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# USAID'S LIBERIA ENERGY SECTOR SUPPORT PROGRAM (LESSP)

## YEAR THREE, ANNUAL TECHNICAL PROGRESS REPORT

### OCTOBER 1, 2012 - SEPTEMBER 30, 2013

CONTRACT 669-C-10-00059-00



September 2013

This document was produced for review by the United States Agency for International Development. It was prepared by Winrock International under USAID's Liberia Energy Sector Support Program, Contract No. 669-C-00-10-00059-00.

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Prepared for: USAID/Liberia  
Period ending: September 2013  
Award No: 669-C-00-10-00059-00  
Contract name: USAID's Liberia Energy Sector Support Program (LESSP)  
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#### Strategic Objectives:

- SO1: To extend grid electricity throughout Monrovia and its environs;
- SO2: To develop hydro capacity and other renewable energy sources;
- SO3: To expand grid electricity to other urban areas and some rural areas; and
- SO4: To improve legal, institutional and regulatory framework in the energy sector.

November 20, 2013

*Cover Photo:* A Booker Washington Institute (BWI) student trainee keeping log during lister engine training, Margibi County, August 8, 2013.

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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## ABBREVIATIONS AND ACRONYMS

ADS	Automated Directive System (USAID)
APL	All Power Labs
B/C	Benefit/Cost
BEO	USAID Bureau Environmental Office
BOQ	Bill of Quantity
BWI	Booker Washington Institute
CA/CM	Contract Administration/Construction Management
CBOs	Community Based Organizations
CCN	Cooperating Country National
CDA	Cooperative Development Agency
COO	Community Outreach Officer
COP	Chief of Party
COR	Contracting Officer's Representative
CPO	Crude Palm Oil
CSET	Center for Sustainable Energy Technology
DBB	Design-Bid-Build
DCOP	Deputy Chief of Party
EA	Environmental Analysis
ECREE	ECOWAS Center for Renewable Energy and Energy Efficiency
EHELD	Excellence in Higher Education for Liberian Development
ELWG	Energy Law Working Group
EMMP	Environmental Mitigation and Monitoring Plan
EPA	Environmental Protection Agency (Liberia)
EPC	Engineering, Procurement & Construction
ERB	Energy Regulatory Board
ESG	Energy and Security Group
FAR	Federal Acquisition Regulations
FED	Food and Enterprise Development Project
FIDIC	International Federation of Consulting Engineering
GEF	Global Environment Facility
GEK	Gasifier Experimenters Kit
GDA	Global Development Alliance
GOL	Government of Liberia
GreenCons	Green Consultancy Inc.
H&S	Health & Safety
HO	Home Office
HQ	Headquarters
IBEX	Investing in Business Expansion
ICT	Information and Communication Technology
IEE	Initial Environmental Examination
IR	Indicator Reference
KBES	Kwendin Biomass Electricity subproject
LBEC	Liberia Biomass Energy Center
LEAP	Liberia Energy Assistance Project
LEC	Liberia Electricity Corporation
LESSP	Liberia Energy Sector Support Program

LMEP	Liberia Monitoring and Evaluation Program
LOE	Level of Effort
LOP	Life of Project
MC	Management Contractor
MEC	Monitoring, Evaluation and Communications Specialist
MEO	Mission Environmental Officer
M&E	Monitoring and Evaluation
MHI	Manitoba Hydro International
MHP	Mini Hydropower Project
MLME	Ministry of Lands, Mines and Energy
MOU	Memorandum of Understanding
MRMHP	Mein River Mini Hydropower Project
MRPC	Mein River Pilot Cooperative
MV	Medium Voltage
NEP	National Energy Policy (Liberia)
NPV	Net Present Value
NRECA	National Rural Electric Cooperative Association
NVE	Norwegian Water Resources and Energy Directorate
NXP	Non-Expendable Property
O&M	Operation and Maintenance
PE	Professional Engineer
PIDS	L-MEPs Performance Indicator Database System
PMP	Performance Monitoring Plan
PPP	Public Private Partnership
PQ	Pre-Qualification
PV	Photovoltaic
RE	Renewable Energy
REFUND	Renewable Energy Fund (RREA)
RET	Renewable Energy Technologies
RFP	Request for Proposal
RREA	Rural and Renewable Energy Agency
QA/QC	Quality Assurance/Quality Control
SCECS	Sorlumba Community Electric Cooperative Society
SBEP	Sorlumba Bio-Mass Electricity Project
SHOPS	Smallholder Oil Palm Support Project
SME	Small and Medium Enterprises
T/D	Transmission/Distribution
UL	University of Liberia
UNIDO	United Nations Industrial Development Organization
USAID	U.S. Agency for International Development
VOCTEC	Vocational Training and Education for Clean Energy
WAPP	West African Power Pool
WB	World Bank
WFMHP	Wayavah Falls Mini Hydropower Project
WI	Winrock International
WTP	Willingness to Pay

# I. EXECUTIVE SUMMARY

This document is the Year Three Annual Progress Report for the Liberia Energy Sector Support Program (LESSP) project for October 1, 2012 through September 30, 2013. The contract for this project was signed by Winrock International on October 4, 2010 and the project ends on October 3, 2014.

As of September 30, 2013, the following progress has been achieved:

Objective One training and policy support activities; the completion of the Objective Two feasibility studies; the majority of environmental clearances from USAID and the Liberia Environmental Protection Agency (EPA); and completion of the drawings, specifications and contract documents for the four pilot subprojects. Remaining work includes the bidding and construction of the Objective Two pilot projects, the procurement of the Objective Three Liberia Electricity Corporation (LEC) materials, and the completion of the Booker Washington Institute (BWI) Biomass Energy Center public-private partnership (PPP).

This Annual Report includes information on LESSP activities by program objective including:

- Activities completed, benchmarks achieved, performance standards completed
- Success stories
- Information on LESSP Impact on Higher Education Institutes (HEI)
- Environmental status reports based on the approved initial environmental examination (IEE) and environmental mitigation and monitoring plan (EMMP).

# II. PROJECT DESCRIPTION

The LESSP team includes subcontractors Energy and Security Group (ESG) and Tetra Tech ES Inc. USAID designed LESSP in response to the Government of Liberia's (GOL) commitment to energy infrastructure rehabilitation, which is an integral component of the nation's macroeconomic development strategy as set forth in the Poverty Reduction Strategy (PRS).

Overarching project objectives:

- Strengthen the GOL's capacity to implement plans for rural electrification as expressed in the National Energy Policy (NEP).
- Establish commercially-viable pilot plants that provide renewable energy services to population centers in Bong, Lofa, and Nimba counties.

- Collaborate with other international donors for the expansion of Monrovia’s power generation, transmission, and distribution network.

LESSP contributes to the following goals in the PRS:

- Build the capacity of the Rural and Renewable Energy Agency (RREA) and the Ministry of Lands, Mines and Energy (MLME)
- Improve legal, institutional, and regulatory framework within the energy sector
- Increase energy access in both Monrovia and the three rural counties
- Launch Liberia’s hydropower generation capability and explore additional generation options from other renewable energy sources.

Expected program results include:

