**REQUEST FOR QUOTE (RFQ)**

**1. Task**

Digital Twin for Grid Operational Integration and Observability

**2. Country**

Malawi

**3. Nature of Support**

Consulting firm/Individual

**4. Duration of Engagement**

3 months

**5. Preferred Start Date**

September 2026

**6. Statement of Work (SOW)**

**6.1 BACKGROUND**

**6.1.1 About ESCOM**

The Electricity Supply Corporation of Malawi (ESCOM) is Malawi's national electricity utility, mandated to transmit, distribute, and supply electricity in support of the country's socio-economic development agenda. As the backbone of Malawi's energy sector, ESCOM plays a pivotal role in enabling economic growth, industrialization, improved public service delivery, and enhanced quality of life through the provision of reliable, affordable, and sustainable electricity services.

Over the years, ESCOM has made significant investments in network expansion, operational modernization, and institutional reforms. However, the utility continues to face several structural and operational challenges that limit its ability to fully realize the benefits of digital transformation and achieve world-class utility performance. While several digital technologies have been deployed, including Supervisory Control and Data Acquisition (SCADA) systems and other enterprise applications, implementation remains fragmented, resulting in limited end-to-end integration and suboptimal utilization of available capabilities.

Consequently, many operational, commercial, and corporate processes remain heavily reliant on manual interventions, leading to inefficiencies, delayed decision-making, and increased operational risks. The absence of seamless real-time integration across critical business systems restricts enterprise-wide visibility of network operations, asset performance, customer service delivery, and financial performance. Furthermore, existing digital platforms provide limited capability for real-time monitoring and management of reliability indices, technical and non-technical losses, constraining efforts to improve planning, operational efficiency and revenue protection.

From a customer and stakeholder perspective, these challenges contribute to service delivery inefficiencies, slower response times, and weakened accountability mechanisms. At the organizational level, the utility continues to face capacity constraints in areas such as change management, digital leadership, data governance, analytics, and evidence-based decision-making, which are essential for sustaining a successful digital transformation journey.

Addressing these challenges presents a strategic opportunity for ESCOM to accelerate its transition into a modern, data-driven, and customer-centric utility capable of enhancing operational excellence, improving financial sustainability, strengthening grid reliability, and supporting Malawi's long-term energy access and economic development aspirations.

### 6.1.2 Overview of ESCOM's Power Network

As of the beginning of 2026, ESCOM's electricity network included an extensive transmission and distribution infrastructure that serves as the backbone of Malawi's power system.

#### 6.1.2.1 Transmission Network

The transmission system consists of:

- 172.65 km of 400 kV transmission lines.
- 1,404.82 km of 132 kV transmission lines.
- 1,072.81 km of 66 kV transmission lines.
- 48 transmission substations with a combined installed transformation capacity of approximately 1,828 MVA.

#### 6.1.2.2 Distribution Network

ESCOM's distribution network is organized into three operational regions: Southern Electricity Supply, Central Electricity Supply, and Northern Electricity Supply. The distribution system comprises:

- 8,729 km of 33 kV medium-voltage lines.
- 3,442 km of 11 kV medium-voltage lines.
- 26,265.27 km of 0.4 kV low-voltage lines.
- 8,566 distribution transformers supplying electricity to customers across the country.

As part of ESCOM's ongoing digitalization program, approximately 326,651 customers have been geo-referenced and digitally mapped, representing about 44% of the total customer base. In addition, significant portions of the network infrastructure have been digitized to support enhanced planning, operational visibility, asset management, and future deployment of advanced grid technologies.

It should be noted that the actual extent of the network may be larger than the figures presented above, as network expansion activities under programs such as Malawi Rural Electrification Program (MAREP), contractor-led projects, and ESCOM-funded works continue ongoing basis. The figures reported primarily reflect assets that have been verified and digitized within ESCOM's current geospatial and network information systems.

### 6.1.3 Foundational Digital Twin Analysis for Grid Operational Integration and Observability

ESCOM maintains a geo-tagged digital network of grid assets, including substations, feeders, and distribution transformers. These data are integrated with GIS layers, including Google Maps, through APIs on the OneSight GIS platform to enable spatial visualization. ESCOM aims to have a robust GIS-based network topology with digital single line diagrams for enhanced network planning. The digital data is however incomplete to enable the required visualizations and analysis, hence calling for complete distribution grid digitalization.

