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**KINGDOM OF SAUDI ARABIA
THE SAUDI FUND FOR DEVELOPMENT (SFD)**

ITB -2017- 171

Technical specifications

Project name: Reconstruction, Furniture and Equipping of Three Schools

**Photovoltaic Solar System for Holly Family School and the Greek Orthodox
Patriarchate School
PAL10- 00099288**

Funded By :
Kingdom of Saudi Arabia
Through The Saudi Fund For Development (SFD)

Implemented By
United Nations Relief And Works Agency (UNRWA)
Through the United Nations Development Programme (UNDP/PAPP)

Technical Specifications of the Photovoltaic Solar system

Technical Specifications of the P.V. Solar system components

Item No	Name of Item	Technical Specifications and Standards
1	PV array:	• Module Efficiency at NOCT at least 16% and more • Operating Module Temperature -40 °C to +85 °C • Maximum System Voltage 1000 V DC (IEC) • Positive Power Tolerance 0 – 5 watts. • Maximum Series Fuse Rating 15A • Junction Box IP67 rated (3 bypass diodes) • Connectors MC4 connectors or Amphenol H4 • Temperature Coefficients of P not more than - 0.42 % / °C • Certifications • Anti- Potential Induced Degradation • IEC 61215 & IEC 61730 Application Class A • ISO 9001 quality standards and ISO 14001 environmental standards Warranty: 20 Years on performance.

3	Inverters 30KW	• 3-phase inverters • String inverters • Island grid operation setting • Input (DC) • Max. DC power (@ $\cos \phi=1$) 30000 W • Max. input voltage 1000 VDC • MPP voltage range /rated input voltage 320V – 800V/600V • Min. input voltage / initial input voltage 150 V / 188 V • Output (AC) • Rated power (@400 V, 50 Hz) 30000 W • Max. apparent AC power 30000 VA • Nominal AC voltage 3 / N / PE; 220 / 380V 3 / N / PE; 230 / 400 V 3 / N / PE; 240 / 415 V • Nominal AC voltage range 160 V – 280 V • AC power frequency / range 50 Hz, 60Hz / -6 Hz ... +5 Hz • Rated grid frequency / rated grid voltage 50 Hz / 230 V • Max. output current 40 A • Power factor at rated power 1 • Adjustable displacement factor 0.8 overexcited ... 0.8 under exited • Phase conductors / connection phases 3/3 • surge arrestor type 2 • Efficiency • Max. efficiency 98% • Must include all necessary Interface modules & data cables and all connections needed to complete and connect the monitoring system to internet. • Certificates: • CE (European Markets Made not china Export), VDE0126-1-1, AS4777, IEC61727 • Note: The inverters capacity must be divided at least 2 inverters. Warranty: 5 Years
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5	Battery Inverter	• 6 KW off grid battery inverter rated power • Compatible with string inverters • Number of phases (grid operation / backup operation) (3/3) • AC input • Voltage (range)230 V (172 – 264 V) • Frequency (range)50 Hz (40 to 70 Hz) • Typical interruption time during grid failure not more than 50 ms • Input battery • Nominal voltage 48 v • Battery type VRLA , FLA , VLA • IUoU charging process with automatic full and equalization charge • Efficiency / self-consumption • Max. efficiency in backup operation 95% • Self-consumption day / night (silent mode) 360 W / 230 W. • Must include all necessary data and interface cables, interface modules and connections for masters & slaves, temperature sensing. • Certificates (European Markets Made not china Export). • EC declaration of conformity(meaning of the EU directive) EN 61000-6-3:2007, EN 61000-6-4:2007, EN 61000-3-11:2000,En 61000-6-1:2007,EN 61000-61000-6-2:2005, EN 62109-1:2010,EN 62109-2:2011, compliance to IEC 61683 Warranty: 5 Years
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6	Battery Bank	• <u>Sealed construction valve regulated lead acid (VRLA) tubular design.</u> • New date of manufacturing not more than six months. • Non-Spillable, Non-Gassing • Designed Service Life 10 years • High quality and reliability • Stainless steel attachment bolts & washers • Heavy duty grids (plates) • Designed for frequent cyclic discharge • Low internal resistance • Maintenance free operation • High Charging Capabilities • Safety valve installation for explosion proof • Exceptional deep discharge recovery performance • Low self-discharge characteristic (must be taken into account when sizing the battery bank) • Specifications must include characteristics curves. • The number of strings 3 strings , 48 volt. • The cycle life at 20°C @ 50% DOD is 3000 cycle. • Shelf Life (% of nominal capacity at (20°C) • Case flame retardant. • EU Germany Made. • Manufactured to European CE. • Compliance to IEC 61427 requirements for photovoltaic energy sys. • Certificates: DIN (technical performance), IEC 60896-21, 22 EN 50272-2 and ISO 9001:2000. Warranty: Minimum 10 Years
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7	PV Hot Galvanized Steel Mounting Structure	The mounting structures for the PV panels should include the following: • The mounting structure uses 40*40*3mm fix hot galvanized steel profile foundations for stands. • The mounting structure uses 50*50*4mm hot galvanized steel angles foundations for PV modules. • The mounting system provides a fixed inclination of the modules from 30 degrees. • The mounting structure components are bonded together to guarantee potential equalization. • The mounting structure is earthed according to internationally accepted standards. • Bidder can prove that the mounting structures and the foundations thereof are structurally suitable to withstand all static loads (weight of modules, wind loads etc) that might occur according to the Site conditions. • The mounting structure uses standardized profiles and mounting • The contractor should provide shop drawing to the mounting structure of the PV before start the work.
8	PV Aluminum Mounting Structure	The mounting structures for the PV panels should include the following: • The mounting structure uses Aluminum Profile structures for stands and PV modules. • The mounting system provides a fixed inclination of the modules from 30 degrees. • The mounting structure components are bonded together to guarantee potential equalization. • The mounting structure is earthed according to internationally accepted standards. • Bidder can prove that the mounting structures and the foundations thereof are structurally suitable to withstand all static loads (weight of modules, wind loads etc) that might occur according to the Site conditions. • The mounting structure uses standardized profiles and mounting • The contractor should provide shop drawing to the mounting structure of the PV before start the work.

