



Rural and Renewable Energy Agency

Securing modern energy access for all Liberians



REQUEST FOR EXPRESSIONS OF INTEREST

Operation, Maintenance and Customer Management of Lofa County Hybrid Mini Grid

Reference No: RREA/LIRENAP/O&M-01

Issue Date: February 19, 2025

Closing Date: March 10, 2025

A. Background

The Government of Liberia has received financing from the World Bank toward the cost of the Liberia Renewable Energy Access Project (LIRENAP). The project is being implemented by the Rural and Renewable Energy Agency of Liberia (RREA), an autonomous agency of the Government of Liberia with mandate to secure modern energy access for all in Liberia. For details on the RREA, please check <https://rrealiberia.org/new/>.

A component of LIRENAP appertains to decentralized electrification in Lofa County, Liberia, which mainly involves the construction of the Solar Power Plant mini-grid with the following characteristics: (i) 5.0 MW solar PV plant with a 7.0 MWh lithium-ion battery energy storage system (BESS), (ii) a 1.8 MW back-up diesel power plant; (iii) 135 km of 33 kV distribution lines; (iv) 235 km of low voltage distribution lines; (v) at least 10,317 service connections to provide access to electricity for about 50,000 people, including small businesses, associations, and public institutions in Lofa County, Republic of Liberia.

B. Objective(s) of the Assignment

The overall objective of this assignment is to operate and maintain the Lofa County hybrid mini-grid and its infrastructure for a period of 10 years with possible extension of up to 20 years, ensuring high-quality service with a minimum of 16 hours/day of operation for the first 18 months and 24 hours/day thereafter, maintaining an average service availability index (ASAI) of over 95%. At the end of the contract, the firm will transfer assets back to RREA. Additional duties include paying government fees through an affermarge arrangement, managing repairs and replacements, and fulfilling obligations outlined in Liberia's utility regulations and mini-grid codes.

C. Description of General Requirements

The private firm's responsibilities will include but not be limited to the following:

- Obtain required operation licenses from Liberia Electricity Regulatory Commission pursuant to the Electricity Mini-grid Code of Liberia (access here: [Liberia Electricity Regulatory Commission | LERC](#))
- Safeguard the T&D network and diesel power plant until commissioning of the Solar PV +BESS after which commercial operation starts
- Operate and maintain the mini-grid and its associated infrastructure
- Carry out repairs, major rehabilitations, replacement of parts for all assets in line with an approved business plan
- Carry out studies to justify the necessity of expansion, renewal and extension of generation and distribution assets,
- Commercially operate the mini-grid including the exclusive right to charge, collect revenues from customers and cover the cost for major rehabilitations and replacement of assets in line with an approved business plan,
- Develop and implement an Operational Environmental and Social Management Plan (O-ESMP) to ensure compliance with environmental, health, safety, and social safeguard measures throughout the operation and maintenance of the mini-grid as the World Bank Standard.
- Pay to relevant government institutions required fees, levies, and taxes as per law,
- Mobilize financing (equity or debts) for working capital,
- Transfer all mini grid assets back to RREA at the end of the O&M period.

D. Submission of Expressions of Interest

The RREA now invites qualified firms ("Operator") to indicate their interest in providing the Services. Interested Firms should provide information and documentary evidence to demonstrate that they have the required qualifications and relevant experience to perform the Services. The shortlisting requirements are:

1. Core line of business and years in business:

- The firm shall be registered/ incorporated as a firm with core business in the field of the assignment.

2. Qualification and Experience of the Firm:

- Firm shall have a minimum of 10 years of operational and maintenance experience as either the sole operator or a primary consortium partner for at least three hybrid mini-grids. These mini-grids should include solar systems, with a total capacity of at least 2.0 MW, and/or serving a minimum of 6,000 active clients.

- Proven ability to operate and maintain hybrid systems that combine solar, battery, and diesel technologies. The firm should demonstrate experience of working within Sub-Saharan Africa, in particular in rural areas, A demonstration of the successful completion of at least two similar assignments in the region will be an added advantage

3. Technical and managerial capability of the firm:

- Operational and Technical Proficiency:
 - i. Extensive experience in Power Quality and Load Management for mini-grids.
 - ii. Demonstrate proficiency in providing O&M services, including predictive maintenance, customer service, and connection expansion for mini-grid systems, ensuring client satisfaction and efficient system utilization
- Demonstrate ability to address and manage power theft and commercial losses effectively, minimizing losses and ensuring sustainability
- Demonstrate ability to expand household connections through innovative approaches
- Demonstrate experience in leveraging finance for replication or expansion of the renewable energy mini grids

4. Institutional and Managerial Strength:

- The firm should demonstrate that they have a reputation for excellence, supported by a strong institutional capacity, technical expertise, and a robust managerial framework.
- Evidence of a high-quality management system, supported by a team of competent technical staff.

