

Annex A – TOR & BOQ

RFP/UNHCR/JOR/2025/1096

FOR THE ESTABLISHMENT OF A FRAME AGREEMENT FOR The provision of Maintenance, Operation, Monitoring, and Cleaning of Solar plants in Azraq Camp

1. Introduction:

This Terms of Reference (TOR) outlines the requirements and expectations for the operation and maintenance (O&M) services for a 5 MWp solar power plant, divided into three phases: Phase 1, with a capacity of 2 MW, Phase 2, with a capacity of 1.5 MW, totaling 3.5 MW on a Net-metering connection, and Phase 3, with a capacity of 1.5 MW on a Wheeling connection.

Plant location: Phases 1 and 2 are inside the Azraq Syrian Refugee Camp, while Phase 3 is located 7 km south of the camp, along the Azraq International Highway.

The plants are directly connected to the grid using step-up transformers. The required maintenance mainly involves cleaning panels, conducting regular tests, installing spare parts, and monitoring generation and PV performance.

The selected contractor will ensure optimal plant performance, reliability, and longevity through regular preventive and corrective maintenance, cleaning, monitoring, reporting, testing, security services, and environmental management.

- 2. Scope of Services** The contractor shall provide comprehensive O&M services, including but not limited to:

2.1 Preventive Maintenance

Regularly inspect and service all equipment, including photovoltaic (PV) modules, inverters, transformer units, combiner boxes, AC boxes, cables, and mounting structures.

Calibration and functional testing of protective devices.

Maintenance of auxiliary systems such as weather monitoring stations and communication systems.

2.2 corrective maintenance

Timely identification and resolution of faults or failures across all solar plant components, including inverters, modules, transformers, switchgear, monitoring systems, and associated electrical infrastructure.

- Diagnosis and rectification of system malfunctions to restore optimal performance.
- Replacement or repair of defective components using OEM-approved parts.
- Coordination with manufacturers for warranty claims and technical support when applicable.
- Test and verify repaired or replaced components to ensure proper functionality.

- Documentation and reporting of faults, corrective actions, and recommendations for system reliability improvement.

2.3 Cleaning services

Dry Cleaning: Routine removal of dust and debris from PV modules using appropriate non-abrasive tools. Cleaning will be done approximately twice a month for each phase, 24 times per/year.

Wet Cleaning: Scheduled washing of PV modules to remove stubborn dirt and maintain optimal performance, considering local water resource constraints and environmental guidelines. Upon request, wet cleaning for the three phases must be conducted monthly, mainly from April to September each year of the contract period, an estimated 5 - 7 times per year per phase.

2.3 Monitoring and Reporting

Continuous monitoring of plant performance.

Real-time data analysis to identify performance anomalies or inefficiencies.

Preparation and submission of daily, monthly, and annual reports detailing energy production, downtime, efficiency metrics, and maintenance activities.

2.3.1 Daily Responsibilities

1. **Visual Inspections:**
 - Inspect PV modules, inverters, cables, and structural components for cleanliness, damage, or other issues.
 - Verify inverter and monitoring system displays for alarms or faults.
2. **Monitoring and Recording:**
 - Record energy generation, irradiance, and temperature data.
 - Check daily performance ratios and flag significant deviations.
3. **Issue Resolution:**
 - Resolve minor issues like tripped breakers or inverter resets and report major faults.
4. **Daily Report Submission:**
 - Submit a **Daily Operational Report**, including:
 - The daily conducted activities.
 - Observations from inspections.
 - Any faults, alarms, or corrective actions taken.

2.3.2 Weekly Responsibilities

1. **Performance Review:**
 - Analyze weekly generation trends and identify inefficiencies.
 - Inspect mounting structures, cable trays, and conduits for wear or displacement.
2. **Module Cleaning:**
 - Clean modules if soiling significantly impacts performance (site-specific).
3. **Inverter Logs:**

- Review logs for recurring errors or anomalies.

2.3.3 Monthly Responsibilities

1. Preventive Maintenance:

- Conduct voltage and current checks for DC strings.
- Perform thermal imaging of critical components (modules, inverters, cables).
- Inspect and test grounding systems.

2. Performance Assessment:

- Analyze monthly performance data, including PR and CUF metrics.
- Identify causes of energy losses (soiling, shading, or equipment inefficiencies).

3. Monthly Report Submission:

- Submit a Monthly Maintenance Report, including:
 - Generation and performance metrics.
 - Findings from inspections, tests, and preventive maintenance.
 - Incidents or faults and corrective actions taken.

2.3.4 Half-Yearly Responsibilities

1. Comprehensive Electrical Testing:

- Conduct insulation resistance tests for cables and modules.
- Test grounding systems and protection devices.

2. Major Maintenance Activities:

- Service transformers (if applicable) and inspect cooling systems.
- Perform deep cleaning of all system components.

2.3.5 Yearly Responsibilities

1. System Audit and Maintenance:

- Conduct IV curve testing for PV strings.
- Perform a full-system thermal imaging scan.
- Audit the plant's condition and identify aging or failing components.

