Scope of Work

Annex 1

Supply, Delivery, Installation, Test and Commissioning of 36 off grid Solar Direct Drive Refrigerators to Hajjah, Hodeida, Taiz, Abyan and Lahj Governorates.



United Nations Development Programme

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Background Information about the Project:

The three years (March 2019-February 2022) joint programme **"Supporting Resilient Livelihoods and Food Security in Yemen joint programme (ERRY II)**" financed by EU, will be implemented by FAO, ILO, UNDP and WFP in six vulnerable governorates: Hajjah, Hodeidah, Lahj, Abyan, Taiz and Sana'a. <u>The overall objective of the programme</u> is to contribute to reduced vulnerability and strengthened resilience capacity of crisis-affected communities in Yemen through creation of sustainable livelihoods and access to basic services. <u>The Specific Objective (Outcome) of the programme</u>: Crisis affected communities are better able to manage local risks and shocks for increased resilience and self-reliance. The joint programme expected to achieve the following results over the implementation timeframe:

- <u>Output 1</u>. Community livelihoods, productive assets and food security are improved to strengthen resilience and self relianace;
- <u>Output2</u>. Vulnerable communities benefit from solar energy for sustainable livelihoods opportunities and enhanced social service delivery;
- <u>Output 3</u>: Communities and local authorities have enhanced capacities to respond to conflict and gender sensitive priorities needs

Yemen Context:

Energy supply in Yemen is minimal nationwide in general. In rural areas, the increasing demand for energy and the limited availability of fuel is among the top challenges' communities face. The total generation capacity of the Yemeni electricity system before the crisis was about 1.223 GW. The supply gap against demand estimated at 500 MW in 2013. Damage to the energy sector since the crisis has caused energy levels to drop more than 50 percent, which in turn has affected the health, education, employment, water, solid waste management, and private sectors, as well as vulnerable households, women and the poor. Rates of using fuelwood have increased rapidly, causing adverse environmental impacts.

As per the socio-economic and rural energy gaps and needs assessments, the findings have indicated that, about 80 percent of households had been affected by interrupted or cessation of energy, affecting home-run businesses (tailoring, small stores, handloom textile, and handicrafts), as electricity plays a pivotal role in the development and profitability of these types of businesses. Delivery of social services has been impacted: 50 percent of health facilities lack reliable energy sources, which affects health service delivery, especially vaccinations. Also, 74 percent of education facilities lack energy sources.

Women in most areas experience energy poverty differently and more severely than men. Without access to reliable energy sources, women and girls spend most of their day performing basic subsistence tasks which constrains them from accessing decent wage employment, educational opportunities and livelihood enhancing options, as well as limits social and political interaction outside the household. In contrast, access to reliable and sustainable energy can significantly enhance women's empowerment by reducing labor burdens, improving their health, and providing them with opportunities for enterprise, income generation, and capacity building.

The solar energy would focus on improving access to service delivery by promoting decentralization of solar services and facilities to generate income opportunities for livelihood improvement. The intervention would consolidate and build on the learnings from ERRY I. Solar energy would focus on a market-based approach to decentralize access to solar services in both rural and semi-urban areas. Community-based affordable solar and renewable solutions would be developed to provide income generation opportunities to affected individuals and households. Schools, health and WaSH facilities, irrigation, producers' group and local businesses, markets, private sectors would be supported to



increase service efficiency. Overall, the solar value chain would be supported and strengthen through women economic empowerment approach.

