Kigali, ... 12 FEB 2026 .....

N° 11.07.023/340/26/MD-EDCL/FG/gu/si

Addendum No 1 to the Request for expression of interest

Reference is made to the Request for expression of interest dated 28th January 2026 for the tender related to the Feasibility studies for utility-scale BESS site(s), preparation of technical specifications, provision technical support for tendering process and supervision of works with reference No RW-REG/EDCL-531654-CS-QCBS and its related Terms of references.

We hereby inform all interested consultants that the request for expression of interest and terms of references previously published have been revised on the qualification criteria as follow:

The interested Consultant should submit the following document:

- Letter for Expression of Interest
- Registration certificate/certificate of incorporation
- Experience of the firm (in table indicating name, scope, period of execution, employer's name and address) proven by certificates of good completion.
  The interested consultant firm should have the following experience:
  - General experience in conducting feasibility studies and supervising BESS projects during the past ten (10) years.
  - Specific experience in feasibility studies, procurement management, and supervision of BESS projects, with participation in at least two (2) similar projects each with at least a minimum contract value of USD 20 million.

In addition to that, the list of key staff and their CVs are no longer required at this stage, since they will be requested in the technical proposals for the consultant firms shortlisted.

Sincerely,

2026.02.10
11:23:01
+02'00'

UMUSHASHI Gentille
Head of Procurement Management services

Félix GAKUBA
Managing Director

10th Floor KCT, KN 2 ST, Nyarugenge District, P.O. Box 3855 Kigali, Rwanda
Tel.: + (250) (0) 787172265, email: info@edcl.reg.rw, website: www.reg.rw

TERMS OF REFERENCE FOR:

Feasibility studies for utility-scale BESS site (s), preparation of technical specifications, provision technical support for tendering process and supervision of works.

1. Background

Rwanda has taken substantial steps to increase the share of renewable energy in its generation mix. Rwanda's power generation capacity has more than quadrupled from 76 MW in 2010 to 466MW in 2025 and the country has successfully reduced its reliance on oil-fired generation through investments in zero/low carbon resources, halving the greenhouse gas (GHG) emissions intensity of electricity in this period. The share of liquid fuel-run power in Rwanda's power generation mix has declined from about 48 percent in 2010 to 6% in 2024 having been replaced by hydropower, lake methane-based power, and to a lesser extent, by solar and peat power. In 2024, the bulk of the energy mix was comprised of domestic hydropower (24 percent), lake methane (18 percent), peat-fired (18 percent), thermal (6 percent), Solar (3 percent), and imports and shared power plants which are predominantly hydro (31 percent). However, the cost of electricity supply in Rwanda is very high at about US$0.17 per kWh (FY24), primarily due to high generation costs. The Government of Rwanda (GoR) is taking several steps to bring down electricity supply costs, including development of domestic solar PV plants with private financing using competitive procurement, increasing regional imports, joint development of large hydro resources with neighboring countries, and improvement in system efficiencies.

Although Rwanda is estimated to have strong solar resource potential, with high-intensity solar resources in the south-central and eastern parts of the country, limited investments have been made in the solar sector, and it represents a small portion in total generation. In 2023, solar resources contributed 3.41 percent of the total installed capacity while they made up only 1.2 percent of the total generation. However, the government plans to promote utility-scale solar in the country as per the least cost-power development plan 2025-2050, where it envisions increasing the energy generated from solar in the generation mix by about threefold in the short term up to 2031 and will expand by two orders of magnitude in 2050. As a first step, the GoR is embarking on the development of 100MW solar PV capacity in the next 2-3 years. This also aligns with the GoR's National Strategy of Transformation 2 (2024-2029), which aims to increase the share of renewable and clean energy in the power generation mix from 51% to 60%.

Battery energy storage system (BESS) is needed for load shifting and grid support and ancillary services. Rwanda observes a sharp evening peak in demand (~25% higher than average daytime demand), which exposes the sector to supply shortages. In the past, Rwanda relied on expensive and carbon intensive thermal generation to meet evening peak demand, which deteriorated sector financial health and contributed to a high greenhouse gas (GHG) intensity of power supply. Significant capacity addition in recent years has allowed Rwanda to decommission most of the thermal power plants, yet issues with fuel availability (for the peat power plant) and delays in development of certain power plants are exposing the sector again to supply shortages in the evening. Therefore,

development of solar capacity needs to be complemented with BESS to help manage Rwanda's evening peaks. The BESS may also be required for grid support and ancillary services, as confirmed in Preliminary Assessment of Solar PV with Battery Storage in Rwanda suggesting the potential for integration of 100MVA immediately and additional 30MVA by 2027. Globally, this shows the potential of Rwandan network to accept a BESS of 130MVA by 2027. However, the required BESS MW/MWh to be installed will be confirmed under this study.

The selected battery storage technology will be lithium-ion, all feasibility study activities, analyses and tendering documents shall be prepared based on this technology (the cathode chemistry is expected to be LFP (Lithium Iron Phosphate)) unless a justified alternative arises during the study.

The TORs are divided into two parts. The first part covers the feasibility study, and the second part covers the owner's engineering. However, the owners' engineering services assignment is not automatic and is subject to the conditions and limitations set out in Part 2 of this TOR.

