

Terms of reference (ToR) for the procurement of services: Supply, Install and Commission Solar System for Luapula Water and Nkana Water

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Contents

I. General information	1
II. Context	2
III. Objectives of the Assignment	3
IV. Scope of Supply and Works (EPC)	3
V. Site Visit and Verification	7
VI. Deliverables	7
VII. Contract Duration	8
VIII. Milestones and Timelines	8
IX. Bidder's Qualifications and Eligibility	9
X. Contract Management	9
Annex 1 – Bill of Quantities	10

I. General information

1.1 Brief information on the Project

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is an implementing agency of the Federal Republic of Germany for technical cooperation. Nexus Energy and Water Program for Zambia (NEWZA), which is a multi-donor Action jointly co-financed by the European Union (EU), the German Federal Ministry for Economic Cooperation and Development (BMZ), and UNICEF. Specifically, GIZ is implementing a part of the NEWZA action plan which is also co-funded by the BMZ and EU as part of the German Development Cooperation program "Water Sector Reform in Zambia." This project focuses on strengthening institutions for sustainable water supply and sanitation in Zambia, aligning with the broader objectives of the NEWZA action plan.

The NEWZA programme supports six Commercial Utilities (CUs), including Nkana Water Supply and Sanitation Company Limited (NWSC) and Luapula Water Supply and Sanitation Company Limited (LpWSC). The programme seeks to improve operational efficiency, service reliability and the financial sustainability of partner utilities, including through renewable-energy solutions.

1.2 Purpose of the Project

GIZ-NEWZA intends to procure suitably qualified contractors for the supply, installation, testing and commissioning of solar photovoltaic (PV) hybrid systems at the sites described in this ToR.

Package / Lot	Utility / Sites	Location	Reference System
Lot 1	Luapula Water Supply and Sanitation Company (LpWSC) – Head Office	Mansa, Luapula Province	19.8 kWp PV + 20 kW 3-phase hybrid inverter + 40 kWh battery storage + generator integration
Lot 2	Nkana Water Supply and Sanitation Company (NWSC) – Ndeke, Chimwemwe, Kalulushi, Chambeshi and Mindolo Branch Offices	Kitwe / Kalulushi, Copperbelt Province	Five hybrid PV systems; reference ToR specifies 3.6 kVA per site

- A contractor may express interest in one or both lots. Where responding to both lots, the technical proposal and pricing shall be clearly separated by lot and site.
- The reference equipment and capacities stated in this ToR are minimum/reference requirements. The contractor shall verify compatibility, sizing and integration requirements before final implementation.

II. Context

2.1 Lot 1 – Luapula Water Supply and Sanitation Company

The Head Office is connected to the ZESCO grid and has a standby 15 kVA generator. The solar system is intended to prioritize solar energy during the day, store excess energy in batteries, and support continuity of supply during grid outages through battery and generator backup.

Site reference: Chitimukulu Road, Mansa; coordinates approximately -11.19696, 28.89433.

The office roof has IT4 roofing sheets inclined at approximately 2 degrees. The contractor shall verify the structural configuration, available roof area, cable routes, existing electrical installation and generator interface during the site visit.

2.2 Lot 2 – Nkana Water Supply and Sanitation Company

GIZ-NEWZA is supporting NWSC with solar PV systems at five branch offices located in Kitwe and Kalulushi Districts of Copperbelt Province. The offices are connected to the ZESCO grid.

The systems are intended to improve power reliability and reduce energy costs, particularly for operational activities including billing and collections.

Site	District / Area	Reference System
Ndeke Branch	Kitwe	3.6 kVA hybrid solar system
Chimwemwe Branch	Kitwe	3.6 kVA hybrid solar system
Kalulushi Branch	Kalulushi	3.6 kVA hybrid solar system
Chambeshi Branch	Kalulushi	3.6 kVA hybrid solar system
Mindolo Branch	Kitwe	3.6 kVA hybrid solar system

The NWSC Bill of Quantities cover key equipment, including hybrid inverters, 600 W bifacial PV modules, 25.6 V / 2.71 kWh lithium batteries, DC combiner boxes, DC disconnects, sub-distribution boards, mounting structures, AC/DC cabling, earthing materials and associated consumables. The detailed quantities shall be confirmed against the applicable reference BOQ issued with the inquiry.

III. Objectives of the Assignment

- Improve reliability and continuity of electricity supply at the participating utility facilities.
- Increase the use of renewable solar energy and reduce dependence on grid electricity where technically and economically appropriate.
- Provide battery backup for essential loads during utility outages.
- Integrate existing backup generation in a safe and controlled manner.
- Ensure complete, compliant and maintainable PV hybrid systems, including electrical protection, earthing, monitoring and control.
- Build the capacity of utility technical staff to operate and maintain the installed systems.

