



**Republic of Yemen**

**Ministry of Water & Environment**

**Urban Water Supply and Sanitation Project**

PROJECT:

**SUPPLY, DELIVERY, INSTALLING, TESTING, COMMISSIONING, OPERATING,**

**HANDING OVER AND MAINTAINING SOLAR PUMP SYSTEM FOR WELL**

**IN MATNAH-YEMEN**

**Funded by: World Bank through UNOPS**

**Sub-project No.:** EHC-AF-WS-SAN-008

**Part 1: Scope of Work**



**Contents**

[1)](#_30j0zll) Background 3

[2)](#_1fob9te) General 3

[3)](#_3znysh7) System Components: 3

[4)](#_2et92p0) *General Requirements* 4

[3.1. Contractor’s general obligations 4](#_tyjcwt)

[3.2 Applicable standards 4](#_3dy6vkm)

[3.3 Quality of materials 5](#_1t3h5sf)

[3.4 Protection of Site, materials and works 5](#_4d34og8)

[5)](#_2s8eyo1) Submittals: 5

[6)](#_17dp8vu) Project Execution 6

[7)](#_3rdcrjn) Manuals, Catalogues and Electrical & Structural Drawings 6

[8)](#_26in1rg) Construction 6

[8.1](#_lnxbz9) Structural Work 7

[8.2](#_35nkun2) Electrical Work 7

[8.3](#_1ksv4uv) Mechanical Work 7

[9)](#_44sinio) *Final documents* 7

[10)](#_2jxsxqh) *Training* 7

[11)](#_z337ya) *Commissioning* 8

[12)](#_3j2qqm3) *Project Staff :* 8

# Background

Due to the conflict in Yemen, resulting in a shortage of public electricity supply and lack of financial resources to secure sufficient fuel for the operation of diesel generators in addition to the unavailability of diesel fuel in the local market at times, resulting in the interruption of most drinking water due to the interruption of pump systems, forcing most The population to rely on contaminated water resources to secure drinking water from the old open wells, some people are forced to bring water from far away, which sometimes takes an hour or more to get 20 litre of plastic water jar or stand for long hours in long queues In order to gain some water, this increases their suffering, especially women and children, UNOPS will support the installation of solar water pumps for some targeted wells in Yemen.

Most old water pumping systems are electrical submersible pumps, electricity is supplied by local generators. Another water pumps types are old submersible pumps run by transfer of kinetic energy through long rod mechanical coupled to running shaft of machine at the top of water well, this types of pumping have low efficiency and require more routine maintenance. Renewable power source would be an ideal for our case. As Yemen enjoys very good solar radiation, a solar power supply system is the most suitable power source.

UNOPS intend to replace old pumping systems which operated by diesel fuel with a new Solar PV Water Pumping System (solar photovoltaic energy).

# General

The general scope of work procure, supply, installing, testing, training and commissioning, operating, handing over of Solar PV Water Pumping System. as required in specifications but not specifically included in the following items:

* Suitable amount of solar PV modules with its mounting structures and arrangements to enhance the availability of solar radiation to achieve the max output power to run Submersible AC pump adequate to lift desired quantity of water via appropriate controller (solar pump inverter VFD) and all accessories
* The good quality material, and applying the latest available technologies with high quality increases bidders’ advantage.
* **The Targeted Wells are as per the following table**

| **Gov.** | **District** | **Well Name** | **Wall Coordinates** | | **Total Dynamic Head (m)** | **Water Requirement (m3/hr)** | **Daily Water Requirement (m3/day)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| N | E |
| **Sanaa** | **MatnahCity** | **Alsnafiah** | 15.245949 ° | 44.011454° | **298** | **36** | **216** |
| **Pump Station at Tank location** | 15.252096° | 44.010138° | **96** | **57.6** | **345.6** |