2. Yearly Report Submission:

- Submit a Comprehensive Annual Report, including:

- Total energy generated for the year.
- Maintenance activities and major repairs/replacements.
- Financial performance (O&M costs and savings).
- Recommendations for upgrades or system optimization.
- Incident report: should contain the details of an unexpected event, such as an accident, equipment failure, or safety violation. It includes key information such as the date, location, individuals involved, cause, impact, and corrective actions take

2.5 Testing

Regular performance testing to verify the energy yield and efficiency of the plant.

Thermographic inspections to identify potential hotspots in PV modules and electrical connections.

Insulation resistance tests and other electrical safety checks as per industry standards.

3. Performance of tests

- The contractor shall be able to conduct the following tests:
 - * Main Transformer: Tan Delta, Winding resistance, and Short Circuit Impedance (Capacity Test)
 - * MV cable: Very Low-Frequency test,
 - * Polarity Test, Voltage Tests, All PV String Tests, MCCB tests, Insulation resistance tests, Continuity tests, and Earthing tests.

2.6 Security Services

- Provision of security service (guards) for each of the 3 phases. Services will be provided 24/7, including holidays, every day of the contract period.
- Regular patrols and monitoring to prevent theft, vandalism, or unauthorized access.
- Maintenance and installation of any needed components or services for the continuity and uninterrupted operation of the existing CCTV system 24/7, every day of the contract period, including any holidays.

2.7 License fees and renewal

Phases 1 and 2 are under one license (3.5 MW), and Phase 3 is under one license (1.5 MW)

- The contractor shall pay license fees for the 3 phases
- The contractor shall renew licenses for the 3 phases in a timely based on expiry

2.8 Inverter warranty renewal:

Pay fees and renew the yearly warranty with the manufacturer for all inverters used in the solar plant (in the three phases).

2.9 environmental management

All packaging and wastes associated with any activities shall be carefully disposed of following applicable Jordanian laws.

The contractor shall be responsible for ensuring the waste materials, packaging, and any other items associated with installations, maintenance, tests, cleaning, and security do not get blown or otherwise distributed around the site. They shall also be careful not to create excessive dust or debris in any area.

Any costs incurred in cleaning wastes or debris generated by the contractor shall be charged to the contractor and paid for at the contractor's expense.

The contractor shall be responsible for repairing and/or replacing anything, which has been damaged by the contractor within the site. They shall also be responsible for cleaning any debris, waste, or other items created during the works.

Regular maintenance of vegetation to prevent shading and fire hazards.

2.10 Performance, Availability, Response, and Resolution Guarantees

The contractor shall guarantee performance in the form of a Performance Ratio guarantee $\geq 85\%$. The contractor shall guarantee an availability level of $\geq 85\%$ at the inverter level. The bidder shall include in the submission documents, his guaranteed Performance Ratio, any corrections, availability guarantee, and defining availability responsibility matrix, methods of calculation, and any excluded conditions. The guarantees shall be done as per IEC61724 and NREL TP-7A40-73822 as applicable.

2.11 Staff and vehicles:

- Project Manager 8 years of experience, 5 of which specifically managing solar PV construction, commissioning, or O&M.
- 1 Site Engineer attending every working day, with 5 years of experience in solar PV operation and maintenance.
- 3 qualified technicians with 5 years of experience in solar PV operation and maintenance.
- Crane, to be available upon need.

3. Submission Documents:

Bidder shall submit the following documents for evaluation:

- **Dry cleaning:** Schedule, methodology, tools, and materials including brush type, datasheet, and/or certificates.
- **Wet cleaning:** Schedule, methodology, tools, and materials including quantity and quality of water provided, brush type, datasheet, and/or certificates.
- **Security:** the bidder shall provide a monthly security plan for each phase.

- **Preventive maintenance:** Schedule, safety, methodology, and activities intended, this includes a list and quantity of tools, machinery, and measurement devices; calibration and/or validation reports must be provided by the awarded bidder after award.
- **Corrective maintenance:** safety, methodology, faults, and corresponding actions.
- **Tests:** Types of tests, test equipment, forms, standards, optimum Readings, methodology, and activities intended.
- **PV Performance forms:** generation on monthly and accumulatively, system availability, onsite consumption. Bidder can include additional details for points above and additional points to demonstrate technical competency.
- **Reports:** the bidder shall submit forms for the daily, monthly, and annual reports.
- **Company profile,** organization chart/management structure, and history of past projects (and proof through Contracts, Purchase Orders, or similar) demonstrating 5 years of experience in solar photovoltaic design, installation, operation, and maintenance, have a minimum of 5 projects of at least 1 MW each within the past 8 years, completed or underway, and provide references for a minimum of 5 relevant client contracts.
Submission of 5 current or former client contacts for reference checks; 5 relevant client contacts for 5 different projects supported with copies of purchase orders/contracts and letters of reference or work completion certificates.
- **The bidder shall detail** all personnel requirements, security measures, scheduled equipment replacement, HSE plan (meeting minimum national and international requirements), maintenance schedules, and operation for each year, and submit CVs of key staff.
- **The bidder shall submit** a copy of valid registration certificates from the Companies Control Department with company purposes including design, supply, installation, operation, maintenance, and testing of renewable energy systems.
- **the bidder shall submit** a Valid License Class "A" from Energy and Minerals Regulatory Commission.
- **The bidder shall provide** financial statements and Audit Reports from the past 3 years.
- **The bidder shall submit** a registration certificate with VAT
- The bidder shall submit** a Valid Commercial bank Account
- **The bidder shall submit** CVs for key personnel including:
 - o 1 Project Manager with 8 years of experience, 5 years of which specifically demonstrate experience in managing solar PV projects in construction, commissioning, or Operation and Maintenance.
 - o 1 Site Electrical Engineer with 5 years of experience in solar PV operation and maintenance.
 - o 3 qualified technicians with 5 years of experience in solar PV operation and maintenance.