2. Part 1: Feasibility Study and preparation of Tender Documents – Scope of Services, Tasks and Expected Deliverables (Lump-Sum)

The main objective of the Feasibility Study is to confirm the need for BESS in Rwanda and determine the optimal size and sites for utility-scale deployment. Specifically, the objectives are:

- Analyze the system-level need for storage and review findings and recommendations from the *Preliminary Assessment of Solar PV with Battery Storage in Rwanda* (including evening peak demand, curtailment reduction, adequacy and reliability concerns, and provision of ancillary services).
- Assess and confirm or update the proposed BESS project site(s), including suitability of location(s), based on findings from the *Preliminary Assessment of Solar PV with Battery Storage in Rwanda*.
- Perform the economic optimization of utility-scale BESS using PLEXOS to determine the optimal sizing of the BESS project at the designated 110/220kv or Medium Voltage if the feasibility study confirms its feasibility. This analysis will update or validate the findings and related assumptions presented in the *Preliminary Assessment of Solar PV with Battery Storage in Rwanda*.
- Conduct a comprehensive power system audit, including stability and protection coordination studies, for the Rwandan electricity network to identify grid weaknesses and areas for improvement.
- For the one site for BESS development confirmed by REG, carry out site investigations, including topographical surveys and preliminary geotechnical investigations.
- Develop a conceptual design for the proposed BESS systems and associated infrastructure and advise on an implementation strategy.
- Undertake comprehensive financial and economic analysis of the proposed BESS investments.
- Prepare project Implementation Plan and Risk Analysis.

- Undertake procurement assessment, including early market engagement (jointly with the Client), market analysis, procurement risk analysis; prepare technical specifications and tender documents for the procurement of EPC contractor for the development of BESS; and prepare the Operation and Maintenance (O&M) contract.
- Facilitate workshops and learning exchanges to ensure knowledge transfer and capacity building for client's counterpart personnel and relevant stakeholders and recommend other suitable training needed to strengthen capacity of the client's staff on BESS.

The scope of work shall include a comprehensive feasibility study covering grid studies, justification for BESS, implementation sequence, conceptual design, costing, financial and economic analysis, risk analysis, preparation of technical specifications, and tender documents for the determined BESS. The scope shall also include capacity building and knowledge transfer to the client and key stakeholders.

The consultant shall provide services in accordance with international standards, codes, and all laws and regulations applicable in Rwanda and the Eastern Africa Power Pool (EAPP) code.

All work shall comply with applicable international and national standards, including but not limited to IEC, IEEE, NFPA 855, IEC 62933-2-1, ISO 9001, ISO 14001 and ISO 45001. The consultant shall list all standards used in each deliverable.

Task 1. Kick-off Meeting and Data Gathering

- Hold a kick-off meeting in Kigali, Rwanda, within two weeks of contract award to review the TOR, develop a detailed work plan, establish reporting formats, and identify key project stakeholders.
- Present an overview of the proposed methodology and schedule.
- Visit proposed site[s] from the *Preliminary Assessment of Solar PV with Battery Storage in Rwanda* to appraise their suitability and requisite infrastructure.
- Collect and assess available information and data from REG and other relevant sources, identify gaps, and develop a plan for collecting additional required information.
- Review of network models and familiarization with Rwanda power system and related system issues
- Review the current power system topology, interconnections, operational regimes and expansion plans.
- Assess the current system protection schemes (generators, power transformer, transmission lines, etc.) and their performance.

- **Deliverable**: Inception Report, detailing findings from Task 1, Power System Review & Network Model Validation Report, Protection Scheme Assessment & Recommendations Report, comprehensive work plan, stakeholder review, information gap analysis, and site visit report.

Task 2. Energy and Power Balance Studies and BESS sizing

Prepare Rwanda system-level model and carry out studies using PLEXOS to confirm/update the need and optimal requirements for utility-scale BESS, referencing existing and planned Rwandan grid plans and results presented in the *Preliminary Assessment of Solar PV with Battery Storage in Rwanda.* For the avoidance of doubt, a PLEXOS model is not currently available and shall be developed by the Consultant at the national and system level. All model files, input data, assumptions, and relevant sources shall be submitted in full as part of the required deliverables.

Specifically, the consultant shall:

- Carry out data collection including: (i) review of existing and planned generation plants in Rwanda with their key technical and economic characteristics (costs, availability, operational constraints, etc.), (ii) review of transmission assets and major substations, (iii) detailed analysis of electricity demand including hourly load profiles, seasonal variations and peak demand characteristics, (iv) review of renewable energy resource potential and variability, with a particular focus on hydropower and solar resources, (v) review of regional interconnections and electricity trade profiles, and (vi) review of system reserve requirements. The data collection phase shall include close consultation with REG and review of existing studies, including the latest *Least Cost Power Development Plan (LCPDP)* and the *Preliminary Assessment of Solar PV with Battery Storage in Rwanda.*
- Conduct a market overview study, including a review of Rwandan electricity market's legal and regulatory framework (e.g., existing tariff models, contractual frameworks between relevant entities, dispatch practices, and generation/demand balancing as per national plans).
- Evaluate system requirements, highlight the possible role of BESS in the power system and recommend appropriate implementation timelines for proposed projects.
- Develop a PLEXOS model of the Rwandan power system with appropriate spatial and temporal granularity consistent with the data availability, with a minimum hourly temporal resolution and a spatial resolution consistent with the main network zones, substations and load centers. This phase will be carried out in close coordination with REG to ensure ownership and transparency.
- Define relevant modelling scenarios in coordination with REG and perform the analyses. Specifically, the consultant will:
    - Prepare a capacity and energy balance for the implementation timeline considering a minimum BESS lifespan (e.g 15 or 20 years depending on throughput).
    - Review and validate (or update) the energy storage capacity (MWh) and corresponding power capacity (MW) for the BESS system(s).
    - Evaluate the potential benefits of BESS for specific applications, including peak shaving, PV shifting (if co-located with solar), energy shifting, deferral of transmission and distribution upgrades and black start capabilities. Determine the suitable operation strategy for the BESS in terms of discharge/charging times and cycles.

