



Request for Quotation
For the purchase of material as per the following information.

A. Introduction

Pact is a US-based organization that has been engaged in a number of poverty alleviation and development program in Ethiopia since 1996. Pact's unique contribution as a development partner lies in the vitality, breadth and sectorial composition of its development programs.

B. Purpose

Pact would like to purchase the following Items for project use.

S. No	Description of the Item	Quantity
1	Submersible pump	1

C. Eligibility

Accordingly Pact invites potential and reliable suppliers fulfilling the following criteria.

1. The Agency/Company detail profile (for both)
2. Business registration certificate from relevant authorities
3. Experience in supplying of similar items, document showing such experience should be attached. Has the ability/capacity to meet deadlines for delivering the items. (for both)
4. Has past experience of supplying such items to similar organizations by meeting deadlines. Letter recommendation from clients.
5. Has the representative in Ethiopia (for international suppliers)

D. Prices:

Prices should be fixed and it includes, installation and costs of delivery to Pact Ethiopia Office. Price should also specify whether it is before or after VAT.

E. Validity:

Quotes shall remain valid for three month from the due date of receipt of quotes. In exceptional circumstances, prior to expiry of the original offer validity period, Pact may request that the offeror extend the period of validity for a specified additional period.

F. Delivery Date:

Not later than 1 month after placing order (signing Purchase Order).

1. Pact shall not be responsible for any costs related to the preparation and submission of the quotation.
2. Late quotes shall not be considered.
3. Pact has the right to cancel or reject the whole or parts of the bid as deemed serves its interest
4. Pact may request for sample checking of the product during the selection process as deemed necessary.

G. Evaluation of Quotes:

Quotes will be evaluated based on the following criteria:

- Adherence to product specifications.
- Price
- Delivery date
- Past experience and performance in supplying similar items in Ethiopia.
- Availability of material at stock
- Has the representative in Ethiopia for International supplier.

H. Award Criteria:

Pact is not obligated to make an award by virtue of having issued this solicitation. Any award is predicated on Pact receiving funding for this express purpose. Pact can only make an award if the product fully complies with the technical specifications mentioned in the RFQ. Pact may make an award to a single offeror should such an award be advantageous to Pact. Alternatively, Pact may make awards to different offerors should such multiple awards be more advantageous to Pact. Any award(s) will be made to the responsible offeror whose offer(s) has/have been determined to be most advantageous to Pact. Pact reserves the right to cancel or reject the offer, in part or the whole as deemed best serve its interest

The bidders should submit the quotation (Technical and Financial) in hand delivery with **SEALED ENVELOP** with copy of the quote to Pact Ethiopia Office. International suppliers can send their quotation (Technical and Financial) by the following email address (infoethiopia@pactworld.org) or stesfaye@pactworld.org up to August 15, 2019, before 5:00 **P.M** and late quotes shall not be considered.

Interested supplier can ask further clarification or question through the following email address (infoethiopia@pactworld.org) and Pact will provide you.

Pact's office is located at Wuhalemat area, Bole Sub-City Wereda 4, House NO. 533. Telephone: •+251-11- 661 65 72/26 44/63 04/67 22

I. Terms and Conditions

A. Disclaimers

- Pact reserves the right to modify by written notice the terms of this solicitation at any time in its sole discretion. Pact may cancel the solicitation at any time
- Pact may reject any or all proposals received.
- Issuance of solicitation does not constitute award commitment by Pact.
- Pact reserves the right to disqualify any quotation based on vendor's failure to follow solicitation instructions.
- Pact will not compensate Vendors for their response to the solicitation.
- Pact reserves the right to issue an award based on initial evaluation of applications without further discussion.
- Pact may choose to award only part of the quantities in the solicitation or to issue multiple awards.
- Pact reserves the right to waive minor proposal deficiencies that can be corrected prior to award determination to promote competition.
- Pact may contact Vendors to confirm contact person, address, and that the proposal was submitted for this solicitation.
- Pact may contact listed past performance references without notice to the Vendor. Pact also reserves the right to contact other past performance information sources that the Vendor did not list in the proposal.
- By submitting a proposal, the Vendor confirms they understand the terms and conditions.
- Information pertaining to and obtained from the Vendor as a result of participation in this solicitation is confidential. The Vendor consents to the disclosure of the documents submitted by the Vendor to the reviewers involved in the selection process. Please note that all reviewers are bound by non-disclosure agreements.
- In exceptional circumstances, Pact Myanmar may request to supplier to extend for the validity of Quotation beyond what has been initially indicated in this RFQ. The quotation shall then confirm the extension in writing, without any modification whatsoever on the Quotation.

B. Purchase Order Terms and Conditions for Commercial Items

APPLICABLE LAW – This purchase order shall be enforced in accordance with the body of law applicable to procurement of goods and services and the laws of the Ethiopia shall apply. By accepting this agreement Vendor agrees to waive any rights to invoke the jurisdiction of the local national courts where this contract is performed.

