

**Annex - B1- Bill of Quantities of Supply and Installation 800 Units of Solar System for the Refugees in Kharaz Camp, Lahj, Yemen**

No.	Description	Unit	Qty Per Unit	Total Qty for 800 Unit	Photo
1	<p><b>Solar PV Module:</b></p> <p>Supply, install, test, and commissioning of solar panels (200) W, the panel should be comprising of either mono-crystalline or polycrystalline;</p> <ul style="list-style-type: none"> <li>- The module type must conform with CE and IEC 61215, IEC 61730, IEC 61701 or equivalent standards;</li> <li>- Module conversion efficiency should be equal to or greater than 20 % under STC;</li> <li>- The PV module shall perform satisfactorily in temperature between – 40 oC to +85 oC;</li> <li>- The rated output power of any supplied module shall have tolerance of 0-5 W;</li> <li>- The module shall be provided with a junction box with IP67;</li> <li>- The supplied module DC voltage should be not less than 1000 VDC;</li> <li>- The product warranty should be at least 10 years.</li> <li>- The price include galvanized Iron base (thickness not less than 4mm) composed of steel angle frame dimensions manufactured by welding, the dimension of the frame should be compatible with the size of one panel, the price including painted two coats using anti-corrosion paint and two coats by the required colour, the panles must be fixed on steel frame by anchor and bolt on the roof of shelters, taking in the account that the base is in the required inclination</li> </ul>	Pcs	2	1,600	
2	<p><b>Solar Inverter</b></p> <p>Supply, install, test, and commissioning of Solar inverter 1000 W Single Phase, Pure Sine wave, 230 V, 50 Hz, 12v DC including all accessories required; with MPPT- Charge Controller, efficiency not less than 92 % @50 VDC -250 VDC VDC input voltage, 12V DC output voltage ;</p> <ul style="list-style-type: none"> <li>- The inverter shall produce pure sine wave form with provision for battery charger, and it can be configured individually or in parallel;</li> <li>- Output frequency shall be 50 Hz;</li> <li>- Total Harmonic Distortion shall be less than 3%;</li> <li>- Designed for indoor enclosure IP 20;</li> <li>- Maximum efficiency should be not less than 90 % at full load;</li> <li>- To be certified to meet at least CE and UL marking and complaint with IEC 62109;</li> <li>- The device should be integrated with LED indicators or LCD display;</li> <li>- It shall allow adjustment of battery voltage and charging current;</li> <li>- The device shall allow connection to grid and/or backup generator(s);</li> <li>- The charging function of the inverter/charger shall include battery charging functionality; and the inverter shall be wired in ways that make use of the inverter's battery charging functionality if the installation includes either mains power or a diesel generator.</li> <li>- Protections required: AC overload and load short circuit, overvoltage, overheating and battery reverse polarity;</li> <li>- Product warranty shall be 2 years.</li> </ul>	Pcs	1	800	
3	<p><b>Solar Battery with Racks</b></p> <p>Supply, install, test, and commissioning of Battery bank voltage shall be 12 volts .</p> <ul style="list-style-type: none"> <li>- Batteries shall be Gel type 150Ah, 12V, the rating shall be calculated @ 10 Hr discharge rate;</li> <li>- Battery cyclic life shall be at least 2500 cycles at 50% depth of discharge (DOD).</li> <li>- Reliable performance at high operating temperatures of up to 50° C;</li> <li>- Wires connected to batteries shall utilize appropriately sized and rated lugs or terminals and proper hardware; battery shall be installed in a secured, well-ventilated powerhouse.</li> <li>- The operating temperature for the battery shall be -20°C to +55 °C;</li> <li>- Product warranty shall be 2 years; warranty certificates shall be provided by the manufacturer.</li> <li>- The price including rack to put the battery on, made of galvanized Iron (thickness not less than 3mm), the dimension of the frame should be compatible with the size of one battery, the price including painted two coats using anti-corrosion paint and two coats by the required colour, the battery must be fixed on steel frame</li> </ul>	Pcs	1	800	

No.	Description	Unit	Qty Per Unit	Total Qty for 800 Unit	Photo
4	<b>DC Cabling</b> Supply, install, test, and commissioning of DC Cabling 2x(1C*10 sqr.mm) (Red& Black) PV to inverter, battery 1KV, Flexible stranded copper per EN 60228, TUV certified. Insulation: Halogen-free, thermoset polyolefin. Jacket: low smoke non-halogenated, flame retardant, oil, abrasion, chemical and sunlight resistant meeting UL 44, UL 854. - All cables shall be marked properly according to approved design so that cable can be easily traced and identified; PV array to battery circuit(s) to be sized for maximum 3% voltage drop at rated array power (Imp); Cable ends connections are to be made through suitable lugs or terminals, crimped properly & with use of cable glands; this item is including the cables and cable trays Cable Tray :- 1mm thickness, Perforated type Galvanized steel cable trays, cable tray covers, clamping bolts and other cable tray accessories such as coupler plates, bends, tees, reducers, vertical elbows in manufactured accordance with ASTM A653 SS, Grade 33, coating designation G90.	LS	1	800	
5	<b>AC Cabling</b> Supply, install, test, and commissioning of AC Cabling Stranded type, TUV certified, double insulation material 1kV XLPE/PVC/CU - All cables shall be marked properly according to approved design so that cable can be easily traced and identified; - All outdoor exposed wiring to be protected from UV radiation and physical damage, all cabling above ground should be suitably mounted inside cable trays with proper covers; - XLPE insulated and PVC sheathed single or multi core flexible copper cables meeting IEC 60227 and IEC 60502; - Cable ends connections are to be made through suitable lugs or terminals, crimped properly & with use of cable glands; <b>2C*10sqr.mm</b> include remove tiles and excavation trench as per site condition	L.S	1	800	
6	<b>LED, Lights</b> Supply, install, test and commissioning of LED light (20 W), and lamp holder - Mount type: Surface Mount; - Color: White; - Lamp luminous efficacy: not less than 100 lm/W; - Housing: Metal; - Input Voltage and frequency: 220-240V, 50 Hz; - Working Lifetime (Hour): at least 15,000 h; - Certification: All related certificates shall be provided such CE, RoHS; - Working at least ten years	No	2	1,600	
7	<b>Ceiling fan:</b> Supply and install solar powered motorized 30 inch ceiling fan of 40 Watt.	No.	1	800	
8	Supply install, light switch, socket outlets, of good quality.	Ls	1	800	