- Analyze different options for BESS lifetime degradation management, including allowing for degradation, augmentation/replacement strategies (oversizing, punctual module augmentation/replacement), and capacity maintenance agreements with OEMs.
- The outcome of this task shall include the definition of key parameters, as outlined in the table below:

BESS Key Parameter	**Units**	**Minimum Requirements**
Plant point of connection (POC)	kV	
BESS Power Capacity at POC*	MW	
BESS Energy Capacity at POC Beginning of Life (BOL)*	MWh	
BESS Energy Capacity at POC End of Life (EOL)*	MWh	
BESS lifetime (BOL to EOL)	Years	
Replacement or augmentation strategy (if any)	-	
Round Trip Efficiency (RTE) at POC (BOL)*	%	
Round Trip Efficiency (RTE) at POC (EOL)*	%	
Cycling or throughput at POC	Cycles/year or discharged MWh	
Usable energy at POC (if different than 100%)	%	
Power factor requirements at POC	-	
Discharge time at BOL	Hours	
Availability (including scheduled and unscheduled maintenance)	%	
Response time	ms	

(*) For the avoidance of doubt, the project requirements shall be defined at the POC. As part of the tendering documents, the EPC contractor shall be required to size all key parameters to be measured and guaranteed at the POC. This means that each OEM/EPC sizing must account for losses, auxiliary loads, and other relevant factors (such as depth of discharge or potential de-ratings) to ensure that the power and energy available at the POC are fully usable and measured in accordance with IEC 62933-2-1.

- Organize a dedicated closing knowledge transfer session for 10 staff from the client presenting the modelling approach, key assumptions, scenarios, results and limitations. The session shall include training on BESS sizing methodology, including how different BESS services are valued and their relative importance, and will include hands-on demonstrations and exercises using the PLEXOS model developed. The session shall be delivered in-person over 5 business days and will be structured to include both theoretical and practical modules with sufficient time allocated for interactive discussions and questions. If required, the consultant will arrange training licenses for 10 REG staff for this purpose.

- **Deliverable**: A report on Energy and Power Balance Studies and Power System Audit, including optimal BESS capacity, energy storage hours, dispatch capacity, technologies, connection points, energy balance with and without storage, timelines, and risks/opportunities. The report shall include BESS Sizing, including capacity and degradation Management, findings on energy/power capacity and lifetime degradation management strategies, well as all other parameters that will form the basis for the subsequent tasks. A training and capacity building report covering the training areas mentioned above.

Task 3. Power System Analysis (Stability and Protection Coordination)

- Update the existing PSSE, Transmission model and Dig Silent transmission model with protection of the Rwandan power system and carry out simulations with and without BESS to confirm location, sizing, and other pertinent technical analyses relating to system stability.
- Analyze impacts on transmission and/or distribution facilities, considering short-circuit current levels, and stability under normal and contingency conditions.
- Conduct analysis to address frequency excursions from VRE intermittency and system disturbances, and for grid voltage support.
- Include the analysis of synthetic inertia provision from BESS as part of the overall system stability assessment.
- Ensure analysis considers Rwandan grid code requirements and international best practices for reliability, security, and operation.
- Assess maximum capacities of transmission facilities, minimum/maximum voltage ranges, maximum short-circuit current/power levels, network losses, voltage stability, N-1 contingencies, and recovery times.
- Propose and justify the technical feasibility of solutions to maximize benefits to the power system.
- Produce active/reactive power flows and voltage profiles for normal and contingency situations, highlighting gains in loss reduction, grid reliability, and voltage stability.
- Carry out maximum and minimum short-circuit current calculations to size electrical equipment, modify protection settings, and reinforce existing facilities if necessary.
- Review Rwanda Network Grid Codes in relation to BESS integration and safe operation, recommending additions for immunity, fault ride-through, oscillation damping, and flicker analysis.
- Evaluate the potential benefits of BESS as a provider of ancillary services, including frequency and voltage support, reactive power compensation, fast frequency reserve, spinning reserve provision, synthetic inertia, and ramp management.
- The Consultant shall define the grid code requirements specifically applicable to BESS and simulations that will require compliance from the BESS integrators/EPC during the execution phase including but not limited to system immunity such as fault ride through capabilities, oscillation damping, flicker analysis among others.

- Frequency stability study (this study shall comprise the analysis of RoCoF, frequency nadir, responses of generating units providing primary control, adequacy of UFLS scheme, system inertia and overall frequency stability of isolated and interconnected operation considering adopted technical scenarios). The frequency stability shall be evaluated with and without BESS under peak and base load conditions.
- Transient rotor angle stability analysis as required based on system criticality (may include determination of available transient rotor angle stability margin of generating units in the system in accordance with adopted operational security limits).
- Review the current protection philosophy as applicable to the BESS point of interconnection and the affected network areas, including potential recommendations to improve the relevant sections of the grid Protection Discrimination policy.
- Conduct protection coordination analysis (static and time-domain) for network zones relevant to BESS integration and draw recommendations for improvements of the existing relay protection system.
- In continuity with the previous tasks, organize a dedicated closing knowledge-transfer session for 10 staff from the client presenting the network and stability analysis approach, key assumptions, scenarios, results and limitations. This session shall recall the overall BESS project evaluation and preparation methodology and tools, clarify the role of network and stability analyses within this methodology, and include training on network stability and protection coordination principles for BESS integration, including how different stability constraints and grid code requirements are assessed and their relative impacts on system operation. The session must include hands-on demonstrations using the network and dynamic models developed.
- The session shall be conducted in-person over 5 business days and shall further emphasize practical interpretation of study results for operational decision-making and future project screening, including common risk indicators and mitigation measures relevant to BESS deployment in small or weak grids. Detailed training materials and model documentation shall be provided to enable the Client's technical teams to replicate, update, and adapt the analyses for future system planning exercises.
- **Deliverable**: A Grid Study Report covering grid connection, power flow, short-circuit analysis, transient stability, protection schemes, dynamic stability assessment, Protection System Review & Coordination, and compliance/recommendations for Rwandan Grid Code to reflect global best practices. Training report and materials as noted above.

Task 4. Conceptual Design and Site Assessment

- Review the suitability of the selected project sites, recommending the most suitable locations based on grid requirements, proximity to generation/load centers, land availability, and local permitting requirements (e.g., fire safety regulations local authority], setbacks, clearances, flooding risks, noise

limitations). The consultant shall complete the assessment with aspects that were not covered in the P*reliminary Assessment of Solar PV with Battery Storage in Rwanda*.