Service conditions:

- In case of and upon award, the awarded bidder shall submit CVs for key personnel and all staff and acquire UNHCR approval. UNHCR at its discretion can approve or reject and require proof of degrees/certificates and experience.
- The contractor may employ local and refugee labor to support the operation and maintenance of the plant, subject to UNHCR approval depending on each worker's role and activities.

- Employment of refugees is encouraged where the skill level is suitable. Professional electricians are required to do critical electrical work.
- The contractor shall guarantee that the services will be uninterrupted for the duration of the contract. Absences due to an emergency need to be approved by UNHCR and a solution agreed upon so that the ongoing project is not adversely affected.
- Equipment damaged during maintenance activities or because of inadequate maintenance or poor security shall be replaced and/or rectified by the contractor at the contractor's expense.
- The contractor is responsible for issuing permits and related expenses, if any, for staff and materials to perform duties.
- When and where tests performed indicate faults or compliance with standards, the contractor is responsible for rectifying and ensuring plants comply with best industry practices and international standards. This includes needed modifications to existing connections within the plant, switchgear, and delivery station, as well as reinforcing earthing.

****Very Important Notes:**

1- UNHCR has a spare for most of the key elements in the system, and the prices for the corrective maintenance shall be decided based on the fault; the need to supply material and installation fees.

2- Please note that a site visit is mandatory before submitting your offer. A site visit is scheduled on 16/04/2025 at 11:00 A.M Local time.

Vendors shall submit IDs for staff and a valid vehicle license 48 hours days before the site visit date to get the needed permissions.

3- The equipment damaged during inadequate maintenance or poor security measures shall be replaced or repaired by the contractor at their expense.

4- The Contractor shall detail all personnel requirements, security measures, scheduled equipment replacement, maintenance schedules, and operations for each year.

5- The contractor may employ local and refugee labor in the operation and maintenance of the plant.

6- Eligibility and Commercial/ Supplier Registration Check: As a prerequisite for a supplier to be deemed eligible for an award of contract, the company should not, or should not be associated with a company or individual, under procurement prohibition by the United Nations, such as prohibitions derived from the consolidated United Nations Security Council Sanctions List available at:

www.un.org/securitycouncil/sanctions/information

UN Secretariat Procurement Division list of suspended or removed vendors, UNGM/World Bank list of suspended or debarred vendors.

Bill of quantities:

Item	Description	Specification	Unit	Quantity/year
Cleaning	Dry Cleaning Phase 1 (2 MW)	Soft cloth or mop. Non-abrasive only. Not prohibited to use Bristle brush, sponge, squeegee	no.	24
	Dry Cleaning Phase 2 (1.5 MW)	Soft cloth or mop. Non-abrasive only. Not prohibited to use Bristle brush, sponge, squeegee	no.	24
	Dry Cleaning Phase 3 (1.5 MW)	Soft cloth or mop. Non-abrasive only. Not prohibited to use Bristle brush, sponge, squeegee	no.	24
	Wet Cleaning Phase 1 (2 MW)	Cleaning shall be done between dusk and dawn. Water and power provided by the contractor - Hard water prohibited - water shall be free from oil, other liquids, debris, excessive turbidity, odors, total hardness <75 mg/L, calcium 75 mg/L max - Max water pressure at nozzle 35bar - Detergent use subject to approval on a case by case basis	no.	6
	Wet Cleaning Phase 2 (1.5 MW)	Cleaning shall be done between dusk and dawn. Water and power provided by the contractor - Hard water prohibited - water shall be free from oil, other liquids, debris, excessive turbidity, odors, total hardness <75 mg/L, calcium 75 mg/L max - Max water pressure at nozzle 35bar - Detergent use subject to approval on case by case basis	no.	6
	Wet Cleaning Phase 3 (1.5 MW)	Cleaning shall be done between dusk and dawn. Water and power provided by contractor - Hard water prohibited - water shall be free from oil, other liquids, debris, excessive turbidity, odors, total	no.	6

		hardness <75 mg/L, calcium 75 mg/L max - Max water pressure at nozzle 35bar - Detergent use subject to approval on case by case basis		
Inspection	Daily inspection and submission of filled daily inspection check-list	one per business day, submission of inspection check-list within 24 hours	no.	261
Monitoring and Reporting	Submission of monthly report for all phases	Includes PV performance, maintenance, measurements and tests	no.	12
	Submission of annual report for all phases	Includes PV performance	no.	1
Performance of Tests	Transformers: Tan Delta, Winding resistance, Short Circuit Impedance (Capacity Test)	Per Transformer	no.	1
	MV cable: very low frequency test	Per plant	no.	1
	Polarity Test	Per plant	no.	1
	Voltage Test	Per plant	no.	6
	All PV string tests	per plant Earth, continuity, arc fault... etc.	no.	4