#### 6.1.3.1 Current enabling conditions for grid operational integration and observability

ESCOM has made significant progress in establishing the foundational digital infrastructure required to support grid operational integration, network visibility, and future smart grid capabilities. To date, the following network assets have been digitally mapped and incorporated into the utility's geospatial information systems:

- 2,650.48 km of transmission network digitally mapped.
- 12,171 km of medium-voltage (MV) distribution network digitally mapped.
- 8,566 substations digitally mapped.
- 326,651 (44%) customers geo-referenced and digitally mapped.

There exists the Southern Africa BESS Centre of Excellence (SABESS COE) which is ready to amplify the project results with support from the Global Energy Alliance for People and Planet (GEA).

#### 6.1.3.2 Current gaps

Despite the progress achieved, several critical gaps remain that constrain full grid observability, operational integration, and data-driven network management:

- Incomplete digital representation of network assets, with portions of the distribution network yet to be geo-tagged, digitized, and incorporated into the enterprise GIS platform.
- Rapid network expansion outpacing digitization efforts, creating a persistent risk of discrepancies between field infrastructure and digital network records.
- Limited financial, technical, and human resources to accelerate the digitization of newly constructed and legacy network assets and to keep data currency.
- High costs associated with feeder geo-tagging, asset verification, and network digitization, particularly across geographically dispersed service territories.
- Absence of digital single-line diagrams (SLDs) for several substations, limiting network visualization, operational planning, fault analysis, and system integration capabilities.

- Need for sustainable governance mechanisms and processes to ensure that all future network additions, modifications, and retirements are captured in near real-time within the digital network repository.

Addressing these gaps will be critical to proving a comprehensive, up-to-date digital network model capable of supporting advanced operational technologies such as SCADA, DMS, OMS, Advanced Distribution Management Systems (ADMS), predictive maintenance, and data-driven investment planning.

### 6.1.4 Grid Operational Integration and Observability

ESCOM's Planning Department currently relies on DIgSILENT to perform network congestion studies using load flow analysis and voltage profile assessments. However, this process faces operational inefficiencies due to limited integration with critical systems such as GIS, SCADA, and commercial platforms, particularly those related to customer billing and new connection management. As a result, many planning activities remain largely manual and depend on insufficient real-time data, constraining informed decision-making for network expansion and new customer connections. These challenges underscore the need to support distribution grid digitalization.

#### *6.1.4.1 Current enabling conditions for grid operational integration and observability*

- Plexos files for all generation and planned generation projects in IRP
- DIgSILENT files covering the whole transmission network
- DIgSILENT files covering the distribution network up to 11 KV
- The existence of SABESS COE to amplify the project results.

#### *6.1.4.2* Current gaps

- Incomplete integration among DIgSILENT, GIS, and SCADA systems.
- Incomplete coverage of the distribution network within DIgSILENT models.
- Limited smart meter deployment, resulting in insufficient real-time operational data.

### 6.1.5 Advanced DER Grid Integration

In 2025, the Malawi Energy Regulatory Authority introduced net metering regulations to facilitate the integration of distributed energy resources (DERs) into the national grid. However, no DER system has yet been connected under this framework. Several DER developers and owners have expressed interest in grid connection, particularly during periods of excess generation, but ESCOM has not yet operationalized the regulatory framework to enable broader DER integration. As proven in comparable markets such as South Africa, DERs have the potential to supplement national electricity supply and help meet rising demand. Advanced DER system integration and analytical capabilities are needed to support efficient system operation and strengthen grid readiness for increased DER integration.

#### *6.1.5.1 Current enabling conditions for DER integration*

- Net metering regulations are in place to provide a policy framework for DER integration.

- Existing DER owners with surplus renewable energy are willing to connect to the ESCOM grid.
- There is unmet electricity demand that could be partially supplied through excess DER generation.
- The existence of SABESS COE to amplify the project results.

#### *6.1.5.2 Current gaps*

- Absence of a demonstration project to serve as proof of concept for DER integration.
- Perceived grid limitations that may constrain effective DER integration.
- Limited technical capacity to model affordable and efficient integration of DERs.

## 6.2 OBJECTIVES OF THE ASSIGNMENT

The overall objective of the consultancy is to support the design and implementation of a GIS-based network topology visualization and analytics platform for selected portions of ESCOM feeders in Malawi to enhance grid operational integration, observability and overall network planning.

