Funded by
European Union
Civil Protection and
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Global Solar and
Water Initiative

Template - Invitation to Tender

Hybrid (Solar + Generator) Water Pumping system – Camp 12, Rohingya Megacamp

1. General Information

1.1. Introduction

Rohingya Megacamp site is located approximately XXX kilometres South East of Cox's Bazar town in Bangladesh. Currently the site water needs are supplied by a combination of shallow and deep handpumps, together with water trucking. On-going drilling efforts will aim to increase the number of deep boreholes equipped with submersible pumps in the future in order to supply chlorinated water for all refugees drinking needs.

1.2. Project Overview

Funds have been made available to solarise 1 high yielding borehole in camp 12. Depending on the result of this work and the monitoring results in the coming weeks/months, more water schemes could get equipped with solar pumping in the area.

The borehole to be solarized has been recently drilled and it is not in service yet.

It is envisaged that the system is made up of the following components.

- Solar generator to provide power
- Water pump to pump the required water, together with pipe up to borehole outlet
- Some control equipment for optimisation and control of the system
- Diesel Generator

Metric measurements – Cubic meters, Kilowatts and Meters should be used as standard in responses.

1.3. Objectives of the Project

The project aims to provide a power system for water pumping (Solar PV and diesel power generation) in the borehole water supply scheme in camp 12 in order to: -

- Meet the domestic water needs of the refugees living in the area at minimum costs
- Maximize the reduction of diesel fuel demand by pumping as much water as possible through solar pumping solution
- Design and install systems with adequate controls and protections to be able to withstand weather anomalies.
- Develop an operation and maintenance program, including a 2-day hands-on training to [ORGANISATION] and partners' technicians

1.4. System Planning and Design

- Due to the complex nature and multiple variables involved in calculating solar system performance, the system must be designed and planned using computer based tools that can closely model the irradiation, power generated from the solar array, ambient temperature and typical pump performance.
- Solar module degradation due to solar module cell temperature rising above 25°C must be factored into the sizing result. The solar module temperature coefficient that was used to calculate these losses must be

indicated in the sizing report to allow for comparison. The calculations on hourly losses per day must be shown.

- Other Solar module losses such as dirt and wiring losses must be factored into the sizing result and clearly stated
- Planning and design should be done showing monthly pumped water outputs in line with the water requirements below (or else, an explanation is given in case it can't be achieved).
- The bidder must provide with their offer an economic analysis showing the payback period for the solar system with the expected cost savings over the life cycle of the systems by taking into account the capital costs and the O&M costs of the system over a period of 25 years from the time of installation.
- A full list of equipment offered should be included together with their technical specifications. Datasheets for pump, inverter and solar panels, showing the certifications of those products, should be provided as part of the offer

The offer should consider the Solar array tilted at 21 degrees and facing South.

2. Project Information

2.1. Scope of Work

This work entails delivery, installation and commissioning of a complete, suitable Solar PV generator {*coupled with diesel generator*} for the high yielding borehole in camp 12, at Rohingya Mega camp site. The scope of works shall include;

- Transport of equipment and structural parts to the sites.
- Installation of the submersible pump complete with pipes, cables and dry running protection.
- Erection of the solar panel support structure for solar panels and positioning of the solar modules on the structure, securing with bolts and nuts with vandal proofing such as spot welding. Construction of a suitable base of reinforced concrete to support the solar panel support structure. Solar panels will be mounted at a height of at least 3 meters above ground level, facing South. Solar panel structure should be designed and warrantied to withstand the weather conditions of the area.
- Installation of all the protective and control equipment including solar controller, change-over switch, cable connections between pump, controller, solar modules and generator, grounding, earthing and lightning protection.
- The controller and all controls shall be housed in a lockable powder coated steel enclosure complete with rodent proof cable access to the enclosure and provision for enough air circulation.
- Installation of a remote monitoring system to allow monitoring with client access rights from computer at Cox's Bazar for, at least, the following parameters: pump status, flow produced, current consumed by the pump, the voltage/power supplied by the solar PV generator and the water level in the borehole.
- Installation of an online chlorination system that will dose chlorine into the pipe proportionally to the water flow at any moment.
- Upon completion of the installation the contractor shall conduct a short-term pumping and equipment test lasting for a duration of 24hrs to monitor both solar and generator.
- On completion of all works, the contractor shall submit to [ORGANISATION] a hard and soft copy of the test certificate comprising a test sheet of parameters including insulation resistance, tested peak flow in m^3/hr and peak frequency in Hz and others