5. Financial Capability:

- Demonstrate financial capacity to manage the projected expenditures prior to collection of adequate revenues (estimated to be at least **US\$ 1 million**).
- Experience in investing in mini grids in developing countries, particularly in contexts where financial and technical challenges are prevalent.

6. Environmental and Social Requirements:

- Interested firms must demonstrate their experience in integrating environmental and social sustainability into mini-grid operations by providing for each of their reference projects information on:
 - i. Compliance with environmental, social and safety regulations;
 - ii. Engagement with stakeholders, mitigation of social impact, design and implementation of community benefit programs and handling of complaints;
 - iii. Organization of waste management, in particular of lithium-ion and diesel residues
 - iv. Management of occupational health and safety;
 - v. Gender and social inclusion; and
 - vi. Integration of climate resilient measures in mini grid operation.

E. To demonstrate their qualifications and experience in meeting the above shortlisting/selection criteria, Consultants are requested to submit, as a minimum, the supporting documentation and meet requirements listed below.

1. A company profile (or link to website), including core areas of business.
2. Company information: name, status, address, telephone number, facsimile number, year of establishment, contact person for the Project) number of permanent staff and partners, fields of expertise.
3. Evidence of how the applicant meets the criteria in section C above including provision of details of most relevant projects undertaken for the specified years, including value of previous services, location, number of staff involved in the contract, name of the Client, name of partners for contract execution and share of services, contract commencement and completion dates, a brief description of the contract.
4. Audited financial statements for the past 3 years.
5. A firm can only use its own qualifications and experience and not of its parent, sister, or subsidiary companies or its employees. The firm's incorporation/trade/registration documents are issued by the concerned government authority of the country of the firm.
6. The firm must not exceed 7 MB in submitting to expression of interests

RREA reserves the right to request the firm for verification of any submitted document/information.

Key Experts will not be evaluated at the shortlisting stage.

F. Invitation

The RREA now invites eligible Firms with required technical and financial capacities to indicate their interest in providing the Services. Interested Firms must provide information indicating that

An Operator will be selected using the Quality and Cost-Based Selection (QCBS) method based on the World Bank' Procurement Regulations, September 2023.

Further information and the detailed Terms of Reference (TOR) for the assignment can be obtained electronically at the following email addresses and Website, from Mondays to Fridays, from 0900 to 1600 hours GMT:

Email:

info@rrealiberia.org, augustinem@rrealiberia.org, samueln@rrealiberia.org, dehkonteew@rrealiberia.org, tenniej@rrealiberia.org Website: www.rrealiberia.org

Expression of Interest clearly marked **Services for the Operation, Maintenance and Customer Management of Lofa County Hybrid Mini Grid**, must be delivered in a written form (in electronic/mail copy) to the address below, on or before **4:00 p.m.** Local Time, on **March 10, 2025**.

Attn: Samuel Bocay Nagbe Jr.

Executive Director

Rural and Renewable Energy Agency

LEC Sub-station, Newport Street

1000 Monrovia 10, Liberia

Email: samuelnrrealiberia.org

Electronic submission should also be copied to the following addresses:

info@rrealiberia.org; stephenp@rrealiberia.org;
augustinem@rrealiberia.org, tenniej@rrealiberia.org, dehkonteew@rrealiberia.org

Only shortlisted firm will be issued the Request for Proposals.

Terms of Reference

1. Background

Country context

Liberia is a low-income country with a population of approximately 4.4 million and a Gross Domestic Product (GDP) estimated at US\$2 billion in 2014. Liberia has made substantial progress in recovering from the 15-year civil war. Between 2009 and 2013, the economy grew steadily at an average rate of 7.3 per cent per year. This performance showed the country's potential for sustainable economic growth and development.