	MCCB test	Test as needed for mechanical, thermal, magnetic functions, insulation resistance	no.	4
	Insulation Resistance Test	per plant	no.	2
	Continuity Test	per plant	no.	1
	Earthing Test	per plant	no.	1
Security services	Security in location per phase	24/7, every day of the year including holidays, remote monitoring through CCTV systems.	months	12
Emergency Visit	Emergency Visit to reach UNHCR projects	Within 2 hours from call. This is applicable when requested by UNHCR Engineer outside working hours	no.	12
License	Pay fees and/or renew license	Fully as per EMRC guidelines and provide documents and receipts to UNHCR	no.	2
Inverter warranty renewal	Pay fees and/or renew warranty	Fully for all inverters as per the manufacturer guidelines and provide documents and receipts to UNHCR	no.	1
Spare Parts (all-inclusive; repair/replace/fees/labor/transportation... etc.)	PV solar panels 265 W	265 W no mismatching permitted with existing - IEC61215, IEC61730, TuV Certified POLY Crystalline Module 5 busbar solar cell Higher module conversion Efficiency 17.26% or higher Half cell ISO9001, ISO14001, OHSAS18001	pcs	20
	PV solar panels 275 W	275 W no mismatching permitted with existing - IEC61215, IEC61730, TuV Certified POLY Crystalline Module 5 busbar solar cell Higher module conversion Efficiency 17.26% or higher Half cell	pcs	20

		ISO9001, ISO14001, OHSAS18001		
	PV solar panels 285 W	285 W - no mismatching permitted with existing - IEC61215, IEC61730, TuV Certified POLY Crystalline Module 5 busbar solar cell Higher module conversion Efficiency 17.26% or higher Half cell ISO9001, ISO14001, OHSAS18001	pcs	20
	PV solar panels 540 W	Model: Mono PERC Half-Cut Solar Panel Power Output: 540W Technology: Monocrystalline PERC Cell Configuration: 144 Half-Cut Cells Module Efficiency: $\geq 21\%$ Temperature Range: -40°C to +85°C Certifications: IEC 61215, IEC 61730, CE, ISO 9001, TUV Product Warranty: 12 years Performance Warranty: 25 years ($\geq 80\%$ output at year 25)	pcs	50
	PV solar panels 600 W	Model: Mono PERC Half-Cut Solar Panel Power Output: 600W Technology: Monocrystalline PERC Cell Configuration: 156 Half-Cut Cells Module Efficiency: 21.5% - 22.5%. Temperature Range: -40°C to +85°C Certifications: IEC 61215, IEC 61730, CE, ISO 9001, TUV	pcs	50

		Product Warranty: 15 years Performance Warranty: 30 years (≥80% output at year 30)		
	Three Phase Inverter	Efficiency 98.8% or higher Highest PV system availability with 60kW units DC input voltage of up to 1000V flexible DC solutions with PV array junction boxes I / AC:III; DC: II IEC62109-1/IEC62109-2 (Class I, grounded - communication Class II, PELV), UL1741-w.non-isolated EPS interactive PV inverters, IEEE1547 VERITAS Approved Suitable with existing system as per site visit - origin and technical specs same quality or higher	pcs	5
	Three phase inverter repairing	Corrective maintenance for the inverters, including diagnostics, troubleshooting, component-level repair, and software/firmware updates.	no.	50

	DC Combiner Box	switching device combination is a string combiner box for up to 12 or 14 PV strings UK10.3HESI1000V fuse modular terminal blocks The positive pole of the solar strings is connected to the UK10,3-HESI 1000V fuse modular terminal blocks The negative pole of the solar strings is connected to the STU35/4X10 BU feed-through terminal blocks or as well to UK10,3-HESI 1000V fuse modular terminal blocks The output cables are connected to the UKH150 and UKH150BU high current terminal blocks or to the load break switch. IP65 Polycarbonate housing Connection of up to 12 or 14 solar strings	pcs	20
	MCCB 400A	400A - 3 pole AC DC 6kv utilisation category A 36kA breaking capacity at 400-415V IEC/ EN 60947 UL 508 H 50 kA 415 V AC durability 10000 cycle mech, 5000 cycle electrical, backplate mounting, ip20 IEC 60529 or higher, ik07 IEC 62262 or higher, -25 to 70 C operating temperature 18 months warranty or more	pcs	10
	MCCB 160A	3 pole AC DC 6kv utilisation category A 50kA breaking capacity at 400-415V IEC/ EN 60947 UL 508 H 50 kA 415 V AC durability 10000 cycle mech, 3000 cycle electrical, backplate mounting, ip20 IEC 60529 or higher, ik07 IEC 62262 or higher, -25 to 70 C operating temperature 18 months warranty or more	pcs	10