- The contractor shall submit to [ORGANISATION] WASH head of sub-Office in Cox's Bazar, a delivery, installation and commissioning report (both soft and hard copies) of all the works done including an operation manual detailing in an easy to follow manner, the operation and maintenance regime to be employed in managing the newly installed solar pumping facilities
- Training of pump attendants on the operation and maintenance of the solar System - 2 day of training at site by an approved trainer
- The system should be of high quality and designed for use in remote locations with harsh weather conditions, especially those typical of Monsoon season. The bidder should outline the key design elements that make the solution suitable for the environment it will be installed in.
- All components of the solar system shall be robust, neatly assembled, firmly fixed supports in ground and designed to allow easy access using adequate tools.
- All components and accessories shall be made from corrosion resistant material and made to be rust-free by galvanizing and or painting of all surfaces that are exposed to the ambient conditions. All materials shall be resistant to effects of excessive moisture, water, and ambient temperature. Resistance to corrosion shall be according to DIN 8985 standards.
- All equipment, parts and accessories shall be well designed and fastened against theft, with considerable difficulty to unscrew the solar modules or metal parts from the entire assembly.

The design life of the system must be 25 years. System design should eliminate the use of components with a short life, for example batteries (typical life of 3-5 years). In this sense, **solar tracking is not an option** due to the maintenance requirements and risk of breakdown in the given locations.

Typical component lives should be:

- 25 years solar generator; 7 years pump motors; 5 years pump ends; 7 years control equipment. All components should be subject to minimal servicing and without expensive parts.
- Civil Structures: 30 years / civil works-frames: 30 years without major repair / Mechanical and electrical fittings: 30 years.

It is strongly recommended as much as possible to visit the site prior to submitting the offer, especially considering that the surface available for solar panels is deemed to be tight.

2.2. Water Requirements

It will be considered that water needs are the same for every month of the year. The system should be **designed taking into account the water requirements for the month with lowest solar irradiation.**

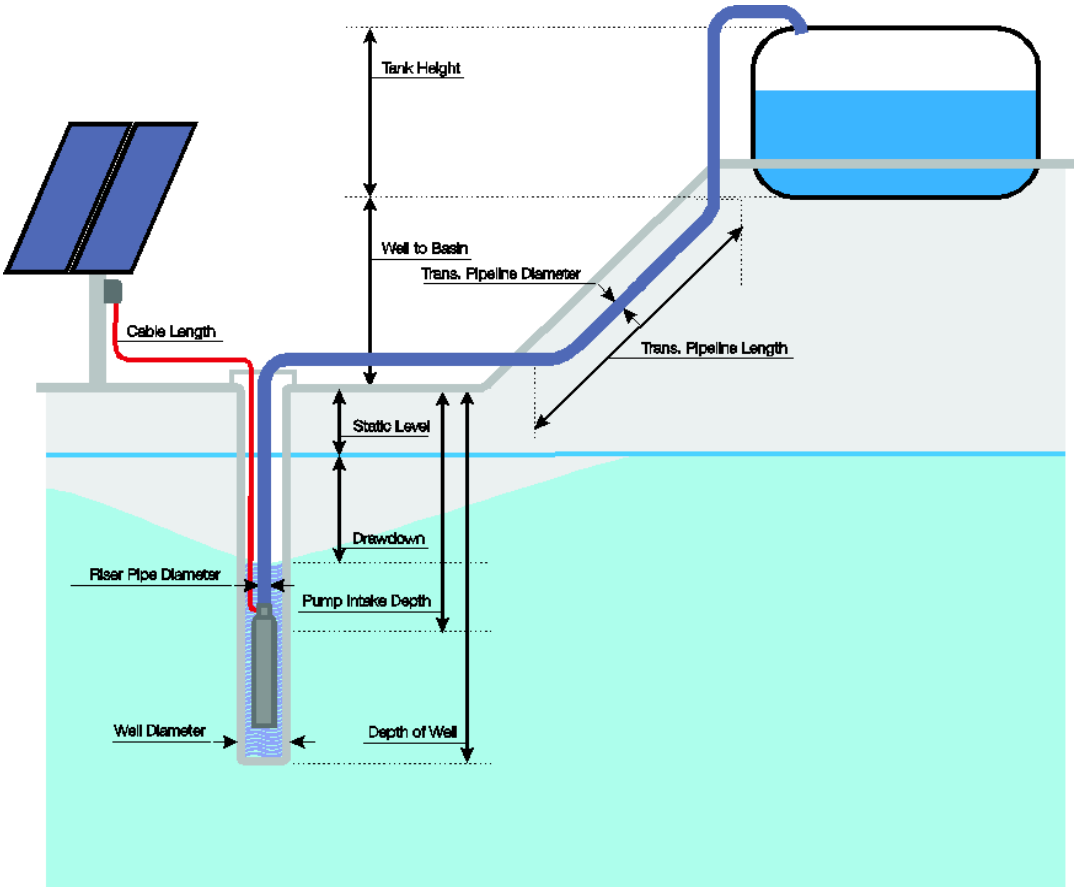
Bidders are asked to send one offer for water output requirements from the solar PV system of 500m^3/day.