- Prepare conceptual designs (at feasibility level) of the BESS, considering battery technology Li-ion (LFP). The conceptual design shall include all major system components description (e.g. battery enclosures, PCS/inverters, transformers, thermal management system, interconnection equipment, fire suppression systems, and control systems), physical layout, electrical and communication interfaces, and required clearances. Clearances and layout shall comply with relevant local regulations and international standards, including NFPA 855 applicable fire safety guidelines. The design shall also consider access for operation and maintenance, and space allowances for future expansion if relevant due to augmentation.
- Conduct site investigations comprising geotechnical and topographical surveys for proposed one site, including boreholes, trial pits, and topographical mapping for all project settlements (BESS infrastructure, substations, cable routes, etc.).
- Consider factors such as cabling interfaces, access roads, construction logistics, equipment for construction/maintenance, performance/availability/warranties, O&M approach, auxiliary power, fencing, and resistance to severe storm events.
- **Deliverable**: A Technical Report including BESS location, conceptual design and geotechnical/topographical survey results. CAD layouts for BESS should also be provided.
- All model files, drawings and datasets must be delivered in native, editable formats (PLEXOS, PSSE, Excel with formulas, AutoCAD/DWG, GIS, and editable reports in Word).

Task 5. Financial and Economic Analysis

- Conduct a detailed **financial analysis** of the BESS project, focusing on project-level viability (cash flows, payback period, Project IRR), and an **economic analysis** to evaluate system-wide and societal benefits. Quantify benefits to the economy, including but not limited to savings from inclusion of low-cost VRE in the system, savings from displacement of thermal generation and reduced fuel imports, reduction in greenhouse gas emissions and foreign exchange premium, value of improved system reliability and avoided outages, impact on job creation and local industry development.
- Analyze and compute proposed **compensation/tariff structures** for BESS based on prevailing models. Benchmark against regional and global best practices and assess implications for Rwanda's regulatory framework and grid code compliance.
- Compare and contrast **public, private, and PPP financing models**, including typical financing assumptions suitable for Rwanda. Assess **risk profiles** for each financing modality, implications for fiscal space, and private sector appetite. Provide **illustrative financing structures** (e.g., debt/equity mix, concessional finance options).

- Conduct **Life Cycle Cost Analysis** and estimate **Levelized Cost of Storage (LCOS)**, considering all lifetime costs (capital, O&M, warranties, battery degradation, disposal).
    - Include battery recycling/reuse strategies and second-life applications.
    - Perform scenario analysis for technology evolution and cost decline trends.
- Calculate **financial and economic NPV**, project cash flows, and IRRs. Estimate additional revenue from Certified Emission Reductions (CERs) and incorporate carbon pricing assumptions, as applicable.
- Carry out **sensitivity analysis** on critical parameters (Capex, Opex, refurbishment, interest rate, discount rate, inflation, exchange rates).
- Estimate costs to avoid, minimize, and compensate **Environmental & Social (E&S) impacts**, aligned with World Bank ESF.
- **Deliverables**: A **Financial and Economic Analysis Report** with clear documentation of assumptions, executive summary with key findings and recommendations. A **live financial model** with formulae and workings, including: LCCA, Cost-Benefit Analysis models, LCOS, NPV, IRR, and appropriate financing mechanisms and sensitivity scenarios.
- Conduct training session for REG team on using the financial model.

Task 6. Project Implementation Plan, Risk Analysis and Capacity Building

- Prepare implementation schedule, tasks listing, responsibilities
- Prepare Risk analysis including technical, economic, scheduling, contractual and propose mitigation measures
- The Consultant shall in consultation with REG arrange a one-week training programme for employees on BESS feasibility study in Rwanda. The Training Session shall include evaluation of planning, contracting, financial and economic analysis, operation and maintenance for BESS Project. REG will cover the cost of mobilizing its required staff members, conference cost, and transport costs for the trainees. The Consultant will cater for the trainers travel costs, accommodation cost, and any other costs incurred by the trainers.
- On-the-job virtual training and discussions will be provided as needed during implementation of the study.
- **Capacity Building and Training Framework**
  Given that Battery Energy Storage Systems (BESS) represent a relatively new technology within the national power system, the Consultant shall assess capacity-building needs and propose a comprehensive training program tailored to BESS operation and maintenance. This shall include:
    - Identification of key competencies required for BESS operators and maintenance technicians;
    - Development of relevant training modules, content outlines, and learning objectives in consultation with REG operation team
    - Recommendations on suitable training methods (classroom, hands-on, simulation, on-the-job, OEM-based training, etc.).
    - Proposed schedule and delivery plan for capacity building aligned with project implementation.

- The Consultant shall provide detailed guidance to ensure that operators and technicians acquire the necessary skills to effectively and safely operate, monitor, and maintain the proposed BESS solution.

Task 7. Market Assessment and Early Market Engagement

- Undertaking procurement assessments including early market engagement, market analysis, procurement risk analysis, identifying required goods, works, consulting and, or non-consulting services required to deliver the BESS project and the appropriate procurement approach(s) and establish the total estimated cost for Project implementation
- Early Market Engagement: To ensure the Feasibility Study and bidding documents are responsive to current market conditions and incorporates practical industry insights, the Consultant shall jointly with REG undertake an Early Market Engagement (EME) exercise. This task aims to consult with key market participants, communicate needs, understand market capacity, capability and trends, openly and transparently discuss possible solutions, stimulate innovation in the design and delivery, test optimal risk allocation and incentives, consider cost/value impacts, benefits and risks of possible solutions.
- The EME shall include:

