

Scope of Works

Solarization of Seven (7) Drinking Water Pumping Stations in Kandahar

ITB No. UNDP/AFG/ITB/2021/0000011207

Table I: Location of the 7 water pumping stations

#	Name of health facility	Required Solar Capacity, kW	Installed Capacities of Pumps, kW	Location		
				Village	District	Province
1	Mahbas Wellsite	150	120	To be provided during the pre-bid meting		Kandahar
2	Fazal Kandahari Wellsite	120	100			Kandahar
3	Dand Wellsite	120	100			Kandahar
4	Sre Miyasht Clinic Wellsite	120	100			Kandahar
5	Sharekat Maiva Wellsite	150	120			Kandahar
6	Ansari Maina Wellsite	120	100			Kandahar
7	Central Pump Station	230	185			Kandahar
TOTAL		1, 010	825			

Scope of work

The United Nations Development Program (UNDP), Afghanistan has made funds available for engaging a capable and qualified Contractor to carry out procurement, supply, installations, configuration, testing, commission and one-year guarantee of Solar Photovoltaic Electrical Systems that shall replace the existing diesel generators at the seven water pumping stations listed above. The Bidders shall refer to the detail 'Bill of Quantities' included in the ITB document for the items required under the scope of work. The detail scope of work includes:

- a. Verification of sites parameters: UNDP will provide initial lists and technical data of the water pumping stations. The offeror are encouraged to visit the sites and verifies the site parameters before procurement of the solar equipment. Some pumping stations may require remeasurement of the capacities of the existing system or the extension of electrical wiring and/or plumbing system. The offeror must verify them during the site visit and include the cost in its financial offer.
- b. Procurement and supply: In accordance with the provided technical specification, offerors shall procure and supply components and accessories for delivering a functional water pumping stations powered by the new solar electrical system. All components of the system must be made available to the Employer or its representative for inspection and quality assurance before their transportation to the locations for

installations. Any units that fails the quality inspection against the technical specification must be replaced.

- c. Transportation, Installations and Calibrations: The offeror shall transport the solar electrical system components to the locations stipulated in this bid document. The offeror must repair or replace any damage to components occurred during the transportation. The offeror shall install, assemble and calibrate the components and ensure their functionality and specified output quantities.
- d. Users' training: The offeror shall provide a one-week trainings about the use of the solar electrical system to the operators of the pumping stations. At the end of training, users must be able to understand at least the following activities about the usage of system.
 - Function of each components
 - Users safety
 - Minimum required parameters for the operation of the system
 - Preventive maintenance of the components
 - Troubleshooting problems

Technical Specifications

A. Solar Pumping System Assembly

The Solar Pumping system consists of seven solar pumping stations with the total capacity of 1,010 kW PV Module array, PV inverters installed at the module site, a battery and an existing control room housing the required battery capacity of about 420 kWh and the battery inverters. The bi-directional battery inverters will act as system controller, ensuring synchronization of the existing diesel generators and PV systems. The salient features of the PV system are compiled in Table II. All seven system needs to be separately installed at the existing seven solar pumping stations. The components of the solar system for each station comprise of:

- PV Modules installed on mounting supports on ground with foundations fixed on reinforcement concrete
- Protection measures to ensure that all equipment is well protected against deliberate damages, theft and non-authorized entry including but not limited to fences around the PV array, lockable doors and windows, as well as any other protection measures that may be required by the site
- Control and battery storage system. Free space in the existing control shall be used for the purpose
- Required inverters, batteries, monitoring and protection devices and outgoing control cubicle
- Earthing system
- Over-voltage protection.

The systems are to be designed in modular form as AC bus based systems, operating at 400 V, 50 Hz AC and shall be fully synchronized with the existing diesel generators. The systems are to be configured in a modular way that allows an easy future up-scaling.

Battery back-up is only required to jump start the pumps. No battery storage system is to be provided in the system. The pumping stations will work during the day and, in case of non-sunny days, the back up generator shall be used power the pumps.

The PV arrays shall be installed at the specified location by the Employer at each site. The bidder must avoid using the arable land for ertions of the PV arrays and its accessories.

a. Solar PV Panel

Unless otherwise specified, any type of PV module can be offered as long as the module has an overall efficiency of greater than 15%.