2.3. Water Source and Environmental Factors

When considering the design of the systems the following planning assumptions should be made. These are subject to specific site inspection but are the basis for the tender award.

Parameter	**Camp 12 borehole**
GPS Location (Long. Lat. Altitude)	N 21, E 92
Borehole Maximum Yield (m^3/h)	60
Daily Water Demand to be supplied with Solar (m^3/day)	>500 m^3/day
Estimated Cable Length from pump to inverter (m)	70

Dirt allowance factor	10%
Surface available for panel mounting (m^2)	xx
Length of pipe from borehole head to water tank inlet (m)	370
Size and type of delivery pipe to tank	4" HDPE
Pump intake depth (m)	xx
Size and type of drop pipe (inside the borehole)	4" GI
Depth of well/borehole (m)	xx
Water Rest level (m)	4
Dynamic Water Level (m)	14
Vertical Height from borehole head to water tank inlet (m)	20
Internal Borehole diameter (inches)	xx
Desired Residual Pressure at Tank inlet (m)	7 to10
Capacity of water tank (m^3)	95m^3 x 6 tanks



3. Other Specifications

3.1. Servicing

Recommended service intervals for each component should be stated along with parts costs, time and skill level required to service.

Solar Generator

Service task	Frequency of task	Time of activity	Skill level of technician	Consumables items and cost

Control Equipment

Service task	Frequency of task	Time of activity	Skill level of technician	Consumables items and cost

3.2. Spare Parts

Parts should be replaceable at a low level of modularity to reduce replacement costs. Spare parts must be readily available on site within 5 days. The bidder must recommend the items that would be supplied in line with manufacturer's recommendation.

3.3. Solar PV Module Quality and Installation

- PV modules must be approved to IEC/EN 61215 and 61730 or UL 1703 certified and listed.
- All modules must be of a robust design. Only certified Polycrystalline or Mono-crystalline silicon modules will be accepted.
- Modules shall be guaranteed for 25 years with no more than 10% derating for the first 10 years, and 20% derating within 20 years. The efficiency of solar-PV cells shall be minimum 16% and solar modules total efficiency of minimum 14%.
- The PV Modules shall be clearly labelled and permanently marked with a data plate containing the following information: manufacturer's name and physical address, type/model number, the watt-peak power rating at STC, open circuit voltage and short circuit current, voltage and current at maximum power point, tolerance and temperature coefficient, country of manufacture, certification, e.g: UL listing, IEC 61215,ISO certification, with fool-proof +ve/-ve connectors

A support structure for the panels will be provided by the bidder. The structure should be designed and warrantied to withstands weather conditions in the area, with special attention to those typical of the Monsoon season.

3.4. Protection

- The system must have dry run protection to protect the system in event of low water levels. Other protection systems should at least include Surge Protection Units (SPUs) and over/ under voltage protection, together.
- An effective discharge path for the surge should be created for earth. One or more 8-foot copper-plated ground rods, preferably in moist earth, should be installed.

