

# TERMS OF REFERENCE (ToR)

## *Technical Specification for Vendor Procurement: Supply, Installation, and Commissioning of Solar Photovoltaic (PV) Hybrid Systems*

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<b>Organization:</b>	World Vision International Sudan
<b>Target Location:</b>	<ol style="list-style-type: none"><li>1. Blue Nile State Field Office &amp; Team Houses,</li><li>2. White Nile state office &amp; Team House</li><li>3. South Kordofan State &amp; Team House</li></ol>
<b>Release Date:</b>	July 2026

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## 1. BACKGROUND & CONTEXT

World Vision International Sudan (WV Sudan) is a child-focused organization committed to the well-being of vulnerable children and communities. Operating in Sudan since 1983, and actively responding to regional operational demands, WV Sudan delivers life-saving and long-term development programs in sectors including Health & Nutrition, Water, Sanitation and Hygiene (WASH), Food Security and Livelihoods, Child Protection, and Safeguarding.

To ensure operational sustainability, climate resilience, and reduced dependency on fossil fuels amid volatile local fuel markets, WV Sudan is transitioning its field infrastructure to renewable energy solutions. Following a comprehensive technical assessment, WV Sudan intends to procure a turnkey, commercial grade Solar Photovoltaic (PV) Hybrid System with battery energy storage for its Blue Nile State Office and Team House installations. This initiative aims to guarantee continuous, high availability power supply for critical ICT networks, cold-chain refrigeration, and general administrative services while minimizing carbon footprint and generator operational overheads.

## 2. PURPOSE & OBJECTIVE OF THE RFP

The objective of this Terms of Reference (ToR) is to solicit competitive technical and financial proposals from qualified solar energy solution providers (the "Vendor") for the engineering, procurement, delivery, physical installation, integration, and commissioning of standalone hybrid solar PV systems.

The selected vendor will be fully responsible for transforming the approved engineering designs into an operational, high-performance asset. Vendors are explicitly required to submit:

- A comprehensive Bill of Quantities (BoQ) itemizing all Tier-1 equipment, balance of systems (BOS), and civilian works.
- A detailed, site specific Installation Plan prioritizing safety, continuous office uptime, and strict adherence to international electrical engineering codes.

## 3. SCOPE OF WORK

The vendor's scope encompasses all lifecycle stages of deployment at the Blue Nile designated facility:

### 3.1 Pre-Installation Validation & Logistics

- **Site Verification:** Conduct physical cross-checking of roof structural integrity, layout footprints, shading angles, and electrical distribution panels prior to mobilization.
- **Logistics & Security:** Secure transit, offloading, and controlled secure storage of all components at the Blue Nile field site, ensuring full liability for equipment safety until formal commissioning handover.

### 3.2 Supply and Installation Technical Requirements

- **Rooftop Structure Installation:** Supply and securely mount anodized aluminum or any suitable material, wind-resilient (>130 km/h) rail mounting frameworks, anchors, and flashing on specified structural surfaces.
- **Solar Panel Layout:** Fix high efficiency Tier-1 PV modules securely with correct orientation, string balance, and hermetic polarity configurations.
- **DC/AC Inverter and Integration:** Install centralized heavy duty hybrid inverters equipped with advanced Maximum Power Point Tracking (MPPT) inputs, adequate passive/active ventilation, and integrated dynamic multi-source bypass routing (Solar/Battery/Grid/Generator).
- **Battery Energy Storage Systems (BESS):** Erect climate controlled, secure Lithium Iron Phosphate (LiFePO4) battery banks complete with intelligent Battery Management Systems (BMS) calibrated for dynamic depth of discharge (DoD) limits to maximize cycle life.
- **Earthing & Lightning Protection:** Install dedicated copper bonded grounding rods, equipotential bonding rails, and surge protection devices (SPDs) ensuring tested system grounding resistance is strictly  $R < 1.0 \Omega$ .

### 3.3 Testing, Commissioning & Handover

- Execute systematic pre-functional, functional, and integrated system acceptance tests under variable operational loads.
- Establish localized and cloud-based performance monitoring interfaces via specialized data-links.
- Deliver a formal Operation & Maintenance (O&M) framework, detailed Standard Operating Procedures (SOPs), and execute comprehensive on-site practical training for designated facility Admin and Technical teams.