1. **ASSIGNMENT** – This purchase order or any interest therein nor claim thereunder shall not be assigned, transferred, or subcontracted by the Vendor.
2. **CHANGES** – (a) By written order, Pact may direct changes for: (i) technical requirements; (ii) shipment or packing methods; (iii) place of delivery, inspection or acceptance; (iv) reasonable adjustments in quantities, delivery schedules or both; and, (v) terms and conditions of this contract required to meet Pact’s obligations under funding agreement. (b) If any such change causes an increase or decrease in the price or in the time required for its performance, Vendor shall promptly notify Pact thereof and assert its claim for equitable adjustment within thirty (30) days after the change is ordered, and an equitable adjustment shall be made. However, nothing in this provision shall excuse Vendor from proceeding immediately with the directed change(s). Changes shall not be binding upon Pact except when specifically confirmed in a written modification.
3. **CONFIDENTIAL INFORMATION** – Vendor shall not publish any information developed under this Purchase Order, nor disclose, confirm, or deny any details about the existence or subject matter of this Purchase Order, or use Pact’s name in connection with Vendor’s sales promotion or publicity without prior written approval by Pact.
4. **DISPUTES** – In case of a dispute arising from this agreement, the parties shall use their best efforts to arrive at an agreeable resolution. Any dispute that is not settled through the above “best efforts clause” shall be settled by arbitration administered by the American Arbitration Association in accordance with its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The arbitrator(s) may not award punitive or special damages. The parties in dispute shall each pay its own expenses in conjunction with the arbitration, but the compensation and expenses of the arbitrator(s) shall be borne in such manner as may be specified in the decision of the arbitrator(s). The Vendor shall proceed diligently with its performance of this purchase order pending the final resolution of any dispute arising or relating to this purchase order. Pact shall continue to reimburse the Vendor for its allowable costs in accordance with the payment provisions of this purchase order except for those costs related to the dispute.
5. **ETHICAL STANDARDS OF CONDUCT** – Vendor shall neither receive nor give any gifts or gratuities in connection with this Purchase Order. Vendor’s employees are required to conduct company business with integrity and maintain a high standard of conduct in all business-related activities. Vendor shall not participate in any unethical conduct during performance of this Purchase Order. Vendor shall not engage in any personal, business, or investment activity that may be defined as a conflict of interest, whether real or perceived.
6. **EXCUSABLE DELAYS** – The Vendor shall be liable for default unless nonperformance is caused by an occurrence beyond the reasonable control of the Vendor and without its fault or negligence such as, acts of God or the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, unusually severe weather, and delays of common carriers. The Vendor shall notify Pact in writing as soon as it is reasonably possible after the commencement of any excusable delay and shall include the Vendor’s estimate of the likely

duration of the delay.

7. **EXPORT AND TRANSPORTATION CLEARANCES** – Vendor shall secure in a timely manner all necessary licenses, approvals, permits and other authorizations, and shall successfully comply with all applicable laws and binding regulations and complete all required administrative processes and other formalities, for export of the Goods and any Related Services from their country of origin, through any intermediary countries, to their destination as specified in the Purchase Order.
8. **INDEMNIFICATION** – The Vendor is solely and exclusively liable to third parties for all costs incurred by the Vendor, all claims of damages against the Vendor arising out of or based on its performance of this purchase order.
9. **INDEPENDENT CONTRACTOR STATUS** – Vendor is, and shall remain, an independent contractor during the performance of this Purchase Order.
10. **INVOICING AND PAYMENT** – The Vendor shall submit proper invoices to Pact for Delivered Goods and Related Services that have been successfully performed in accordance with any directions stipulated in the Purchase Order form, and the Term and Conditions attached. To constitute a “proper invoice” within the meaning of this clause each invoice shall provide the following information and attached documentation:
 - a. Vendor name, invoice date, and delivery date (for Delivered Goods) or performance date (for Related Services);
 - b. Purchase Order number;
 - c. Description of each type of Delivered Goods and Related Services included in the invoice, together with the applicable Unit Price; and
 - d. Vendor payment information
 - e. The following certification, manually signed by an authorized official of Vendor:

“ The undersigned hereby certifies that (i) the invoice has been prepared from Vendor’s books and records in accordance with the terms of the cited Purchase Order, and to the best of my knowledge and belief, it is correct, the sum claimed is proper and due and has not been claimed or paid before, the Goods have been delivered and any Related Services have been performed, the quantities and prices specified are consistent with the Order, and all necessary Pact approvals have been obtained, and (ii) appropriate refund to Pact will be made promptly upon request in the event of disallowance of any portion of the invoice pursuant to the terms of the Contract.

BY: _____

TITLE: _____

DATE: _____

Invoices shall be submitted in an original and two (2) copies, to the party identified in receive invoices in the Purchase Order. Invoices determined not to be proper due to the existence of deficiencies will be returned to Vendor, generally within ten (10) business days of submission, with major deficiencies noted for correction.

11. **PACKING AND MARKING** – Vendor shall pack, mark for export and ship goods in compliance with the requirements of this Purchase Order, as well as all applicable transportation regulations, carrier tariffs and sound commercial practice. Packing must be sufficient to ensure safe arrival at destination, and fully cover such any foreseeable hazards. Vendor shall be solely responsible for complying with all applicable laws as well as sound international practices for the packaging, labeling, transportation and shipping of the Goods (including, if applicable, hazardous materials safeguards). Vendor shall enclose a packing slip with this Contract number in a secure and durable envelope

attached to each container.