9	Battery Mounting Structure	The mounting structures for the Battery Bank should include the following: • Battery banks rack from the same manufacturer of the batteries. • The shape of the structure must be enough to carry all the weight of the required batteries for the system. • Bidder should prove that the mounting structures and the foundations thereof are structurally suitable to withstand all static loads that might occur according to the Site conditions. • Galvanized steel bars, plates and angles, the fixation accessories, should be painted with one primer coat & two coats of oil paint. • Batteries must be fixed in their positions according to standard • Battery should be easy access to periodic maintenance. • The contractor should provide shop drawing to the mounting structure of the Battery Bank before start the work. • Well-Ventilated for Increased Battery Safety and Longevity • Protective Terminal Covers • Space-Saving Design with Smaller Footprint
10	Battery Fuse Box	• Nominal voltage: 12/24/48 volt DC • Nominal current depending on the fuse plug: 125/200/250A • Fuse Type: NH01 • Bracket: Load Disconnecting Switch • Fuse number: 6 • Protection Degree IP65 • Mounting: Wall mounting • Ambient temperature: -20C ...+60C • No. of battery inlets: 6 • No. of connected battery inverters: 3 • EC Declaration of Conformity. DIN EN 50272-2, DIN EN 60529 and DIN EN 50178 • Width x Height x Depth: 500 x 375 x 255 mm Warranty: 3 Years

11	DC and PV Cables	<u>PV, DC wires and Cables:</u> • All PV, DC cables and wires are designed to withstand the demanding environmental conditions that arise in any fixed, mobile, roof or architecturally integrated photovoltaic installation, all should be according to the following specifications: • Solar guarantees the maximum efficiency in the energy transmission throughout the full service life of your installation. • Conductor: tinned copper flexible Class 5. • Insulation: halogen-free cross-linked elastomer • Jacket: halogen-free cross-linked elastomer • Standards: TÜV 2 Pfg 1169/08.2007 , UTE C 32-502 • Voltage: 1.8 kV DC - 0.6/1 kV AC • The DC cables must be sized such that the voltage drop between the PV array and the inverter is less than 1% of the total PV array DC voltage. • Handle 1, 3 times the source short-circuit current (PV modules) for the string wires. • Cable tray must be installed for DC cables minimum 10*10 cm tray • Maximum conductor temperature 120° C (1) IEC 60216 • Resistance to extreme temperatures Minimum: -40°C IEC 60811-504, -505, -506 • Resistance to ultraviolet radiation (UV) UL 1581 • Resistance to ozone IEC 60811-403 • Resistance to water absorption IEC 60811-402 • The sizes of Dc cables must be two colours and sized in accordance with the installation requirements applicable on site. Warranty: 3 Years
12	3-Phase Digital Meter (KWH meter)	• Voltage Input: 230 VAC ± 15% per phase. • Current Input: / 5 A,/1 A (optional) • Low Current: 1% (50mA). • Include a currents transformer (CT's). • The KWh meter has digital screen with data & interface connections for monitoring by the Remote Monitoring System Warranty: 2 Years