## 4. MANDATORY SYSTEM TECHNICAL SPECIFICATIONS

All hardware quoted within the Vendor's BoQ must adhere strictly to the following standards:

Component	Mandatory Minimum Requirements	Compliant Standards
<b>PV Modules</b>	Monocrystalline Perc/Half-Cell technology; Minimum capacity $\geq 550\text{Wp}$ per panel; Efficiency $\geq 21\%$ ; Linear output warranty $\geq 25$ years. Tier-1 Manufacturers only.	IEC 61215, IEC 61730, CE

<b>Hybrid Inverters</b>	Pure Sine Wave, Bidirectional Hybrid Inverter; Intelligent multi-source management; High-efficiency MPPT controllers ( $\geq 98\%$ ); Integrated LCD monitoring and remote telemetry interfaces.	IEC 62109-1/-2, EN 50549
<b>Storage (BESS)</b>	Lithium Iron Phosphate (LiFePO <sub>4</sub> ); Modular rack-mounted configurations; Cycles $\geq 6,000$ at 80% DoD; Embedded smart BMS with communication integration.	IEC 62619, UN38.3, CE
<b>Balance of System (BOS)</b>	UV-resistant solar-grade DC cables (minimum 6mm <sup>2</sup> ); IP65/IP67 combiner boxes with integrated DC fuses and Type 2 SPDs; Anodized aluminum mounting hardware.	EN 50618, IEC 60364-7-712
<b>Earthing System</b>	Dedicated solid copper earth rods, heavy-duty conductors, copper busbars; Maximum allowable system resistance strictly bounded.	R < 1.0 $\Omega$ (Tested), IEEE 142, NEC 250

## 5. REQUIRED FORMAT FOR BILL OF QUANTITIES (BOQ)

Vendors must structure their financial proposal strictly according to the matrix template provided below. Lump-sum entries for aggregate items will result in immediate disqualification. All quantities must map directly back to the vendor's calculated electrical layout drawings.

Item	Detailed Description & Technical Specification	Technical description, model & Partnumbers	Unit	Qty	Unit Cost (USD)	Total Cost (USD)	Brand / Origin
<b>1.0</b>	<b>Solar Photovoltaic Array Hardware</b>						
1.1	Tier-1 Monocrystalline PV Modules ( $\geq 550\text{Wp}$ ,	[Vendor to fill]	Pcs	[Vendor to fill]			

	high-efficiency, anti-PID)						
1.2	Anodized Aluminum or equivalent Rooftop Structure (Wind-rated, complete with non-corrosive anchors/rails)	[Vendor to fill]	Set	1			
<b>2.0</b>	<b>Power Conversion &amp; Energy Storage Systems</b>						
2.1	Industrial Smart Hybrid Inverter (Three-Phase / Single-Phase as per site, MPPT integrated)	[Vendor to fill]	Unit	[Vendor to fill]			
2.2	Lithium Iron Phosphate (LiFePO4) Rack Battery Enclosure (≥6000 cycles at 80% DoD, integrated smart BMS)	[Vendor to fill]	Unit	[Vendor to fill]			
<b>3.0</b>	<b>Balance of Systems (BOS) &amp; Protection Electronics</b>						
3.1	Pre-wired IP65 Combiner and Protection Boxes (including DC fuses, isolation breakers, Type 2 SPDs)	[Vendor to fill]	Lot	1			
3.2	Solar Rated XLPE DC Cable (4mm <sup>2</sup> / 6mm <sup>2</sup> , UV-resistant, Halogen-free)	[Vendor to fill]	Meters	[Vendor to fill]			
3.3	Heavy-Duty AC Armored Interconnection Cables, distribution trunking, and high-impact conduits		Lot	1			

3.4	Integrated AC Changeover Panel (Automatic / Manual sequence interlocking with current fuel generator)	[Vendor to fill]	Unit	1			
<b>4.0</b>	<b>Grounding, Safety System &amp; Instrumentation</b>						
4.1	Comprehensive System Earthing Grid (Copper-clad earth rods, organic soil-treatment compound, bonding)	[Vendor to fill]	Set	1			
4.2	Remote Cloud Real-Time Telemetry Interface (Data Logger, GSM/Wi-Fi modem, sensor integration arrays)	[Vendor to fill]	Set	1			
<b>5.0</b>	<b>Civil Works, Structural Installation, Engineering Services</b>						
5.1	On-site physical structural installation, testing, commissioning, and validation fees	[Vendor to fill]	Job	1			
5.2	As-built engineering drawings, complete operations/maintenance documentation, and local staff training	[Vendor to fill]	Job	1			
	<b>TOTAL CONTRACT VALUE (CIP PORT SUDAN / BLUE NILE OFFICE SITE)</b>		Year	1		<b>USD \$</b>	