12. **PRICE** – The Price specified on the Purchase Order form is a firm, fixed, all-inclusive total price covering performance of all of Vendor’s obligations pursuant to this Contract, including but not limited to, supply of delivered goods to destination and successful performance of all Related Services; warranty-related costs and charges; any and all required licenses, maintenance or use charges; and all other costs and charges of whatever description or amount, in connection with or resulting from Vendor’s performance.
13. **QUALITY ASSURANCE (INSPECTION AND ACCEPTANCE)** – All Goods delivered, and services rendered pursuant to this Purchase Order shall be subject to inspection and testing by Pact prior to acceptance. Payment shall only be made for accepted Goods and services. If Vendor delivers non-conforming Goods, Pact may, at its option and Vendor’s expense: (i) return the Goods for refund or credit; (ii) require Vendor to promptly correct or replace the Goods; (iii) correct the nonconformance; or (iv) obtain conforming Goods from another source. Pact shall specify the reason for any return or rejection of nonconforming Goods and/or shall describe the action taken. Prompt removal and replacement or correction (as applicable) of the issue will be done by the vendor no later than (10) business days after receiving notification of rejection of Goods or services. Vendor shall be liable for any increase in costs, including procurement costs attributable to Pact’s rejection of the non-conforming Goods or Services.
14. **SEVERABILITY** – If any court of competent jurisdiction determines that any provision of this agreement is invalid or unenforceable, such a determination shall not affect the remaining provisions of this agreement. Further, each valid provision under this agreement shall be enforced to the fullest extent permitted by law.
15. **TERMINATION** – Pact may terminate performance of work under this purchase order, in whole or in part, if (a) the funder terminates the prime agreement, (b) the Vendor defaults in delivering the proper goods and fails to cure the default within ten (10) days after receiving a notice from Pact specifying the default, or (d) the funder orders the termination of the purchase order. Default includes failure of the Vendor to make progress in the work so as to endanger performance. If this purchase order is terminated for convenience, Pact shall be liable only for the actual, reasonable, substantiated and allowable costs with the total amount to be paid by Pact being determined by negotiation. If terminated for cause, Pact shall not be liable to the Vendor for any amount for supplies not accepted by Pact.
16. **WARRANTY** – In addition to any warranties required by any other provision of this Purchase Order, and any other warranties that may be established by operation of the applicable laws, Vendor hereby expressly warrants that all Goods (including without limitation their parts) and Services supplied, as applicable:
 - a. are free of defects in material and workmanship for the warranty period specified in the manufacturer’s standard warranty commencing on the date the Goods are accepted;
 - b. conform to applicable specifications and regulatory agency requirements, and are free of defects in design;
 - c. are free of latent defects (as used herein, defects that meet the following criteria: (a) such defects are not apparent to either Party during customary manufacturing or quality testing and/or inspection; and (b) such defects result solely from defective material, workmanship, or design and are not caused by misuse or misapplication of the Equipment);
 - d. are new; unused; non-remanufactured and non-refurbished; not previously disposed as Government surplus; and produced entirely from Goods meeting all of the foregoing

requirements (including but not limited to materials, parts, components and sub-assemblies thereof);

- e. will, to the extent found to be in breach of any warranty specified in this purchase order, be removed, and repaired or replaced, covered by new warranties identical to those that applied to the originally supplied Goods and services, extending for the longer of [a] the remainder of the original warranty period, or [b] a new warranty period;
- f. ensure that all spares and replacement parts are the same as the original spares and parts unless formally replaced by an improved and Pact-approved technical equivalent;
- g. comply with the description on the Purchase Order form and all other requirements of this Purchase Order in all respects;
- h. Vendor has no knowledge of any patents or copyrights which are infringed or may be infringed, or any trade secrets or other proprietary rights of other persons which are or may be misappropriated or violated by using, making, copying, licensing, distributing or selling the Goods.
- i. If any Goods or services supplied hereunder are defective or otherwise do not meet the warranties specified herein or otherwise applicable, Pact may, at its option: (1) reject the affected item(s) and require a full refund or credit; (2) reject the affected item(s) and require prompt correction or replacement (freight prepaid) at Vendor's sole expense; (3) retain it/them at a equitably adjusted price; or (4) require Vendor to provide, if available, corrections in the form of field change order kits (including components, instructions and other necessary materials) from Vendor so that Pact may make necessary changes or repairs. Repaired or corrected items shall be subject to the same warranties as if they were new. While returned item(s) are in Vendor's possession and while in transit during return to Vendor and reshipment to Pact, all risks and costs of loss, destruction or damage shall be for Vendor's account.
- j. Pact shall submit warranty claims to Vendor within a reasonable time after Pact becomes aware of any breach, indicating the nature and date of the claim.
- k. Vendor shall promptly correct any problem reported by Pact by making necessary changes in the Goods or their manufacturing processes so that further Goods to be delivered to Pact shall be as warranted herein. If Vendor becomes aware of any non-conformance to any warranty relating to the Delivered Goods, Vendor shall promptly notify Pact thereof in writing.
- l. Pact shall have the right, at any time and from time to time, to stop further shipments of Goods from Vendor to Pact that do not conform to the warranties and other requirements of this Contract, and in such event Pact shall advise Vendor of Pact's best identification and assessment of the problems. Further shipments of Goods shall not be made to Pact until and unless Vendor has corrected the specified areas of non-conformance in Products, or Pact authorizes in writing the shipment of such Products pending Vendor's correction.

Annex 1.

1. Detail Specifications and standards

2. Detail Specifications and standards Solar Powered Small Scale Irrigation

2.1. SYSTEM PLANNING AND DESIGN

The system must be designed and planned using computer based tools that can closely model the irradiation, rainfall, power generated from the solar array, typical pump performance and can verify this through comparison with actually installed systems. Planning and design should be done showing monthly pumped water outputs. Systems design shall consider providing the required water on average annual irradiation. **It is the pre-request and mandatory for the fulfillment of the bid.**

Site specific and design relevant data

When considering the design of the systems the following planning assumptions should be made.