# System Components:

* The WORK to be performed under this document shall consist of furnishing system, tools, equipment, materials, supplies, and manufactured articles, and furnishing all labour, transportation, and services, including fuel, power, water, and essential communications, and performing all work or other operations required for the fulfilment of the Contract in strict accordance with the Contract Documents. The WORK shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the EMPLOYER.
* The contractor is also required to make sure that all required materials, equipment’s; subsystem is included in his offer to deliver a completed and functional system., includes but not limited the following components:
  + Solar PV modules consisting of required number of Crystalline PV modules;
  + Fixed Mounting structures suitable for number of PV panels;
  + PV combiner box;
  + Solar pump inverter (VFD with built in MPPT controller);
  + Submersible AC pump set (Motor & Pump) with suitable Cables and Accessories;
  + System Cables (DC & AC);
  + Raiser Pipes and Joints;
  + PVC pipe for cable holding.
  + Earthing, short-circuit, surge and lightning protections;
  + Mechanical Water Flow Meter;
  + Chain Link Fences with two leaflets gate to protect the system;
* The contractor should take into account the site condition in terms of obstacles and shadings.
* This scope of works is not meant to be a comprehensive definition of works, but merely a guide for the items of work contained within this tender package;
* The contractor should be testing the water quality
* Installation of PV system & Water Pumping System components shall be done in accordance with manufacturer operation manual adequate to lift desired quantity of water, bidders will be required to submit stamped operation and manuals prior commencement of works;
* Site levelling, the contractor shall survey and conduct all site levelling such as cut and backfill in any type of soil, removing/cut the existing asphalt/tiles, laying 15 cm sand above conduit, safety electrical cables with safe depth from existing ground level, re-pavement, and all related civil work
* The contractor shall carry out any operational costs to finish the installation at location.
* The Contractor shall generate a site plan, which indicates the structural and electrical works that is required for the successful completion of the Project such has to be approved by UNOPS;
* Removing the old existing bore wells' pumping units including pumps, motors, cables, riser pipes, flow meters complete with all accessories and deliver to well management or general Authority for rural water supply projects; all required costs for dismantle shall be bared by the contractor.
* The contractor shall clear, from all areas planned for the work, materials, debris, etc, prior to the commencing of work;
* Contractor shall clear, from all areas planned for the work, materials, debris, etc, after complete installation;

# *General Requirements*

# 3.1. Contractor’s general obligations

The Contractor will have sole responsibility to ensure that all aspects of the contract shall be undertaken within the current laws of the Republic of Yemen if the current laws allow for the need of certain permits, licenses, guarantees or special documentation with the granting of approvals by the port authorities, Regional Authority or other bodies.

# 3.2 Applicable standards

The Contractor must ensure that the engineering, procurement, construction, testing, commissioning, operation and maintenance of the facility components, including all auxiliary facilities and systems, are according to internationally recognized standards and codes in their latest edition. It is the responsibility of the Contractor to check and comply with all regulations which apply to any part of the contract.

The latest editions of the Standards, Codes and Recommendations issued by the following organizations must apply for the engineering, construction, testing and commissioning of the Facility.

International Standards (Highest precedence)

* ISO International Standardization Organization.
* IEC International Electro Technical Commission.
* National Standards.
* BSI British Standards Institution.
* Eurocodes and Standards.

# 3.3 Quality of materials

All components, equipment and materials shall be new and shall comply with all relevant codes. The Contractor shall only supply and deliver equipment and materials that are suitable for the use in the applicable operational and weather conditions, as where such will be installed.

All materials and equipment shall be of a robust design and of a proven technology, i.e. same type of equipment shall be in use successfully for more than one year at 3 different locations, without major breakdowns on similar duties and conditions. Unproven or prototype equipment or components are not acceptable.

* Procurement and expediting tasks for all equipment and materials are the responsibility of the Contractor;
* The equipment and materials shall be purchased by the contractor, and it is understood that the cost of this equipment, materials, shipping and transportation;
* All of the procured material shall be brand new with valid warranty certificates;

# 3.4 Protection of Site, materials and works

All materials and equipment shall be stored and protected in such a manner as to prevent any damage or deterioration from any cause whatsoever until such time as they are incorporated in the works.

The Contractor shall be ready to advise the UNOPS’s Engineer of the location and condition of the materials at any time including materials shipped by sea.

The Contractor shall provide adequate security staff and lighting as required to safeguard the works from damage and theft and shall take all reasonable precautions to prevent unauthorized access.

The Contractor shall take care to prevent disruption to existing operations in the facility and surrounding establishment.

# Submittals:

**All offers must include the following items :**

* The original certificate for all supplied items
* The authorization of manufacturer
* Performance tests certificate from the manufacturer
* Recommended and priced special tools
* All original and completed catalogues for each supplied item
* At least one-year warranty from the operation date of each supplied items. (any other warranty will not be accepted)
* Service and parts manuals
* Detailed work implementation plan should be submitted along with the offer.
* In addition to that, the tenderers are requested to present information along with their offers as follows :
* Information on proper representative and/or local workshop/dealership for back-up service/repair and maintenance/spare parts, etc., including their names and addresses.
* Quote for service parts for each unit of equipment.
* These specifications describe the basic requirements for goods. Tenderers are requested to submit with their offers the detailed specifications, drawings, catalogues, etc. for the products they intend to supply.
* Any tender not containing sufficient descriptive material to describe the proposed equipment / components of the system may be treated as incomplete and hence may be rejected. Such descriptive materials and specifications submitted will be retained. Any big deviations from these will not be accepted.
* Relevant original descriptive literature of the Goods showing conformity to the technical specifications must be provided with the bid. Irrelevant literature downloaded from the Internet shall not be accepted.