**Specific Objectives:**

- Work with ESCOM and SABESS COE to reduce reliance on manual field-based asset mapping with an efficient and quicker way of geotagging network assets using drone surveys.
- Work with ESCOM and SABESS COE to enhance network planning with the development of geospatial network maps, asset visibility, digital single line diagrams and visualization of grid outages along the selected feeders
- Work with ESCOM and SABESS COE to provide a platform for visualizing grid reinforcement and enhancement requirements, realizing improved accuracy of real-time simulations for new grid investment decisions
- Work with ESCOM and SABESS COE to strengthen network planning through feeder-level smart metering and feeder-level demand forecasting in real time, network analytics, and planning capabilities that enable feeder-level determination of technical and commercial losses, as well as SAIFI and SAIDI indicators
- Work with ESCOM and SABESS COE to enable faster preparation and delivery of new customer connection quotations
- Work with ESCOM and SABESS COE to enable bidirectional power flow analysis and implementation of Malawi's net-metering regulations
- Work with SABESS COE to provide capacity building for stakeholders (ESCOM) to perform all the activities in the scope of works.

### 6.2.1 General Procurement Compliance

All equipment, materials, and services procured under this assignment (including all activities across Lot 1, Lot 2, and Lot 3) must be conducted in strict compliance with the Global Energy Alliance (GEA) Procurement Policy. A copy of the GEA Procurement Policy will be shared directly with the final selected vendor(s) prior to contract execution. Bidders must explicitly demonstrate adherence to these guidelines in both their financial and operational proposals.

#### 6.2.2 Procurement Process

This Request for Quote (RFQ) forms the first stage of a two-stage procurement process. In the first stage, GEAPP is seeking quotations from qualified firms to assess market capability , vendor suitability and pricing. Successful respondents may subsequently be invited to submit  technical and financial proposals at the second stage.

Submission of a quotation at this stage does not guarantee an invitation to submit proposals, nor does it create any obligation on the part of GEAPP to proceed to the second stage or to award a contract.

#### 6.2.3 Non-Binding Nature of this RFQ

This RFQ is issued for information and pricing purposes only and does not constitute a commitment by GEAPP to proceed with procurement, award a contract, or provide funding. A successful quotation is non-binding and does not guarantee work, funding, or any contractual engagement.

GEAPP reserves the right to cancel this RFQ, reject any or all quotations, or modify the scope, timeline, or procurement approach at any time without liability. GEAPP assumes no obligation, responsibility, or liability for costs incurred by respondents in preparing or submitting their quotations.

## 6.3 SCOPE OF WORK

The works are split into three LOTs as below and the consultancy firms can bid for one, two or all three LOTs.

### 6.3.1. LOT 1. Create a digital network typology with drone surveys, geospatial visualisations and SLDs

#### 6.3.1.1 Tasks

- Undertake a drone-based survey of network assets along five feeders, 40F feeder (LLB 405), 10F feeder (LLB 105), 30F feeder (LLB 305) and 20F feeder (LLB 305), from Kanengo substation where the BESS is connected; and 2LF feeder (2L5) where the Lifuwu Irrigation Scheme in Salima is connected.
- Geo-tag and digitize all grid assets along the feeders and incorporate them into the ESCOM enterprise GIS platform i.e., integrate them with GIS layers, including Google Maps, through APIs on the OneSight GIS platform to enable spatial visualization.

- Develop a robust GIS-based network topology (geospatial network maps) with digital single line diagrams (SLDs) for the feeders to enable asset visibility, network visualizations and analysis including operational planning, fault analysis, and system integration capabilities.
- Ensure ESCOM has platforms for visualizing grid reinforcement and enhancement requirements along the feeders including the ability to track and support the management of technical losses and power quality.
- Provide classroom and on-the-job training to SABESS and ESCOM employees in the full cycle of activities listed above from planning, drone surveys, development of geo-maps and SLDs, network visualizations and analysis for operational planning, grid expansion / enhancement programs, fault analysis, and other system integration aspects. The on-the-job training will include supervision of one full cycle of task activities carried out by SABESS and ESCOM employees.