The solar PV module should conform to the relevant standards listed under the “*Applicable Standards and Certifications*” section of these specifications. Moreover, as a general note the solar PV modules should be rugged and have the ability of withstanding extra loads of snow and wind.

b. Mounting Assembly

The mounting assembly used to house the Solar PV module assembly should have the following characteristics;

- Able to withstand high winds
- Corrosion Resistant
- Waterproof Junction Boxes
- Legs that could fix into the ground / roof

It should be noted that these characteristics would be completely at the discretion of the Employer’s Representatives’ approval during site works.

c. Controller and Protection System

The Solar Pumping System should have the controller and all the necessary accompanying systems to ensure the following capabilities;

- Maximum Power Point Tracker (MPPT) to ensure high extraction efficiency from the Solar PV Modules
- A monitoring system to regularly monitor the water level in both the water storage tank and the well and turn On/Off the pump accordingly

A properly sized protection system at the outgoing of the system should be provided to ensure system safety during faults. Further to this, all junction boxes and other housing assemblies should have a protection rating of at least IP 54.

d. Motor/Pump Assembly

Unless otherwise specified, the Pump assembly should adhere to the following minimum specifications;

- Type: Centrifugal (Preferred); Surface
- Rugged Construction
- Ability to work with a wide range of voltages
- Ability to work for long periods of time, unattended
- Motor/Pump Assembly Efficiency of greater than or equal to 60% at rated head and flow, unless, the specific product for the rated head and flow is not available
- Conformance to relevant standards, as specified under “*Applicable Standards and Certifications*” section of these specifications
- Shall have power curves clearly showing power consumption at different heads and flow.

e. Inverter

In case, the offeror proposes an AC Pump Assembly, the offeror is required to include an inverter in its offer as well. The inverter should conform to the relevant standards, as specified under “*Applicable Standards and Certifications*” section of these specifications. The minimum inverter efficiency, as stated in product documentation should be 90%.

f. System Safety

Unless otherwise specified, the offeror is required to provide ample evidence, in the form of compliance certificates and/or test results, to ascertain the Pumping System Safety. The main constituents under this heading are;

- Rust Protection
- Over Temperature Protection
- Pressure resistance
- Reverse Flow Protection
- Safety Valves
- Safety Line and Expansion Lines
- Blow-off Lines
- Lightning Protection
- Water Contamination resistance

The above mentioned system safety aspects should not be deemed to be suffice for overall acceptance of the product offered. The offeror is required to conduct and/or present compliance certificates and test results for all factors outlined in the concerned standards identified in this document.

B. Applicable Standards and Certifications

Unless otherwise specified, the offered product and its components are required to conform to the following list of applicable standards and certifications. It is worth mentioning that any standard and/or certifications complementing any other standard and/or certifications should be mentioned by the offeror.

PV relevant EN-and IEC-standards are listed per technical component in the following chapters. All norms are defined as state of the art and are relevant for the quality status of a product

i. General

- IEC 17025 General requirements for the competence of testing and calibration laboratories
- IEC 61194 Characteristic parameters of stand-alone photovoltaic (PV) systems
- IEC 61427 Secondary cells and batteries for photovoltaic energy systems (PVES) – General requirements and methods of test
- IEC 61724 Photovoltaic system performance monitoring – Guidelines for measurement, data exchange and analysis
- IEC 62124 Photovoltaic stand-alone systems – Design verification

ii. Modules

- IEC 62804 Measurement procedures for materials used in Photovoltaic Modules
- IEC 61345 UV test for photovoltaic (PV) modules
- IEC 62804 System voltage durability qualification test for crystalline silicon modules (draft)
- IEC 62548 Design requirements for photovoltaic (PV) arrays
- IEC 62716 Ammonia corrosion testing of photovoltaic (PV) modules
- IEC 62788 Measu
- IEC 61730 Photovoltaic safety qualification
- IEC 61829 Crystalline silicon PV array, on site measurements
- IEC 60981 Photovoltaic devices – procedures for temperature and irradiance corrections to measured I-V characteristics
- IEC 60904 Photovoltaic devices
- IEC 61173 Overvoltage protection for photovoltaic (PV) modules
- EN 50380 Datasheet and nameplate information for photovoltaic modules.

- IEC/EN 61215 Crystalline silicon terrestrial photovoltaic (PV) modules -Design qualification and type approval.
- IEC/EN 61646 Thin-film terrestrial photovoltaic (PV) modules -Design qualification and type approval.
- IEC/EN 62108 Concentrator photovoltaic (CPV) modules and assemblies -Design qualification and type approval.
- IEC/EN 61853-1 Photovoltaic (PV) module performance testing and energy rating –Part 1: Irradiance and temperature performance measurements and power rating.
- IEC/EN 61701 Salt mist corrosion testing of photovoltaic (PV) modules.
- EN 50461 Solar cells -Datasheet information and product data for crystalline silicon solar cells.