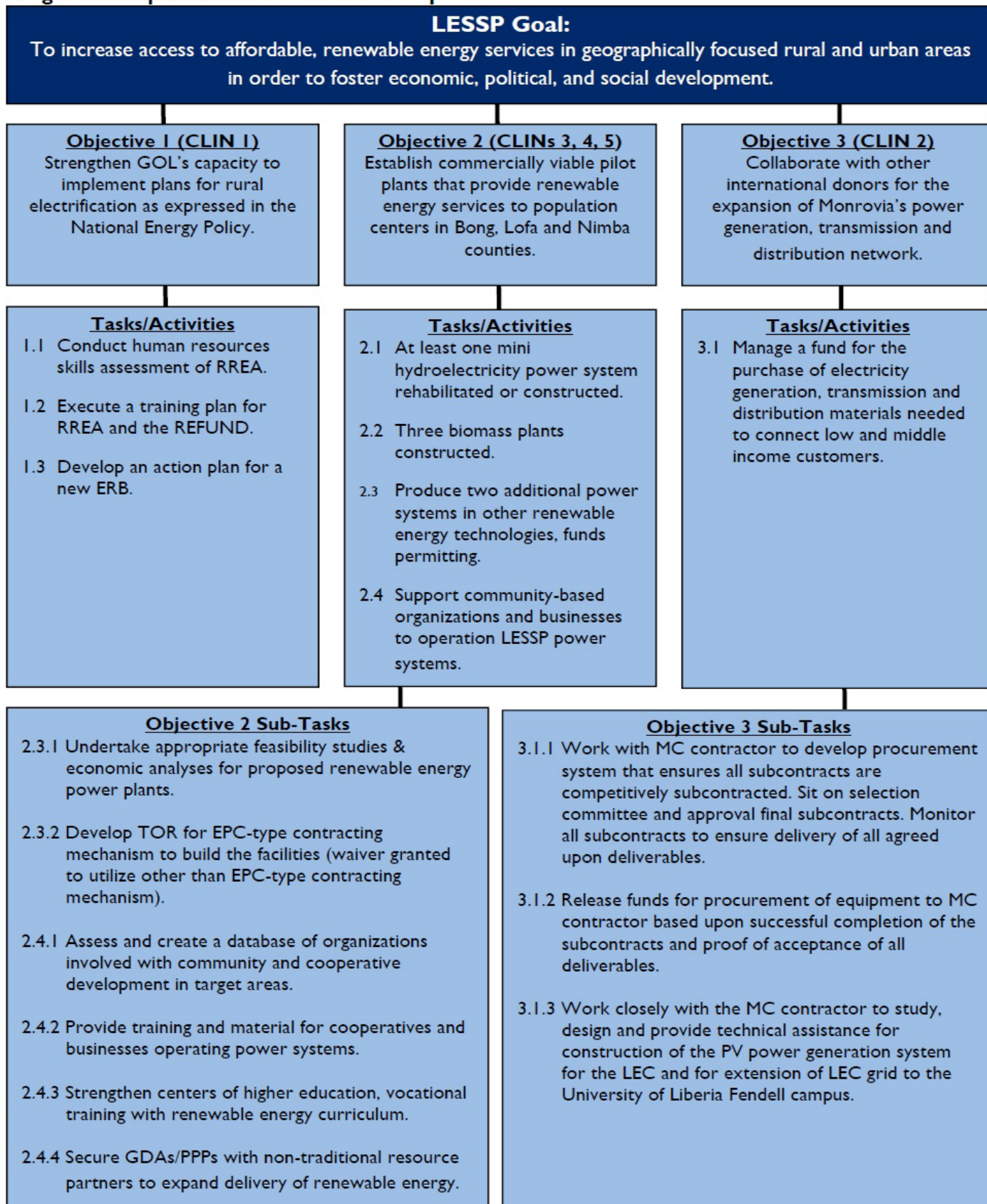
- Increased and sustainable access and affordability of electricity within urban and rural poor communities
- Improved performance of local governments, civil society and the private sector in monitoring, regulating, and managing the use of renewable energy
- An increase in the percentage of households and businesses utilizing clean energy and a corresponding increase in economic activity
- Policy changes that improve the investment climate for the energy sector.

LESSP’s three objectives are broad and diverse, encompassing energy sector regulation and institutional reform; renewable energy (RE) pilot power plant construction and commercialization; strengthening of community-based organizations (CBOs) and institutions of higher education; public-private partnership development; and support to the Liberia Electricity Corporation (LEC) to hasten the provision of electricity connections for lower income customers. A common thread connects the various subcomponents: the focus on RE as a key tool for enabling economic growth and building an environment conducive to private investment in the energy sector.

The LESSP Team has developed a comprehensive strategy and implementation plan that reflects lessons learned and global experience in energy policy and regulatory reform, institutional capacity building, rural electrification, RE technologies and service delivery, CBO and enterprise development, and Global Development Alliance/Public Private Partnership (GDA/PPP) development.

Diagram A, LESSP Activity Map (next page), illustrates the project goal, the three objectives, and the tasks and sub-tasks associated with the program objectives.

**Diagram A. Updated LESSP Activities Map**





# III. OVERALL PROJECT PROGRESS

## I. HIGHLIGHTS

- 1. LESSP Mid-Term Review:** The project conducted a Mid-Term Review in October and November 2012 and recommended mid-course adjustments in the three LESSP Objectives. The major recommendations included aligning the budget to cater to higher than anticipated pilot project construction costs and significantly reducing the grant component of the project.
- 2. U.S. Ambassador Visits Mein River Subproject site and BWI:** On March 13, 2013, U.S. Ambassador met LESSP staff at the Lower Kpatwee Falls south of Gbarnga and in Bong County to visit the Mein River Mini Hydropower Project (MHP) site. Superintendent of Bong County and LESSP staff accompanied her. She then travelled to the Booker Washington Institute (BWI) and met LESSP project staff there to view the EcoPower ECOWAS Center for Renewable Energy and Energy Efficiency (ECREE)-funded biomass energy gasifier grant project. The gasifier on exhibit is the same model planned to be used in the Kwendin Community Biomass Electricity Project.
- 3. Completion of Drawings and Specifications for LESSP Subprojects:** Moving to design-bid-build from engineering, procurement and construction (EPC) procurement requires completed drawings and specifications. LESSP staff completed drawings and specifications for the Sorlumba, Kwendin and new Gbarngway PV subprojects this year. Additionally, final drafts of the substation, transmission, and distribution line drawings and specifications were received for the Mein River Mini-hydro subproject (MRMHP) on August 23, 2013. LESSP engineers reviewed the documents and sent comments to LESSP engineering design consultants. Progress was estimated to be 98% completed by the end of September 2013. LESSP expects to finalize the MRMHP subproject documents by October 15, 2013.
- 4. First Successful Test Run of Lister Type Diesel Engine using Crude Palm Oil (CPO):** This test run was done at a local automobile and engine repair-shop, ELMERS Workshop, Bushrod Island on July 18, 2013, using Crude Palm Oil (CPO) produced by small holder farmers in Sorlumba Village, Lofa County. The CPO was used to fire the engine instead of diesel fuel and electricity was generated from the lister engine for the first time in Liberia's History. This test indicates that the planned use of three 12 kW engines in the Sorlumba village community electrification project will be successful.
- 5. Legal Registered Status Obtained for LESSP Cooperatives:** Kpakpormein Farmer Cooperative (KFC), Bong County, one of the partners in the proposed Mein River Power Company and the Kwendin Lorkiah Electric Cooperative (KLEC), the Gbarngway Woeyah Electric Cooperative and the Sorlumba Community Electric

Cooperative Society (SCECS) were each legally registered with the Government of Liberia Cooperative Development Agency (CDA). These are the first four electricity cooperatives in Liberia.

- 6. Biomass Energy & Electricity in Liberia Workshop:** The workshop was held on July 10, 2013 in collaboration with EcoPower, All Power Labs, the Food and Enterprise Development Project (DAI/FED) and Investing in Business Exchange Project (IESC/IBEX). The goal of the workshop was to introduce the

APL GEK Biomass Gasifier Technology and its application as an effective and less expensive alternative to diesel fueled generators in agricultural commercial machinery and the financing of the RE infrastructure. There were approximately 35 participants at this workshop.



- 7. Completion of Liberia**

**Electricity Corporation (LEC) Monrovia Photovoltaic Electricity Generation System and Fendell Campus University of Liberia Electricity Line Engineering Concept Studies:**

In response to USAID's request to replace the procurement of distribution line materials to LEC in Objective Three, the project conducted concept studies between February and April 2013 and submitted final reports to USAID in April and June 2013, respectively.

- 8. LESSP Youth Engagement:** In August 2013, LESSP interviewed nine engineering students from the University of Liberia (UL) and Stella Maris Polytechnic (SMP) for positions as full-time on-site construction inspectors for the four LESSP pilot subprojects. Four of the engineering students were from UL pursuing Bachelor of Science degrees in two disciplines, civil and electrical engineering. The other five students were from Stella Maris Polytechnic (SMP) pursuing associate degrees in electrical engineering. The interview committee found five students, two from SMP and three from UL, to be excellent candidates for the jobs. These students were chosen and will be receiving practical training on construction and renewable energy technologies and construction inspection for three months beginning in October 2013. Following the training period, the candidates will serve as site inspectors for each of the subprojects. One candidate will also serve as an in-office engineer.



Additionally, The Biomass Brothers, a group of 12 students from the Booker Washington Institute (BWI), was established under the EcoPower subcontract. The group is a collaborative effort of LESSP, BWI, and EcoPower and was trained in the operation and maintenance of the 8 HP (5 kW) diesel – CPO (crude palm oil) Lister engine at BWI. The training, conducted by LESSP, was held in early August 2013 and training materials and per diem were provided by LESSP. A written test was given to evaluate the students on August 5, 2013 and trainees were certified on August 10, 2013.

Two of the Biomass Brothers have been selected for advanced operations and maintenance training of the APL GEK gasifier. They will be sent to the All Power Lab (APL) GEK Gasifier assembly plant in Berkeley, California, where they will work with the APL engineers and technicians for one month. LESSP made the arrangements for their passports and visas. Tickets will be purchased by EcoPower and other expenses will be covered by EcoPower and APL. The trip is planned for November 2013.

**9. Mein River Subproject Partners MOU and Articles of Incorporation:** The partners of the Mein River Power Company (Cuttington University, the Phebe Hospital and School of Nursing, and the Kpakpormein Farmer Cooperative) signed the Memorandum of Understanding (MOU) that gave each the legal authority to join the partnership for the establishment and ownership of the Mein River Power Company. Articles of Incorporation (AOI) to formally establish the Mein River Power Company were also signed. This is the second Power Company in Liberia to be established, behind the Liberia Electricity Corporation (LEC).