The parameters of the feeders including the km coverage are given in the Annex

#### 6.3.1.2 Expected outputs

- Improved process cost efficiency through reduced reliance on manual field-based asset mapping
- Enhanced network planning enabled by digital network typology and single line diagrams
- A platform for visualizing grid reinforcement and enhancement requirements
- A platform to support the management of technical losses and power quality
- Improved technical expertise and know-how of ESCOM and SABESS staff in creating a digital network typology with drone surveys, geospatial visualizations and SLDs

### 6.3.2. LOT 2. Feeder-level smart metering and analytics for new investment decisions

#### 6.3.2.1. Tasks

- Update existing DIgSILENT files for the targeted feeders
- Integrate the geospatial data with DIgSILENT files for the targeted feeders
- Carry out feeder analysis to confirm the recommended points that require smart feeders to support the real-time power flow visualization initiative which is designed to enable feeder-level determination of technical and commercial losses, as well as SAIFI and SAIDI indicators.
- Procure and deploy at least 100 smart meters (CTPT Meter ~3 ph 4 wire; class 0.2) and related ancillary equipment being: 100 Pole mounted HV meter kiosk with a testblock; 1100metres of 2.5mm 12 core cable; 80 Pole mounted metering units (33000/110; 400/200/100/1A; 3 phase 4 wire); 20 Pole mounted Metering unit (11000/110; 400/200/100/1A; 3 phase 4 wire)—the detailed specifications of each item are in Annex.

- Carry out a mini assessment to confirm the material requirements for such equipment stated above (type and numbers of meters, metering units etc.) before finally procuring them.
- For the meters, ESCOM may require a physical factory acceptance test and that should be quoted as a reimbursable expense for 2 people from ESCOM being cost for accommodation and travel to country of factory acceptance test.
- Carry out enhanced network planning through feeder-level smart metering and analytics that uses continuous real-time data streams from smart meters to support real-time power flow simulations and voltage profile assessments.
- Carry out real time feeder simulations and load profiling to support bottleneck identification through constraint violation and correlation analyses between loading and voltage
- Carry out real time feeder-level simulations for demand forecasting through historical and trend analysis
- Demonstrate outage visualization along the selected feeders through integration with outage logs, SCADA alarms, and feeder interruption and restoration records
- Calculate technical and commercial losses, as well as SAIFI and SAIDI, at feeder level and identify the pain points
- Using right platforms, perform network congestion studies using load flow analysis and voltage profile assessments to assess network expansion or infrastructure requirements for new connections
- Using integrated ESCOM platforms (i.e., GIS, SCADA, DIgSILENT, and other commercial platforms), prepare and visualize new customer connection requirements, showing the cost profiles and the actual quotation at the click of a button
- Provide classroom and on-the-job training to SABESS and ESCOM employees in the full cycle of task activities above with feeder-level smart metering and analytics to the point of developing new customer connection quotations, and determination of losses, power quality indices of SAIFI and SAIDI, and other relevant real-time power flow simulations and voltage profile assessments. The on-the-job training will include supervision of one full cycle of task activities carried out by SABESS and ESCOM employees.
- To reinforce knowledge transfer and practical learning, the Consultant shall organize a 3–5-day benchmarking visit for five (5) ESCOM and SABESS representatives to a leading utility or country that has successfully implemented a comparable initiative. The visit should enable participants to gain first-hand experience of implementation strategies, governance arrangements, operational practices, challenges met, and key success factors to support effective implementation at ESCOM.

**6.3.2.2 Expected outputs**

- Improved digital platforms for smart meter analytics and enhanced grid planning for selected five feeders
- Improved accuracy of real-time simulations for new grid investment decisions

- Faster preparation and delivery of new customer connection quotations
- Enhanced network planning through feeder-level smart metering and analytics
- Feeder-level determination of technical and commercial losses, as well as power quality indices including SAIFI and SAIDI
- Demonstrated visualization of grid outages along selected feeders
- Improved feeder-level demand forecasting supported by real-time and historical data analysis
- Improved technical expertise and know-how of ESCOM and SABESS staff in Feeder-level smart metering and analytics for new investment decisions

**6.3.3. LOT 3. Advanced DER grid Integration-**

**6.3.3.1. Tasks**

- Implementation of a proof-of-concept net metering demonstration through Lifuwu milling and irrigation scheme in Salima. Supported by Global Energy Alliance funding, the Lifuwu mill is equipped with 36 kW of solar PV and a 50 kWh battery system, while the irrigation scheme has 210 kW of solar PV. The installation has already been configured to support net metering, including bi-directional metering and reverse power flow.
- Procurement and installation of two bi-directional meters and system for integration and maintenance/management of the bi-directional flow, complete with data recording
- Deployment of advanced weather-correlated probabilistic solar and wind forecasting tools to support uncertainty quantification and improve day-ahead and intra-day forecasting for both DER and utility-scale renewable energy systems. In the initial phase, the Lifuwu Solar PV would serve as the pilot DER case.