    - Develop EME Approach Strategy: In consultation with REG, prepare an EME document that includes a detailed project profile, an overview of the proposed procurement and implementation strategy including timetable for procurement and risk allocation, and a summary of key issues for discussion with market participants. A proposed list of relevant parties to consult, including technology manufacturers, EPC and O&M contractors, shall be identified. In parallel, a general notice will be prepared by the Consultant for publication by REG to invite interested parties. This activity shall be prepared following the World Bank Procurement Guidelines.
    - Conducting EME Consultations: Jointly with REG organize a physical or virtual engagement session, during which EDCL and the Consultant will present the project profile to market participants. Prepare a presentation that will cover key elements of the project, project's objectives, proposed risk allocation, technical specifications, commercial structure, procurement requirements, an overview of the anticipated evaluation criteria, and common shortcomings observed in previous procurements.
    - Request for Market Feedback: Following the engagement session, REG will share the draft bidding document, prepared by the Consultant, with participants for review and feedback. The aim is to improve the bidding document content based on industry input, in line with best practices.
    - Information to Be Sought from Participants: Contractors will be requested to provide feedback on the following areas: (a) the proposed procurement strategy ; (b) draft technical specifications, proposed risk allocation, contract structure, pricing models (e.g., BOQ), and bid evaluation methodologies; (c) prevailing market prices, pricing strategies, and factors influencing pricing; (d) observed market trends, including competing

procurement demands that may affect supplier availability; (e) availability of alternative solutions or differentiated products/services; (f) innovative technologies and approaches relevant to the scope of work;(g) key risks or vulnerabilities within the current supply chain.

- Synthesize Findings: Organize and participate in workshops with REG and other key stakeholders to review the findings from the consultations. The feedback will be used to identify key considerations and refine the technical, financial, and procurement components of the Feasibility Study and in the bidding documents.

- **Deliverable**: The Consultant shall prepare a Market Sounding Report, summarizing the engagement objectives, the companies consulted, a consolidated list of questions and answers, and a summary of findings. The consultant shall revise the draft bidding document to consider the feedback from the EME. The report shall detail how the market feedback has been incorporated into the final Feasibility Study Report and in the bidding documents.

Task 8. Documentation for Procurement of an EPC and O&M Contractor

- Prepare documents for the Project procurement, including tender documents with detailed technical specifications, performance standards, evaluation criteria, including rated criteria if applicable, draft EPC contract, and in line with the O&M strategy developed and agreed with REG, an O&M agreement, based on the latest World Bank Procurement guidelines applicable to the Project (e.g., Standard Bidding Documents for Procurements of Works) along with detailed Liquidated Damages (LD) and performance measurement matrices, reflecting World Bank Guidelines and industry best practices regarding risk allocation, equipment procurement, warranty, penalties, commissioning, and payment milestones.
- Prepare an O&M strategy and advise REG on the optimal strategy for tendering the O&M services, including the assessment of whether certain costs within a Long Term Service Agreement (LTSA) could be financed by the financiers of the BESS project for the first 2-3 years, and payment obligation transferred to the Client after 2-3 years. Provide recommendations consistent with sector practice and project risk profile. The main goal is to ensure that performance guarantees are transferred to the Client and remain in force so that the Client is fully protected during the lifetime of the assets.
- Note: For the avoidance of doubt, the O&M contract will not cover the **operations/dispatching** activities of the BESS. This will be a utility-owned asset and will be operated and dispatched by the utility. As part of the Feasibility Study, the consultant shall support REG in preparing the operation strategy, whether in-house or via a third-party operator (service provider), to ensure the asset is properly utilized. In case an additional tender is required for operation and dispatch, the consultant shall prepare the tendering documents for the service provider operating the asset.
- **Deliverable**: Tender Documents for EPC; O&M strategy, including technical bid forms and draft O&M agreements.

Task 9. Final Report

- Prepare the Final Report at the end of the study, incorporating all study analysis, findings, and deliverables outlined in this TOR.
- The report will include an Executive Summary outlining the project's rationale, essential features, and a summary of findings and recommendations, designed as a bankable stand-alone document for seeking financing.
- All reports and supporting data (spreadsheets, drawings, simulation results) must be submitted in specified electronic formats (.doc, .xls, .pdf, AutoCAD, PLEXOS and PSSE compatible).
- **Deliverable**: Final Feasibility Study Report, Executive Summary, and all accompanying model input datasets and model outputs.

2.1. Team Composition & Qualification Requirements for Key Experts

The Consultant shall be fully responsible for the performance of the assignment and shall ensure knowledge transfer to the relevant REG team. The team will need to have an extensive overall experience with the energy sector authorities in sub-Saharan Africa, and experience in grid integration and planning as well as a local team will be particularly valuable. The key staff shall be able to communicate (orally and in writing) effectively in English.

The Consultant must propose staff for at least the following key positions:

- **Project Manager**: Master's degree in engineering (energy), economics, policy, or project management. At least fifteen (15) years of professional experience in the electricity sector, with seven (7) years as a project team leader. Good command of English and excellent report writing skills. Responsible for overall project success.

- **Power System Specialist**: Bachelor's degree in electrical engineering. At least ten (10) years of professional experience in electricity sector, with seven (7) years in power system analysis, particularly in stability and protection coordination studies.

- **Battery Energy Storage Systems Specialist**: Master's degree in electrical Engineer/Renewable Energy. At least ten (10) years of professional experience in the electricity sector, with five (5) years in design and deployment of utility-scale BESS. Experience in undertaking BESS feasibility studies and implementing BESS projects. Implementation shall be demonstrated for at least two BESS projects larger than 20 MWh using lithium-ion technology. Relevant implementation experience may include serving as Owner's Engineer (as BESS specialist) or working as part of an EPC contractor or BESS integrator. A signed reference letter from each project customer shall be provided, with evidence of successful project completion.

- **Procurement Specialist**: Bachelor's degree in supply chain management or procurement, engineering, economics, business, public administration, law, or a related field,.Recognized procurement certification such as CIPS, CPM, or CPSM will be an added advantage. At least ten (10) years of progressively responsible

procurement experience in infrastructure/energy, including end-to-end procurement for grid-scale assets, with a track record preparing tender documents under World Bank Procurement Regulations. Direct experience with plant "design, supply and install" or EPC contracts and with technologies such as BESS, substations, and inverter-based resources is strongly preferred.