**10. Electricity Cooperative(s) and Company Environmental Permit and Legal Obligations Training Workshops:** These four training courses were conducted by LESSP from July 30 to August 5, 2013 at the four subproject sites: Kwendin, Yarwein Mehsonnah District, Sorlumba, Foya District, Gbarnway, Salayea District and Phebe

Hospital. The purpose of the training program was to introduce legal and environmental obligations under the law of the GOL to the three electric cooperatives and one power company, who are to own and manage LESSP's RE pilot power subprojects. There were 52 participants at four training courses.



**11. Liberia Biomass Energy Center Established at BWI:** As discussed with U.S. Ambassador during her visit to BWI in March 2013, LESSP (after consultation with partners BWI and EcoPower) prepared a PPP project proposal for establishment of the Liberia Biomass Energy Center (LBEC) at BWI and submitted it to USAID. The proposal was approved as a LESSP subcontract (EcoPower) and grant (BWI) funded subproject. The LBEC will generate biomass electricity for BWI (70 kW) and will showcase a demonstration platform for biomass energy in Liberia.

On July 5, 2013, a 20 kW GEK gasifier was installed at the Biomass Center by the joint All Power Lab (APL) and EcoPower team, in addition to the 10 kW GEK gasifier. On July 17, an 8 HP (5 kW) Lister diesel engine, which has been modified to use both diesel and crude palm oil (CPO) by ELMERS Liberia, was installed at the BWI Biomass center. LBEC currently houses a 35 kW power system. Two 20 kW gasifier units will be added in January 2014, with a future total capacity of 70 kW. The electricity generated from the gasifiers will be connected to the BWI labs, workshops and administrative buildings.

**12. U.S. Congressional Delegation Visit to LEC, Bushrod Island:** The USAID Liberia Mission asked LESSP staff to provide a briefing and presentation on renewable energy (RE) in Liberia to a large U.S. Congressional and

NGO delegation. The presentation took place at the LEC Bushrod Island electricity generating station in Monrovia on August 26, 2013. The large delegation included U.S. Senators from South Carolina, South Dakota, Georgia, Missouri, Wyoming, and Nebraska. The party



also included ONE co-founder and ONE President and CEO.

Government of Liberia representatives from MLME were also present including the Minister, Deputy General Manager of LEC, and Executive Director of the Rural & Renewable Energy Agency (RREA), They were accompanied by U.S. Ambassador to Liberia, USAID Mission Director, Director of the USAID Economic Growth Office, and LESSP COR.

LESSP staff provided a 15-minute presentation on LESSP and the two 10 and 20 kW biomass gasifiers that are being used at BWI. The two gasifiers were transported from BWI and set up at the Bushrod Island facility to demonstrate electricity generation using palm kernel shells, an agricultural waste, for the delegation.

### **13. Power Africa Director's Visit to BWI:** The Director of U.S.

President's new Power Africa initiative, visited the Booker Washington Institute (BWI) on September 17, 2013 for a briefing and presentation on RE in Liberia. New LESSP COR, Senior Adviser at USAID Kenya, and Program Assistant/Specialist USAID Kenya accompanied him. This visit was part of the preliminary tour of the partner countries of Power Africa, the main goal of which is to provide electricity to Sub-Saharan Africa. With an initial set of six partner countries (Ethiopia, Ghana, Kenya, Nigeria, Tanzania, and Liberia) in its first phase, Power Africa will add more than 10,000 megawatts of cleaner, more efficient electricity generation capacity. It aims to increase electricity access by at least 20 million new households and commercial entities with on-grid, mini-grid, and off-grid solutions.



LESSP staff provided a two-hour briefing on off-grid electrification in Liberia, LESSP's Eagle Power Concept Study, and the six LESSP subprojects that included a demonstration of electricity generation using Lister engines (with crude palm oil as fuel) and APL-GEK gasifiers (with palm kernel nut shells as fuel).

#### **14. Completion of a Draft GOL Vetted 2013 Energy Law and MLME Fact Finding**

**Trip to Uganda and Ghana:** LESSP closely worked with the MLME and the broader Energy Law Working Group (ELWG) (consisting of 19 officials from nine government ministries and agencies and advisory support by LESSP) with a goal of developing a consensus energy law for Liberia over the six months between January to June 2013. A draft energy law was completed and handed over to the Minister in June 2013. Between June and September the Minister held internal meetings on the law before it could be sent to the legislature for action. During this interim period, LESSP sponsored the travel of the Assistant Minister, Energy and the Norwegian Water Resources and Energy Directorate (NVE)-funded energy law attorney to travel for two weeks to Ghana and Uganda to see how their energy laws and independent regulatory boards were established and how they operated.

**15. Near Completion of RREA Renewable Energy Fund (REFUND) Operating Guidelines:** During September 2013, LESSP incorporated comments from the RREA executive director and finance director into the REFUND operating guidelines. LESSP provided a revised version of the guidelines to the RREA, incorporating their comments made to the previous draft. LESSP is currently awaiting their inputs to finalize the guidelines.

**16. LESSP Paperless Construction Management Tools:** LESSP will incorporate the use of iPads in inputting data and information about the progress of the subproject construction throughout the next year. Daily inspection reports, non-conformance reports (NCRs), request for information (RFI) reports, material inspection reports, EMMP Reports, and photos and other information will be managed and recorded with the iPads. The Database Development Specialist prepared the FileMakerPro forms on the first iPads and is configuring them to connect the information immediately into a database in the office. Four more were ordered and are scheduled to arrive in Year Four. LESSP trained project engineers and site inspectors on iPad operations. Each of the five inspectors will receive an iPad.

## **2. PROJECT AND FINANCIAL MANAGEMENT AND OPERATIONS**

LESSP staff held weekly meetings to discuss program activity status with the USAID COR. Other numerous ad hoc discussions ensued by email and telephone throughout the quarter with

the COR and other USAID officials. These communications covered several issues such as status and progress reports on the four hydro and biomass pilot projects; budget realignment and contractual issues; various USAID rules and regulations; and requests for approvals regarding long-term and short-term personnel changes and travel to and from Monrovia.

Meetings were held with the RREA, MLME, IBEX, EHELD, FED, UNIDO, Mein River project partners, Bong County Officials selected stakeholders, and other local organizations and individuals. Notes of important meetings were prepared and submitted to USAID.

### **3. MONITORING AND EVALUATION TASKS AND ACTIVITIES**

A monitoring field visit was conducted at the subproject sites in Lofa and Nimba counties by the Monitoring, Evaluation and Communications Specialist to track the implementation of planned activities during the year.

# IV. WORK PLAN PROGRESS

## ACTIVITIES COMPLETED, BENCHMARKS ACHIVED, AND PERFORMANCE STANDARDS COMPLETED

### I. Objective One: Strengthen GOL’s capacity to Implement Plans for Rural Electrification as Expressed in the National Energy Policy

#### **TASK 1. Conduct Human Resources Skills Assessment for the MLME (RREA specific).**

Conduct a skills assessment of human resources within the Rural and Renewable Energy Agency (RREA) for new staff hires. Utilize the skills assessment as the basis of developing a training plan that will help build technical and managerial capacity of the RREA to implement its plans for rural electrification.

SUBTASK	ACTIVITIES PLANNED IN APPROVED WORK PLAN	STATUS
1.1	Conduct the HR skills and needs reviews for any new RREA directors hired in Year Three	Completed. No further training planned. The midterm evaluation called for additional RREA training and plans. However, plans to carry out additional training needs assessment were on hold until the budget realignment exercise was completed.
1.2	Update skills assessment report for new RREA directors	Not required. Skills assessment was not carried out in Year Three, per contract revision/budget realignment.

#### **TASK 2: Develop and Execute Training Plan to Assist RREA.**

Develop and execute a training plan on the basis of results from Task 1. The primary focus of the task will be to build capacity of staff at the Rural Renewable Energy Agency (RREA) and the Renewable Energy Fund (REFUND), as elaborated in the national energy policy.

SUBTASK	ACTIVITIES PLANNED IN APPROVED WORK PLAN	STATUS
2.1	Develop training plan for any new RREA directors hired in Year Three	Not required. This activity was not carried out per contract revision/budget realignment.



2.2	Conduct at least two training courses for RREA Directors (to include new hires) and MLME staff	Not required. This activity was not carried out per contract revision/budget realignment.
2.3	Draft REFUND operating guidelines	Provided final draft for RREA review; awaiting final comments
2.4	Finalize REFUND operating Guidelines	Will finalize guidelines pending RREA input.

### **TASK 3: Develop Action Plan for MLME Independent Electricity Regulatory Board (Commission)**

<b>SUBTASK</b>	<b>ACTIVITIES PLANNED IN APPROVED WORK PLAN</b>	<b>STATUS</b>
3.1	Prepare final energy law review and report	Energy law review provided to government and key stakeholders. Review of energy law by nine GOL agencies complete.
3.2	Finalize ERB Action Plan	Draft ERB Action Plan provided to government and key stakeholders. At the conclusion of the energy law review, this will be reconsidered, as appropriate.