Public service institutions such as school, health centers/facilities, local authority offices, safe spaces, market centers, and places would have the provision of access to solar energy. Combination of PV solar system and the microgrid would be implemented to support the above institutions to resume the critical facilities and functions. The institutions would be identified through a range of the criteria in close collaboration with the Ministry of Public Health, Ministry of Education, MOPIC, Local Authority, and relevant government agencies. The technical team would conduct the energy gap assessment which will fed to the community resilience planning (Local Governance and Social Cohesion Component). The intervention would adopt the good practices and lessons learned identified in ERRY I to improve the services in public institutions. The solar energy operational guideline has developed which covers sectors such as education, health, WASH, Agriculture, Jobs, and Employment. The guideline provides criteria of selecting institutions, the process of implementation, potential bottlenecks and risks, and mitigation guidance. The guideline also provides a solution for different structures within the sector such as education and health. The implementing partners would be trained on the good practices; lessons learned and operation guideline to create awareness and orient front line, staff. The intervention would build synergy with WFP and support the rehabilitated or constructed community or public assets with solar energy provision. The good practices have highlighted that the replacement of solar energy solution has enabled the public institutions to have monetary savings every month. The savings utilized in improving or upgrading work environment.

Solar energy solutions for individuals and households would also be the focus of the interventions. Consider the lack of access to energy for displaced, returnees, refugees and host communities in the rural areas, solar energy solutions would not only improve access to energy but would also help support them in income generation activities. The experience of ERRY I highlights that the household with PV solar lantern was able to save \$10/month and it helped in setting up microbusiness due to prolong access to energy. The access to PV solar lantern was also able to support the vulnerable households in reducing the protection and GBV risks, especially among IDPs living in open spaces.

General Description:

United Nations Development Programme UNDP - Supporting Resilient Livelihoods and Food Security in Yemen (ERRY II) project is planning to provide solar vaccine refrigerators (SDD) to support the immunization and vaccination programme of Yemen through enhance rural health facilities capacity to deliver vaccination services for affected communities. Off-grid solar direct drive refrigerators integrated with solar panels, lightning protection system and other accessories will be delivered and installed in 36 Health centers and units in five governorates under the supervision of national immunization programme.

The refrigerators will be handed-over to public health ministry- immunization program and operated by the administration of the targeted health facilities. In addition, the supervisors and staff of those facilities will be trained in refrigerators operation, regular and preventive maintenance.

Scope of Works:

- Supply, delivery, installation, testing, commissioning, operating, handing over and maintaining solar vaccine refrigerators to health facilities in Hodeida, Hajjah, Abyan, Lahj and Taiz governorates.
- Supply of the complete systems, including all accessories and tools etc. as per technical specifications given below.

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- The bidder must also provide a detailed description, datasheets, catalogues, drawing, performance international certificates and valid warranty certificates for all proposed components and goods with detailed specifications.
- The selected bidder should submit the Product/type test reports from accredited laboratories for proposed products.
- Documentary evidence such as original manuals, catalogs, brochures etc.as a proof of product specifications under the compliance list should be submitted.
- All system's components shall be inspected by UNDP project team before implementation starting.
- The contractor will be responsible for providing training courses focusing on refrigerators operation, regular and preventive maintenance and management, the scope of training and schedule shall be proposed by the contractor and approved by UNDP project team.
- The supplier should provide user manual which include the following information as a minimum:
 - a. System operation in detailed steps
 - b. Health and safety guidance.
 - c. Basic operations description.
 - d. Cool-down time instructions to assure both acceptable temperatures and full autonomy is achieved.
 - e. Preventive maintenance tasks (e.g. daily, weekly, and monthly).
 - f. System monitoring
 - g. Fault diagnosis
 - h. cleaning of the equipment and fault reporting.
 - i. Safety and emergency shutdown procedure
 - j. User manual and must be written in Simple language (local language) to be more understandable in targeted rural communities.
- For electrical, mechanical and civil works to be carried in the site, bidder should consult the project team before executing the work.
- The supplier must provide Any additional works not covered above, but necessary for the functioning of the system and required as per specification incorporated. The works of minor nature, which are not mentioned, shall be incorporated by the bidder.
- The bidder should install and provide full protection system against lightning strike to ensure that all system's components are fully grounded all time, any equipment fails due to lightning strike will be replaced by the supplier under warranty service with no cost.
- Ensure each piece of electrical equipment & apparatus will be connected to the main earth busbar by means of branch/main connection of earth conductors.
- Warranty period for the entire system shall be at least 2 years including replacement of components if needed. The Warranty Period commences after UNDP's acceptance of a delivery made by the supplier or its authorized representative.
- The supplier warrants to UNDP, among others, that:
 - a. The Goods shall be new and factory packed and shall conform to the bid Documents.
 - b. The Goods are free from defects in workmanship and materials.
 - c. The Goods are contained or packaged in a manner adequate to protect them; and
 - d. It has the personnel, experience, qualifications, facilities, financial resources and all other skills and resources to perform its obligations under the contract.
- The bidder is responsible for arranging all accessories and measuring/testing instruments required to smoothly commission the system.