- **Financial Analyst/Energy Economist**: Bachelor's degree in finance, Commerce, Economics or a related field. At least ten (10) years of professional experience in project/corporate finance, with five (5) years in financial evaluation and modeling of power generation projects. Good command of English.
- **Geotechnical Engineer**: Professional Civil/Geotechnical Engineer with at least ten (10) years of experience in geotechnical investigations and site characterization. Conducts geotechnical analysis and coordinates topographical surveys for the proposed sites.
- **Topographical Surveyor**: Licensed surveyor with at least ten (10) years of experience in topographical surveys for energy projects. Conducts topographical surveys for proposed sites.

2.2. Reporting Requirements and Time Schedule for Deliverables

The Consultant will provide all necessary expertise and services to enable the task to be completed within Five (5) months from the date of contract signing.

Deliverables and Timeline (from contract signing):

Deliverable	**Timeline (weeks from contract signing)**
Task 1 – Inception Report	Week 2
Task 2 - Report on Energy and Power Balance Studies and Power System Audit	Week 6
Task 3 - Grid Study Report	Week 8
Task 4 – Conceptual Design Report	Week 12
Task 5 – Financial and Economic Analysis	Week 14
Task 6 – Project Implementation Plan and Capacity Building Workshop	Week 15
Task 7 – Market Sounding Report (including procurement strategy) and draft bidding documents	Week 17
Task 8 - Tender Documents	Week 18
Task 9 - Final Report	Week 20

2.3. Client's Input and Counterpart Personnel

[REG] will oversee the study and appoint its project manager and Project Implementation Team to work with the consultant. [REG] shall provide all key available information, *Preliminary Assessment of Solar PV with Battery Storage in Rwanda*, master plans, and

relevant studies, and facilitate the Consultant's access to documents and information necessary for the study. The Consultant shall cover the costs of fee-based data.

2.4. Improvements on Terms of Reference

The Consultant may offer suggestions and improvements on the Terms of Reference which would result in better implementation of the study.

2.5. Acceptance of Study Results

The interim reports and the final report transmitted by the Consultant shall be formally approved by the Client REG before proceeding to the next stage. Any delays attributable to the Consultant shall be justified in writing and accepted by the Client.

2.6. Payment Schedule

The payment schedule will be defined in the RFP in the draft contract and will be milestone-based.

3. Part 2: Owner's Engineer Consultancy Services

3.0 OE Assignment Objectives

The main objective of the OE assignment is to provide comprehensive professional services to the Client to ensure that the BESS project is implemented successfully, safely, and in full compliance with the agreed technical specifications, conceptual designs, contractual agreements, applicable regulations, and international best practices. The OE shall safeguard the Client's technical, commercial, environmental, and social interests throughout the procurement, implementation/ execution testing and commissioning of the project. The Government of Rwanda is in discussions with the World Bank regarding potential financing of the BESS project. It is expected that the cost of the OE will be financed from the financing secured by GoR for the BESS Project. This scope shall be included in the consultant's financial proposal for the feasibility study and will form part of the project's second phase. The cost for second phase shall be presented separately from the cost of the first phase. The award of the feasibility study does not constitute automatic award of the OE services.

The client reserves the right to retain the same consultant for the Owner's Engineer scope, subject to:

(a) sole discretion of the Client;

(b) in the opinion of the Client, satisfactory performance of the consultant in the feasibility study assignment.

(c) the Client having been able to secure adequate funding for the BESS project;

(d) there being no material adverse change in the capacity of the Consultant including in the technical, financial, commercial, and social and environmental from that presented during the technical proposal of the consultant.

3.1. Tendering support and evaluation (Lump-Sum)

Subject to the conditions and limitations under paragraph 3.0 above, the Consultant shall support REG with the tendering process.

Task 10. Support towards procurement of BESS Contractor

- Support REG's evaluation committee in confirming/updating bid evaluation criteria in accordance with the bidding document and World Bank procurement regulations The consultant shall support the evaluation committee to:
  - Set up a fair, transparent, non-discriminatory and objective bid evaluation procedure and evaluation criteria.
  - Design a transparent and non-discriminatory bid evaluation process that will ensure comparable bids.
  - Devise effective systems for transparent communications with bidders; and
  - Inspire market confidence.
- Support REG in administering the bidding process: The Consultant shall provide all necessary administrative support to the Client for the efficient and professional management of the bidding process. preparation of responses to bidder queries, participate bidder conferences.
- Support with evaluation of bids: The Consultant will, together with the nominated staff of the Client, evaluate the bids. The Consultant will also support the Client with the contract negotiation with the selected bidder.

3.2. Scope of Services for Supervision of BESS Execution (Time-Based)

The scope of work for the Owner's Engineer shall cover the pre-construction, construction, commissioning, and initial operational support phases of the BESS project, encompassing design review, construction monitoring, quality assurance, health and safety oversight, contract administration, environmental and social compliance supervision, testing and commissioning oversight, and support during the defects liability / initial O&M period, based on the technical specifications and draft agreements prepared during the feasibility and procurement phases.

The OE's role shall include, but not be limited to, the following key tasks.

Task 11. Contract and Project Management Oversight

- Organize and lead a project inception / kick-off meeting with the Client and the EPC Contractor to confirm scope, roles and responsibilities, communication protocols, reporting formats, and decision-making processes.
- Supervise the EPC Contractor and administer the EPC Contract and the O&M Agreement prepared during the procurement documentation phase, ensuring compliance with contractual obligations, technical specifications, and agreed performance guarantees.
- Monitor the overall project implementation schedule prepared during the feasibility study, including identification and regular updating of the critical path and key milestones, and advise the Client on corrective actions in case of delays to ensure timely completion.