The solar radiation of the site should be taken from NASA.

Given Parameters	Description
Location:	Afar Region, Zone 3, Amibara Woreda, Halaydege Site
Geographical Coordination	Latitude : 9 ^o 28'33"N; Longitude: 40 ^o 31'52" E
Source type	Borehole
Well depth	503m
Static water level (SWL)	66.10m
Pumping test Pump position	150m
Maximum drawdown	69.42m
Dynamic Water level (DWL)	135.52m
Safe Yield	75l/s
Borehole surface to water collection pond in vertical height	10m
Borehole surface to water collection pond in horizontal distance	50m
Distance from PV array to well	10m
Daily water requirement	126m ³
Type of riser pipe	GI , new
Solar Array inclination	15 ^o to South
Water Temperature	48 ^o C
Design month	Annual Average month

2.2. Specify source of Manufacturer

Specify source or manufacturer of solar pumping major components (module, Pump, Controller/inverter, cables, pipe, etc.,) in order to realize a complete pumping system by

submitting manufacturing authorization letter. **Controller and pump should be the products of one manufacture for compatibility system components and for sustainability of the system.**

2.3. Photovoltaic (PV) modules:

- The type of photovoltaic (PV) module should be mono or polycrystalline.
- PV modules must be approved to IEC/EN 61215 and 61730 or UL 1703 certified and listed
- The efficiency of the PV modules should be minimum 15% and fill factor should be more than 70%.
- The terminal box on the module should have a provision for “opening” for replacing the cable, if required.
- Crystalline modules shall have a bypass diode which is located in the PV module junction box so that they can be replaced without replacing the module.
- Each PV module must use a RF identification tag (RFID), which must contain the following information:
 - a. Name of the manufacturer of PV Module.
 - b. Model or Type Number/ Serial Number. The serial number of the module must be encapsulated inside the solar panel.
 - c. I-V curve for the module.
 - d. Peak Wattage of the module.
 - e. I_m , V_m and FF for the module.
 - f. Open Circuit Voltage and Short Circuit Current of each module.
- Module junction box with IP65, connector MC4 with 4 mm² cable with a length of 70% of module length.
- The module framing should be such that it permits secure connection to the mounting structure, prevents edge damage and has the longevity to withstand environmental factors for the duration of the module warranty period.
- Module liner warranty: The PV modules must be warranted to retain at least 90 % of its nominal rated output measured at STC for 10 years and 80% at 20 years.
- Solar panel junction boxes must include bypass diodes to protect the solar panel against “hot spot” phenomena, which can lead to module destruction. By pass diodes must be easily replaced, without changing the module or the junction box, welded diodes are not accepted.
- Other relevant information.

2.4. Motor and pump end

The water pump is often referred to as two distinct parts, a pump-end (or wet end) and pump motor (motor). As these terms are used somewhat interchangeably, for the purposes of this tender we will use pump-end to describe the hydraulic element and motor to describe the drive for the pump. Pump is used to describe both parts together.

- The following minimum information must be included in the pump documentation
 - Manufacturer name and model
 - Maximum voltage
 - Maximum current
 - Maximum total head
 - Nominal discharge and head.

- Pump end should be directly coupled with motor.
- Working temperature greater than 50⁰ C (degree Centigrade). Hence the Minimum working temperature of the pump should be 50°C.
- Minimum permissible sand content of 25mg/l
- Max. external diameter of pump including motor over the cable should be, 96 mm for well casing 4" and 5", 143mm for well casing 6"(six inch), 185mm for well casing 8"(eight inch), 216mm for well casing 10"(ten inch), 267mm for well casing 12"(twelve inch) and 318mm for well casing 14"(for ten inch).
- The pump motor may be either AC or DC (brushless) operated, and the pump impeller is centrifugal/helical or other type. The mono block DC/ AC motor pump set has its driving unit and impeller mounted on a common shaft, thereby giving it a perfect alignment. The only requirement is that the maintenance demands of the pump should be minimal, and the pump is intended to be operated down the borehole for 5 years without maintenance. Pumps which will require replacement of brushes, diaphragms, bushings or other components as part of routine maintenance during this period are not acceptable.
- Pump system performance curves shall be provided at time of tender for the expected solar and hydraulic conditions. Daily water output curves shall be provided, Instantaneous output curves may be provided. Pump performance shall be tested during the "Test or "Blueprint" installation to ensure compliance before acceptance.
- Be of modular design to allow for replacement of individual parts (pump-end, pump motor and electronics) if failure occurs.
- not use electronics underground / underwater
- Ceramic or equivalent non corrodible materials are used for bearings to provide long life expectancy
- Other relevant information

Motor Portion

- The motor are water lubricated and cooled. Oil is not used for lubrication to avoid failure and contamination to drinking water supplies.
- The motor can be operate on DC or AC depending on the specific site
- Motor windings are copper, with winding insulation.
- have an efficiency of at least 80%.
- Motor speed in rpm should be within the range of the controller/inverter supplied for the system.
- Motor has not be limited to less than 20 start / stop cycles in one hour so as to maximize water output at in early morning late afternoon and on cloudy days
- Motor body (sleeve) should be made of stainless steel except the two opening ends for rewinding purpose.
- motor shaft ends should be made of stainless steel
- Motor tail cable should be flat and in one shield
- The following details should be marked indelibly on the motor body, but not limited to:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number/ Serial Number.
 - c. Rated power in KW/HP
 - d. RPM
 - e. Efficiency
 - f. Voltage and current
 - g. Temperature

- Other relevant information.