Liberia still faces many challenges in laying the foundation to transition from post-conflict recovery to long-term development. The economy remains vulnerable to external shocks given its dependence on primary commodities, imported foods and fuel, its limited diversification, and the volatility of commodity prices. Inequality remains high and is exacerbated by the dearth of infrastructure and social services nationwide and by the asymmetry of the reconstruction efforts, mainly focused on Monrovia where a quarter of the population lives.

The Government's economic and social development programs aim to benefit both urban and rural populations, reducing disparities in services. About 58 percent of Liberia's population lives outside of Monrovia and its main economic corridors, in small towns and rural areas. The majority of households in the towns are engaged in agriculture and trade with Monrovia and other locations, related services (such as machinery supply and repair, carpentry, metal-working, etc.) and local commercial activities. Households in surrounding rural areas are mainly subsistence farmers and/or petty traders, with little or no cash income. The lack of basic infrastructure services such as electricity and transport impose a significant constraint on local economies and hinders the development of income-generating activities. Women are still amongst the poorest in rural communities.

Sector and Institutional context

Improved electricity services are urgently needed to support the country's economic transformation and to improve the lives of the population. The electrification rate of Liberia in 2020 reached 27.5 percent and the rural electrification rate was 8.4 percent. Liberia also has one of the highest electricity tariffs in the region at US\$0.26/kWh (2023). Expanding access to reliable and affordable electricity supply is a high priority of Liberia's Pro-Poor Agenda for Prosperity and Development 2018-2023. The agenda includes a US\$3.3 billion infrastructure investment program to overcome the constraints imposed by the lack of access to basic services.

LEC's customer base has increased from 2,469 customers in July 2010 to 30,485 customers in January 2015 and to 180,000 active customers in 2023. After the end of the Liberian civil war, the Liberia Electricity Corporation (LEC) resumed operations in 2010, focusing initially on re-establishing service in Monrovia. Donors, including the World Bank, financed a number of electricity sector investments including the installation of 22.6 MW of diesel-based generation plants, and the reconstruction of a basic distribution network and connections for low-income customers.

The GoL, with the support of donors, has started to develop electricity and lighting services in rural areas and small towns. In 2010, GoL established the Rural and Renewable Energy Agency (RREA) to promote electrification and the use of renewable energy in such areas.

RREA aims to facilitate the economic transformation of towns and rural areas by accelerating the commercial deployment of modern and renewable energy services. RREA's primary function is the planning, development, and promotion of projects together with public, private, and community developers.

Current project

The Government of Liberia (GoL) and the World Bank (WB) are currently implementing in partnership the Liberia Renewable Energy Access Project (LIRENAP) which aims at increasing access to electricity and fostering the use of renewable energy sources in the country. The most significant project financed through LIRENAP is the Lofa County mini grid, which once completed will provide electricity service to approximately 10,000 households in the towns of Voinjama, Foya, Kolahun, Massambolahun, Bolahun and surrounding areas in Lofa County.

The project is ongoing under the oversight of the Rural and Renewable Energy Agency (RREA) and comprises of a 5.0 MW solar plant to provide power supply for a 33 kV distribution network serving the five principal population centers in the Lofa County mini-grid system. Power supply also includes a 7.0 MWh lithium-ion battery energy storage system (BESS) and three 600 kW diesel generators comprising a 1.8 MW diesel power plant in Voinjama, to provide supplementary power during the rainy season when solar irradiation diminishes. As of October 2024, the distribution system is nearing completion, and the diesel power plant will be completed in April 2025.

RREA projects that the Lofa County mini grid could be ready for commercial operations by May 2025, with the diesel power station ready to deliver electricity service to the distribution network while the solar-battery power plant is under construction.

Accordingly, RREA intends to contract a private firm, with the required technical and financial capacities, through a competitive process to operate and maintain the Lofa County Hybrid Mini-

Grid infrastructure for a period of ten (10) years, with the option to extend for an additional ten (10) years.