#### **Task 1: Conduct HR Skills Assessment of RREA**

This task was completed in Years One and Two for RREA senior managers. In Year Three, six new staff members were hired and a survey was provided to each of these individuals regarding their skills/needs/gaps. However, the final skills assessment was not completed as it was determined there would be no further RREA training in Year Three., per budget modification/contract revision

#### **Task 2: Execute a Training Plan for RREA and the Renewable Energy Fund (REFUND)**

The revised version of the REFUND was provided this year to RREA, incorporating their comments to the prior draft. Finalization is pending feedback from RREA.

### **Task 3: Develop an Energy Law Revision and an Action Plan for a new Electricity Regulatory Board**

The Draft GOL 2013 energy law was completed based on comments received from the 19 member ELWG impaneled by MLME Minister. The 19 members represented GOL ministries and organizations.

There had been discussions with MLME about facilitating broader stakeholder dialogue across the 15 counties, which USAID and LESSP was prepared to support. However, to date, there has been no follow-up on this issue.

In addition to the energy law, LESSP prepared related materials that were also provided to MLME. These included: (1) a chronology on the process used in developing the energy law (2013- Energy Law of Liberia: A Chronology); (2) a PowerPoint presentation on the energy law for use by MLME in presenting the document; and (3) a two-page energy law factsheet that provides a summary of key energy law provisions for MLME distribution to interested parties; and (4) final report on the MLME-LESSP policy study tour to Uganda and Ghana.

## **2. Objective Two: Establish Commercially Viable Pilot Plants that Provide Renewable Energy Services to Population Centers in Bong, Nimba, and Lofa Counties**

### **TASK 1: Establish Atleast One Hydroelectric Power System**

<b>SUBTASK</b>	<b>ACTIVITIES PLANNED IN APPROVED WORK PLAN</b>	<b>STATUS</b>
Subtask 2.1.1	Undertake feasibility studies and socio-economic analyses; obtain environmental approvals for Mein River Hydropower project from USAID	Completed. BEO, USAID formally approved the environmental analysis (EA) report for Mein River Mini Hydropower project in January 2013.
Subtask 2.1.2	Develop TOR for EPC contracting mechanisms to build the facilities. Release bidding documents for procurement of subcontractors for Wayavah Falls Micro Hydropower subproject and select vendors/subcontractors for Wayavah Falls	USAID cancelled this project under the LESSP contract due to high construction cost and low benefit/cost (B/C) ratio in May 2013. Preliminary assessment for solar PV is being carried out as an alternative.

## TASK I: Establish Atleast One Hydroelectric Power System

SUBTASK	ACTIVITIES PLANNED IN APPROVED WORK PLAN	STATUS
	Prepare quality control / quality assurance (QA/QC) plan for Wayavah Falls Micro Hydropower project and submit to USAID	Completed. A revised QA/QC plan generic to all subprojects was submitted and approved by USAID.
	Create bidding document for Mein River Hydropower project and submit to USAID for review and approval	97% completed. This activity was delayed due to delay in issuing contract amendment to STTA pending USAID budget realignment.
	Release bidding/tender documents and select the vendors or subcontractor for Mein River	Not completed. Scheduled to begin in November 2013.
	Site mobilization and complete construction of Wayavah Falls. Conduct environmental mitigation and monitoring according to approved EMMPs.	Cancelled project.
	Site mobilization and initiate preparatory work for construction of Mein River. Conduct environmental mitigation and monitoring according to approved EMMPs.	Not completed / scheduled for January 2014.

## TASK 2: Establish Three Biomass-powered Electricity Systems

SUBTASK	ACTIVITIES PLANNED IN APPROVED WORK PLAN	STATUS
Subtask 2.2.1	Undertake Feasibility Studies and Socio-economic Analyses – Complete the Feasibility Study for the second biomass project located in Kwendin in Nimba county	Completed.
	Obtain environmental approvals of the Kwendin biomass electricity project from USAID and L-EPA	Partially completed. The application to EPA was made in Jan 2013 and the EPA environment permit was obtained in May. LESSP has comments from the USAID Mission Environmental Officer (MEO).
Subtask 2.2.2	Develop procurement strategy for each of the components of the Kwendin biomass electricity project	Completed.
	Develop procurement strategy for each of the components of the Sorlumba biomass electricity project	Completed.
	Create bidding/tender documents for procurement of suppliers and subcontractors for the Kwendin and Sorlumba projects.	Completed.
	Release bidding/tender documents and select the preferred vendors/subcontractors for the construction of the Kwendin project	Bidding will begin in November 2013.
	Prepare and submit draft quality control plan for the construction of the Kwendin project.	Completed a generic QA/QC plan applicable to all subprojects.
	Re-release bidding/tender documents and select the preferred vendors/subcontractors for the construction of the Sorlumba project	Bidding will begin in November 2013.
	Prepare and Submit draft Quality Control Plan for the construction of the Sorlumba project.	Completed a generic QA/QC plan applicable to all subprojects.

	Prepare and submit Construction Schedule for the Sorlumba and Kwendin subprojects	Completed.
Construction	Site mobilization and complete construction of the Sorlumba project. Conduct environmental mitigation and monitoring according to approved EMMPs.	Not completed.
	Site mobilization and complete constructions of the Kwendin project	Not completed.

**Task 3: Funds permitting; produce two additional power systems using any of the following technologies: solar, wind, biofuels, geothermal or wave.**

<b>ACTIVITIES PLANNED IN APPROVED WORK PLAN</b>	<b>STATUS</b>
Two additional power systems	RE options assessment report submitted to USAID.

**Task 4: Develop a program to establish community-based organizations and/or assist local businesses to operate and manage LESSP power systems**

<b>SUBTASK</b>	<b>ACTIVITIES PLANNED IN APPROVED WORK PLAN</b>	<b>STATUS</b>
Subtask 2.4.1	Create database of community and cooperative organizations in target areas	Activities completed in Year One.
Subtask 2.4.2	Provide training and material support for cooperatives/businesses operating power systems  Finalizing and implementing a comprehensive training plan	Training plan completed in Year Two. Training on basic electricity and house wiring and uses and safety of electricity carried out. A revised training plan will be prepared.
Subtask 2.4.3	Provide STTA to strengthen centers of education in RE science & engineering  Update curriculum for centers of higher education	Completed in Year Two. Further activities to depend on funding availability.  Completed in Year Three. An STTA and NRECA consultant conducted more activities this year.

### **Wayavah Falls MHP**

The technical specifications, construction drawings, and engineer's estimate were updated and revised in March 2013. The engineer's estimate showed the cost of Wayavah Falls MHP to be \$440,000, over 200% more than the feasibility study level cost estimate carried out in 2011. Some of the reasons why the engineer's estimate was higher than the feasibility study level cost estimate was that it included freight and shipment of materials and equipment, insurance, and the service drop cables and meters.

During the budget realignment process in May 2013, LESSP and USAID canceled Wayavah Falls MHP, as it represented a large investment for a small generation capacity and RREA already demonstrated a micro hydro plant. LESSP and USAID agreed to study and find an alternative renewable energy option to electrify Gbarnway town within a smaller budget. A local solar PV system supplier and installation firm, following a quick load assessment in the field, provided a memo with a preliminary proposal that was sent to USAID for review on July 1, 2013.

A meeting was facilitated by LESSP staff with the Gbarnway town community to communicate the change in project. The replacement project includes the Gbarnway home-to-home solar power electricity subproject.

### **Mein River Mini Hydropower Project**

In January 2013, the overall LESSP construction procurement plan was reviewed and changed from EPC to design-bid-build, in order to reduce potential construction costs and to increase the participation of local contractors in all four subprojects.

The change of contract model from EPC contract to design-bid-build also required the preparation of detailed specifications and construction drawings. In February, the LESSP STTA design team was instructed to prepare these construction drawings. However, this task was put on hold in March 2013 while LESSP budget realignment was under review. As of the end Year Three, the drawings and specifications for this subproject are 97% complete. The design-bid-build contract model is also in the final stage of completion.

The legal due diligence report for formation of Mein River Power Company was reviewed, consultation was held with stakeholders (USAID, RREA, MLME, Cuttington University, and Phebe Hospital) and the report finalized during the last quarter. Follow up consultation process with the partners of proposed Mein River Power Company led to the agreement on the MOU (in early July). The adoption of the Articles of Incorporation also took place in September this year.

At the request of LESSP, a NRECA team visited Liberia to collaborate on institutional strengthening of the proposed Mein River Power Company. The funding for this collaboration is supported by the Cooperative Development Program, another USAID-funded project implemented by NRECA. A load demand and “willingness to pay” (WTP) survey was carried out in June in the project area and also in Gbarnga (capital of Bong). A partners’ workshop was held to create more in depth awareness of the subproject and to start engaging stakeholders in the preparation of the business plan of the power company. NRECA is working to finalize the load demand, WTP survey report, and draft business plan.

A new flow probe was procured and installed in April 2013 to replace the vandalized flow probe installed near the intake of Mein River project site.