**6.3.3.1. Expected outputs**

- System for supporting/managing bi-directional flow and metering abilities including data records
- A demonstrated proof of concept for net metering implementation
- Increased power injection into the grid from DERs, thereby improving power availability and access
- Accurate weather-correlated probabilistic solar/wind forecasting platform for uncertainty quantification.

**6.4 DELIVERABLES**

- Inception Report – Detailed work plan, and stakeholder engagement plan
- Bi-weekly implementation progress reports
- Training Report and Documentation Package – User manuals, technical documentation, and training presentations and notes
- Final Report and Presentation – Consolidated report showing implementation of all tasks, key insights for replication and scale up, and recommendations for future enhancements

### 6.5 TIMELINE

The consultant is expected to conclude the work in 3 months. Final project plan with milestones and timelines shall be agreed before commencement of the work with SABESS and ESCOM.

### 6.6 CONSULTANT REQUIREMENTS

The consulting team vying for all LOTS should have expertise in:

- Proven experience in drone surveys and geo-mapping of grid assets
- Expertise for analytical visualisation of grid assets and network typologies with dashboards and digital platforms
- Experience in developing robust GIS-based network topology (geospatial network maps) with digital single line diagrams
- Understanding of DIgSILENT and related grid modelling tools
- Technical knowhow of smart meter operations and systems including installations and real-time data downloads for power flow simulations and voltage profile assessments
- Ability to carry out feeder-level simulations for demand forecasting
- Experience in determining technical and commercial losses, as well as SAIFI and SAIDI, at feeder level
- Ability to integrate GIS, SCADA, DIgSILENT, and other commercial platforms to support preparation of new customer connection requirements, showing the cost profiles and the actual quotation at the click of a button
- Experience in DER grid integration and management of related systems, particularly in weaker grids
- Capacity to train and provide technical support to utilities

Consultants interested in just a single or two LOTS should demonstrate expertise in the selected LOT(s)

### 6.7 REPORTING AND OVERSIGHT

The Consultant will report on technical matters to SABESS and ESCOM but administratively to the Global Energy Alliance for People and Planet. Regular progress updates, consultations, and validation workshops will be conducted to ensure all stakeholder needs and expectations are met.

### 6.8 RFQ Timeline

| Key Activity | Date |
|---|---|
| Issue Date | 06-Aug-2026 |
| Submission of Applicant Questions | 13-Aug-2026 (15:00 CAT) |
| Responses to Applicant Questions | 17-Aug-2026 |
| Deadline for RFQ Submissions | 23-Aug-2026 (15:00 CAT) |

**Instrument Type:** Contract (fee-for-service)

All RFQ submissions and/or communications must be shared via email to felix.khembo@energyalliance.org and contractsgeappafrica@energyalliance.org in line with the timeline stated above. The following title "RFQ No. GEA-MW/2026/01" should be included in the subject line of all communications with LOT number if consultant is only interested in one LOT.

While the Global Energy Alliance (GEA) intends to adhere strictly to this schedule, GEA reserves the sole right, at its absolute discretion, to extend the submission deadline or modify the procurement timeline as necessary to ensure a competitive and compliant bidding process. Any such extensions or amendments will be communicated formally in writing to all confirmed respondents.

### 7. COSTING (Inclusive of Taxes)

*Kindly insert the total fee for the services.*

| Deliverable # | Deliverable Description | Deliverable Price | Total Price (USD) |
|---|---|---|---|
| Professional fees (inclusive of all applicable taxes) | | | |
| Expenses | | | |
| Materials | | | |

## 8. ANNEX

### 8.1 Feeder Parameters

The parameters of the feeders including the km coverage, level of asset geotagging and number of customers are given in the Table below:

| FEEDER | DISTANCE NOT GEOTAGED (Estimates) KM |
|---|---|
| Kanengo LLB 105 | 35 |
| Kanengo LLB 205 | 40 |
| Kanengo LLB 305 | 40 |
| Kanengo LLB 405 | 20 |
| Salima 2L5 | 3 |

### 8.2 Meter Specifications

11and 33KV Metering Unit (POLE

KIOSK SPECIFICATIONS 110'

MD Post Paid 400v.pdf

MD Post Paid 110V.pdf