	MCCB 125A	3 pole AC DC 6kv utilisation category A 36kA breaking capacity at 400-415V IEC/ EN 60947 UL 508 H 50 kA 415 V AC durability 10000 cycle mech, 5000 cycle electrical, backplate mounting, ip20 IEC 60529 or higher, ik07 IEC 62262 or higher, -25 to 70 C operating temperature 18 months warranty or more	pcs	10
	160-400A Adjustable breaker	3 pole AC 8kv utilisation category A 50kA at 380-480V IEC/ EN 60947 UL 508 N AC durability 15000 cycle mech, 6000 cycle electrical, backplate mounting, ip40 IEC 60529 or higher, ik07 IEC 62262 or higher, -25 to 70 C operating temperature 18 months warranty or more	pcs	10
	Busbar 20/10	20/10mm, Pure copper, Insulated with heat shrink 1000V, operating temperature - 55C-135C degrees, UL, CSA, MIL, color for each phase including all needed link bends/curves and accessories i.e. nuts, bolts, heat shrink... etc.	m	20
	Busbar 30/10	30/10mm, Pure copper, Insulated with heat shrink 1000V, operating temperature - 55C-135C degrees, UL, CSA, MIL, color for each phase including all needed link bends/curves and accessories i.e. nuts, bolts, heat shrink... etc.	m	20
	Busbar 20/5	20/5mm, Pure copper, Insulated with heat shrink 1000V, operating temperature - 55C-135C degrees, UL, CSA, MIL, color for each phase including all needed link bends/curves and accessories i.e. nuts, bolts, heat shrink... etc.	m	20

	Busbar 30/5	30/5mm, Pure copper, Insulated with heat shrink 1000V, operating temperature - 55C-135C degrees, UL, CSA, MIL, color for each phase including all needed link bends/curves and accessories i.e. nuts, bolts, heat shrink... etc.	m	20
	Combiner Box fuses	PV / 1000VDC - 15A - Cylindrical fuse, cartridge type, 40°C to +85°C, IEC 60269-6, UL 2579,	pcs	100
	Modular Surge Arrester	Type 1 + 2, 230/400V AC 3p 350V remote signaling single contacts!SD (1 C/O) Electrical Distribution Network Type, IT230 TN-C earthing systems, Imax 50kA, Iimp 12.5kA, <1.5 kV type 1 max voltage protection, clip-on mounting, DIN rail support, response time <=25ms EN61643-11:2012, IEC 61643-11:2011, CE, IP40 front, IP20 built-in IEC 60529, -25-60C operating temperature	pcs	5
	Distributio n board	Wall mounted, galvanized - IP65 - 600mm*400mm*200mm, 230V/400V AC, 50Hz or 60Hz, IP66, RAL7035, IEC 61439-1 & 61439-3, IEC 60898 / IEC 60947, Door with lock,	pcs	5
	Weather Station	Class 2 thermopile pyranometer ISO 9060:1990, adjustable solar irradiance sensor for global or plane of array, PV panel back temperature sensor, ambient air sensor, Modbus RTU communication, stainless steel hardware, 2-year warranty, optional add-on sensors, wide operating temperature range, weather resistant, SunSpec certified - US, EU, UK or Japanese origin	pcs	1

	Monitoring Screen	LED A++ or A+++ 43", QHD, IPS panel, 75Hz, sRGB 99%, HDR1000,	pcs	2
	HD-TVI Analog Camera	IP Bullet camera, 2.8 to 12mm motorized lens, IR range up to 40m 720p Dual power IP66 Suitable with existing system as per site visit - Same quality or higher	pcs	10
	IP Bullet Camera	CE, FCC, RoHS, ONVIF Profile S/G/T, CMOS, Operating Temperature: -30°C to 60°C, IP67 or 66, IPv4, IPv6, TCP/IP, HTTP, HTTPS, FTP, DHCP, NTP, RTSP, ONVIF, IR Range: 30m, 50m, or up to 100m, Resolution: 2 MP (1080p), 4 MP (1440p), 5 MP, or 8 MP (4K), Suitable with existing system as per site visit - Same quality or higher.		10
	DVR	HD-TVI Hybrid 8/16 Channel recorder up to 4/8 IP cameras real-time recording 48 Terabyte Suitable with existing system as per site visit - Same quality or higher	pcs	1
	NVR	16/32/64 channel h.265 NVR 2U real-time recording 48terabyte Suitable with existing system as per site visit - Same quality or higher	pcs	1
	Power Supply	Universal 12VDC 3.5A Suitable with existing system as per site visit - Same quality or higher	pcs	5