2. Objective(s) of the Assignment

The objectives of the successful Firm will be:

- Operate and maintain the Lofa County hybrid mini-grid and its associated infrastructure for a period of ten (10) years with the possibility of extending it for an additional ten (10) years, according to the quality of service standards set forth in the Electricity Mini-Grid Code of Liberia, namely: at least 16 hours/day of operation during the first 18 months and 24 hours/day thereafter with a availability percentage target as described in *Schedule 3 Facility Monitoring*.
- Obtain required operation licenses from Liberia Electricity Regulatory Commission (LERC) pursuant to the Electricity Mini-grid Code of Liberia.
- Prepare annual operation and maintenance (O&M) plan for each fiscal year (the first-year plan covering the time from signing the lease agreement to the end of the fiscal year).
- Obtain approval of the Lofa County mini-grid tariffs from LERC.
- Jointly with RREA, carry out the Works Inspection of the mini-grid infrastructure, once completed, and provide comments to RREA Owner Engineer (OE) to inform the Facility Report and issuance of the Substantial Completion Certificate.
- Jointly with RREA, inspect contracted works by the distribution and generation construction contractors to determine Final Completion and enable the Owner Engineer to issue the Final Completion Certificate.
- Sign an Affermage contract with the RREA for a period of ten (10) years with the possibility of extension. In an affermage arrangement the Operator retains its fee from collections and pays a “lease fee” to the Government, provided there is a surplus after covering all costs.
- Arrange for Annual Financial Audit and share each audit report with RREA.
- Conduct repairs, major rehabilitations, replacement of parts for all assets in line with an approved business plan and prudent utility practice.
- Conduct technical and economic studies to justify the necessity of expansion, renewal and extension of generation and distribution assets, publishing near-term and long-range work plans and technical studies for review by RREA.

- Expand the distribution network by connecting additional customers based on power availability, at the Firm's own cost to be recovered by tariff revenues in the affermage contract.
- Expand electricity generation capacity to the extent necessary to maintain quality of service standards and to mitigate supply constraints arising from equipment degradation, customer growth, load growth, end of equipment lifecycle, planned/unplanned maintenance activities, and other operational scenarios that may arise.
- Commercially operate the mini grid including the exclusive right to charge, collect revenues from customers and cover the cost for major rehabilitations and replacement of assets in line with an approved business plan. Commercial operations will require and rely upon a highly functioning customer information system and prepaid (pay-as-you-go) smart metering infrastructure.
- Pay to relevant government institutions required fees, levies, and taxes as per law.
- Mobilize financing for sufficient working capital.
- Maintain a sufficient, competent, and motivated workforce in compliance with all relevant labor laws as well as proactive policies towards worker safety, gender equity, and social inclusion.
- Conduct, jointly with RREA, Facility Inspection and agree on schedule of works to be carried out before transferring the assets back to RREA at the end of the 10-year term.
- Transfer all mini grid assets back to RREA at the end of the O&M period.
- Perform any other responsibility as stipulated in the Liberia Micro Utility Licensing Regulations, 2020 and Liberia Electricity Mini Grid Code, 2022.

3. Scope of Services, Tasks (Components) and Expected Deliverables

3.1 Operation and Maintenance of a 5.0 MW Solar Plant

- The Firm will oversee the operation, troubleshooting, and maintenance of a 5.0 MW solar plant with 7.0 MWh BESS including all its components: PV modules, battery energy storage system, inverters, step-up transformers, monitoring systems, control software, MV and LV switchgear, lightning protection systems, control building, civil works, and more. The ultimate size of the solar and battery system may be updated during the ongoing design of the plant, in which case the Firm shall be notified of any modification.

- The Firm will participate in the pre-commissioning (for completion certification) and commissioning (for operational acceptance) of the facilities, which will be conducted by the construction contractor.
- The EPC contractor shall finance the costs appertaining to the pre-commissioning and commissioning activities from secured working capital, to be recovered from revenues during the commercial operation of the mini-grid.
- The Firm shall conduct regular monitoring of the solar plant's performance using software and weather sensors including pyranometers, anemometers, and thermometers, to track energy production under varying solar irradiance conditions, wind conditions, and ambient temperatures and detect anomalies. Routine inspections of solar panels, inverters, batteries, racking, conductors, and other equipment will be carried out to identify any damage that may affect energy production.
- The Firm shall maintain detailed records of maintenance activities, inspections, and repairs to track the plant's performance and maintenance history. Additionally, the Firm will keep logbooks of operational parameters such as energy production, weather conditions, system's performance, faults and issues.
- The Firm shall maintain a regular solar panel cleaning schedule, using only equipment and methods that will not result in damage to solar energy equipment.
- The Firm shall maintain a functional and active fire alarm and fire suppression system in the BESS infrastructure to protect worker safety and environmental hazards.
- The Firm shall maintain a proactive waste management and e-waste reduction strategy to minimize disposal of waste in environmentally sensitive areas or in proximity to population centers or wildlife.
- The Firm shall monitor equipment degradation, corrosion, leaks, and damage over time to keep all aspects of the solar and battery system as well as the balance of plant in normal, safe, working order throughout the operational period.