The revision of the QA/QC Plan was completed and submitted to USAID and approved. The revised QA/QC plan will be applicable to all four to six pilot subprojects. The Health and Safety Plan was also submitted and approved by USAID.

### **Sorlumba Community Biomass Electricity Subproject**

The small 5.0 kW lister-type engine manufactured by Poweranand Enterprises was shipped from India and cleared customs in Monrovia on May 20, 2013. This engine is the prototype used to test crude palm oil (CPO) to assist LESSP in designing the pretreatment system. In the previous quarter, LESSP, through an RFP process, identified a firm experienced in the design of pre-treatment systems. LESSP successfully generated electricity using crude palm oil for the first time in Liberia’s history in the first test of the engine at ELMERS Workshop, Bushrod Island, on June 18, 2013. Subproject drawings and specifications are 100% complete.

### **Kwendin Community Biomass Electricity Subproject**

After the approval of the feasibility study for the Kwendin Biomass subproject by USAID, an application was submitted by GreenCons (LESSP’s subcontractor) to the EPA of Liberia for environmental approval in January 2013. Following technical discussions, the EPA issued an environmental permit in May 2013. The environment review report was submitted to USAID Liberia and forwarded to BEO on June 3, 2013.

Subproject drawings and specifications are 100% complete.

### **Biomass Energy Center**

Added to Objective Two, as part of the September 2013 contract modification, was a contract with EcoPower, a Liberian firm, and a grant with BWI, both under a PPP to form the Liberia Biomass Energy Center (LBEC) established at BWI. This LBEC will generate biomass electricity for BWI (70 kW) and will showcase a demonstration platform for biomass energy in Liberia. EcoPower ordered a new 20 kW gasifier for this subproject which arrived and was assembled on July 5, 2013. Two new generation 20 kW gasifiers have been ordered and will arrive in January 2014.

Currently, there is a 35 kW system in place at the LBEC: one 5 kW Lister engine, one 10 kW APL-GEK gasifier, and one 20 kW APL-GEK gasifier.

### 3. Objective Three: Collaborate with International Donors for the Expansion of Monrovia’s Power Grid

#### **TASK I. Manage a fund for the purchase of electricity generation, transmission, and distribution materials needed to connect low and middle income customers.**

The contractor shall manage a fund for the purchase of electricity generation, transmission, and distribution materials (e.g. PV panels, poles, meters, wire, and transformers) needed to connect low and middle income customers.

<b>SUBTASK</b>	<b>ACTIVITIES PLANNED IN APPROVED WORK PLAN</b>	<b>STATUS</b>
3.1.1	<p>Work with the contractor of a five year management contract (MC) for the Liberia Electricity Corporation (LEC).</p> <p>Establish technical specifications, compete the subcontracts for the procurement of materials, installing the materials, overseeing quality control for the expansion of the distribution network.</p> <p>Work with the MC contractor to develop a procurement system that ensures all subcontracts are competitively subcontracted.</p> <p>Participate in subcontract selection committees and approve all final subcontracts.</p> <p>Monitor all subcontracts to ensure the delivery of all agreed upon subcontract deliverables.</p>	<p>LESSP maintains excellent relationships with LEC MHI staff and Liberian staff.</p> <p>Two concept studies for (1) an on grid PV system and (2) a transmission/distribution (T/D) line extension to the Fendell UL campus are complete and include preliminary BOQs, costs and specifications.</p> <p>Two subcontracts for materials and equipment will be released in 2014. Contract documents are prepared.</p>



3.1.2	Release funds for the procurement of distribution equipment to the MC contractor based upon the successful completion of the subcontracts and proof of acceptance of all subcontract deliverables.	
3.1.3	Work closely with the MC contractor to study, design, and provide technical assistance for construction of the PV power generation system for the LEC and for extension of LEC grid to the University of Liberia, Fendell campus.	LESSP will carry out this procurement in December 2013. LESSP is working closely with the Ministry to ensure proper implementation.

In February, USAID requested LESSP to undertake two RE subprojects in lieu of the Objective Three tasks. A proposed contract modification was requested by USAID to allow the substitute work. This change in subprojects was included in the contract modification and the revised budget.

The previous component contract wording was:

*The contractor shall manage a fund for the purchase of electricity distribution materials (e.g. meters, wire, transformers) needed to connect low and middle income customers. This task has two Sub-tasks:*

*Subtask 3.1.1: The Contractor shall work with the contractor of a 5 year management contract (MC) for the Liberia Electricity Corporation (LEC). The MC contractor will be responsible for establishing the technical specifications, competing the subcontracts for the procurement of materials, installing the materials, overseeing the quality control for the expansion of the distribution network. The Contractor shall be responsible for working with the MC contractor to develop a procurement system that ensures all subcontracts that will receive USAID funds are competitively subcontracted. The Contractor will sit on subcontract selection committees and will approve all final subcontracts to be paid using USG funds. The Contractor shall monitor all subcontracts to ensure the delivery of all agreed upon subcontract deliverables.*

*Sub task 3.1.2: The Contractor will release funds for the procurement of distribution equipment to the MC contractor based upon the successful completion of the subcontracts and proof of acceptance of all subcontract deliverables.*

Two new subprojects in lieu of the above subtasks are:

Procurement of equipment and materials for approximate 500 kW to 1 MW on-grid photovoltaic generation system for LEC in Monrovia;

Procurement of equipment and materials for extension of LEC T/D network to connect the University of Liberia (UL, Fendell Campus).

The actual construction and construction procurement for both of these subprojects will be carried out by LEC, at their cost.

The concept studies for both of these proposed subprojects were completed and submitted to USAID and LEC in April / May 2013.

## Project Management and Monitoring and Evaluation Activities

<b>Activities Planned in Approved Work Plan: Project Management</b>	<b>Status: (Completed, Not Completed)</b>
Quarterly Progress Reports	Completed
<b>Activities Planned in Approved Work Plan: Monitoring and Evaluation.</b>	<b>Status (Completed, Not Completed)</b>
Conduct quarterly site visits (Gbarway, Sorlumba, Kwendin, Mein)	Completed. Quarterly site visits were carried out by Community Outreach Officer (COO).
Compile narrative summary of quarterly site visits (Site visit checklist)	Completed. Site visits were carried out by COO.
Update LESSP M&E indicator filing system (electronically on shared drive and hard copy)	Completed
Tracking of meetings and training courses to ensure that standards & procedures are being properly followed & reported upon	Completed
Summarize construction schedule, quality control plans, vendor contracts, and site financial analysis/local management report	Completed

# V. ACCOMPLISHMENTS

## Objective One

1. The draft energy law was prepared following three meetings of the energy law working group (ELWG). The draft was submitted to the ELWG for final review and comments.
2. Discussions are ongoing regarding a draft plan for the Energy Regulatory Board submitted to MLME and key stakeholders.
3. The draft REFUND operating guidelines were submitted to RREA. LESSP is awaiting comments.
4. The visit of the Liberian Delegation to Ghana and Uganda to learn about policy and regulatory issues was successful.

## Objective Two

### Procurement Plan for Pilot Subprojects

1. A local contractors' information day meeting was held on May 7, 2013. The purpose of the workshop was to provide an overview of LESSP subprojects to construction contractors. The workshop brought together 35 Liberian contractors along with representatives from the Ministry of Public Works, RREA, USAID, IBEX and Liberia Building Market Project. The Contractors' Information Day Workshop Report was submitted to USAID on May 22, 2013.
2. The prequalification (PQ) of local and international contractors was not conducted due to the pending LESSP budget realignment review. Ultimately, it was decided not to carry out the PQ process, as this would have resulted in significant delays issuing the RFPs.
3. The construction drawings, technical specifications and BOQs for each subproject are nearing completion. The preparation of RFPs is underway.

### QA/QC Plan

4. A Construction Management Guidelines and QA/QC Plan (Revised), was submitted to USAID on May 15, 2013 and approved. This Plan is generic and is applicable to all subprojects.
  - a. The new subproject forms for QC are being formatted for use on iPads to promote paperless construction sites.
  - b. In consultation with EHELD, five engineering students from UL and the SMP were selected. The students are currently being trained as full-time on-site construction inspectors.

### **Wayavah Falls MHP**

1. The Wayavah MHP was cancelled in June by USAID, due to high cost of construction.
2. An operation and maintenance training for the Wayavah Falls operators with VOCTEC had been scheduled for November 2013. When WFMHP was cancelled, LESSP held discussions with VOCTEC on the best way forward. As 90% of the training material preparation had been completed by VOCTEC, it was proposed to hold the training courses for operators of Yandohan MHP, BWI instructors, and RREA/MLME engineers. A revised training plan has been received from VOCTEC for review by partners.