IV. Scope of Supply and Works (EPC)

The assignment shall be undertaken on an EPC basis for the relevant lot(s). The contractor shall be responsible for detailed verification, design finalization, supply, installation, testing, commissioning and handover of a complete and operational system.

4.1 Contractor's Responsibilities

1. Review the reference ToRs, load information and Bill of Quantities and identify any technical gaps before pricing.

2. Undertake site verification/assessment, including electrical supply arrangements, load distribution, available installation area, structural conditions, cable routes, earthing and existing backup power arrangements.
3. Prepare/confirm the detailed electrical integration design and ensure compatibility of all components.
4. Verify and, where necessary, optimize the sizing of PV strings, inverter inputs, batteries, AC/DC cables, breakers, isolators, surge protection devices and earthing conductors.
5. Supply all equipment, materials, accessories and consumables required for a complete installation.
6. Install PV modules, mounting structures, inverter(s), batteries, distribution/protection equipment, cabling, earthing and monitoring/control equipment.
7. Carry out testing and commissioning, including insulation resistance, polarity, continuity, earthing, protection, functional operation, grid synchronization where applicable, battery charge/discharge and backup operation.
8. Provide as-built drawings, system configuration records, test results, warranties and operation and maintenance manuals.
9. Train designated utility technical staff on operation, routine inspection, safety and basic maintenance.
10. Comply with applicable Zambian requirements and relevant IEC standards for PV systems, electrical installations, inverters, batteries and grid interconnection.

4.2 Lot 1 – LpWSC Technical Requirements

Reference System Configuration

Component	Reference Requirement
PV array	19.8 kWp comprising 36 × 550 W modules
Hybrid inverter	1 × 20 kW, three-phase hybrid inverter, 400 V AC class, with integrated MPPT capability
Battery storage	40 kWh nominal, comprising 8 × 5 kWh lithium-ion / LiFePO ₄ batteries
PV arrangement	Reference configuration: 3 strings × 12 modules, subject to verification against the selected inverter's MPPT voltage/current limits
AC integration	Common three-phase AC busbar / MDB arrangement with phase matching L1-L1, L2-L2 and L3-L3
Generator	Existing standby 15 kVA diesel generator to be integrated as secondary backup source

Earthing	Minimum two copper-bonded earth electrodes; earth-enhancement compound such as bentonite where required to achieve the specified resistance
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4.3 Lot 1 - Electrical Integration Requirements

- The inverter shall provide balanced three-phase AC output and connect to a common three-phase AC busbar system.
- The common AC busbar shall feed the main three-phase distribution board and shall be adequately rated for the connected sources and loads.
- The installation shall maintain correct phase correspondence with the existing installation: L1 to existing L1, L2 to existing L2 and L3 to existing L3.
- PV DC circuits shall include appropriate DC isolation and surge protection. A DC combiner box shall be provided where required by the selected inverter/string arrangement.
- The hybrid inverter shall have integrated MPPT functionality; a separate external MPPT/high-voltage charge controller is not required unless specifically required by the selected equipment architecture.
- The battery bank shall be connected to the inverter through appropriately rated DC protection and shall include compatible battery management and inverter communication.
- The generator shall be integrated through an appropriate ATS and/or inverter generator interface, with electrical/mechanical interlocking to prevent unsafe parallel operation or back-feeding into the utility grid.
- The system control philosophy shall allow generator start when the grid is unavailable and the battery state of charge reaches the agreed low threshold, subject to the capabilities of the selected inverter/generator interface.
- Three-phase voltage monitoring/protection shall be provided where required to protect against abnormal voltage, phase loss and phase sequence conditions.
- AC and DC SPDs shall be installed in accordance with the detailed design, equipment manufacturer's requirements and applicable standards.
- Cable lengths shall be verified and measured on site. The contractor shall provide final cable sizing calculations based on current carrying capacity, voltage drop, installation conditions, short-circuit withstand and applicable derating factors.

4.4 Lot 1 - Earthing and Lightning/Surge Protection

The contractor shall provide a complete earthing system comprising at least two copper-bonded earth electrodes. Bentonite or an approved earth-enhancement compound may be

used where required to achieve an earth resistance not exceeding 5 ohms. The contractor shall test and document earth resistance during commissioning and provide certified results.

4.5 Lot 1 - LpWSC Load Reference

The LpWSC source load includes a daily load demand of 63,526 Wh/day for the listed office loads. The contractor shall verify the proposed operating strategy for PV, battery, grid and generator.

Load	Qty	Power / Unit	Operating Hours/day	Daily Energy (Wh)
Desktop computers	10	150 W	8	12,000
Laptops	21	65 W	8	10,920
Servers	3	300 W	24	21,600
LED lights	8	8 W	12	768
4' fluorescent office tubes	32	16 W	12	6,758
Security wall cameras	9	10 W	24	2,160
Motorized gate	1	1,000 W	2	2,600
Standard printers	6	100 W	4	2,880
Standard upright fridges	2	200 W	8	3,840
Total				63,526

4.6 Lot 2 – NWSC Technical Requirements

The NWSC requires five branch-office PV hybrid systems. Each site is referenced as a 3.6 kVA hybrid solar system. The contractor shall use the applicable reference BOQ for each site and shall verify the site-specific configuration before final pricing.