- The Firm will prepare annual operation and maintenance plans and submit them to RREA for approval. The Firm shall monitor the state of health of all major equipment and recommend replacement schedules in the O&M plans.

3.2 Operation and Maintenance of a 1.8 MW Diesel Plant

- The Firm will operate, troubleshoot, and maintain a 1.8 MW diesel plant. The operator will participate in the pre-commissioning (for completion certification) and commissioning (for operational acceptance) of the facilities, which will be conducted by the construction contractor. The plant will consist of an array of three 750 PRP/825 ESP diesel gensets, which must be operated according to specifications. The average load factor should not exceed 70% of the engine's prime power rating during any 24-hour period. Additionally, an overload capability of 10% will be limited to 1 hour within every 12-hour period. If the solar plant is not completed by the given in-service date, the employer may subsidize the operation of the diesel plant by providing diesel fuel in-kind, subject to its contractual arrangement with the Firm. Whether operating on diesel alone or in conjunction with solar, the peak load must be managed effectively with planned operational reserves.
- The Firm will apply appropriate start and stop procedures to prolong generators' lifespan. Routine maintenance (daily and weekly) will include inspecting fuel levels, oil levels, coolant levels and checking for any leaks or unusual noises. In case of faults, the Operator is responsible for identifying and troubleshooting issues such as engine misfires, overheating or low oil pressure.
- The Firm will perform any necessary repairs to minimize downtime and prevent further damage. The Firm will not permit unauthorized technicians to operate or repair the plant.
- During plant operation, the Operator must comply with Health and Safety standards and regulations, following safety protocols to protect personnel and equipment.
- The Firm shall maintain a proactive waste management and leak containment strategy to minimize exposure or disposal of petrochemical waste in

environmentally sensitive areas or in proximity to population centers or wildlife.

- The Firm shall monitor equipment degradation, corrosion, leaks, and damage over time to keep all aspects of the diesel system as well as the balance of plant in normal, safe, working order throughout the operational period.
- The Operator will prepare annual operation and maintenance plans and submit them to RREA for approval. The Firm shall monitor the state of health of all major equipment and recommend replacement schedules in the O&M plans.

3.3 Distribution system operation and maintenance

The Lofa County hybrid mini grid is composed of 135 km of 33 kV distribution lines and 235 km of low voltage distribution lines. The operator will be responsible for:

- 1) Conduct routine inspections of the system, including the MV and LV line, and act upon any issues requiring major maintenance.
- 2) Conduct day-to-day maintenance work. If shutdown is required, the operator shall prepare a schedule of planned outages.
- 3) Conduct routine vegetation management and brush clearing under LV lines and MV lines.
- 4) Conduct operations on the MV and LV networks as required.
- 5) Maintain a minimum level of rolling stock of transformers and other necessary material.
- 6) Take custody of the mandatory spare parts received from the Employer and replenish spare parts reserves over time in accordance with prudent utility practice.
- 7) Replace faulty meters as per all the applicable laws, regulations, guidelines, and other Standards of Performance notified by the Regulator.

8) Conduct monthly reading of all network feeder meters and customer postpaid meters and monitor energy sold via customer prepaid meters. Detect anomalies and minimize losses in metering, billing, and collections.

9) Maintain the existing frontline distribution network/ systems/IT assets and systems as per Prudent Practices and the standards prescribed by the Regulator.

3.4 Commercial Operation and billing

The responsibility of the operator related to the commercial operation of the mini grid will be to:

1) Manage an initial meter population of 10,317 meters (initially 10,000 single-phase & 317 three-phase) and maintain a minimum level of additional meters available for future replacements with oversight support from RREA. The construction contractor's scope extends to meter connections and service drops, whereas customers are responsible for their own in-house wiring and electrical installation on their property and premises. Houses will only be connected by the Contractor when house wiring, done by a qualified electrician, is completed, done correctly, and deemed to be safe. In the case the households are unsuitable for in-house wiring, such as houses with only one or two rooms, ready boards (5 Amp or 10 Amp) will be installed and connected to meters by the construction contractor. Customer connection contracts would be designed in line with LERC customer care and quality of service regulations. The employer will furnish the list of customers, their details, and the connection plan to the selected Operator.