### **Mein River Mini Hydropower Project**

1. Several consultation meetings were held with partners of the proposed Mein River Power Company (MRPC) to review and finalize the MOU and the Articles of Association for registration of MRPC. The partners signed the MOU on July 5, 2013. Respective partners' board resolutions for the Articles of Association were also obtained during this time.
2. Following consultations that began in December 2012, an agreement was reached with NRECA in May 2013 on the scope of work for institutional capacity building of Mein River Power Company.
  - a. A five member NRECA team visited Liberia in May and June 2013 and (1) carried out load demand and willingness to pay surveys and (2) conducted a workshop with partners of the MRPC. The workshop familiarized partners with the required steps to organize a well-functioning utility and to engage partners in the preparation of a business plan for the power company. The workshop was an eye opener to the partners and highly successful.
  - b. Mein River Power Company Institutional Support Workshop – June 5, 2013. Report was submitted to USAID on June 20, 2013.
  - c. The draft business plan has now been sent to LESSP. A new training course was conducted in September.

3. The new data logger probe for automatic gauging station was installed in April to replace the stolen and damaged probe.
4. LESSP and CDA jointly met with the three clans of Kpatwee, Meinquelleh, and Kporyorquelleh in Suakoko and Sanoyea Districts, Bong County. The purpose of the meeting was to provide explanations of the structure, scope, and functions of the Mein River Power Company and the need to support the establishment of Kpakpormein Farmer Cooperative (KFC).
5. LESSP has completed consultations with the Board of Directors of Cuttington University, Phebe Hospital, and the Kpakpormein Farmer Cooperative to get their respective approvals for legal participation in the establishment and ownership of the Mein River Power Company.
6. LESSP met with Mein River project partners and received their signatures on the Memorandum of Understanding and the Articles of Incorporation for the legal partnership and the establishment of the Mein River Power Company.

#### **Sorlumba**

1. LESSP issued a purchase order for procurement of a small lister engine from Poweranand of India. The engine cleared customs in Monrovia on May 20, 2013.
2. A Liberian agro-machinery manufacturer and dealer, ELMERS in Bushrod Island, was contracted to fabricate the pre-treatment system and carry out a test run using CPO as fuel for the lister engine. LESSP engineers provided the conceptual design for the pre-heating system. A test run was set up, using a piece of cotton cloth to filter the CPO at the first stage. The successful test run took place on June 18, 2013, proving that CPO can be used with the lister engine and produce electricity. Further test runs were carried out with further improvement on the pre-treatment and heating set up.
3. Training courses on the lister engine operation were conducted at BWI beginning August 1, 2013.

#### **Kwendin**

1. LESSP completed a feasibility study for an alternate biomass project in Nimba and submitted it to USAID. Approval for the 60 kW Biomass Electricity project for implementation was received in Quarter 10.
2. An application with a project brief for KBEP was submitted to the EPA for an environment permit in early January 2013. After several consultations, the EPA issued the permit for KBEP in May 2013.
3. An environment review report was submitted to USAID and BEO for review in May.
4. Electric Cooperative, land title deed contribution:

- a. An eleven member Steering Committee, responsible for the facilitation and formation process of Kwendin Lorkiah Electric Cooperative (KLEC), was established and trained. Community Mobilizers/Organizers and the Acting Managers of the KLEC were also recruited. Membership for the KLEC was launched and 27 individuals registered and bought shares in the cooperative.
- b. An application was submitted to the Liberia CDA and Ministry of Foreign Affairs for registration of the cooperative. The application was approved and the KLEC was registered on April 26, 2013.
- c. The local community contributed the land for the project site. The land title deed was submitted to the President of Liberia and is awaiting approval.

In terms of general cooperative accomplishments, LESSP facilitated the travel of Cooperative Development Agency (CDA) government officials to meet with local leaders in LESSP project areas. The purpose of the trip was to introduce participants and assess the work of LESSP in facilitating the formation, training, and capacity building of cooperatives. These cooperatives will assume the ownership and management of the various power systems that are being constructed in designated communities in Bong, Nimba, and Lofa Counties. Local participants included chiefs, elders and citizens. At the end of the visit, two of LESSP sponsored cooperatives were certificated by CDA.

LESSP also met with county superintendents of Bong, Nimba, and Lofa and other local leaders, such as the District Commissioner, and Clan and Town Chiefs, to update them on LESSP project status and activities.

### **Monitoring & Evaluation**

The MEC Specialist conducted a routine inventory of LESSP M&E indicator Filing system to ensure that periodic reports submitted to USAID are filed in accordance with well-defined procedures. Field visit and meetings reports were also tracked and filed in line with LESSP Indicator filing System.

The MEC Specialist completed data entry and targets for all LESSP indicators for Fiscal Year Two 2013 in the USAID Performance Indicator Database System (PIDS).

### **Training needs assessment of four electric cooperatives**

LESSP Finance Manager made visits to Sorlumba, Gbarnway, and Kwendin subproject areas and performed a training needs assessment on financial practices. Based on the needs assessment, training courses focused on financial practice will be designed for these cooperatives.

## I. OUTPUTS THIS REPORTING PERIOD

PMP Indicators	Report this Year
<b>Objective One</b>	
Number of government officials trained in energy resources, energy-policy and regulation and other related practices	None, as no training was approved for Year Three.
ERB Action Plan developed (y/n)	Yes. Draft Action Plan has since been circulated for review and comments.
<b>Objective Two</b>	
Quantity of operational renewable energy generation capacity constructed	None for this reporting period
Number of community members trained in construction, maintenance or management of power systems	Six persons (two females and four males) were trained from Kpakpormein Farmer Cooperative (KFC) on Cooperative Elections by CDA.
Number of community-based management entities established and trained	Three community-based management entities have been established. Kwendin Electric Cooperative and Kpakpormein Farmer Cooperative were established this year. Mein River Power Company was formally registered with Government of Liberia (Liberia Business Registry).
Number of centers of higher education and vocational education strengthened with curricula in renewable energy disciplines.	One – RE Curriculum provided to EHELD/University of Liberia.
US dollar value of funding leveraged from public and private sources for LESSP pilot energy systems	<p>Approximately USD \$30,000 has been secured for Gbarway and Sorlumba (includes the cost of land – \$21,000, access road \ construction - \$8,000, and shares in the cooperative – \$1,000)</p> <p>LESSP secured \$1.25 M for co-financing of the construction of MRMHP.</p>



PMP Indicators	Report this Year
<b>Objective Three</b>	
LEC procurement system and financial policies and procedures reviewed and verified to meet USAID standards (y/n)	This indicator reference (IR), including indicators, is under revision by USAID

## 2. DATA QUALITY ASSURANCE

As a quarterly requirement, in accordance with the Performance Management Plan (PMP), the MEC Specialist conducted a project progress monitoring visit to the Sorlumba and Wayavah subproject sites. During the visits, focus group discussions and key informant interviews were conducted to gather relevant data.

The training plan for power system operators and cooperatives has been drafted and will be revised and updated in the next year.

# VI. BEST PRACTICES

## I. PROCUREMENT PLAN

In Year Three, changes were made to the procurement plan, contract model, and the construction schedule for all four subprojects. In order to save time in the administrative process for procurement, a revised construction procurement plan was prepared for all four construction subprojects in March 2013. The plan allows procurement for all subprojects to be carried out at the same time.

## 2. COST ANALYSIS

In September, LESSP's Energy Economist created cost comparison analyses and models to estimate the net present value (NPV) of electricity costs produced using LESSP subproject renewable energy (RE) machinery vs. diesel generators. These analyses showed that subproject RE electricity generation will be less expensive (by approximate 40% to 50%) than for similar fossil fuel electricity generation. Specific subproject cost analyses (e.g. Sorlumba costs using lister engines powered by CPO and Kwendin costs using gasifiers powered by rubber wood chips) were set up, as well as blank models for lister engines (CPO) and gasifiers (powered by palm kernel nut shells). Drafts for the subproject and model cost analyses for solar PV systems and hydropower plants have been completed; however, modifications are still needed. The models can also be used to inform decisions on which technologies to invest in by commercial and public entities seeking to generate electricity or to enter the energy sector.

## 3. COMMUNITY OUTREACH

LESSP MEC Specialist and the COO continued to manage project information and communications with the Government, public, and media in year three. LESSP provides quarterly progress reports to USAID, as well as frequent informal presentations and reporting to GOL stakeholders and donors on LESSP progress, challenges and achievements. Formal public events were developed as well, in compliance with the approved LESSP branding and marking plan. LESSP's communications and outreach activities in Year Three focused on the four subprojects in Bong, Lofa, and Nimba counties, including formal project launch activities.

## VII. ENVIRONMENTAL STATUS

An environmental intern was recruited to prepare an environment checklist for all subprojects and a training plan for community leaders in the subproject sites. The training course was conducted in four locations: (1) Kwendin, Yarwein Mehnsannah District on July 30, 2013; (2) Surlumba, Foya District on August 2, 2013; (3) Gbarnway, Salayea District on August 4, 2013; (4) Phebe Hospital, Suakoko District on August 5, 2013.

LESSP subcontractor GreenCons assisted in the development and completion of environmental compliance and monitoring efforts.