	6mm DC Cables	<p>Temperature range -40 °C to +90 °C, Max. temp. at conductor +120 °C, tin plated copper, Nominal voltage According to VDE U0 /U 600/1000 V AC // 1800 V DC conductor/conductor - double insulated - Ozone resistant acc. to EN 50396 - Weather and UV resistant HD 605/A1 - Halogen-free EN 50267-2-1, EN 60684-2 Resistant to acid and bases EN 60811-2-1 Flame-resistant VDE 0482-332-1-2 DIN EN 60332-1-2, IEC 60332-1</p> <p>Abrasion-resistant sheath DIN EN 5351 Resistant to short-circuits up to 200°C, short-circuits temperature 200°C/ 5 sec, service life - 25 years, Hydrolysis and ammoniac resistant, TuV certified</p>	m	500
	4mm DC Cables	<p>Temperature range -40 °C to +90 °C, Max. temp. at conductor +120 °C, tin plated copper, Nominal voltage According to VDE U0 /U 600/1000 V AC // 1800 V DC conductor/conductor - double insulated - Ozone resistant acc. to EN 50396 - Weather and UV resistant HD 605/A1 - Halogen-free EN 50267-2-1, EN 60684-2 Resistant to acid and bases EN 60811-2-1 Flame-resistant VDE 0482-332-1-2 DIN EN 60332-1-2, IEC 60332-1</p> <p>Abrasion-resistant sheath DIN EN 5351 Resistant to short-circuits up to 200°C, short-circuits temperature 200°C/ 5 sec, service life - 25 years, Hydrolysis and ammoniac resistant, TuV certified</p>	m	500

	Aluminum Cables	1*300sqmm Armoured OVC insulated cables 600/1000V according to BS6346 and IEC60502-1 Annealed Copper or Aluminum Conductor according to IEC 60228 Insulation PVC type TI 1 according to BS6346 or Type PVC/A according to IEC60502-1 Bedding extruded black PVC Armor Aluminum wires for single core Sheating: PVC tpe TM 1 according to BS6346 or Type ST1 according to IEC 60502-1	m	300
	Aluminum Cables	1*240sqmm Armoured OVC insulated cables 600/1000V according to BS6346 and IEC60502-1 Annealed Copper or Aluminum Conductor according to IEC 60228 Insulation PVC type TI 1 according to BS6346 or Type PVC/A according to IEC60502-1 Bedding extruded black PVC Armor Aluminum wires for single core Sheating: PVC tpe TM 1 according to BS6346 or Type ST1 according to IEC 60502-1	m	300
	Copper Rod	Copper purity is 99.95%, Tensile strength over 600N/mm2, Lifetime 28 years, Rod Diameter 17.2MM length 1.2m	pcs	5
	Flood Lights (Specify spec)	220-240V, 50Hz, Color temperature 6500K, Luminous flux 17,000 lm or higher, lifetime 30,000 hours or higher, IP65 or IP67, Temperature range -20...+55 °C, 1 year warranty	pcs	20
	Cable tie 10cm (pack of	UV resistant compatible with DC cables above, operating temp:-40/+85, outdoor use, PA6.6-V2 UL94,	pcs	75

	100 pieces)			
	Cable tie 30cm (pack of 100 pieces)	UV resistant compatible with DC cables above, operating temp:-40/+85, outdoor use, PA6.6-V2 UL94,	pcs	75
	MC4 cables male and female 4sqmm	1000V DC, 30A, Contact Resistance: $\leq 0.5 \text{ m}\Omega$, Insulation Resistance: $\geq 5000 \text{ M}\Omega$. Polycarbonate (PC) / Polyphenylene Ether (PPE), Contact Material: Tin-plated Copper. IP67, -40°C to +85°C, UL94-V0, UV Resistance, Salt Mist and Ammonia Resistance. IEC 62852, TÜV, UL 6703. compatible with DC cables above	pcs	200
	MC4 cables male and female 6sqmm	1000V DC, 30A, Contact Resistance: $\leq 0.5 \text{ m}\Omega$, Insulation Resistance: $\geq 5000 \text{ M}\Omega$. Polycarbonate (PC) / Polyphenylene Ether (PPE), Contact Material: Tin-plated Copper. IP67, -40°C to +85°C, UL94-V0, UV Resistance, Salt Mist and Ammonia Resistance. IEC 62852, TÜV, UL 6703. compatible with DC cables above	pcs	200
	Inverter Manager	Compatible with Inverter specs above Suitable with existing system as per site visit - Same quality or higher	pcs	1
	Switch for Inverter Manager	Data communications 8 RJ45 port DIN Rail Mount Unmanaged Ethernet Switch, 10Mbit/s, 100Mbit/s Suitable with existing system as per site visit - Same quality or higher	pcs	1