- Establish and maintain project controls for progress, cost, quality, risks, and changes, including a change management procedure for variations and claims.
- Provide regular monthly progress reports to the Client, detailing the status of execution, performance against the schedule and budget, key risks and issues, environmental and social compliance, and any recommended mitigation measures.
- Manage and provide expertise regarding the risk management matrix developed during planning, particularly concerning mitigation of risks during development, construction, defects liability, and operation periods.
- Support the Client in managing interfaces between the BESS project and other stakeholders and systems, including grid operator, central SCADA, telecommunications, and any parallel infrastructure works.
- Assist the Client in reviewing and responding to Contractor claims (time and cost), preparing technical position papers, and supporting any dispute resolution processes.
- Ensure systematic documentation and filing of all project correspondence, minutes, reports, drawings, approvals, and test records to support contract administration and future operation.

Task 12. Technical Design Review and Quality Assurance

- Review and approve the basic and detailed engineering designs and submissions provided by the EPC Contractor, ensuring full conformity with the technical specifications for EPC procurement, relevant standards, and the conceptual design.
- Verify that the design parameters defined during feasibility, such as BESS power and energy capacity (BOL/EOL), round-trip efficiency, response time, availability, warranty conditions, and other key performance parameters, are maintained in the detailed design and reflected in the control philosophy and operating strategies.
- Ensure that all components, including battery modules, racks and containers, power conversion systems, medium-voltage equipment, protection and control systems, and supervisory control centers, adhere to the specified quality requirements and relevant standards (for example IEC and other applicable international and national standards and best practices).
- Review foundation works, cable routes, buildings, fire-fighting systems, and other related infrastructure construction, ensuring adherence to the conceptual design layouts, geotechnical recommendations, drainage requirements, and site constraints.
- Verify compliance with all grid code requirements specifically applicable to BESS, including fault ride-through capabilities, reactive power and voltage control, frequency response, oscillation damping, and flicker and harmonics analysis, as defined for the safe and reliable deployment of BESS.
- Review and, where necessary, request or confirm system studies (for example load flow, short-circuit, dynamic simulations, protection coordination, and

electromagnetic compatibility) to ensure that the BESS connection and operation do not adversely affect grid performance.
- Review and approve the EPC Contractor's quality assurance and quality control plans, inspection and test plans (ITPs), and factory and site test procedures, and verify their implementation.
- Conduct or witness selected factory inspections and Factory Acceptance Tests (FAT) for critical equipment (such as batteries, PCS, transformers, and control systems) and issue recommendations or approvals as per the contract.

Task 13. Construction Supervision and Environmental and Social Compliance

- Establish and maintain an OE site supervision team proportionate to the project size and risk profile, to provide regular and effective supervision of civil, mechanical, electrical, control, and communication works.
- Conduct rigorous, systematic site supervision of civil, mechanical, and electrical works carried out by the EPC Contractor, verifying that materials, workmanship, and construction methods comply with approved designs, technical specifications, and quality standards.
- Review and approve the Contractor's health, safety and security plans, method statements, and job safety analyses, and monitor their implementation, including the use of appropriate personal protective equipment and adherence to safe work practices.
- Monitor and enforce compliance with all Environmental and Social requirements outlined in the final Environmental and Social Impact Assessment (ESIA) Report, Environmental and Social Management Plan (ESMP), and local regulatory approvals, including management of environmental risks like chemical spillage and electrochemical fire hazards, noise, dust, and waste. Ensure full compliance with the WB ESF requirements.
- Ensure adherence to all local permitting requirements, including construction permits, environmental permits, and fire safety requirements by local authorities and insurers.
- Oversee the implementation of the Stakeholder Engagement Plan of the ESIA and support the Client in addressing any social or resettlement needs arising during execution, in coordination with relevant authorities.
- Verify the Contractor's environmental and social performance through regular inspections, review of monitoring data and incident reports, and recommend corrective actions as needed.
- Review and certify quantities, work progress, and quality to support the approval of interim payment certificates, variation orders, and any extensions of time.

Task 14. Testing, Commissioning, and Handover

- Review and approve the Contractor's testing and commissioning plans, including procedures, acceptance criteria, and responsibilities for FAT, pre-commissioning, commissioning, performance tests, and Site Acceptance Tests (SAT).
- Witness and confirm the results of Factory Acceptance Testing (FAT), commissioning tests and Site Acceptance Tests (SAT), and any required reliability

or trial operation periods, and prepare associated test reports and recommendations.

- Verify that the installed system meets the expected performance standards and is capable of delivering the contracted services and complying with grid code requirements and performance guarantees.
- Validate all performance measurement methodologies, metering arrangements, and calculations for penalties related to deficiency in asset performance, as detailed in the EPC agreement and O&M agreements.
- Prepare punch list, review and approve as-built documentation, including drawings, datasheets, protection settings, communication configurations, and software versions, to ensure that they accurately reflect the installed system.
- Review and verify O&M manuals, emergency procedures (including fire detection and suppression, isolation, and ventilation), and spare parts lists prepared by the EPC/O&M Contractor, and advise the Client on their adequacy.
- Supervise the final handover of the asset, ensuring all documentation, including SCADA/EMS integration requirements, cybersecurity provisions, licenses, source files, and passwords, are fully met and properly transferred to the Client.
- Facilitate knowledge transfer and capacity building activities for the Client's counterpart personnel on BESS operation and maintenance, including training sessions, on-the-job coaching during commissioning, and the provision of training materials as defined in the project plan.
- Support the Client in issuing the Taking-Over Certificate / Provisional Acceptance Certificate and in defining the start and duration of the defects liability period in accordance with the contract.

