

## **TECHNICAL STATEMENT OF WORK (TSOW)**

### **SOLAR LIGHTING FOR ROJ CAMP PLAYGROUND PROJECT**

#### **Solar playground (Garden) Lighting Devices**

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## SOLAR LIGHTING FOR ROJ CAMP GARDEN PROJECT

### 1. INTRODUCTION

The lighting device is either of the **All-in-two** type where it consists of two parts: 1- The solar panel 2- The remaining parts (battery - LED array and the controller in the same body) or the lighting device is of the **All-in-one** type where the panel, LED, battery and charging regulator are in one body (**preferably an All-in-one type**) and achieve ambient lighting (360°) and designed to withstand the climatic, environmental and atmospheric conditions of the site: annual average and extreme seasonal phenomena, in particular solar radiation, availability of sunlight, Relative humidity up to 95%, wind speed up to 120 km/h, ambient temperature from -20°C to +65°C, high levels of dust, UV rays, insects, etc.

### 2. THE SOLAR PANEL

#### *I. Minimum Technical Specifications:*

- i. Cell: Mono-crystalline silicon or Poly-crystalline, the bidder must submit a 10-year.
- ii. Manufacture warranty, a 12-year 90% performance guarantee, and an 80% performance guarantee in the 25 year and cover materials and manufacturing faults for 10 years.
- iii. Panel capacity must be at least 25 Watt sufficient to fully charge the battery between (5-8) hours solar brightness maximum.
- iv. Module efficiency > 17.
- v. The panel's frame must be made of weatherproof galvanized aluminium.
- vi. Minimum IP rating of product: IP65.
- vii. The solar panel life span must be no less than 25 years.

#### *II. Minimum requirement:*

The catalogues required for solar panel as below at least:

- |                           |                               |
|---------------------------|-------------------------------|
| ▪ Cell type               | ▪ Operating temperature range |
| ▪ Temperature coefficient | ▪ Module efficiency           |
| ▪ Power capacity          | ▪ (I, V) and (P,V) curve      |

#### *III. Technical Data Sheet and Manuals:*

Each module must have a technical data sheet including the following:

- |   |                          |
|---|--------------------------|
| ▪ Name, monogram or manufacturer's mark, module reference number, serial number, and lifespan | ▪ Operating Temperature. |
| ▪ Module's efficiency.  | ▪ Power capacity         |
| ▪ (I, V) and (P,V) curve  |                          |

The bidder must provide the specifications and catalogues of the installed panels in English and Arabic languages. Detailed and clear installation, operations and maintenance manuals Arabic and English must be provided with each delivered product.

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### 3- LED ARRAYS

#### *I. Minimum Technical Specifications:*

- Must be manufactured according to international standards.
- Capacity from **30 W** to **60 W**.
- Daylight colour temperature: 3000 - 6,000 K  $\pm$  500 K.
- Min. LED beam angle 140° at least.
- Min. LED life 25,000 hrs.
- Min. lighting efficiency 160 lumens/watt at least.
- The outer casing of the device must be aluminium.
- Aluminium heat exchanger (aluminium cooling plates).
- Operating temperature: -20 to +60 C.
- IP: 65.
- CRI >70
- Optical sensitization should be either by a sensor or controller.
- Operation time: All nights even in rainy, cloudy, foggy, high-humidity days.  
360° Glow.

#### *II. Minimum requirement:*

The bidder must provide technical specifications and catalogues. The catalogues of the LED arrays must include the following information at least:

- Aluminium heat exchanger (aluminium cooling plates).
- The LED arrays power
- Inlet's volt
- Lighting efficiency
- Luminous flux
- CRI
- Color temperature
- LED lifespan
- IP rate
- Operating temperature range

### 4- BATTERY

#### *I. Minimum Technical Specifications:*

- i. Battery type: **LiFePo4 Lithium-Iron Phosphate**.
- ii. Battery capacity: **300 Wh** at least operate the required load for the operation period.
- iii. Life cycle at 50% Deep of discharge (DOD) min. 5000 cycles at 25°.
- iv. The battery's voltage and capacity must be stable during night operation time.
- v. Battery operating temperature (charging/discharging, not storage temp.) from -20°C to +65°C
- vi. All parameters should be clear on the battery's body
- vii. Charging and discharging curves are required
- viii. The battery life should be not less than 8 years, and its warranty must be at least 5 years
- ix. Batteries' production date should be maximum three months earlier before from the purchase order issue date.

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### *II. Minimum requirement:*

The catalogues of the battery must include the following information at least:

- |                        |                               |
|------------------------|-------------------------------|
| ▪ Battery type         | ▪ Operation temperature range |
| ▪ Charging current     | ▪ Charge and discharge curve  |
| ▪ Discharge current    | ▪ DoD @ 50%                   |
| ▪ The battery capacity | ▪ Battery volt                |

### **5- CONTROLLER (REGULATOR- CHARGER)**

#### *I. Minimum Technical Specifications:*

- i. Minimum lifespan of the charge controller should be 10 years and the warranty period should be at least 5 years.
- ii. Programmable inverted charger: the charge controller shall enable the hourly power consumption of lighting to be controlled and programmed, so that it can be regulated during the night-time (e.g., from dusk: 3h at 100 per cent, 2h at 50 per cent etc.) and with automated intelligence to cope with reduced sunlight capture or low battery charge.
- iii. Controller to be **MPPT** according to the conditions at the site
- iv. The following minimum protection functions should be available, overcharge, over-discharge, overcurrent and overvoltage, short circuit, polarity inversion.
- v. Controller must stop discharging when the power level reaches 15% of the battery capacity.
- vi. Operating temperature: -20 to +65 C.

#### **II. Technical Data Sheet and Manuals:**

Each Charge controller must be delivered with a technical data sheet including the following information:

- |  |   |
|--|---|
| ▪ Name, monogram or manufacturer's name and mark | ▪ Self-consumption data                             |
| ▪ Nodule reference number                        | ▪ Weight, charging strategy                         |
| ▪ Serial number                                  | ▪ Warranty  |
| ▪ Rated capacity                                 | ▪ Maximum power current and maximum system voltage. |