- Exact locations: Will be provided for the selected bidder by project team.
- The quoted transportation cost shall cover the prices for transportation of all equipment within all installation's locations within the following Districts: Abs-Hajjah, Az Zuhrah-Hodeidah, At Tazyah and Ash Shammayten-Taiz, Al Musaimeer-Lahj, Khanfar-Abyan.
- Successful bidder is required to provide following documents when equipment is delivered:
- a. A complete list of system components with associated manufacturers literature, specifications and warranties.
- b. A complete copy of user manuals in Arabic.
- c. Recommended annual maintenance schedule with maintenance instructions.
- d. Submit detailed implementation plan after signing contract.
- e. A functional block diagram, an electrical single line diagram and physical layout diagram for the total system.
- f. All technical details given in the offer should be supported with documentary evidences such as manufacturer's catalogs, leaflets, test certificates, data sheets etc.

Other requirements

The bidder should also comply with the following service requirements, warranty and after sales services;

- a. All the equipment/components are new, unused, and of the most recent or current models, free from defects and that they incorporate all recent improvements in design and materials.
- b. The bidder or authorized local representative should provide all product upgrades/updates issued by product manufacturers.
- c. Should be able to provide replacement items of all system component within 3 working days after the notice of malfunction during the warranty period.
- d. The bidder/ authorized local representative must be able to attend to site problems on site within three working days with fair notice from customer.
- e. An operation and troubleshooting training, and recommended maintenance schedule shall be handed over to the project team / in-house personnel at the installation/commissioning.

Technical Specification

SDD refrigerators:

- a. SDD refrigerators equipped with solar panels, Mounting structure, DC cables, Remote Temperature Monitoring Device and other accessories as an integrated package.
- b. Off-grid SDD refrigerator with freezer with Net Volume of 30 60 litres refrigerator and freezer.
- c. Minimum Vaccine capacity of 57 liter.
- d. Minimum Freezer gross volume of 24 liter.
- e. Direct cooling type.
- f. Temperature range: 2-8°C
- g. The refrigerators should be valid certified by WHO PQS under E003/RF05 list and CE.
- h. CFC free.
- i. Holdover time at 43°C: 100h.
- j. Refrigerator must be able to maintain the acceptable temperature range in the vaccine storage compartment when operating in the hot zone (+43°C) and at a minimum rated ambient temperature of +10°C or lower.
- k. The zone within the vaccine compartment that is designated for vaccine storage must remain within the acceptable temperature range during any continuous ambient temperature test or day/night cycling temperature test.