Pump Portion

- The pump must meet EN 809 and EN 60034-1 or internationally recognized equivalent standards
- Availability of UL / MET listed products may be required.
- Rotors, Impellers, diffusers, shaft and pump body should be made of stainless steel with a minimum grade of AISI 304 or higher
- Stainless steel non-return valve at the out let.
- Stainless steel strainer at pump suction
- pumps must be matched closely to the ground water temperature to ensure maximum efficiency
- The following details should be marked indelibly on the pump body, but not limited to
 - a. Pump discharge and total head.
 - b. Complete pump performance at duty point and at different heads and discharge.
 - c. Rated Pump power in HP or KW.
 - d. Pump efficiency
- Other relevant information.

2.5. Power Cable

The cables from the array to the control cabinet and from the control cabinet to the pump shall meet with the following specifications: "IEC 60811-common test methods for insulating and sheathing materials of electric cables".

- The cable should be flexible and used to supply electrical motors.
- Power cable should be insulated with PVC sheath having, flexible, annealed and tinned copper conductors of high conductivity.
- 4 core power cable (in one shield) flat or round type to minimize the pump diameter and flange size.
- The selected cable from panel to controller and controller to motor should be clearly indicating the number of cores, cross section and material.
- Cable diameter to be such that the voltage drop at the maximum depth setting is not more than 3% at an the temperature of 50°C.
- Cable connected with motor should be with water proof joint to the motor cables.
- Cable length for each pump should be according to the requirement.
- The cable diameter, number of core, and manufacturer name should available on the cable.
- Cables must be color coded in accordance with the existing electric coding norms in PV applications. (I.e. blue being negative pole).
- Securing of cables and safety rope on riser pipe done every 3m apart.
- The cable from the array to the control cabinet shall be armored in a HDPE pipe, with a minimal wall thickness of 3mm, for protection (depending on the distance between the controller and combiner box).
- The HDPE pipe shall be underground (at least 40cm deep) for the distance between the array and the control cabinet.

- The minimum size of cable shall be as follows:
 - Module to module: 2.5 mm²
 - Array to control box: should be higher than that of the size of cable given for the pump
 - Pump cable: minimum as per given on the system sizing provided by bidder.
- Other relevant information.

2.6. System Controller

Control equipment is any equipment that is used between the solar generator and the pump motor. Control equipment includes monitoring, power conversion, MPPT (Maximum Power point Tracking) sensors and other equipment related to the solar pumping system.

- The control equipment must meet EN 61800-1, EN 61800-3, EN 60204-1 or internationally recognised equivalent standards
- The control box should be mounted separately under the higher part of the array of the PV array and a minimum of 50cm from the ground.
- Protection against reverse polarity.
- Efficiency $\geq 90\%$,
- Integrated MPPT (maximum power tracking), Enclosure class IP 54
- Control inputs for dry running protection, remote control, data display and signal indicator shall be inbuilt in the controller, etc.
- Protected against overload and over temperature, over and under voltage and short circuit.
- have the ability to add on an optional power pack if required in the future.
- Provide diagnostic indicators to show status.
- have provision for continuous performance measurement.
- have an on /off switch at ground level to allow for speed control adjustment at ground level.
- Not allow users to adjust speed controls without the use of tools to avoid tampering.
- Not be integrated into pumps as this presents service access problems.
- Have simple system health indicators that are user visible for trouble shooting purposes – typically of pump status, pump speed, well dry, tank full information.
- Be easy to service and unit replaceable by a trained person with modest skills.

2.7. Junction box

Protective index for junction box shall comply with IP54.

2.8. Dry run protection

The system must have dry run protection (electrode sensor) to protect the system in the event of low water levels. The dry run protection must:

Be of modular design, exchangeable and preferably a float mechanism. Wet electrodes will not be accepted due to unpredictable and unreliable performance.

Not be an integral part of the submersible pump or due to issues with serviceability and cost of replacement. Control equipment matched to pump and array. Control equipment is any equipment that is used between the solar generator and the pump motor. Control equipment includes monitoring, power conversion, and other equipment related to the solar pumping system.

2.9. Mandatory accessories

Accessories like pressure switch, surge protector, liquid pressure sensor, water meter, sun switch, cable splice kit, PV disconnects, PV combiner, two pairs of pipe clamp and etc., to be fitted with the system according to the system design.

2.10. Distant Monitoring of Solar Pumping Systems

Data regarding system performance and real-time status must be available for viewing and analysis from a distant point. The requirement is that all pump systems included in this specification can be monitored from one central office.

2.11. Remote Control of Solar Water Pumping Systems

The system must be capable of being controlled (speed, pump on, pump off) from a remote point. This is to provide central management of water delivery. The system must have safeguards to prevent local override of any remotely set parameters.

2.12. PV Mounting structure

The PV array is mounted on a pedestal which is made from concrete and Masonry with a height of not less than 40 cm from the ground. Mounting structures should be anodized aluminum and should be able to withstand wind speeds of minimum 120km/h. The lower part of the array shall be between 1m from the ground level so as to ensure easy cleaning.

No tracking systems are permitted. Fixed Mount structures are less expensive and tolerate higher wind loading.

PV modules are generally tested, labeled and listed with four mounting holes used for bolting the modules to the mounting surface. Module manufacturers shall provide instruction manuals that specify where top clamps may be used on the module frame where required.

Drawing for the support structure which includes number of modules on lines and system wiring should be submitted with the offer during the material supply.