- Must have a lightning arrestor that won't be connected or touching any part of the solar pumping scheme and that will remain the tallest structure on site and grounded with a copper strips of not less than 25mmx4mm.
- All submersible cable shall be 4-core copper strand, 100% water-tight with PVC or rubber insulation suitable for temperatures up to 400C. A high quality, waterproof connection between the pump wires and supply cable is critical.
- All underground cables shall be armoured.

3.5. Control Equipment

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.

A power inverter shall be used to convert DC power from solar PV modules to AC power that can be used to power an AC motor based water pump. The inverter shall act as a pump drive or controller manufactured and supplied to work with the specified pump type, and universally works well with induction motors; suitable for solar water pumping applications.

The inverter shall be designed to provide convenient information about voltages, switch and sensor status, and overload conditions; and provide maximum power [maximum power point tracking (MPPT) and current boosting] under varying conditions.

It should provide direct solar connection as standard and have the ability to add on an optional power back up if required in the future.

The control equipment must meet EN 61800-1, EN 61800-3, EN 60204-1 or internationally recognised equivalent standards

Other features:

- Controlling of the pump system and monitoring of the status of system operation, including selectable display of operating i input/output amperage, power and voltage, pump speed and temperature.
- Has two control inputs for well probe (dry running protection), float or pressure switches for remote control, with automatic reset after well probe turns pump off
- Protections for over current, under voltage, over speed, over temperature, reverse polarity and dry running.
- Data logging of operating parameters including running time, starting/stopping time, max power/voltage of day and total energy generated in the day. The data can be recalled for reference
- *Ease of servicing*: Control equipment must have simple system health indicators that are user visible for trouble shooting purposes: typically, of pump status, pump speed, well dry, tank full, low source power information
- *Accessibility:* Control equipment must be positioned at 0.5 to 1.5m from ground level for ease of servicing, adjustment and system health diagnostics. Control equipment will be wall mounted inside the generator house that will be built in the borehole compound.
- *Environmental Protection:* Control equipment must be housed in a suitable enclosure of robust design for mechanical and environmental protection to at least IP54 or higher.

3.6. Submersible Pump

- The borehole pump shall be of submersible multistage centrifugal type closely coupled to an AC motor constructed from AISI 304 Stainless steel or higher. All metal material used for pump construction shall be corrosion resistant, permanently lubricated and maintenance free.

- The motor end shall be constructed with the following features: 3-phase 415V AC motor (50Hz speed controlled, +5hz selectable speed), corrosion-resistant, all stainless steel exterior construction, stainless steel shaft, ceramic bearings, NEMA mounting dimensions, hermetically-sealed windings, water lubrication, pressure equalizing diaphragm, able to withstand min water temperature 30°C.
- The pump end of the water pump shall be constructed with the following features: centrifugal multistage direct-coupled pump end, non-return valve, stainless steel (AISI 304 or higher), water lubricated rubber bearings, able to withstand maximum sand content 50g/m^3, able to withstand min water temperature 40°C.
- For solar systems, a water pump equipped with a variable frequency/speed induction motor is highly recommended.
- The pump motor must have an efficiency of at least 80% and not be limited to less than 20 start / stop cycles in one hour so as to maximise water output in early morning late afternoon and on cloudy days.
- The pump must meet EN 809 and EN 60034-1 or internationally recognised equivalent standards.
- The pump set must be of modular design to allow for replacement of individual parts (pump end, pump motor and electronics) if failure occurs.
- The system must have dry run protection to protect the system in event of low water levels.
- The pump set should be able to fit into the existing xx inches borehole casing

3.7. Warranty, Defects Liability, Service and Maintenance

The bidder should detail as part of the technical proposal the warranty period, defects liability period (DLP), repairs/ replacement cover by the warranty and the technical support that will be provided after installation in case the scheme develops a problem.

It is expected that during this period, the bidder will be responsible for making good at their cost repair and replacement of faulty parts and shall promptly attend to faults on demand.

In addition, they shall submit with their offer, a priced proposal for a 2 year service agreement after expiry of the warranty and DLP. The service agreement shall include but not be limited to periodic routine maintenance of the equipment as well as on demand maintenance. The cost of the priced service proposal will be considered separately from the main offer.

The bidder should also detail as part of the technical proposal their availability and capacity to provide backup support from within the country.

