Pump
1	System Configuration	As per the pump connection requirement
a)	SPV ARRAY	
i)	Array Wattage	11,390 Wp or more
ii)	Array Voltage	As per design
b)	SPV MODULE	
i)	Number of stage	07
ii)	Wattage under STC	ATLEST 250Wp EACH
c)	MOTOR PUMP SET	
i)	Capacity	10.0HP
ii)	Input Voltage	Max 800VDC
iii)	Voltage range in which pump will continue to lift water	440 TO 800VDC)
d)	SUPPORT STRUCTURES	
i)	Number	
ii)	Tracking	Fixed type
	ELECTRONICS AND OTHERS	

e)	Cables etc.	As per requirement 1CX4Sq MM for all DC connection & 3Cx 4.0SQMM from Pump to controller connection
f)	Inverter	
g)	Inverter Output Voltage	0-400 AC, 0-50HZ
h)	Delivery Pipe	75mm. To 90MM HDPE pipe or PPR pipe only to be used (the length of the delivery pipe should be as per site requirements)
i)	Spares	
1.	Average Daily Water Delivery	190,000.00 litres per day @ 50M head In 6 hours peak sunshine
2	Shut Off head	75M
3	Suitable Bore size	8 inch
4	Floater & Suction pipe	Open dual ac pump need to be keep in the floater and suction pipe will required upto water source

TABLE 4.2: TECHNICAL SPECIFICATIONS for 15 hp pump

S.NO.	Model No.	15 Hp Dual Solar Submersible Pump
1	System Configuration	As per the pump connection requirement
a)	SPV ARRAY	
i)	Array Wattage	16000 Wp or more
ii)	Array Voltage	As per design
b)	SPV MODULE	
i)	Number of stage	06
ii)	Wattage under STC	ATLEST 250Wp EACH
c)	MOTOR PUMP SET	
i)	Capacity	15.0HP
ii)	Input Voltage	Max 800VDC
iii)	Voltage range in which pump will continue to lift water	540 TO 800VDC)

d)	SUPPORT STRUCTURES	Fixed TYPE
i)	Number	
ii)	Tracking	Fixed type
	ELECTRONICS AND OTHERS	
e)	Cables etc.	As per requirement 1CX4Sq MM for all DC connection & 1x3Cx 6.0SQMM from Pump to controller connection
f)	Inverter	
g)	Inverter Output Voltage	0-400 AC, 0-50HZ
2.	Delivery Pipe	75mm. To 90MM HDPE pipe or PPR pipe only to be used (the length of the delivery pipe should be as per site requirements)
3.	Spares	
3.	Average Daily Water Delivery	3,30,000.00 litres per day @ 50M head In 6 hours peak sunshine
	Shut Off head	65M
	Suitable Bore size	8 inch

4. MOTOR PUMP SET:

- The pump set supplied by the successful bidder should be from an ISO 9001 certified And BIS certificated company only .

5. PROTECTION AND SAFETY:

The following protection and safety measures shall be ensured; no damage shall occur to the system under these conditions.

- Protection against dry operation of motor pump set shall be provided
- The motor shall be protected against transients from the power supply according to IEC 60664-1 "Overvoltage Category III"
- Foot valve shall be provided against lightning, storms etc.
- MIVs shall be provided in junction box against open circuit, accidental short circuit and reverse polarity
- The motor shall be protected against over-temperature; in the case where the temperature rises the motor shall be cut out automatically. The motor shall be cut in automatically when the temperature has dropped to normal range.

6. **MOUNTING STRUCTURE**

- Leg assembly of mounting structure made of GI pipes of different size, galvanized Pipe / tubes may be accepted. The work should be completed with supply, fitting fixing of clamps, saddles, nut & bolts etc. While quoting the rate, the bidder may mention the design & type of structure offered. All nuts & bolts shall be made of high quality stainless steel.
- The structure shall be designed to allow easy replacement of any module and shall be in line with site requirements.
- The structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site.
- The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels. At the same time it should withstand wind speed up to maximum 150 km/h.
- The drawings along with detailed design shall be submitted to Associate Director SKUAST-K Leh for approval before starting the execution work. The supplier/manufacturer shall specify installation details of the PV modules and the support structures with appropriate diagrams and drawings. The work will be carried out as per designs approved by Associate Director SKUAST_K Lehh.

7. **JUNCTION Box/control Box.**

- A junction box if needed with an on/off switch mounted on a support pole must be provided with a suitable cable in order to connect the SPV array directly to the DC centrifugal pump or to the AC submersible pump through an inverter.
- The junction boxes shall be dust, vermin and waterproof and made of FRP / ABS / Thermo Plastic.

8. **BIS SPECIFICATION:**

Components and parts used in the solar pumping system (SPV pumps) should conform to the BIS specifications wherever such specifications are available & applicable.

9. **INSTALLATION:**

The drilling and casing of the borehole for submersible pumps shall be carried out by the government itself. The supplier will supply and install the SPV modules, array tracking structure, pump set, inverter (Electronics), delivery pipe as per site requirements (details of head provided in **List of Locations for Installation**) of HDPE/PPR pipe and other accessories as per the MNRE specification. If the pipe required for submersible pumps is more than 50 metres, then rate of the pipe per meter length should be quoted. In case of surface pumps the supplier will supply and make the necessary foundation and other accessories for the installation of SPV surface pumps.

10. **BILL OF QUANTITIES for 10 hp pump**

Si. No	Description	Total	Units of Material
1	Solar Modules (crystalline, 250Wp minimum)	11390	Wp
2	Junction Box with all latest protection inbuilt	Suitable for above	Set
2	Motor Pump Set (12.5HP Submersible AC Pump, Duel type)	1	Set

3	Mounting/Support Structure for Solar Modules (manual tracking ensured)	1	Set
4	PCU or Inverter for AC submersible pump	1	Set
5	Delivery Pipe (HDPE/PPR Pipe, of 75 to 90mm diameter size for AC pumps as per site requirements)	1	In meters as per site requirement
6	Cables 1CX4SQMM DC cables 3Cx4SQMM cable	As required	Set
7	Other misc./BoS items (nuts, bolts, washers, etc.)	1	Set
8	Safety Rope	1	One

11. BILL OF QUANTITIES for 15 hp pump

Si. No	Description	Total	Units of Material
1	Solar Modules (crystalline, 250Wp minimum)	16000	Wp
2	Junction Box with all latest protection inbuilt	Suitable for above	Set
2	Motor Pump Set (15HP Submersible AC Pump, Duel type)	1	Set
3	Mounting/Support Structure for Solar Modules (manual tracking ensured)	1	Set
4	PCU or Inverter for AC submersible pump	1	Set
5	Delivery Pipe (HDPE/PPR Pipe, of 75 to 90mm diameter size for AC pumps as per site requirements)	1	In meters as per site requirement
6	Cables 1CX4SQMM DC cables 1X3Cx6SQMM cable	As required	Set
7	Other misc./BoS items (nuts, bolts, washers, etc.)	1	Set
8	Safety Rope	1	One



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