Excavation of foundation for the structure

- ❖ All trees, bushes and hedges are to be removed within a distance of 5 meters from the area of the foundation foundations. Roots are to be killed or removed within this width in order to minimize shed for the PV module. NB:- And this trees , bushes and hedges at the site shall not be cut down, damaged or destroyed without the approval of the Engineer/or the community in order to minimize complains.
- ❖ Excavation for structures shall be to width and depth necessary to provide adequate space for structural foundation and supporting formwork, and if required over excavation of unsuitable material, over excavation required because of unsatisfactory soil conditions resulting from lack of drainage or dewatering equipment will be the responsibility of the contractor.
- ❖ Depth of excavation for black cotton soil shall be up to a depth of 1.5m or until the soil texture changes. For other stabilized soils the minimum depth of excavation for the foundation should be up to depth of 1m.
- ❖ Any excavation, backfill or mass concrete foundations in excess of that specified on the drawings or ordered by the site engineer will be at the **Contractor's expense**.
- ❖ The bulk excavated shall be filled with selected material and compact in layers not exceeding 150mm

- ❖ If excess foundation excavation is executed by the contractor, the over laying structure should be placed there without back filling. Thus, the excess volume of work of the structure put is due to the expense of the contractor.

Concrete work for the structure

- ❖ Minimum Cement Content of the concrete of class C-15 shall be 200 kg/m³.
- ❖ Minimum Cement Content of the concrete of class C-25 shall be 300 kg/m³.
- ❖ The water/cement ratio shall be the minimum consistent with adequate workability but in any case not greater than Maximum free water/cement ratio of 0.55. The Contractor shall take into account that this requirement may need the inclusion of a workability agent in the mix as per the engineer approval.
- ❖ Concrete shall not be placed during rain which is sufficiently heavy or prolonged to wash mortar from coarse aggregate on the exposed faces of fresh concrete.
- ❖ Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperature differentials within the concrete sufficient to cause cracking.
- ❖ The methods used for curing shall not cause damage of any kind to the concrete. Curing shall be continued for as long as may be necessary to achieve the above objectives but in any case for at least seven days or until the concrete is covered by later construction whichever is the shorter period.
- ❖ The concrete block of C-25 grade should be reinforced with the reinforced bar of 10mm diameter and with 1:2:3 ratios.
- ❖ Minimum size of support structure shall be 70cmx70cm and the depth should be as per the actual soil formation of the area. That is for stabilized soils 70cm and for black cotton soil up to 1.5m.

2.13. Grounding

Grounding issues shall be free from failing inspection at PV installations as a result of hardware and product installation inconsistencies. Typically, a module has four labeled grounding holes that have been tested to meet UL 1703 requirements for safe connection to earth through the equipment-grounding system. Module instruction manuals and tech notes shall be provided with detail on how these labeled grounding holes are intended to be used to ground the PV modules.

The system shall be grounded to a single point using the shortest practical route to an adequate earth contact using an uninterrupted copper conductor of at least 16mm of diameter and 1500mm length to be properly installed in the ground.

The maximum allowable earth resistance will be 10 ohms with the maximum bonding resistance 0.2 ohms. The maximum allowable earth resistance between consumer earth terminals to earth spike will be 1.7 ohms.

Note that the lighting arrestor and grounding rod should be copper in material.

2.14. Riser Pipes, Fittings, valves and water meter

General

Galvanized steel pipes, screwed and socket for pipes lower four inch and flange joints for pipes five inch and above, conforming to ISO specification and screwed to ISO7 specification and having the following diameters, thickness and weight (in table below);

- Max. External diameter of the flanged pipe should be 143mm for well casing 6"(six inch), 178mm for well casing 8"(eight inch), 216mm for well casing 10"(ten inch), 267mm for well casing 12"(twelve inch) and 318mm for well casing 14"(for ten inch).
- All the pipes, fittings & valves should be a minimum of PN 16.
- After fabrication & machining of flanges all pipe work, fittings & Valves shall be tested to a test pressure equal to 1.5 times the flange Pressure rating
- The bolts and nuts must be stainless steel and rubber gasket should be supplied in every flange connection
- All valve bodies should give the following information
 - Manufacturer's name
 - Hydraulic test pressure
 - Size of valve
 - Direction of flow "Arrow"

Water meters

The water meters described with this specification have to be used with potable water. Material construction shall be selected for their strength, resistance to corrosion and shall not impart to the water object able taste, odor or toxic substance in normalized concentration.

- Type: Single/Multi jet, dry dials & magnetized drive,
- Flanged Standards: The water meter shall comply with BS 5728/1 class B measuring requirement. Any other equivalent standard Class C or B Marking:
- Marking on the water meter i.e. size flow rate etc. should be clearly visible and permanent type.
- Pressure: Minimum working pressure shall be 16 bars test pressure 1.5 times working pressure. All water meter shall operate without leakage or damage to any part at working pressure minimum of 16 bar, minimum working temperature of the water meter is 30°C.
- Material Constructions: The body main casing shall be of quality copper alloy or cast iron with raising markings to indicate the direction of flow and size.
- Register box ring and lid: Register housings shall be constructed of bronze and provide full protection of the register assembly. Registers shall be straight-reading and shall read in cubic meter.
- Spindle: Rotor spindle of phosphor bronze piston spindle of nickel alloys or equivalent durable or synthetic polymer.
- Register magnetic drive dial and easy to be read
- Reading: - direct
- Accuracy: - all meters shall be certified as having been tested by the Manufacturer for accuracy
- Spare parts: - recommended spare parts for 3 year should be separately enclosed.
- Strainers: Water meter shall be provided with durable strainers. The Strainers shall be made of suitable material which can with stand Corrosion and maximum pressure.