4. Deliverables

- The contractor, in consultation with [ORGANISATION] Cox's Bazar office, will be responsible for logistical issues required to facilitate delivery, installation, testing and commissioning of a complete, suitable Solar PV pumping system {coupled with diesel power generation}.
- On completion of all works, the contractor shall submit to [ORGANISATION] a hard and soft copy of the test certificate comprising a test sheet of parameters including insulation resistance, tested peak flow in m^3/hr, available power, current, peak frequency in Hz and others.
- Upon completion of the installation the contractor shall conduct a short-term pumping and equipment test lasting for the duration of 24hrs to monitor both solar and generator.
- The contractor shall submit to [ORGANISATION] WASH coordinator of sub-Office in Cox's Bazar, a delivery, installation and commissioning report (both soft and hard copies) of all the works done including an operation

manual detailing in an easy to follow manner, the operation and maintenance regime to be employed in managing the newly installed solar pumping facilities **(must be provided before final payment is made).**

- The contractor shall conduct 2 days training of pump attendants and [ORGANISATION] staff on the operation and maintenance of the solar system by a qualified manufacturer-approved trainer **(must be done before final payment is made).**

5. Bidder Qualification

The bidder should comply with the following points:

- The bidder should represent a manufacturer of good international standing and with experience to meet the requirements of this project.
- The bidder must have a minimum of 4 years' experience of designing, installing and maintaining solar pumping solutions of a similar size, scope and application. As evidence of experience and success is able to demonstrate they have similar pumps in operation for the last 4 years.
- The bidder must make available a minimum of 3 reference projects in which they have worked. The reference projects must be of a similar scope, size and implemented within Bangladesh. References will be followed up.
- The bidder should be able to provide positive references from international organisations within the country. There should be an overall positive reputation for good business practise, professionalism and financial stability.
- The bidder must have qualified and trained staff that is certifiable with the equipment manufacturer. Training must be of a level to successfully implement the project.
- The bidder must have access to spare parts supply with backing from the equipment manufacturer. Spare parts should typically be available within 5 days of payment.
- The scope of this tender must not represent more than 10% of the bidder's total annual production to ensure that capacity restrictions do not impact quality.

6. Evaluation of Tender and Other considerations

6.1. Evaluation criteria

For the award of this project, [ORGANISATION] has established evaluation criteria which govern the selection of offers received. Evaluation is made on a technical and financial basis.

S/No.	Evaluation Criteria	Total score
1.	System Design & Compliance with Specifications given by [ORGANISATION]	60
2.	Financial and other legal considerations	40
Total		**100**

6.2. Activity Timeline

The delivery, installation and commissioning of a complete, suitable Solar PV power structure {coupled with diesel power generation} for camp 12 should take a maximum of 4 weeks upon award of the contract at a date determined by [ORGANISATION] and the successful vendor.

A workplan will be provided along with the offer by the bidder.

6.3. Obligations: [ORGANISATION] sub-office

[ORGANISATION] will pay the contractor(s) upon completion of the works as per the contract documents, and receipt of the reports on camp 12 site. In addition [ORGANISATION] sub-office will not facilitate field logistics for the contractor(s) such as transport, except where extremely necessary security will be provided.

ORGANISATION] will hand over all sites to successful contactor as necessary.

[ORGANISATION] will not make any advance/down payments and all payments shall be made as stipulated on the Contract document and upon certification by [ORGANISATION] Engineers.

If the Vendor will be unable to deliver, [ORGANISATION] will unilaterally cancel the order.

6.4. Obligations: The Contractor

Upon successful bidding the contractor will enter into a contractual agreement with [ORGANISATION] through an original contract document signed by an authorized [ORGANISATION] signatory.

The Contractor shall then supply, and install Solar PV – Diesel Hybrid Power System in camp 12 site. On completion the Contractor will commission, the Solar PV – {Diesel Hybrid Power System} in camp 12 site, with full participation of [ORGANISATION] designated management and field staff.

[ORGANISATION] holds proper ethical conduct in the highest regard. If it is discovered that corrupt or unethical practices have been undertaken by the vendor or been attempted, the vendor will be disqualified from this work and any further engagement with [ORGANISATION].

The contractor will have initial briefings at [ORGANISATION] sub-office and a final debriefing session will be organized in the same place upon completion of all or part of the assignment.