Environmental status on each of the subprojects is as follows:

<b>Surlumba Biomass Subproject</b>	
MEO and BEO Approval	Submitted February 2012.
L-EPA Permit	Project brief submitted in October, 2011, Permit in Jan 2012, Valid until Jan 2014.
EMMP	Completed December 2012.
IEE	Completed.
<b>Kwendin Biomass Subproject</b>	
MEO and BEO Approval	The Environment Review report was submitted on 3 June, 2013. No response has been received from BEO at the time of writing this report, however the MEO responded with some questions that will require WI/LESSP response.
L-EPA Permit	Application submitted in January 2013. Permit obtained in May 2013.
EMMP	Generic EMMP for LESSP projects completed and approved by USAID in Dec 2012. Environmental monitoring and mitigation will be conducted throughout the construction of the project, starting from Jan 2014.
IEE	Completed.
<b>BWI Biomass Center</b>	
MEO and BEO Approval	GreenCons (LESSP consultant for environment) preparing project brief. Will be submitted for approval in November 2013.

L-EPA Permit	GreenCons (LESSP consultant for environment) preparing project brief. Will be submitted for approval in November 2013.
EMMP	Generic EMMP for LESSP projects completed and approved by USAID in Dec 2012.
IEE	Completed.

**Gbarway Solar Home System (was originally Wayavah Falls Micro-hydro and all the permits were received in January 2012)**

MEO and BEO Approval	GreenCons (LESSP consultant for environment) preparing project brief. Will be submitted for approval in November 2013.
L-EPA Permit	GreenCons (LESSP consultant for environment) preparing project brief. Will be submitted for approval in November 2013.
EMMP	Generic EMMP for LESSP projects completed and approved by USAID in Dec 2012. Environmental monitoring and mitigation will be conducted throughout the construction of the project, starting in Jan 2014.
IEE	Completed.

## VIII. SUCCESS STORIES

In Year One, LESSP developed a Cross-Cutting Issues (Gender, Youth, ICT) Integration Plan to serve as a guide to LESSP team throughout the implementation of project activities to keep cross-cutting issues at the forefront of planning, design, training, community ownership transfer, as well as the selection of beneficiaries and trainees. With its focus on improving energy infrastructure, LESSP activities and results can positively impact some cross sector areas important to USAID including local capacity building, democracy and governance, environmental sustainability and economic growth. Year Three's success stories demonstrate LESSP's achievements in these areas. The following success stories can be found in Annex I in their entirety:

- “Leaders from Ministry of Lands, Mines and Energy Travel to Ghana and Uganda on Policy and Regulatory Issues”
- “First Electricity Cooperative in Liberia Established with USAID’s Liberia Energy Sector Support Program”
- “Laying the Foundation for a Sustainable Future: Equipping Booker Washington Institute Students with Technical Skills to Generate Renewable Energy Electricity in Liberia
- “Building the Capacity of Youth: Two Booker Washington Institute ‘Biomass Brothers’ Trained to Assemble APL Biomass Gasifier in Berkeley, California”

# **ANNEX I - SUCCESS STORIES**

I October 2012 – 30 September 2013

## LEADERS FROM MINISTRY OF LANDS, MINES, AND ENERGY (MLME) TRAVEL TO GHANA AND UGANDA ON POLICY AND REGULATORY ISSUES



Assistant Minister meets with the Permanent Secretary of the Uganda MEMD & Chair of the Rural Electrification Board. Attending were UMEME's General Manager, MLME's Legal Advisor and LESSP's Legal Advisor.

The Government of Liberia, led by the MLME, is in process of developing a new energy law and related Electricity Regulatory Board plan. USAID's LESSP is supporting this effort.

From June 23-July 5, 2013, the delegation travelled to Accra, Ghana, and Kampala, Uganda, to meet with key stakeholders who have been active in the development and implementation of national energy laws and regulations. The delegation was led by the Assistant Minister of the MLME, and included MLME's Legal Advisor, and LESSP's Legal Advisor.

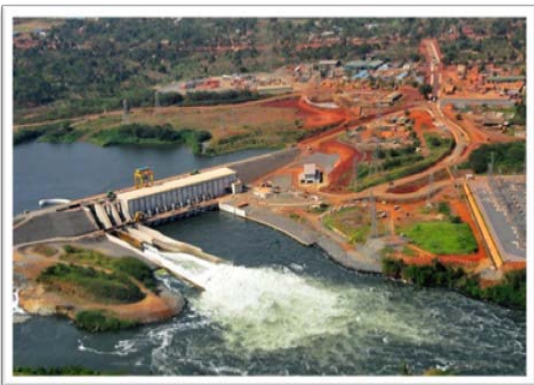
In Ghana, the team met with the Minister of Energy and Petroleum (MoEP) and his team, who described the Ministry's activities in energy policy and regulatory reform. The delegation also met with the Energy Commission (EC), which serves as the technical regulator for electricity and natural gas; the Public Utilities Regulatory Commission (PURC), which is the financial regulator for electricity and water services to consumers; the Volta River Authority (VRA), the largest generator and supplier of electricity for industrial, commercial and domestic use; and the Kumasi Institute of Technology and Environment (KITE), a non-profit organization which has had a major influence on energy policy formulation and implementation in Ghana and West Africa.



Ghana Targets Renewable Energy

Highlights of the visit:

- The Republic of Ghana developed a legal framework for the energy sector, passing laws on electricity, natural gas, petroleum, renewable energy, and water.
- The national goal is committed to universal electrification by 2020. Currently, electricity access for households is estimated to be 50%, provided largely by the grid.
- The MoEP is responsible for energy policy formulation. The Energy Commission plays an energy policy advisory role, and issues licenses for operation of renewable energy and large power plants.



Uganda Bujagali Hydro Project

- The EC has exclusive control of the National Grid System (Transmission). The Government introduced profit participation into management of the Energy Commission to improve technical, financial, and commercial operations. For generation, the sector is open to Independent Private Providers (IPPs) and Public-Private Partnerships (PPPs).
- The PURC, one of Ghana’s regulatory entities, operates independent from other government institutions. It is responsible for regulation of electricity generation, transmission, distribution, and tariff approval.
- All consumers pay for electricity consumed, including Government institutions/ministries. The country runs a block end-user tariff system for electricity, reaching all customer classes.

In Uganda, senior officials from the Liberia delegation met with the Ministry of Energy and Mineral Development (MEMD), the Electricity Regulatory Authority (ERA), the Rural Electrification Agency, the Ministry of Foreign Affairs, the Uganda Investment Authority, and the Rural Electrification Board. The meetings yielded significant lessons learned for Liberia:

- The Republic of Uganda has an impressive energy law with introduction of the Electricity Act in 1999. This
- Act led to the reform of the electricity sector in the country.
- The Government still plays a dominant role in the energy sector, controlling the national grid. There are clear laws for electricity/power, oil, water, natural gas, and petroleum. Free entry into the electricity sector for IPPs and PPPs are encouraged.
- Uganda has an unbundled electricity system to foster transparency and investment, and a private distribution system that is operating successfully.
- The country has an independent Electricity Regulatory Authority; tariffs are set to allow for a fair return on capital, while protecting consumers. Uganda’s Ministry of Energy and Mineral Development sets policy, but does not interfere with the work of the ERA.
- The Law established an Electricity Disputes Tribunal (EDT) to hear and settle electricity sector disputes in a business-like manner, avoiding a lengthy court process.
- Private sector is reluctant to invest in large infrastructure projects; the Government leads in this area.

The delegation garnered valuable information and lessons on the roles and responsibilities of key government agencies in enhancing electricity access. This included guidance for servicing low income consumers and communities; encouraging private sector participation and energy infrastructure development; licensing of energy service providers; tariff setting; and standards development and enforcement. The wealth of experience gained by the delegation has been communicated to key decision-makers responsible for formulating a legal framework for the energy sector of Liberia, updating the 2009 National Energy Policy, and developing a national Energy Law.

At the conclusion of the trip, the Assistant Minister noted “we learned a great deal about factors to consider in developing a workable energy law—from those who experienced it firsthand. Both governments offered to continue to work with the Government of Liberia on the policy framework.” The MLME legal Advisor observed “*the research tour provided an opportunity to reinforce the Zero Draft of the Liberia Energy Law, which seeks to provide attainable, affordable, and sustainable energy services across the country.*”



## FIRST ELECTRIC COOPERATIVES IN LIBERIA ESTABLISHED WITH USAID'S LIBERIA ENERGY SECTOR SUPPORT PROGRAM



Training Sessions of KLEC Election Committee facilitated by CDA, NEC and LESSP



An elder member of the Cooperative receiving ballot and casting her vote during the KLEC elections



Elected Officials being inducted into office by Representative of the Cooperative Development Agency (CDA)



Members of Kwendin Lorkiah Electric Cooperative posted for group photo after the induction of the Board officials

Liberia has one of the lowest rural electrification rates in the world, with only 2% of the population in rural areas having access to electricity. In June 2011, after conducting a survey on existing community based organizations in the project areas, the conditions observed determined the formation of the cooperative. The results of the survey presented:

- All the local community organizations were not legally registered and established.
- No organizational structure was in place.
- There was no existence of legal instruments such as, the Bylaws, Charter, Articles of Incorporation or other necessary documents.
- There were no existing offices or legitimate officials.