	Galvanize d paint	Volume Solids (ASTM D2697) $46 \pm 2\%$ SPECIFIC GRAVITY 1.5 ± 0.05 Theoretical spreading range 11.5 - 9.2 sqm/Ltr Recommended Dry Film Thickness 40 - 50 microns/coat Recommended Wet Film Thickness 88 - 110 microns/coat Flash point 38°C	kg	15
	Earth cable 1*120sqm m soft drawn	1*120sqmm soft drawn bare copper conductor max temperature 80°C - max DC resistance per KM at 20°C is 0.153Ohm - BS EN 60228 IEC 60228	m	50
	Earth cable 1*50sqm m soft drawn	1*50sqmm soft drawn bare copper conductor max temperature 80°C - max DC resistance per KM at 20°C is 0.387Ohm - BS EN 60228 IEC 60228	m	50
	Earth cable 1*120sqm m plain annealed	1*120sqmm plain annealed copper stranded conductor with PVC TI3 1.6mm insulation as per IEC 60227 Green and Yellow - Rated 450/750V max temperature 80°C - max DC resistance per KM at 20°C is 0.153Ohm max AC resistance per KM at 20C is 0.1968Ohm - BS EN 60228 IEC 60228	m	50
	3*4sqmm cable	CU/XLPE/SWA/PVC	m	300
	2*2.5sqm m cable	CU/XLPE/SWA/PVC	m	300
	4*50sqm m cable	CU/XLPE/SWA/PVC	m	300
	1*150sqm m cable	CU/XLPE/SWA/PVC	m	300
	1*120sqm m cable	Earthing CU/PVC	m	300
	1*70sqm m cable	Earthing CU/PVC	m	300
	1*50sqm m cable	Flexible cable CU/PVC	m	300

	Data Cable	Cat6a Solid UTP Acc. to ISO/IEC11801 EN50173 EIA/TIA568-A CATEGORY 7 Flame retardant IEC60332-1-2 Smoke density IEC61034 Suitable with existing system as per site visit - Same quality or higher	m	300
	RJ45 ethernet jack	for CAT5&6 Ethernet Cable or UTP, RoHS/CE/UL/FCC/CE/ISO9001/ISO14001,	pcs	50
	Fiber Optic Cable	4 Core 9/125 Suitable with existing system as per site visit - Same quality or higher	m	300
	PVC Pipes 50 Inch	UV resistant, ISO 4422 / 1452, IEC 61386, IP65 - IP67, -5°C to +60°C, Color: White or Gray,	m	200
	PVC Pipes 32 Inch	UV resistant, ISO 4422 / 1452, IEC 61386, IP65 - IP67, -5°C to +60°C, Color: White or Gray,	m	200
	PVC Pipes 25 Inch	UV resistant, ISO 4422 / 1452, IEC 61386, IP65 - IP67, -5°C to +60°C, Color: White or Gray,	m	300
	PVC Pipes 20 Inch	UV resistant, ISO 4422 / 1452, IEC 61386, IP65 - IP67, -5°C to +60°C, Color: White or Gray,	m	200
	Cable trunk 50*100m m	PVC Electric, ISO 4422 / 1452, IEC 61386, -5°C to +60°C, Color: White	m	20
	Cable trunk 20*10mm	PVC Electric, ISO 4422 / 1452, IEC 61386, -5°C to +60°C, Color: White	m	50
	Enclosures	Polyester Reinforced with Fiberglass IP65 With Canopy Height 1000mm - Width 750mm - Depth 320mm Tin plated Copper Busbars 30x5mm 3Phase and Earth		5

	2.5m steel pole	galvanized steel including concrete base/suitable with the existing base.	pcs	5
	3m steel pole	galvanized steel including concrete base/suitable with the existing base.	pcs	5
	Screws / Bolts	as needed in the site for fixation.	kg	5
	Switchgear or any related internal component	36 kV, 2500A, (1000V breaker insulation) 25kA 1s-3s, peak 65kA/ 70/80 kV insulation, IP3X, Vacuum Circuit Breaker, - 25 - 40°C, IEC62271-200 , IAC class) / IEEE Std C37.20.7 (1D-S class), IEC 62271-200, IEC 62271-102, IEC61243-5, IEC62271-1, IEC62271-200, IEC62271-103, IEC62271-102, IEC62271-100, IEEE C37.74, IEEE C37.20.3, IEEE 1247, IEEE C37.123, IEEE Std C37.20.4, IEEE C37.04, IEEE C37.06, IEEE Std C37.09, IEEE C37.20.7 For internal components shall be of same or higher quality as existing	pcs	1
	1500 KVA transformer or any related component inside	Step up 415V/33kV ISO9001:2000 Complied with IEC 60076, IEC 60354, IDECO, EDCO, JEPSCO Working Temp up to 45 Hermetically sealed Tapping $\pm 2.5\%$ - $\pm 5\%$ Dyn11 Frequency 50Hz Oil immersed type, same quality or higher than the existing based on site visit	pcs	1
	MV Cables	1*150sqmm 19/33(36) kV single-core Aluminum Class 2 XLPE Insulated, copper wire screen, hard drawn aluminum wire armor, PVC sheathe cable black to IEC60502-2:2005, IEC 60332-1,	m	50