2) Supply and implement a hosted prepayment (or pay-as-you-go) vending system to enable management of the customer database by the operator. The system will include the master station for the use of the operator for database access, and the Credit Dispensing Units (CDU) to use with pre-payment meters, with Standard Transfer Specification (STS) compatibility. The Operator is free to include in its business plan a proposal to implement an Advanced Metering Infrastructure (AMI) to enhance the metering system's capabilities for real-time monitoring of power consumption, peak demand, voltages, tampering alerts, and others.

3) Conduct physical inspections of the meters to ensure that there has been no tampering of meters.

4) Energy accounting and audit meters shall be tested whenever the accuracy is suspected or whenever the energy and other quantities recorded by the meter are abnormal or inconsistent with readings of electrically adjacent meters. Testing of consumer meters shall be done whenever

consumption patterns change from similar months or seasons of the previous years or when there is consumer's complaint pertaining to a meter.

5) Optimize the services provided to the Lofa County Hybrid mini grid customers using demand side management and other measures, in compliance with LERC regulations and prudent utility practice.

6) Collect payments from customers through an automated, prepaid (or pay-as-you-go) transaction management system. Maintain, upload and manage customer and system information regularly to the hosted vending system. Promote the use of mobile money and cashless transactions for most payments, rather than using cash.

7) For those customers who cannot or choose not to pay with mobile money, perform customer assessment to determine the best locations to set up vending/payment locations. Establish and operate these payment locations and/or authorized vendors of prepaid electricity tokens, including receipt and management of cash received, supply of internet access, and other equipment as needed. It is expected that the operator will consider these minimal costs, such as laptop, printer, and communications equipment, in their proposal.

8) Initiate necessary action when needed, in accordance with the procedure for anti-theft, remote disconnection, and control of commercial losses as defined in the Act and applicable LERC Regulations and Directives.

9) Obtain approval of the Lofa County hybrid mini-grid tariffs from LERC. Tariffs collected should enable the operation of the Lofa County Hybrid mini grid for ten (10) years. This includes covering operation and maintenance, operator fee, repairs and replacements, and extension of the distribution network.

10) Verify the accuracy and precision of metered data and furnish the same to various agencies as prescribed by the Regulator.

3.5 Customer Services

Addressing customer complaints is crucial for establishing strong client relationships. To achieve this, the Firm will enter into fair and uniform customer connection agreements with all customers in the Lofa County hybrid mini grid. During operations, the Firm will:

- 1) Address all complaints and queries as it relates to the system under management and its customers utilizing a customer management system implemented by the Firm. The Firm shall provide a walk-in center to address issues. The Firm will address customers' complaints and provide reports to RREA and LERC regarding the resolution of these complaints.
- 2) Make available, on demand, a copy of the complaint handling procedure, revised from time to time, for inspection by the public at each of the relevant premises during normal working hours; and
- 3) Provide free of charge a copy of the procedure revised from time to time to each new Consumer, and to any other person who requests it at a price not exceeding the cost of duplicating it.

3.6 *New Connections*

The Firm shall endeavor to extend electricity service as many customers as possible by increasing the number of connections during the operational period, subject to economical and technical constraints. The Firm will perform a connectivity assessment of the area to determine any system needs or requirements and will design a strategy to achieve the maximum connections including how to obtain the necessary funds. To comply with this, the Firm will:

- 1) Connect additional customers close to the existing network to offer grid densification, provided technical and economic conditions allow. The Firm will be responsible for connecting additional customers above the initial 10,317 connections as per the business plan that will be submitted together with the future proposal.
- 2) Expand the distribution network if financially justified within the tariffs approved by LERC. Grid expansion activities will be at the discretion of the Firm and at its own expense.
- 3) Secure external funding for network expansion, including grants, results-based financing (RBF), subsidies, or other incentives from public or private funders and donors. The plans to extend the distribution network shall be included in the Annual Plans and report on progress in the Quarterly Reports.

3.7 *Repair Fund*

The Firm will create a dedicated bank account for establishing a repair fund to extend the lifetime of the assets to 20 years and replace any assets with operational lifecycles of less than 20 years. Both a representative of the Firm and a representative of RREA should be a signatory to the repair fund account so that these funds can only be used with the approval of both the Firm and RREA. The Firm shall monthly pay the agreed amount into the repair fund account to make sufficient resources available when needed. In the Annual Operation and Maintenance Plans, the Firm shall project the utilization of the repair fund.

