Invitation to Tender – Hybrid (Solar+Genertor) Water Pumping system for EL Firdos Refugee camp.

1.General Information

1.1 – Introduction.

El Firdos refugee camp is located approximately 65 kilometers South of El Daien town in East Darfur State. The water needs are increasing as refugees keep coming in the camp.

Nowadays 120m^3 of water needed by camp resident is supplied by just 1 borehole with a safe yield of 14m^3/h. Another 1 will be probably drilled in the area in future.

1.2 - Project Overview.

Currently, the pumping system in El Ferdos refugee settlement is powered by 33 KAV generator. After the installation of the solar system the generator is expected to be kept as standby and the pumping system will be powered mainly by the solar power grid.

For the borehole to be solarized (BH1) in El Firdos, it is thought that the system should be hybrid. It has to be taken into account that **a generator with a pump 7.5 KW is already installed in the borehole and this will not be included in the offer.**

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
- Some control equipment for optimisation and control of the system
- Water storage and distribution
- 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 schemes in the mentioned refugee camps in order to

- To meet the domestic water needs of the refugees living in the refugee camps at minimum costs
- Maximize the reduction of diesel fuel demand and improved reliability of power generation of water supply installations
- 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 NGO, UN, Government 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 and can verify this through comparison with installed systems.

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).

A full priced BoQ of equipment/materials offered should be included together with the their technical specifications.

For the location the array should be **tilted at 15 (latitude) degrees south**.

2. Project Information.

2.1 - Scope of Work.

This work entails delivery, installation and commissioning of a complete, suitable Solar PV power structure {*coupled with diesel power generation*} BH1 of EL Firdos refugee camp.

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, 15 altitude degree 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 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 automatic 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 Oxfam a hard and soft copy of the test certificate comprising a test sheet of parameters including insulation resistance, tested peak flow in m3/hr and peak frequency in Hz and others
- 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. The bidder should outline the key design elements that make the solution suitable for the environment it will be installed in.

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.

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 considering the water requirements for the month with lowest solar irradiation.***

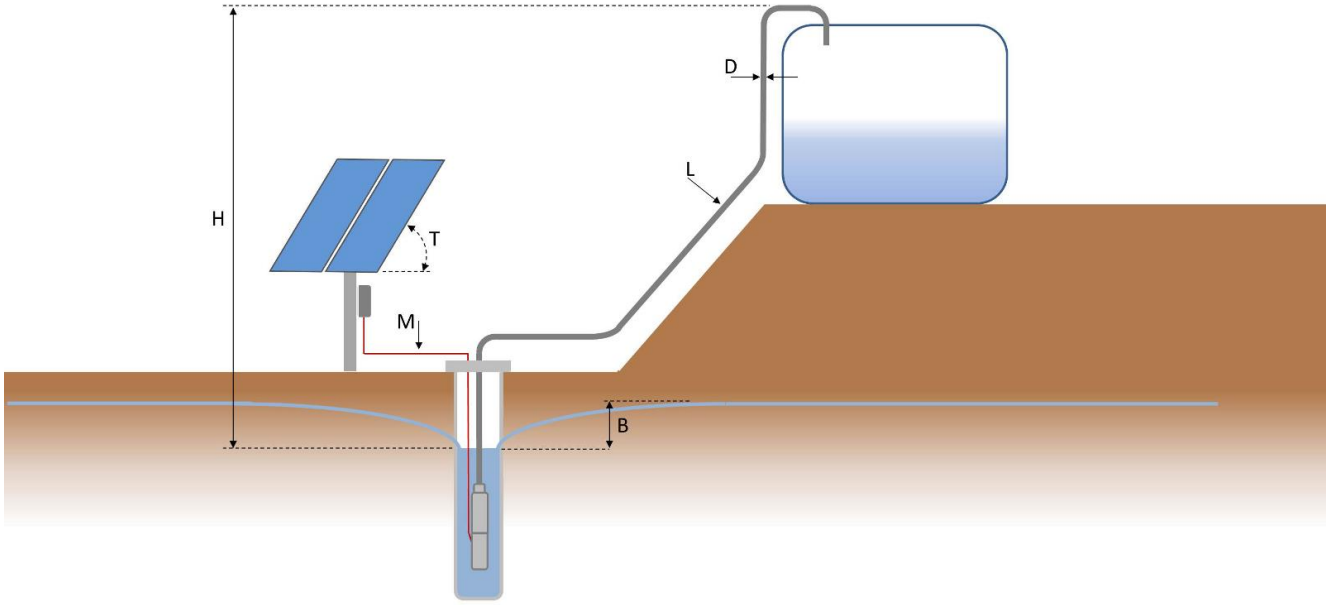
Bidders are asked to send 1 quotation for Water Output Requirements for the PV system of 80m3/day