Connection

- The diameter of the water meter shall be as in the BOQ accordingly.
- The connection shall be flanged on both sides.
- The water meter shall be designed for easy removal of all interior parts without disturbing the connection to the pipe line.
- Bolts and Nuts: The bolts and nuts must be stainless steel and rubber
- Gasket should be supplied in every flange connection

Gate Valve

- The gate valve unless otherwise specified shall be of the non-rising spindle type and be in accordance with the relevant clauses of BS 5163.
- Valves shall have good quality cast gray iron bodies, high tensile brass spindles, and gun-metal nuts.
- The bolts and nuts must be stainless steel and rubber gasket should be supplied in every flange connection

Check valves

- Check valves shall possess high speed closing characteristics by use of heavy flaps with external weights where specified but designed for minimum slam condition when closing.
- Flaps should be fitted with renewable bronze organ or gun-metal sealing faces, which shall met accurately with renewable bronze on gun-metal seating rings in the valve body. All seating-sealing shall be positively located.
- The bolts and nuts must be stainless steel and rubber gasket should be supplied in every flange connection.

Dimensions

Nominal size mm/inch	Class of pipe	Outside diameter		Wall thickness Mm	Nominal mass of steel tubes				
		Min. mm	Max. mm		Plain end		Screwed and socketed		
				Kg/Mts	Mts/tonne	Kg/Mts.	Mts./tonne		
40/1.5"	Heavyduty	48	48.8	4.0	4.38	228	4.42	228	
50/2"		59.8	60.8	4.5	6.19	162	6.26	162	
60/2.5"		75.4	76.6	4.5	7.93	126	8.05	126	
80/3"		88.1	89.5	5.0	10.3	97	10.5	97	
100/4"		113.1	115.0	5.4	14.5	69	14.8	68	
125/5"		138.5	140.8	5.4	17.9	56	18.4	54	
150/6"		163.9	166.5	5.4	21.3	47	21.9	46	
200/ 8"		214.7	216.5	5.6	29.9		30.5		

2.15. Environmental protection

Control equipment must be housed in a suitable enclosure of robust design for mechanical and environmental protection to a minimum of IP54 or higher.

Fencing

- A fence shall be built around the array.
- The surfaced enclosed by the fence shall be such that the area taken up by the array constitutes no more than 40% of the total enclosed area.
- The height of the fence is to be a minimum of 2.0m high, measured from the top.
- The Contractor is responsible for ensuring the stability of the fencing at all stages of construction.
- The fences shall be gabion mesh wire.
- The fence post shall be of galvanized steel (angular iron 40x40x4mm) placed in c-20 class concrete filled pits. The corner posts and the gate posts shall extent at least 100cm into the ground; the other posts shall extent at least 50cm into the ground. The gate and all corner posts shall be braced by a same size steel angle iron or pipe.
- The engineer will reject any damaged posts or any posts with missing weather tight sealing plugs. The Contractor will be responsible for removing and replacing any rejected fence posts and supplying and fixing any missing weather tight sealing plugs.
- The entrance gates shall be single leaf or double leaf, as per the size of project.
- The gates shall be hinged to reinforced posts and shall be complete with locks and stops.
- The Contractor must ensure that the gate and all items fitted to the gates are correct for the required handing and opening of the gate.
- There shall be a barbed wire running along the top of all the posts and the gate.
- The wire of the netting shall have at least 2mm diameter. The netting shall be attached to the poles by galvanized steel wire. A hinged and lockable steel gate shall be provided.

3. Provision of certificates and documentation

3.1. Certificates

The system manufacturer must operate a quality management system that is ISO 9001 or equivalent and have recognised third party verification. Knowledge and proof of adherence to necessary product safety standards must be demonstrated. Bidders must have availability of TÜV or equivalent listed products for supply. Solar modules, pumps, motors, and control equipment must meet the necessary CE / international standards for safety and where applicable functionality.

3.2. Users' manual

The supplier must provide a User's Manual intended for safe operation/maintenance. This manual will be included with each of the systems and will be the basis of the training of the water system caretakers by the suppliers. The manual must be in English and Amharic and all documentation should be simple and easy to follow and understand. Use of sketches or graphics should be made to make the manual easier to use. The documentation is to include the following:

How the system works: The relationship between energy available on a daily basis, sunlight conditions and how the solar water pump works should be clearly and simply explained.

- A description of all user interactive hardware including disconnect switches and status indicators.
- Any user maintenance items.
- A user trouble-shooting guide.
- A block diagram showing the main components.

- Contact information of suppliers and manufacturers for maintenance and access to spare parts.
- The user manual shall be amply illustrated.

3.3. O&M manual

The supplier must provide an Operations and Maintenance Manual to be used by the service technicians. The manual must be in English. The manual will include the specific details on installation, operation and maintenance:

- A detailed technical description of the system and all its components.
- A complete copy of the User's Manual.
- A complete list of all system components, with associated manufacturers documentations, specifications and warranties.
- A recommended periodic maintenance schedule of the complete water supply system, with complete maintenance instructions.
- A detailed troubleshooting guide, referencing all the system components. This shall include diagnostic and repair procedures that can be done by the supplier or a qualified third party. Repairs and procedures to be done by trained electricians familiar with photovoltaic systems shall also be identified (if any).
- A functional block diagram, electrical single-line drawing showing the placement of all hardware and ratings of all component and physical layout diagram.

