**Scope of Work (SoW)**

**Project Title:** Supply and Installation of 129.86 kW Solar Power System with Battery Backup
**Location:** [Insert Site Name and Location]
**Client/Contracting Authority:** [Insert Client Name]

**1. Objective**

To design, supply, install, test, and commission a standalone solar photovoltaic (PV) power system with an output capacity of approximately **129.86 kW(3sets of 50KW Inverter size)**, including battery storage, solar panels, and inverters, to ensure sustainable and reliable power for [insert application/site].

**2. System Components**

The contractor shall supply and install the following components:

**a. Solar Panels**

* Quantity: **229 units**
* Rating: **550W per panel**, 48V
* Total Capacity: **125.95 kW**
* Connection Type: **Parallel**
* Mounting Structure: Corrosion-resistant ground or rooftop mounts (as applicable)

**b. Battery Bank**

* Voltage: **48V DC**
* Total Capacity: **To match 0.5-day reserve with 50% DOD and 20% aging factor**
* Battery Type: Deep-cycle (Lithium-ion or GEL/AGM)
* Configuration: **Parallel/Series connection**
* Quantity: To be determined based on 200Ah/48V units
* Battery Management System (BMS) included

**c. Inverter**

* Capacity: **129.86 kW**
* Type: Pure sine wave, off-grid/Hybrid inverter
* Efficiency: Minimum **95%**
* Features: Smart control, remote monitoring, overload and surge protection

**d. Cabling & Accessories**

* All DC and AC cabling, connectors, combiner boxes, isolators, breakers, grounding and earthing systems as per IEC/NEC standards.

**3. Installation and Commissioning**

The contractor shall:

* Carry out site preparation including mounting structure installation.
* Install solar panels, battery bank, inverters, and all related components.
* Perform electrical wiring, grounding, and protection as per safety standards.
* Commission the system and perform full functionality tests.
* Provide system manuals, as-built drawings, and warranty documents.
* Train the client’s personnel on operation and basic maintenance.

**4. Performance Requirements**

* Daily Energy Production: **1,009,390 Wh/day** (adjusted to **1,135,563.8 Wh/day** after loss corrections)
* Sunshine Average: **9 hours/day**
* System should operate efficiently under ambient temperatures up to **30°C**
* Battery bank must sustain 0.5 days of backup at 50% DOD

**5. Quality and Standards**

All materials and installations must comply with:

* IEC 61215, IEC 61730 (solar panels)
* IEC 62109 (inverters)
* IEC 61427 or equivalent (batteries)
* National Electrical Code (NEC)
* Local regulations and best practices

**6. Timeline**

* Mobilization: Within [X] days of contract signing
* Completion: Within [Y] weeks from mobilization

**7. Deliverables**

* Fully installed and operational solar PV system
* Test and commissioning report
* Warranty certificates (minimum 10 years for panels, 5 years for inverters and batteries)
* O&M manual
* End-user training session



**Steel Structure Details for 229 Solar Panels (Ground Mount)**

**1. Basic Assumptions**

|  |  |
| --- | --- |
| Parameter | Value |
| No. of Panels | 229 |
| Panel Size | 550W (approx. 2.27m × 1.13m) |
| Total Area | ~586 m² (excluding spacing) |
| Mounting Type | Ground-mounted fixed tilt |
| Tilt Angle | ~15°–25° (optimal for Sudan) |
| Row-to-row spacing | ~1.5–2.5 m (to avoid shading) |
| Wind Load Zone | Up to 150 km/h (Sudan average) |
| Foundation Type | Concrete footing or driven piles |

**2. Structural Breakdown**

**A. Mounting Frame Design (Typical per Table/Structure Unit)**

|  |  |
| --- | --- |
| Component | Specification |
| Columns/Posts | Hot-dip galvanized steel C-Channel or SHS (Square Hollow Section) 80x80x3 mm or 100x100x4 mm |
| Beams (Rails) | C/U Channel 60x40x2 mm or Aluminum Rails (if lighter structure preferred) |
| Purlins | C/U Channel 50x30x2 mm, spaced ~1m |
| Bracing | Flat bar 30x5 mm or angle 25x25x3 mm (diagonal) |
| Fasteners | SS 304 bolts and nuts, 8.8 grade minimum |
| Panel Clamps | Mid & end clamps, anodized aluminum or SS |

**B. Module Table Configuration**

|  |  |
| --- | --- |
| Design Option | Details |
| Modules per Table | 6 (2 vertical × 3 horizontal) |
| Number of Tables | ~39 |
| Table Area | ~5.5 m × 3.5 m per structure |
| Tilt Angle | 20° facing true south |
| Foundation Type | Concrete footings 300x300x800 mm or driven steel piles (if soil allows) |

**3. Foundation Design**

|  |  |
| --- | --- |
| Parameter | Recommended |
| Depth | 600 mm to 1000 mm (based on soil) |
| Width | 300–400 mm |
| Type | RCC (M20/25), with rebar cage |
| Quantity | 2–4 foundations per table (depends on design span) |

**4. Wind Load Consideration**

* **Wind Speed Design Value**: up to 150 km/h
* **Structure Design Standard**: Follow **ASCE 7** or **Eurocode 1**
* **Add Bracing** for lateral stability and anti-uplift mechanisms (embed depth or anchors)

**5. Material Summary (Approximate for Full 229 Panels)**

|  |  |
| --- | --- |
| Item | Quantity (Approx.) |
| Steel posts (80x80x3 mm) | ~160–200 pcs |
| Beams/Rails | ~1500–1800 meters |
| Fasteners (bolts, nuts, washers) | ~3000–4000 sets |
| Concrete (for foundations) | ~30–35 m³ |
| Panel clamps (mid + end) | ~800–900 pcs |

**6. Other Requirements**

* **Anti-corrosion**: All steel should be **hot-dip galvanized** (min. 80 microns coating)
* **Drainage/ground clearance**: Minimum 0.5–0.6 m from ground to bottom of panel
* **Earthing/Bonding**: Every table grounded with copper wire (min. 16 mm²)
* **Access paths**: Leave 0.8–1 m access between tables for maintenance