In addition, the citizens of the community were claiming to be the sole organizers of the unstructured organizations, and also claiming ownership and leadership of these organizations. LESSP concluded the intended impact will not be successful on the community's residents for owning and managing a power system without an effective structure in place. LESSP provided information on the types of business organizations, which led to the selection of establishing a Cooperative model of business to own and manage the project in a sustainable manner. The community members were motivated by the three principles of the cooperative business: (1) User-Owner, (2) User-Control, and (3) User-Benefit.

Liberia has a great potential for harnessing energy from biomass and hydropower. The principles demonstrated the future strength of the community residents and communities' socio-economic position through the establishment of the cooperative businesses. LESSP project aims to demonstrate commercial viability of hydro power and biomass projects.

This guided the process of forming the Kpakpormein Farmer Cooperative in Bong County, representatives of the three adjacent clans to the Mein River project site and will partner with the Cuttington University and Phebe Hospital on the ownership and management of the Mein River Power Company. To carry out the cooperative election activities for Kwendin Lorkiah Electric Cooperative in Nimba County, the various legal documents, including the drafted Articles of Incorporation, the Cooperative Bylaws and the MoU were discussed and revised. Also, facilitated with Liberia Cooperative Development Agency (CDA) and the Liberia National Election Commission (NEC), to set up the training of the KLEC committee. Also, facilitated the conduct of the elections and induction of KLEC first official Board of Directors, along CDA and NEC.

An elder of Kwendin, stated, "We are glad for our full participation into the...cooperative that will take ownership and management of the electricity project that...LESSP has brought to our community." A female youth of Kwendin stated, "Our village will turn into a modern city...thank God for USAID which ...is providing the money ... to make sure that this project works."

## LAYING THE FOUNDATION FOR A SUSTAINABLE FUTURE: EQUIPPING BOOKER WASHINGTON INSTITUTE STUDENTS WITH TECHNICAL SKILLS TO GENERATE RENEWABLE ENERGY ELECTRICITY IN LIBERIA



During training, a Biomass Brother runs tests and records data on the 5kW Lister Engine running on crude palm oil (CPO)



The Biomass Brothers operate BWI's biomass gasifiers using palm kernel shells as fuel



The Biomass Brothers want to recruit new members from the BWI business program

“We figured out that the best fuel is used palm kernels. This is really great because usually people just throw those away,” a “Biomass Brother,” said while training at BWI at the new Biomass Energy Center.

Ten students have been dubbed the ‘Biomass Brothers’ – a group of Booker Washington institute (BWI) students who are part of the new BWI Biomass Energy Center’s education and capacity building program funded as a Public Private Partnership (PPP) by USAID’s Liberia Energy Sector Support Program (LESSP). The PPP is made up of BWI, LESSP, and EcoPower, a Liberian renewable energy (RE) company.

After the start of their training last year, all members of the Biomass Brothers are now able to manage and operate two generator gasifiers (running on palm kernel shells and rubber tree wood chips) and one Lister engine (running on crude palm oil) to generate 40 kW electricity for the BWI. The BWI campus will soon have half its electricity needs generated by the completed 70 kW gasifier systems in December 2013.

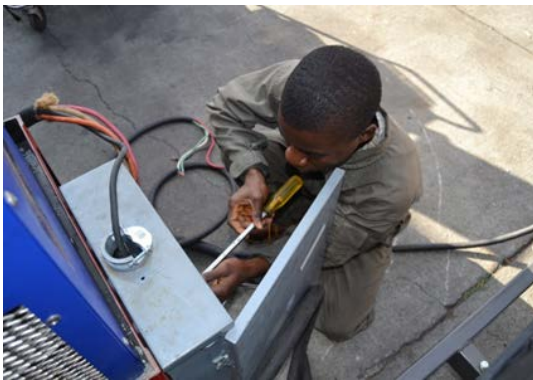
The ability to manage this technology paves the way for renewable energy electricity generation in Liberia to be a reality. The successful training of these students at BWI means that future RE generation systems in Liberia will have skilled operators and mechanics to maintain them thus promoting sustainability.

The RREA (Rural & Renewable Energy Agency) will also use the Center with BWI as an extension and demonstration unit to showcase biomass electricity generation for rural Liberian citizens and commercial enterprises. The gasifiers are also made in Berkeley, California USA by All Power Labs (APL). Both EcoPower and their sub APL are also assisting the Biomass Brothers in the development with hands on training and even all expenses paid trips to the USA to train at APL facilities in CA. “Jobs are not just a promise for us now.” One of the students said. “It’s a reality. And we want others to have that same promise.” (7/2013)

## BUILDING THE CAPACITY OF THE YOUTH: TWO BOOKER WASHINGTON INSTITUTE (BWI) “BIOMASS BROTHERS” TRAINED TO ASSEMBLE APL BIOMASS GASIFIER IN BERKELEY, CALIFORNIA



A Biomass Brother gets hands-on experience on engineering and fabrication



The two BWI students learn more about the gasifier operations and assembly



“It’s so great to have this opportunity to travel here and see gasifiers being made!”  
- Biomass Brother

The Biomass Brothers are a group of BWI (Booker Washington Institute located in Kakata, Margibi County) students who are part of the new USAID funded BWI Biomass Energy Center’s education and capacity building program funded as a Public Private Partnership (PPP) under the Liberia Energy Sector Support Program (LESSP). The PPP is made up of BWI, LESSP, EcoPower, a Liberian renewable energy (RE) company, and All Power Labs (APL), a gasifier manufacturer. The “Brothers” are able to manage and operate two generator gasifiers that produce electricity from rubber tree rood chips and one Lister diesel engine diesel engine that makes electricity from crude palm oil.

Two of the best students, were selected for two weeks training at APL facilities in Berkeley, California. All costs of the trip were sponsored by EPL and APL; LESSP managed the passport and visa processing as well as briefings to prepare them for their trip. These students were sent to continue the education and training they have been receiving at the BWI. The All Power Labs is the sole provider of biomass gasification technology in the USA.

The President of EcoPower Liberia (the gasifier distributor), who met them in their trip, said they have shown great interest and understanding and enthusiasm at APL. They have demonstrated a deeper knowledge of the gasifier technology including the engineering, fabrication, electronics, and operation and maintenance. They are participating in many areas of training that are intense and hands-on. I can truly say that these two guys are real pioneers in Liberia representing the Biomass Brothers, BWI, EcoPower, and APL well.”

LESSP has developed a program to strengthen the capacity of the youth at BWI and other Higher Education Institutions (HEIs). LESSP is creating a pathway for Liberian youth to gain the skills and knowledge to become RE operators and mechanics in Liberia. This successful training for youth is helping “off-grid” renewable energy electricity become a reality in Liberia.

# **ANNEX II – LESSONS LEARNED**

I October 2012 – 30 September 2013

Year Three provided a number lessons to LESSP and staff in regards to operating renewable energy projects in Liberia. A selection of these lessons is listed below.

1. EPC contracting is not suited for Liberian contractors. LESSP found design-bid-build to be far more effective and has coupled it with on the job training to ensure strong construction management
2. To ensure that project schedules are maintained, environmental clearances, designs, and feasibility studies have to be implemented concurrently.
3. Effective customized cost analyses that can be modified to various situations in pilot renewable energy projects will guarantee that decision makers have the best information available.
4. In order to develop accurate cost estimates used to compare bid prices, custom unit rate analysis must be used.
5. Working with the GOL CDA and Business Registry will result in sustainable business development with little need for expatriate organization oversight. LESSP has found Liberian agencies and ministries extremely cooperative and easy to work with.
6. Success is highly dependent on coordinating field work with the Office of the Superintendent and the District Administration of the district the project is taking place in.
7. Construction in Liberia can continue in the rainy season if properly scheduled.
8. In any electrical project there is a period of time between the end of construction and financial independence. Typically, it can be expected that a new electric company will need at least eight months of operation before its revenues can cover its expenses. Financial support needs to be built in to the operational plans for all nascent companies.
9. Hydropower projects in Liberia will only provide electricity for eight to ten months of the year due to the dry season. Projects will need an alternative source of energy.
10. It is critical to the sustainability of any project to build strong partnerships to coordinate beneficiaries. Well-crafted and useful training programs should be implemented.

Additionally, project operational support will be required for a three year period after the end of LESSP.

- I 1. Electrical and civil engineers working in Liberia should be members of the Engineering Society of Liberia.
- I 2. Engineering sustainability in Liberia depends on providing young engineers and non-engineers with opportunities in project management and project design. Capacity building and training courses should be provided.
- I 3. Construction contractors should be provided with on the job training and capacity building to enable them to build larger projects more efficiently in the future.
- I 4. Historical data for Liberian water flow and meteorology is very limited.
- I 5. Paperless construction management can be utilized to ensure sustainability and efficiency of construction projects.

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