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.

	Borehole 1
GPS Location (Long. Lat. Altitude)	Lat.: E 11. 05 16.8 E 25. 19 17.3
Borehole Maximum Yield (m3/h)	17
Daily Water Demand to be supplied with Solar (m3/day)	80
Estimated Cable Length (m)	125
Dirt allowance factor	5,00%
Total Dynamic Head (m)	100
Power of Genset (kVA) – already purchased-	33
Capacity of water tank (m3)	50
Estimated Cable Length from pump to inverter (m)	125
Dirt allowance factor	5.0%
Length of pipe from borehole head to water tank inlet (m)	29.4
Size and type of delivery pipe to tank	GI 2 inch
Pump intake depth (m)	97
Size and type of drop pipe (inside the borehole)	ASTM 2 inch
Depth of well/borehole (m)	342
Water Rest level(m)	67.2

Dynamic Water Level (m)	70.32
Vertical Height from borehole head to water tank inlet (m)	108
Internal Borehole diameter (inches)	8 5/8 inches
Desired Residual Pressure at Tank inlet (m)	



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 10 days. The bidder must recommend the items that would be supplied in line with manufacturer's recommendation.

3.3 - 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 rainy and windy 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 armored.

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 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 recognized equivalent standards

Other features:

-Controlling of the pump system and monitoring of the status of system operation, including selectable display of operating 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

Control equipment must

- be separate from the other system components.

- 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.

- *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/m3, 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 maximize water output in early morning late afternoon and on cloudy days.

-The pump must meet EN 809 and EN 60034-1 or internationally recognized 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 8 5/8 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 Oxfam office, will be responsible for logistical issues required to facilitate delivery, installation, testing and commissioning of a complete, suitable Solar PV pumping system

- On completion of all works, the contractor shall submit to Oxfam 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 Oxfam WASH coordinator 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 Oxfam and government 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, the bidder 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 Sudan. References will be followed up.

-The bidder should be able to provide positive references from international organizations within the country or testimony showing engagement with Oxfam. There should be an overall positive reputation for good business practice, 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 10 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, NGO has established evaluation criteria which govern the selection of offers received. Evaluation is made on a technical and financial basis.

It is recommended that 'Soundness of Technical Designs & compliance with specifications given by NGO take at least half of the 60% corresponding to Technical offer evaluation, while financial considerations take 40%.

S/No.	Evaluation Criteria	Total score
1.	System Design & Compliance with Specifications given by NGO	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 BH2 should take a maximum of 4 weeks upon award of the contract at a date determined by Oxfam and the successful vendor. **A workplan will be provided along with the offer by the bidder.**

7- Obligations: Oxfam.

Oxfam will pay the contractor(s) upon completion of the works as per the contract documents, and receipt of the reports on BH1 site. In addition, Oxfam sub-office will not facilitate field logistics for the contractor(s) such as transport, except where extremely applicable necessary security will be provided. Oxfam will hand over all sites to successful contactor as necessary.

Oxfam will not make any advance/down payments and such payments shall be made as stipulated on the Contract document and upon certification by NGO Engineers. If the Vendor will be unable to deliver, Oxfam will unilaterally cancel the order.

8 - Obligations: The Contractor.