6.5. Submission of Invitation to Tender (ITT)

Interested and qualified companies should submit their application to XX@YY.org and ZZ@HH.org please indicate the tender you are applying for in the title of your email. Submission should be done by Date……..

{END}

See Annexes below

Annexe A – Technical Evaluation Check List

To assess before awarding Tender

No.	Deliverable	Provided (Y/ N)	Score	Comment
1	Daily water output meet requirements (section 2.2)		____ /8	
2	Full list of equipment provided together with technical specifications and data sheets (section 1.4)		____ /6	
3	Operation and Maintenance programme developed (section 3.1)		____ /6	
4	PV modules approved to standards (section 3.3)		____ /8	
5	Protection for low water level, SPU, under/ over voltage, lightning protection make part of system proposed (section 3.4)		____ /8	
6	Control equipment quality to standards (section 3.5)		____ /3	
7	Warranty of equipment detailed, including warranty for solar panel structural design (section 3.7)		____ /6	
8	Availability of post warranty service plan explained (section 3.7)		____ /3	
9	Workplan attached (section 6.2)		____ /8	
10	Bidder meets qualifications (section 5)		____ /4	
TOTAL SCORE			**____ /60**	

Annexe B – Deliverables List

These 4 deliverables MUST be provided by awarded company before last payment is made

No.	Deliverable	Provided (Y/ N)	Comment
1	2-day hands-on training provided on-site (section 1.3 & 4)		
2	Panels mounted at least 3m above ground level, tilted at Latitude degrees and all of them facing South (sections 1.4 and 2.1)		
3	Full testing, installation and commissioning report handed to [ORGANISATION] (section 2.1 & 5.2)		
4	Operation manual for community operators in both English and local language handed to [ORGANISATION] (section 2.1 & 4)		

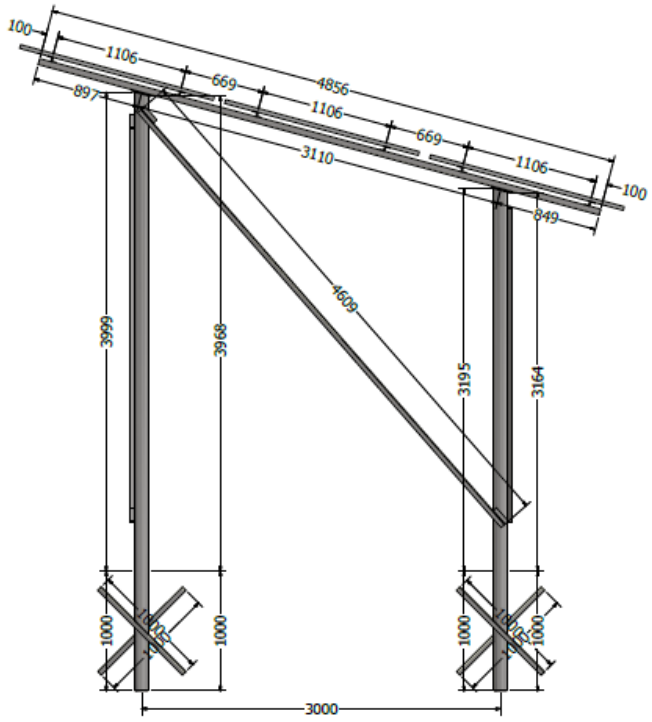
Annexe C – Sample Equipment List

The bidder should be free to suggest any components that have been omitted and which form a critical part for the sound operation of the system.