- I. The thermostat must be set to prevent freezing in any part of the vaccine storage compartment, it must be designed so that it cannot be adjusted by the user.
- m. Refrigerator must be able to operate at a continuous minimum ambient temperature of +10.0°C or lower whilst maintaining the acceptable temperature range. A freeze-prevention circuit is required to protect against freezing at low ambient temperatures.
- n. Power consumption: To be less than 0.8 kWh per 24 hours.
- o. Refrigerator should be equipped with temperature remote monitoring device with minimum specification as mentioned below.
- p. The contracted supplier will provide unlimited access to the monitoring Web-platform, portal service, receiving SMS and email messages
- q. Refrigerator must prequalify with at least a minimum autonomy of three days at the minimum solar radiation reference period and when tested for the hot zone by testing in accordance with E003/RF05-VP.4.
- r. The door or lid must be fitted with a lock. Two keys are to be supplied with every unit.
- s. Corrosion resistance: The legal manufacturer must certify compliance that internal and external cabinet, lid and frame are protected against corrosion as appropriate to EN ISO 6270-1 / ASTM D2247 / EN 13523-26, EN ISO 6270-2 / EN 13523-25, ISO 6272 / EN 13523-5 and ISO 2409: 2013.
- t. Electrical safety rating: The legal manufacturer must certify compliance with IEC 60335-1, IEC 60335-2-24 and IEC 60364-1.
- u. The ambient temperature range during transport and storage is -30°C < +70°C when the product is inactivated.
- v. The appliance is to be equipped with a locking female and male coupler system ("plug and play") that is compatible with the solar array interconnection cable and polarity.
- w. Warranty: minimum of two-year replacement warranty in the event of any component failure arising from defective design, materials or workmanship.

Remote Temperature Monitoring System

- a. Min logging interval: 1-10 minutes.
- b. IP rating: IP66.
- c. Main material: ABS PLASTIC.
- d. Accuracy: +/- 0.5°C.
- e. Power source: Rechargeable battery.
- f. Battery type: Li-ion, certified Operates on a single charge for minimum of 180 days.
- g. Battery shelf life: 2 years.
- h. Minimum and Maximum working temperature: -20°C / +60°C.
- i. User interface: LCD screen.
- j. The product should be provided with Barcode, Serial Number and IMEI Number.
- k. Device Should be User programmed.
- I. The monitoring system should provide on-time on-line temperature data monitoring, and the alarms can be received via audio, visual, SMS, WEB, e-mail and Stores 30 60 days temperature data in memory which can be downloaded to the computer.
- m. The device should be able to transfer the data via GPRS and SIM card from local to the cloud. The quoted price shall cover the hardware, WEB platform, computer software, Phone application if applicable, and service charges (SIM card and portal service).
- n. Product certificates: CE, FCC, IC, Anatel, ACMA, PQS.

Solar panels



- a. The required capacity of solar panels should be according to manufacturer recommendation.
- b. The solar panels must conform to CE and IEC 61215, IEC 61730, IEC 61701 or equivalent standards.
- c. The PV module shall perform satisfactorily in humidity up to 100% with temperature between 40 °C to +85 °C.
- d. The module shall be provided with a junction box with IP67.
- e. Trees and branches should be cleared to avoid casting shadows on the solar array.
- f. Solar refrigerators should be located away from direct sunshine.
- g. The solar refrigerator cabinet should be placed at a minimum of 300 mm away from any walls to allow for free air circulation.

Mounting structure

- a. The PV modules shall be mounted on fixed metallic structures having adequate strength and appropriate design, which can withstand the load of the modules and high wind velocities. theft-deterrent fasteners should be used.
- b. The support structure shall be Anodized aluminum or Stainless steel or hot dip galvanized steel.
- c. Hot dipped galvanizing which provides at least spraying thickness of 80 microns.
- d. The structure should be capable of withstanding a wind load of 120 km/hr.

Earthing and lightning protection system

- a. The supplier shall provide complete earthing for the non-current carrying metal parts of all components and lightning protection circuit.
- b. All non-current carrying metal objects such as solar PV panel frames, mounting structures, enclosures etc. shall be properly grounded and conductor size should not be less than 4mm2.
- c. The earth wire conductor shall be made of copper.

Recommended Accessories for Installation Process

As a minimum, accessories include the following per complete system:

- a. 1 Compass to assist in the process of site orientation
- b. 1 Set, assorted no. of Cable lugs suitable for the various cable terminations