	MV Cables	1*240sqmm 19/33(36) kV single-core Aluminum Class 2 XLPE Insulated, copper wire screen, hard drawn aluminum wire armor, PVC sheathe cable black to IEC60502-2:2005, IEC 60332-1,	m	50
	First Aid Kit	containing: Up to date first-aid manual list of emergency phone numbers Sterile gauze pads of different sizes adhesive med tape adhesive bandages (band-aids) in several sizes Elastic bandage Splint Antiseptic wipes Splint soap Antibiotic ointment antiseptic solution (like hydrogen peroxide) Hydrocortisone cream (1%) acetaminophen and ibuprofen tweezers sharp scissors safety pins disposable instant cold packs calamine lotion alcohol wipes or ethyl alcohol mouthpiece for giving CPR plastic non-latex gloves (at least 2 pairs)	pcs	3

	Fence	Galvanized 2.7 meters high cross link fence consisting of 5.5cm*5.5cm*3.65mm with a 2 inch diameter and 2.8mm thickness and 3.5 total high steel pipes every 2 meters, 3 meters above the ground. 80cm steel angle 40*40*4mm bended forward at angle 45 degrees for the outside fence with 3 line of barbed wire to be fixed on top. 1 line of razor wire 1 meter diameter to be fixed between the fence. Supplying and installing a main 5x10 cm high bridge 3 meter total height supported with two steel pipes 2 inch diameter and 2.8 mm thickness for each H bridge for corners. Supply and install 4 lines horizontal wires 2.9mm diameter fixing, fittings and 50*50*50 cm minimum square concrete bases for the supports. Price must include constructed a tie foundation of 20 cm depth (10 cm above ground and 10cm underground)*15cm width along the fence (outside and inside) including all civil works, wood works, excavation and restoring the original surface. if the length of the fence exceeds 25 meters, two diagonal pipes have to be provided and installed to support the middle (for every 25m) all bracing pipes to be welded). Concrete foundation Spec 50cm*50cm*50cm hole filled with concrete mix with stones. Providing and casting a normal concrete (cement: fine aggregate: coarse aggregate ratio of 1:3:6) with minimum breaking load of 15MPa after 28 days, concrete curing at	m	100
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		least of 3 day periods and all to complete the job, supply and install welded steel bar 40 cm length, 8mm diameter at the bottom of galvanized pipe 20cm		
	Fence Metal Mesh	steel, galvanized, mesh size 5.5X5.5cm, wire diameter 3.5mm, 2.5m high,	m	200
	Double Swing Gate	5m width, 2m height - Delivery and installation within` 24 hours including holdays Supply materials, equipment and labor for manufacturing if needed, a swing vehicle gate. Covering material is galvanized chain link fence consisting of 5.5cm*5.5cm*3.65mm. Price must include installing three 8cm strong heavy duty welded with H bridge (5*10cm), welding overlap between dor frame and h-bridge 16mm). A	pcs	1

		rubber wheel shall be installed for each part. Provide and install two crossing pipes for each side of the gate. Price must include installing concrete footings 50*50*50 cm with steel support and two downward sliding locks of 12mm diameter		
	Double Swing Gate	6m width, 2.5m height - Delivery and installation within 24 hours including holidays Supply materials, equipment and labor for manufacturing if needed, a swing vehicle gate. Covering material is galvanized chain link fence consisting of 5.5cm*5.5cm*3.65mm. Price must include installing three 8cm strong heavy duty welded with H bridge (5*10cm), welding overlap between door frame and h-bridge 16mm). A rubber wheel shall be installed for each part. Provide and install two crossing pipes for each side of the gate. Price must include installing concrete footings 50*50*50 cm with steel support and two downward sliding locks of 12mm diameter	pcs	1
	Battery	12V 18Ah, IEC 60896 / IEC 61427, UL 1989, RoHS & CE, suitable with the exciting system.	pcs	27
	Switching Charger - Rectifier	AC input: 230 V+15% - 15%, 50/60HZ, 6A, DC output: 110V, Floating voltage 122.9 V, Max charger current 8A, Current of charge of battery 1.8A, CE, UNE - EN 50178 (1998), UNE - EN	pcs	3

		61000-6-2 (2001), UNE - EN 61000-6-4 (2001), must be suitable with the existing charging system.		
	Air Conditioner split unit	18,000 BTU - DC inverter technology - Ductless - 220-240V SEER / EER 20/12.5 HSPF / COP 10/3.35	pcs	3
	Fire Alarm Sensor	ceiling mounted, AA battery powered	pcs	3
	Mid clamp	Fix panel to structure - Aluminum/steel must be suitable with existing structure	pcs	200
	End clamp	Fix panel to structure - Aluminum/steel must be suitable with existing structure	pcs	200
	Cable lug	4mm cord end - 99% copper tin electro-plated	pcs	200
	Cable lug	6mm cord end - 99% copper tin electro-plated	pcs	200
	Fire extinguisher maintenance	CO2	pcs	9
	Fire extinguisher	CO2	pcs	3