iii. **Inverter**

- EN 50524 Data sheet and name plate for photovoltaic inverters.
- EN 50530 Overall efficiency of grid connected photovoltaic inverters.
- IEC/EN 61000-6-2 Electromagnetic compatibility (EMC) -Part 6-2: Generic standards -Immunity for industrial environments.
- IEC/EN 61000-6-4 Electromagnetic compatibility (EMC) -Part 6-4: Generic standards -Emission standard for industrial environments.
- IEC/IS 61683: Photovoltaic Systems – Power Conditioners – Procedure for measuring efficiency
- IEC 60068-2 (1, 2, 14, 30): Environmental Testing

iv. **Junction Boxes**

- EN 60439-1 Low-voltage switchgear and control gear assemblies -Part 1: Type-tested and partially type-tested assemblies.

v. **Cables**

- EN 50396 Non electrical test methods for low voltage energy cables.
- IEC/EN 60332-1-2 Tests on electric and optical fibre cables under fire conditions –Part 1-2: Test for vertical flame propagation for a single insulated wire or cable -Pro-cedure for 1 kW pre-mixed flame.
- EN 50267-2-1 Common test methods for cables under fire conditions -Tests on gas-es evolved during combustion of material from cables -Part 2-1
- IEC/EN 60811-2-1 Insulating and sheathing materials of electric and optical cables -Common test methods -Part 2-1: Methods specific to elastomeric compounds; Ozone resistance, hot set and mineral oil immersion tests (IEC 60811-2-1:1998 + A1:2001)
- IEC/EN 60811-1-4 Insulating and sheathing materials of electric and optical cables -Common test methods -Part 1-4: General application; Tests at low temperature.
- IEC/EN 61034-2 Measurement of smoke density of cables burning under defined conditions. Part 2: Test procedure and requirements.
- EN 50267-2-2 Common test methods for cables under fire conditions -Tests on gas-es evolved during combustion of material from cables -Part 2-2: Procedures; deter-mination of degree of acidity of gases for materials by measuring pH and conductivity.
- EN 50267-2-1 Common test methods for cables under fire conditions -Tests on gas-es evolved during combustion of material from cables -Part 2-1
- IEC/EN 60216-1 Guide for the determination of thermal endurance properties of elec-trical insulating materials; part 1: general procedures for the determination of thermal endurance properties, temperature indices and thermal endurance profiles.
- IEC/EN 60228 Conductors of insulated cables.

vi. **Batteries**

- EN 50272-1/IEC 62485-1: Safety requirements for secondary batteries and battery installations – Part 1: General safety information
- EN 50272-1/IEC 62485-2: Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries:
 - 1.1.7 Concrete
 - ACI Manual on Concrete Practice, American concrete Institute, 2009
 - ASTM A615/A615M: Concrete Reinforcement
 - ASTM A185/A185-07: Steel welded wire reinforcement
 - ASTM C 150: Cement

C. Labelling

Unless otherwise specified, all the products proposed should have labelling which consist of at least the following product information. This information is of utmost importance dDuring the execution stage of the project.

SN	Item	Labelling
1	Solar Module Assembly incl. Controller and Protection Assembly	<ul style="list-style-type: none"> – Name of manufacturer – Type – Serial Number – Year of Production – Maximum Power, W_{peak} – Maximum Current, I_{max} – Maximum Voltage, V_{max} – Short Circuit Current, I_{sc} – Open Circuit Voltage, V_{oc} – Module operating temperature
2	Pump/Motor Assembly	<ul style="list-style-type: none"> – Name of manufacturer – Type – Serial Number – Year of Production – Maximum head, m or ft – Maximum flow, m^3/h or gpm or lpm etc – Maximum Efficiency – Starting Current – Normal Operating Conditions (Voltage, Pressure, Temperature)

D. Balance of System

The offeror is required to include all other equipment rendering the system as fit for purpose in its offer, including the control system. If the existing control system at the pumping stations are not fit for the purpose, offeror shall modify or replace it with a system.

E. Installation and Commissioning

The offeror is required to provide installation services and provide a system rendered as Fit-for-Purpose.

Warranty details:

1. Solar PV Panel – 25 years
2. Motor/Pump Assembly – 2 years

F. After Sales Services

Unless otherwise specified, the offeror is required to provide a minimum of 1 year after sales services which include the O&M and repair services.

Delivery Requirements

Delivery Requirements	
Delivery date and time	Bidder shall deliver the goods within 1 month after Contract signature.
Delivery Terms (INCOTERMS 2020)	DAP
Customs clearance (must be linked to INCOTERM)	<input checked="" type="checkbox"/> Not applicable Shall be done by: <input checked="" type="checkbox"/> Supplier/bidder
Exact Address(es) of Delivery Location(s)	Kandahar provinces of Afghanistan. Refer to the 'Scope of Work' section
Distribution of shipping documents (if using freight forwarder)	N/A
Packing Requirements	N/A
Training on Operations and Maintenance	One day Operation, maintenance and Troubleshooting training to the users
Warranty Period	1 Year
After-sales service and local service support requirements	Yes, until one year from the date of handingover the system to the users
Preferred Mode of Transport	Land