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

The Contractor shall then supply and install Solar PV Power System in BH1 in El Nimir refugee camp site. On completion the Contractor will commissioning, with full participation of Oxfam designated management and Field staff, the Solar PV – {Diesel Hybrid Power system

Oxfam holds proper ethical conduct in the highest regard. If it is discovered that corrupt or unethical practices have been undertaken by the vendor or attempted, the vendor will be disqualified from this work and any further engagement with Oxfam. The contractor will have initial briefings at Oxfam sub-office and a final debriefing session will be organized in the same place upon completion of all or part of the assignment.

9. Submission of Request for proposals (RFP)

Interested and qualified companies should submit their application to Oxfam Office in Khartoun please indicate the tender you are applying for in the title of your email. Submission should be done by Date……...

{end}

Annexe A – Check-Up Summary List.

To assess before awarding Tender.

Number	Deliverable	Provided (Y/N)	Score	Comment
1	Daily water output meet requirements (section 2.2)		___ /9	
2	Full list of equipment provided together with technical specifications (section 1.4)		____ /6	
3	Operation and Maintenance programme developed (section 3.1)		____ /6	

4	PV modules approved to standards (section 3.3)		____ /9	
5	Protection for low water level, SPU and under/ over voltage make part of system proposed (section 3.4)		____ /9	
6	Control equipment quality to standards (section 3.5.2 and 3.5.5)		____ /3	
7	Warranty of equipment detailed (section 3.6)		____ /6	
8	Availability of service explain (section 3.6)		____ /3	
9	Workplan attached (section 4.2)		____ /9	
TOTAL SCORE			____ /60	

Annex B

These 3 delivarables MUST be provided by awarded company before last payment is made

Number	Deliverable	Provided (Y/ N)	Comment
1	2 day hand-on training provided on-site (section 1.3)		
2	Panels mounted at least 3m above ground level, tilted at Latitude degrees and all of them facing North (sections 1.4 and 2.1)		
3	Full testing, installation and commissioning report handed to NGO (section 2.1 & 5.2)		

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.	Motor AC DRIVE SUB 6" 7.5kW Highly efficient 3-phase AC motor, Frequency: 25...51 Hz, Premium materials, stainless steel: AISI 304 **Pump Unit PUk2-9 C-SJ8-44 (Motor, Pump End)**	1	set		
2.	Supply and install 10 kW electro mechanical control panel	1	pc		
3.	Controller Lorentz PSk2-9 C-SJ8-44 with data module, Power max. 10 kW Input voltage max. 850 V Optimum Vmp** > 575 V	1	pc		

	Motor current max. 17 A Efficiency max. 98 %				
4.	Metallic Enclosure for housing the controls, well ventilated and lockable	1	pc		
5.	Supply and install 40A Change over switch or equivalent to the system	1	pc		
6.	Supply and install LC250-P60 48 pc. 12,000 Wp; 24 x 2 modules; Number of cells in series 60, Number of cells in parallel 1, polycrystalline modules, Max. Max. power current Imp [A] 8.23, Max. power voltage Vmp [V] 30.4, Short circuit current Isc [A] 8.81, Open circuit voltage Voc [V] 37.6 All technical data at standard test condition: AM = 1.5, E = 1,000 W/m^2 , cell temperature: 25 ° C	50	pc		
7.	Supply 4-cores PVC SUBMERSIBLE 99% copper cable from well head to pump. (POWER CABLE) 6 mm^2 3-phase cable for power and 1-phase cable for ground	100	M		
8.	Appropriately sized cable joint	1	pc		
9.	6 mm2 4-cores PVC/SWA 99% copper armoured cable from controller to well head. (UNDERGROUND CABLE)	25	M		
10.	1.5 mm2 2-core PVC round hardened submersible WELL PROBE cables waterproof	100	M		
11.	1.5 mm2 4-cores PVC/SWA 99% copper armoured cable from control panel to well head for WELL PROBE	25	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	0	pc		
14.	5/8 100% copper earth rod.	1	pc		
15.	6 mm2 Copper earth cable	10	M		
16.	10mm2 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	0	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, 150 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 El Nimir refugee camp 65 km southof El Daien town	**1**	**LS**		