4.7 Lot 2 - Reference Equipment

- Hybrid inverter(s) as stated in the reference BOQ.
- 600 W bifacial solar PV modules.
- 25.6 V, 2.71 kWh lithium batteries.
- DC combiner boxes with fuses and surge protection, where required.
- DC disconnect switches with 125 A fuses, where specified by the reference design.
- Sub-distribution boards.
- Mounting structures including rails, clamps and accessories.

- AC and DC cabling as specified in the applicable BOQ, including 4 mm², 10 mm² and 35 mm² cables where applicable.
- Earthing materials including copper cable and clamps.
- All lugs, glands, conduits, trunking, cable ties and other consumables required for a complete installation.

All materials shall be new, certified and compliant with applicable Zambian requirements and relevant international standards. The contractor shall provide a complete operational system rather than limiting the scope to the listed components.

V. Site Visit and Verification

Prospective contractors are encouraged to undertake site visits before submitting their technical and financial response. The site visit shall establish, as applicable:

- Existing electrical supply and distribution arrangements.
- Load distribution and critical-load priorities.
- Available PV mounting area and structural configuration.
- Roof condition and safe access arrangements.
- Cable routes and approximate cable lengths.
- Location and suitability of inverter, batteries, MDB/DBs and protection equipment.
- Existing earthing system and required improvements.
- Generator rating, control interface and physical connection point at LpWSC.
- Space, ventilation, environmental and safety requirements for batteries and electrical equipment.
- Any site-specific requirements affecting installation cost or programme.

Cable lengths in the inquiry BOQ may be treated as provisional/subject to site measurement. The contractor shall nevertheless include all necessary cable accessories, glands, lugs, containment, termination and installation requirements in its price.

VI. Deliverables

- Site assessment report / verification record.
- Inception report and implementation work plan.
- Detailed system design and electrical integration drawings, including single-line diagram.
- Equipment data sheets and confirmation of compatibility.
- Cable sizing and voltage-drop calculations and protection selection/coordination rationale.
- Supply and installation of all equipment and accessories.
- Installation and commissioning test report.
- As-built drawings and final system configuration.

- Training of designated utility technical staff (four staff for NWSC; four staff for LpWSC).
- Warranty certificates.
- Operation and maintenance manuals.
- Final report including system performance parameters and commissioning results.

VII. Contract Duration

GIZ shall hire the Contractor for an anticipated contract period of 53 days, from 1st October to 22nd November 2026.

VIII. Milestones and Timelines

The following are the milestones of the project.

Milestone	Due Date	Location	Actors
Kick-off Meeting	3 rd Oct 2026	Virtual	NEWZA / Contractor / LpWSC
Site visit to establish / verify operational protocols and structural configurations / layout.	9 th Oct 2026	Mansa	NEWZA / Contractor / LpWSC
Inception Report outlining the workplan, system design, interfacing with existing supply systems, and other site assessment findings.	14 th Oct 2026	NEWZA	Contractor
Supply, installation and commissioning of the PV solar system.	8 th Nov 2026	Mansa	NEWZA / Contractor / LpWSC
Training technical staff.	9 th Nov 2026	Mansa	NEWZA / Contractor / LpWSC

Final Report that includes overall system performance (include performance parameters), training conducted, as built configuration, and O&M manuals.	16 th Nov 2026	NEWZA	NEWZA / Contractor / LpWSC
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IX. Bidder's Qualifications and Eligibility

- a. Minimum of 5 years' experience in the supply, installation and commissioning of PV solar systems.
- b. Evidence of 3 similar contracts in the last 5 years.
- c. Valid license from the National Council for Construction (NCC) Grade 6 as minimum, category E.
- d. Valid Energy Regulation Board License.
- e. Valid EIZ practicing license.

X. Contract Management

1. Nature and scope

The contractor is responsible for providing the following:

- Accommodation
- Transportation
- Ensuring high safety standards

2. Contract Requirements:

a. Roles and responsibilities

- NEWZA Component Manager shall coordinate and guide the contractor during the assignment
- The Utility Advisor shall facilitate ensure effective coordination and collaboration between the contractor and the Commercial Utility Company.

b. Contract Management

- There will be the first briefing meeting between the contractor and GIZ NEWZA before the start of the assignment to agree on the framework and process.
- All contract-related issues to be communicated to the contract manager (GIZ NEWZA Project Component Manager) only.

- Any support required on site will be facilitated by the Utility Advisor.

c. Costing Requirements

The cost of the supplying, installing and commissioning of the PV solar system will according to the bill of quantities provided.

Annex 1 – Bill of Quantities