12. Installation Supervision and Testing

Pact Ethiopia will supervise the installation of the system by technical personnel.

Final inspection

Final Inspection of the supply of all goods and installation will be conducted at the final destination sites by Technical staff of Pact Ethiopia. The inspection will be made against the technical specification of the supplier's offer.

Installation checked and approved by the purchaser technical personnel. The inspection shall include check for proper handover of system of users, installation of cables as well as placement of system equipment's are aesthetically correct and the mounting of module properly tilt 15 degree and oriented south direction.

If the Inspection of the supply of goods and installation found some faults/error, the purchaser shall give the supplier a notice stating the finding for rectification. If the supplier fails to commence to rectify the reported errors within fifteen days (15) as per in the warrantee, applicable liquidated damage (0.5% of the total installation cost) per week deduction shall apply.

For satisfactorily completion (completion of installation, functionality of the system, conduction of users training; the purchaser shall arrange provisional acceptance certificate.

12.1. Operational Acceptance Certificates

As soon as the installation are completed operationally and structurally as well as put in tight and clean conditions as specified in technical specification, the purchaser issue operational certificates for successfully completed sites.

If the purchaser noticed minor defects and errors, that not materially affecting the operation and safety, thus inform the supplier/contractor to undertake rectification within 14 (fourteen) days. Failing to commence installation in accordance with the requirement leads to deduct the cost thereof from any monies owing to the supplier/contractor.

12.2. Completion Certificates

The commissioning document is an initial record after the system has been successfully installed in all sites listed in the contract and made operational and should contain pertinent data relevant to the condition of the system. It is therefore important to pay attention to technical details and measurements necessary for future servicing, repair and warranty issues of the system.

The initial presentation of product certificates by the supplier to attest to compliance of component or device is required prior to field commissioning.

The purchaser issue certificate to the Supplier/Contractor attains successful completion.

13. BILL OF QUANTITIES

The Bill of Quantities for the solar water pumping sites of SSIP should be listed according to the following template.

13.1. Local Material and Installation costs

#	Item	Description	unit	Qty	Unit price in Birr	Total price in Birr
1	Foundation of array support structure	Made of concrete with grade of RC 25. Use reinforcement bar with $\varphi = 8\text{mm}$, c/c 200mm vertically and horizontally in all faces Excavate: 70cmx70cmx70cm for stabilized soils and 70cmx70cmx1.5m if black cotton soil	Ls			
2	Fence for solar array	Mesh wire 2m away from solar array support structure foundation in all directions & 2m height.	LS			
3	System Installation	Installation of the pumps, panels , fixing the equipment, wiring, system check and make ready for commissioning;	LS			
4	Training of technicians	On job training for four persons of which two are community technicians and two person from the woreda Agriculture and Livestock office.	L.S			
Sub-Total						
VAT						
Total						

14.1. Bill of Quantities for goods imported from abroad

#	Item	Description	unit	Qty	Unit price in Foreign currency (specify the currency)	Total price in Foreign currency (specify the currency)
1	Solar module	-----mono/poly crystalline in peak power (Wp)	Pcs			
2	Controller with all accessories	----- rated power in KW	Pcs			
3	Submersible Solar pump	----- Rated power in KW	sets			
4	Power cable (Pump cable)	Made of copper, flexible 4 core 4 x __mm ² , with hose of __ m PVC __ in diameter	m			
5	Junction box (JB)	Protective index for junction box which comply with IP54.	pcs			
6	Cable from PV array to junction box and from junction box to controller	Flexible wiring between solar array to junction box (JB) and from JB to pump controller. 2 core x __ mm ² (black & red).	m			
7	Well Prope/ water level sensor with cable	Well probe/water level sensor with __m of __ mm ² cable made of copper	Sets	1		
8	Grounding rod with grounding cable	System earthing protection consists of copper rod 16mm diameter and 1.5m length dig into ground, cable __ mm ² , __m length.	Sets	1		
9	Grounding cable that connects PV holes and structure together	Grounding cable made of copper to ground PV modules with screw of size __ mm ² and __m long yellow/green	m			

10	Accessories					
10.1	Surge protector		no	1		
10.2	Cable Splice kit		no			
10.3	Sun switch		no	1		
10.4	DC-PV Disconnect		no	1		
10.5	PV protect		no	1		
10.6	Pressure switch	Pressure switch with saddle clamp/float switch depending on the system design	no	1		
10.7	Water meter		no	1		
10.8	Gate valves		no	1		
10.9	Check valve		no	1		
10.11	pairs of Pipe clamp		no	2		
10.12	Safety cable with clamp		m			
11	Sacrificial anode	fitted with the proposed pump motor	No	1		
12	Array Support Structure	Made of aluminum, Tilted at 15 ⁰ , which can handle the shortest height of PV array from ground is 1m and should resist the wind speed of 150km/hr	set	1		
13	Riser Pipe	Heavy Duty GS pipe of length and diameter ___ mm with heavy duty coupler	m	140		
14	Pressure line --- mm	HDP	m	50		
	Sub-Total					
	VAT 15%					
	Total					

14.2. Grand summary of bid cost

S.No.	Total sub Cost by Type of delivery	Local ETB	Foreign Currency
1	Local Material		
2	Installation		
3	Training		
4	Total FOB Price		
5	Freight charge to Djibouti		
6	Local Transport cost from Djibouti port to Destination site		
7	Insurance For marine and Inland transport		
8	Local Tax (VAT)		
	Total		