# Project Execution

* Once the project is awarded, the contractor is entitled to carry out detailed site visit, site survey with PMU Sana’a/ UNOPS representative to identify component's locations, cabling routing, and any other necessary works;
* A Regular status meeting with PMU Sana’a/ UNOPS representative shall be carried out to discuss current and planned activities and significant issues;
* The contractor has to submit the final a stamped design and shop-drawings to be verified and approved by PMU Sana’a/ UNOPS.
* The Contractor must provide work installation plan and implementation period such has to be approved by PMU Sana’a/ UNOPS.

# Manuals, Catalogues and Electrical & Structural Drawings

* Bidder shall submit catalogues and data sheets of all the offered PV systems equipment with detailed technical specifications for the proposed systems and components. In addition, the contractor shall submit all required doc’s such as Shop Drawings, catalogues, factor acceptance tests, test reports by other accredited parties. The offered PV systems shall be capable to operate in the climatic site conditions ensuring the system sustainability and durability
* All as built drawings and layout shall be prepared using AutoCAD including but not limited to: as belt drawing,

# Construction

Contractor shall implement its standard Quality Assurance / Quality Control plan for construction activities on the Project Site .

* The contractor shall supply all labor, tools, machinery, equipment and equipment transportation for all work;
* The contractor shall keep the site clean and orderly throughout the duration of construction .
* The contractor shall provide permanent equipment marking, labeling and signage for the project .
* The contractor shall fully comply with all applicable notification, safety and work rules when working .
* It is the contractor responsibility to clean the modules once the construction work is completed .

## Structural Work

* The contractor should take into account the site condition in terms of obstacles and shadings;
* The contractor has to provide a stamped drawing and design verified from a reputable engineering office; such office has to be approved by PMU Sana’a/ UNOPS.

## Electrical Work

* All grounding and protection equipment throughout the system shall be sized and specified to reduce damage on all components, such system shall be approved by PMU Sana’a/ UNOPS;
* The contractor shall install all the required components required for data logging and monitoring;
* All electrical works shall comply with the manufacture instructions and regulations;
* System configuration, testing and commissioning should be carried out by an experienced electrical engineer.

## Mechanical Work

**-** Removing of existing raiser pipes and Installation of new raiser pipes with all required fittings and accessories.  
- Installation of piping components mechanical water flow meter, air release valve, non-return valves and gate  
valve.  
- Installation of piping fittings and accessories required to install the mechanical and piping components.  
- Installation of well head cover

-Flushing and cleaning for all new piping components

# *Final documents*

The Contractor shall supply comprehensive shop-drawings before installation, in addition to the final documentation which shall include as-built drawings, calculations, operation manuals and maintenance manuals in the English language.

Three draft copies of the final documentation shall be submitted for comment at least one week before completion date

Following the approval process, the contractor shall submit the final as-built drawings, operating manuals and maintenance manuals within one week after UNOPS approval.

# *Training*

* The awarded contractor shall carry our comprehensive training for 2 personnel where the solar system will be installed, the training will be focusing on system operation, maintenance and troubleshooting, the training scope shall be approved by UNOPS, the activities shall include but not limited to the following:
* Solar pump operation
* Solar Inverter operation
* System isolation
* System monitoring
* Fault diagnosis
* Safety and emergency shutdown procedure
* User manuals, operation manuals and drawings must be provided in Arabic and in English.

# *Commissioning*

* The contractor shall provide a time plan and test procedure for the process of commissioning;
* The contractor shall offer all goods and materials for inspection examination and witness testing. He shall inform the UNOPS or his authorized representative of the date when the goods and materials will be ready for inspection and witness testing. If the tests are beyond the resources of the supplier, he shall make arrangements for these to be carried out elsewhere;
* Such testing should include the following tests as minimum:
* Cable insulation and continuity test: such tests should be carried before commending installation;
* System earthing test: The earth resistance should be measured to ensure operators safety.

# *Project Staff :*

The bidders Should provide the following key personnel under the project.

* Project Manager: Project Manager: With 3 years’ experience as a Project Manager, the Project Manager shall be responsible for the successful management of assigned project, its technical quality, schedule, logistics, project staff coordination, client communications, negotiating scopes and fees, billing and client follow-up maintenance.
* Project Engineer: With a Bachelor’s Degree in Electrical Engineering from a reputable University; with at least (3) Years of experience of work in electrical, civil or construction works management including minimum of (3) years of works in similar nature and magnitude of works. The Project Engineer shall perform field engineer duties including all setting out and applies the design as well as liaising with and working alongside the engineers and sub-contractors. He shares responsibility for site security, health and safety, and the organization and supervision of material and human resources in the field. Ensure that material and placement comply with the technical specifications, will analyses failure, and implement corrective and preventive action to ensure contracted quality is provided, creates and maintains quality documentation, such as quality manuals, quality procedures, etc., is responsible for planning, and carrying all required tests for using quality material and their placement, continuously improving QA receiving inspection process and procedures, and prepares QA/QC reports.

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