ITEM	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.	Lorentz C-SJ 42-10 c/w 15kW 6" motor	**1**	**set**		
2.	Supply and install 15kW electro mechanical control panel	**1**	**pc**		
3.	Lorentz PSk2-21 Controller with datamodule	**1**	**pc**		
4.	Metallic Enclosure for housing the controls, well ventilated and lockable	**1**	**pc**		
5.	Supply and install 40A Change over switch	**1**	**pc**		
6.	250 Watt crystalline solar modules - Yingli, Jinko or Solarworld or equivalent	**120**	**pc**		
7.	10 mm^2 4-cores PVC **SUBMERSIBLE** 99% copper cable from well head to pump. (POWER CABLE)	**60**	**M**		
8.	Appropriately sized cable joint	**1**	**pc**		
9.	10 mm^2 4-cores PVC/SWA 99% copper armoured cable from controller to well head. (UNDERGROUND CABLE)	**20**	**M**		
10.	0.75 mm^2 2-core PVC round hardened submersible WELL PROBE cables waterproof	**120**	**M**		
11.	1.5 mm^2 4-cores PVC/SWA 99% copper armoured cable from control panel to well head for WELL PROBE	**20**	**M**		
12.	Well probe kit for dry run protection and which must be compatible with the supplied controller	**1**	**pc**		
13.	3-meter length borehole UPVC pipes and sockets DN 130	**17**	**pc**		
14.	5/8 100% copper earth rod.	**1**	**pc**		
15.	10mm^2 Copper earth cable	**10**	**M**		
16.	10mm^2 twin flat DC cable	**200**	**M**		
17.	Lorentz PS communicator with 1 year access rights for remote monitoring	**1**	**pc**		
18.	Lorentz PV Disconnect 1000-40-5	**2**	**pc**		
19.	Lorentz PV combiner	**1**	**pc**		
20.	Lorentz PV surge protector	**1**	**pc**		
21.	DN100 water meter c/w pulse cable connection and connect to the controller	**1**	**pc**		
22.	Auxiliary PV lighting system: 40W solar powered street light, complete with 150AH battery, 125W PV Module and 15A charge controller c/w pole, battery box and PV mounting	**1**	**set**		
23.	Lightning arrestor with copper strips of not less than 25mmx4mm	**1**	**pc**		
24.	5" well head cover for12" steel casing c/w well head accessories	**1**	**set**		
25.	25mm airline PVC pipe	**9**	**pc**		
26.	Allow for civil works of reinforced concrete and foundation bolts, the whole foundation must be raised to a level such that steel column won't be in contact with storm water	**1**	**LS**		

27.	Supply and erect a panel support structure made of 4'' Pipe Class A poles, drilled plates 160*160*8mm, 50x50x3mm rafters, 50x50x3mm SHS struts and ties, 40x40x4mm angle iron, 15^0 tilt and lower end to be minimum 3m above ground level to support the quantity of panels above. All joints to be bolt and nuts with spot welding	**1**	**LS**		
28.	Transport and installation of all the equipment and materials to XXX, xxxx km from Cox's Bazar	**1**	**LS**		
OTHERS					
29.	Equipment & tool set to be used by scheme operator (digital multimeter-rating 1000V, set of screw drivers, cable cutter, pliers, hummer, set of allen-keys, insulating tape-10pcs etc)	**1**	**set**		
30.	Alarm system set with siren for intrusion and safety protection of solar modules, where intrusion detection is based on mechanical vibrations/ tampering of the solar array structure, wired and integrated within the installation; complete with all accessories	**1**	**LS**		
31.	Design and production (printed in full colour and bound) of maintenance charts, record keeping books and facility data plate - well laminated	**1**	**pc**		
32.	2 years' service maintenance contract after expiry of 1 year DLP	**1**	**pc**		
	SUB TOTAL				
	ADD VAT				
	TOTAL				

Sample Support Structure



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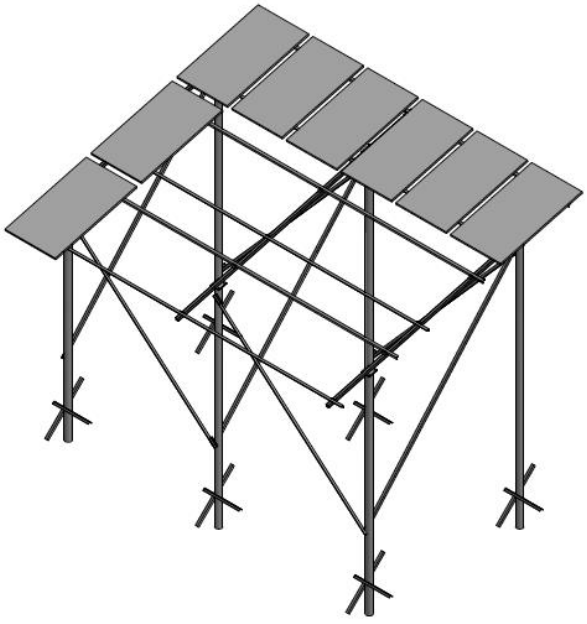

ASSEMBLY