Task 15. Support during the Initial O&M and Defects Liability Period

- Monitor the technical and commercial performance of the BESS during the defects liability and initial O&M period, including availability, response time, energy throughput, round-trip efficiency, and degradation against warranted values.
- Review and comment on the O&M Contractor's maintenance plans, activity reports, outage plans, and spare parts management, and advise the Client on any required improvements to ensure safe and reliable operation.
- Assist the Client in identifying, documenting, and following up on defects, under-performance, or recurrent alarms, and in ensuring timely rectification by the Contractor in line with contractual obligations and warranties.
- Support the Client in the assessment and resolution of warranty claims, performance liquidated damages, and any disputes related to BESS performance or degradation.
- Provide technical advice to the Client on optimization of operating strategies and use cases of the BESS, within the constraints of the design and warranties.
- Participate in periodic performance review meetings with the Client and the O&M Contractor, and prepare a final technical report at the end of the defects liability and initial O&M support period, summarizing performance, issues encountered, corrective actions taken, and recommendations for long-term operation.

3.3. Team Composition & Qualification Requirements for Key Experts

The Consultant shall be fully responsible for the performance of the assignment and shall ensure knowledge transfer to the Project Implementation Unit. The team will need to have an extensive overall experience with the energy sector authorities in sub-Saharan Africa, and experience in grid integration and planning as well as a local team will be particularly valuable. The key staff shall be able to communicate (orally and in writing) effectively in English.

The Consultant is expected to propose staff for at least the following key positions:

- **Project Manager**: Master's degree in engineering (energy), economics, policy, or project management. At least 15 years of professional experience in the electricity sector, with 7 years as a project team leader. Good command of English and excellent report writing skills. Responsible for overall project success.
- **Battery Energy Storage Systems Specialist**: Master's degree in electrical Engineer/Renewable Energy. At least 10 years of professional experience in the electricity sector, with 5 years in design and deployment of utility-scale BESS. Experience in undertaking BESS feasibility studies and implementing BESS projects. Implementation shall be demonstrated for at least two BESS projects larger than 20 MWh using lithium-ion technology. Relevant implementation experience may include serving as Owner's Engineer (as BESS specialist) or working as part of an EPC contractor or BESS integrator. A signed reference letter from each project customer shall be provided, with evidence of successful project completion.
- **Electrical Engineer:** Master's degree in a related engineering specialization. Minimum of 10 years of experience in the energy sector, with strong command of storage technologies and standards. Proven experience in grid stability analysis and renewable integration planning.
- **Civil Engineer:** Master's degree in civil engineering from a recognized university. Minimum of 10 years of overall professional experience, including at least 5 years in the design of generation or storage projects of comparable nature, size and complexity. Experience in at least 2 similar projects. Experience in similar assignments in Sub Saharan countries is considered an advantage.
- **Electrical Site Engineers:** Bachelor's degree in electrical engineering. Minimum of 10 years of experience in installation, testing and commissioning supervision of electrical distribution systems and substations. Responsible for daily oversight of contractor activities related to installation, testing and commissioning of the BESS, ensuring accuracy, timing, proper methodology and quality control. Must have completed at least 2 turnkey projects involving similar supervision responsibilities and must demonstrate installation and commissioning experience in similar facilities. The engineer must reside full time in Rwanda at the project site throughout the construction and commissioning period.

- **Environmental and Social Specialist:** Master's degree in natural sciences. Minimum of 8 years of relevant experience in environmental assessment of infrastructure and energy projects. Strong command of international standards, including World Bank safeguard policies. A social specialist must be made available if any proposed sites involve private, community or informally used government land.

- **Contract Management Specialist:** Master's degree in economics, business or finance. Minimum of 5 years of experience in contract management in international projects. Provides guidance and support to ensure contract compliance and assists the client in monitoring financial progress with fairness and transparency.

3.4. Reporting Requirements and Time Schedule for Deliverables

The Consultant will provide all necessary expertise and services to enable the task to be completed within 18 months from the date of contract signing + 24months of defect liability period.

Deliverables and Timeline (from Phase 2 contract confirmation):

The table below summarizes expected deliverables from the consultant

Implementation Stage	**Deliverables**
Design Review and Team Mobilization	• Design Review Reports • E&S Review report • Grid Code Gap Note
Procurement and FATs	• Procurement Review Report • Factory Acceptance Tests Reports • Equipment and Materials Approval Notes • Manufacturing and Delivery Monitoring Report
Construction Supervision	• Monthly Progress Report • Quality Assurance/Quality Control (QA/QC) Reports • Health, Safety and Environment (HSE) Compliance Reports • Environmental and Social Management Plan (ESMP) Monitoring Reports • **T**echnical Query Log (TQ Log) and Responses • Non-Conformance Register
Testing, Commissioning and Grid Integration	• Commissioning Procedures Review Report • Site Acceptance Test (SAT) Reports • Performance Test Reports • **Grid Integration Test Report** (Frequency response, voltage control, active/reactive power performance, protection and control validation)

	• Recommendation for Provisional Acceptance Certificate (PAC)
Close-Out & Handover	• Final Completion Report • Review of As-Built Documentation • Operation and Maintenance (O&M) Readiness Assessment • Training Completion Report • Recommendation for Final Acceptance Certificate (FAC)

The consultant will be responsible for leading weekly/monthly meetings and take relevant meetings minutes.

Client's Input and Counterpart Personnel

REG will oversee the study and appoint its project manager and Project Implementation Team to work with the consultant. [REG] shall provide all key available information, *Preliminary Assessment of Solar PV with Battery Storage in Rwanda*, master plans, and relevant studies, and facilitate the Consultant's access to documents and information necessary for the study. The Consultant shall cover the costs of fee-based data.

3.5. Improvements on Terms of Reference

During the preparation of technical proposals, The Consultants firms may offer suggestions and improvements on the Terms of Reference which would result in better implementation of the study.

3.6. Payment Schedule

The payment schedule will be defined in the RFP in the draft contract; This phase will be covered by a time-based contract.

4. QUALIFICATION OF THE FIRM

The interested consultant firm should meet the following requirements:

- General experience in conducting feasibility studies and supervising BESS projects during the past ten (10) years.
- Specific experience in feasibility studies, procurement management, and supervision of BESS projects, with participation in at least two (2) similar projects each with at least a minimum contract value of USD 20 million