3.8 *Tariff*

Tariffs collected should enable the operation of the Lofa County Hybrid mini grid for ten (10) years. This includes covering operation and maintenance, operator fee, repairs and replacements, and additional customer connection costs. To enable additional connections to the distribution network, there should be sufficient capacity to cover peak demand and resources to invest in expanding the distribution network and generation facilities. The Firm should expand the distribution network if financially justified without making tariffs unaffordable. The Firm may also try to secure grant funding for network expansion. The plans to extend the distribution network shall be included in the Annual Plans and report on progress in the Quarterly Reports.

The Firm is financially responsible for the addition of electricity generation capacity. Solar irradiation may be limited during the rainy season or other atmospheric conditions, making the mini-grid reliant on diesel electricity and subject to diesel price fluctuation or escalation. Even though it will not be an impediment in the initial years of operation, as new customers are added to the mini grid, it will be necessary to expand the PV Plant, BESS, and diesel plant. The justification for such expansion will depend on the cost, cost of capital and the ability to access financing. It may, however, be possible to obtain external financial support or subsidy for renewable energy expansion. The Firm shall, from time to time, evaluate the situation and make long-term capacity extension expansion plans and identify options to implement these plans.

The Firm is required to provide financing for working capital to cover initial cash flow shortfalls. The amount of financing required is not estimated to exceed US\$1.0 million but depends on the operation and maintenance plan of the Firm. The initial financing shall be recovered within 2 years after the start of operation of the Lofa County mini grid.

4. Team Composition & Qualification Requirements for the Key Experts

The firm is responsible for hiring professional and qualified staff to fulfill the responsibilities of various business functions. Key management positions require a minimum of a bachelor's degree in business administration or an equivalent qualification. It is recommended that Electrical Engineers be recruited to oversee top O&M positions. Additionally, the firm should employ qualified technical staff with experience in grid maintenance, meter reading, and billing. The firm is also responsible for proposing a training plan for its employees, which should be updated at least annually. The total headcount of employees hired and retained by the firm will be subject to the firm's discretion. An organizational chart listing Key Experts and envisioned non-key expert personnel shall be provided in the proposal and maintained in the quarterly and annual reports during the operational period.

The following are the requirements for the named Key Experts:

a) Position K-1: Operations Director:

The Operations Director shall have a master's degree in electrical engineering, Business Administration, or a related field and at least 10 years of experience in operations or asset management of power systems. At least 5 years of experience should be in electric utility or renewable energy projects.

b) Position K-2: Commercial Director:

The Commercial Director shall have a master's degree in business administration, or a related field, and at least 7 years of experience in commercial project management or customer service management. At least 5 years of experience should be in the electric or water utility industry.

c) Position K-3: Administrative Manager:

The Administrative Manager shall have a bachelor's degree in Business Administration, or a related field and at least 7 years of experience in operations, logistics, or administrative management of power systems or utility companies.

5. Reporting Requirements and Time Schedule for Deliverables

The Firm is required to prepare and submit several reports to the RREA as specified in the Affermage Contract. These reports must detail the execution of the operation and maintenance annual plans as outlined in the Business Plan. In addition, LERC may request further reports. For example, the Firm will be required to present LERC with a monthly update on the following indicators:

- Number of consumers served by tariff category in the period
- Electricity sales by tariff category in the period (kWh)
- Net electricity generation by power plant(s) in the period (kWh)
- Resulting renewable fraction for the period and 12-month rolling average (%)
- Total ATC electricity losses in the period, and 12-month rolling average (%)
- Solar plant availability in the period and 12-month rolling average (%)
- Diesel plant availability in the period and 12-month rolling average (%)
- Energy efficiency of the diesel power plant for the period, and 12-month rolling average (kWh/liter)
- Total revenue collected by tariff category in the period (LRD)
- Total expenditures in the period (USD) broken down by staff costs, fuel expenses, non-fuel power plant O&M, distribution network O&M, customer costs, administrative and support expenses, depreciation and financial expenses, grid densification or expansion (CAPEX) expenses.
- Average number of hours of electricity service per day in the period (Hrs.)
- Total average service availability index (ASAI) for the period (%)
- Average response time to a new service request (days)
- Average response time to a customer claim or inquiry (days)
- Average new connection time (days)