## 6. DETAILED INSTALLATION PLAN REQUIREMENTS

The vendor must provide an explicit, chronologically structured Installation Plan as part of their technical response. This document will serve as a key metric for evaluation and must cover the following phases:

### 6.1 Task Breakdown & Gantt Chart Schedule

A detailed Work Breakdown Structure (WBS) tracking deployment timelines over an assumed execution window. Key mandatory milestones to map include:

- Mobilization & Material Delivery Inspection (MIR) at Blue Nile Office.
- Structural Framework anchors layout, structural sealing, and verification.
- PV Module installation, alignment, string routing, and polarity validation.
- Power Room preparation, Inverter/BESS structural rack mounting, ventilation test.
- AC Interconnection Integration, Grid-Tied / Generator automated interlock installation.
- Grounding network resistance compliance certification ( $R < 1.0 \Omega$ ).
- Commissioning tests, staff capability training workshops, and formal handover.

### 6.2 Site Deployment Methodology

Detailed explanations regarding how the vendor plans to handle the following operational realities:

- **Business Continuity Plan (BCP):** Step-by-step procedure to keep Blue Nile office communications, local Network Room, and critical operations fully functional during final electrical changeovers. Power interruptions must be planned outside operational hours and limited to <120 minutes.
- **Material Logistics & Protection:** Precise details on on-site storage, climate control protection for battery arrays before mounting, and secure handling workflows.

### 6.3 Health, Safety and Environment (HSE) Plan

Mandatory HSE Standards:

- Daily Pre work Safety Orientation and Toolbox Talks documented on-site.
- Strict deployment of Fall Protection Systems (Static lines, full-body harnesses) for all rooftop actions.
- Provision and verified enforcement of complete Personal Protective Equipment (PPE) for all personnel (Arc-flash gear, insulated gloves rated >1000V, steel-toe boots, high-visibility vests).

## 7. QUALITY ASSURANCE, CONTROL & REPORTING

The vendor will comply strictly with the programmatic monitoring workflow dictated by World Vision technical supervisors:

- **Inspection Framework:** Adherence to predetermined Inspection and Test Plans (ITPs), Material Inspection Reports (MIRs), and Work Inspection Reports (WIRs) signed off at every stage.
- **Non-Conformity Management:** Any observed deviations, substandard items, or safety structural violations must be fully remediated by the vendor within 48 hours of notification.
- **Reporting Milestones:** Submit mandatory physical outputs including:
  1. Inception Report & Validated Site Work Schedule (within 5 days of signing).

2. Weekly Progress Bulletins (comprising high-resolution photo logs and checklist completions).
3. Draft Commissioning Protocol.
4. Final Comprehensive Technical Asset Dossier (comprising detailed As-Built Single-Line Diagrams, Operations & Maintenance Manuals, and Staff Training Sign-off Logs).

## 8. TECHNICAL EVALUATION CRITERIA FOR PROPOSALS

Bidding responses will be evaluated based on a strict 100-point matrix broken down below:

Evaluation Criteria Item	Sub-attributes & Quality Parameters Assessed	Weight (%)
<b>Corporate Experience &amp; Staff Qualifications</b>	Proven history executing commercial hybrid solar installations; verification of key engineering resumes (Lead Electrical Engineer, Certified Renewable Specialist); submission of at least 2 formal corporate recommendation letters from international organizations.	30%
<b>Technical Compliance &amp; Product Quality</b>	Complete alignment of proposed BoQ equipment items with required Tier-1 standards; valid provision of datasheets and compliance certificates (IEC, CE, UN38.3).	30%
<b>Installation Methodology &amp; Timeline Realism</b>	Clarity, structure, and technical logic of the proposed site installation plan; robustness of Business Continuity management during changeover; logical scheduling via clear Gantt paths.	20%
<b>Safety Engineering &amp; EHS Framework</b>	Quality of the submitted Environment, Health, and Safety protocols; detailed fall protection, toolbox documentation setups, and LOTO compliance proofs.	20%
<b>TOTAL METRIC ALLOCATION</b>		<b>100%</b>