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FINAL REPORT

MID-TERM EVALUATION OF THE LIBERIAN ENERGY SECTOR SUPPORT PROGRAM

January 15 , 2013

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DISCLAIMER

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

ACRONYMS

AfDB	African Development Bank
BRP	Buchanan Renewable Power
BWI	Booker Washington Institute
CLSG	Cote d'Ivoire, Liberia, Sierra Leone and Guinea
CO	Contract Officer
COR	USAID Contracting Officer's Technical Representative
CSET	Center for Sustainable Energy Technology
EC	European Commission
EGAT	Economic Growth, Agriculture and Trade
EG	USAID Economic Growth Office
EIB	European Investment Bank
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPC	Engineering, Procurement and Construction
EPP	Emergency Power Project
ESG	Energy and Security Group
EU	European Union
FORECAST	Focus on Results: Enhancing Capacity across Sectors in Transition Countries
GDA	Global Development Alliance
GOL	Government of Liberia
GON	Government of Norway
HFO	Heavy Fuel Oil
IFC	International Finance Corporation
IPP	Independent Power Provider
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt fur Wiederaufbau
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hour
LEAP	Liberia Energy Assistance Program
LEC	Liberia Electricity Corporation
LESSP	Liberia Energy Sector Support Program
LRTF	Liberia Reconstruction Trust Fund
MC	Management Contractor (of LEC)
MHI	Manitoba Hydro International
MLME	Ministry of Lands, Mines & Energy
MOH	Ministry of Health
MPW	Ministry of Public Works
MW	Megawatt
MHP	Micro or Mini Hydro Power
NEP	National Energy Policy
NGO	Non-Governmental Organization

NREL	National Renewable Energy Lab
NTP	Notice to Proceed
NVE	Norwegian Water Resources & Energy Directorate
O&M	Operations and Maintenance
OPIC	Overseas Private Investment Corporation
PMP	Performance Management Plan
PRS	Poverty Reduction Strategy
PV	Photovoltaic
QA/QC	Quality Assurance/Quality Control
RE	Renewable Energy
REFUND	Renewable Energy Fund
RESCO	Rural Energy Service Company
RREA	Rural and Renewable Energy Agency
SME	Small and Medium Enterprises
SO	Strategic Objective
T&D	Transmission and Distribution
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
USAID	US Agency for International Development
USG	United States Government
USTDA	United States Trade and Development Agency
WB	World Bank

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EXECUTIVE SUMMARY

Liberia's electricity sector is one of the most underdeveloped of any USAID-assisted country. Rates of access to publicly provided electricity are among the lowest in the world, while the per-unit cost of electricity is among the highest. There is little private investment in the sector, and the Ministry of Lands, Mines & Energy lacks the technical capacity to champion meaningful reform and expand access in Monrovia or throughout the country. The lack of access is a significant barrier to Liberia's economic development.

The Liberia Energy Sector Support Program (LESSP) was designed by USAID/Liberia to increase access to affordable renewable energy services in geographically focused rural and urban areas in order to foster economic, political and social development. Winrock International is the Mission's implementing partner. LESSP interventions were designed to effect the following changes in Liberia: (i) increased, sustainable access and affordability of electricity within urban and rural poor communities; (ii) improved performance of local governments, civil society and the private sector in monitoring, regulating and managing the use of renewable energy; (iii) an increase in the percentage of households and businesses utilizing clean energy, and a corresponding increase in economic activity; and (iv) policy changes that improve the investment climate for the energy sector.

PURPOSE OF THE EVALUATION

USAID/Liberia contracted with Development Training Services (dTS) to conduct a mid-term evaluation of LESSP. Key evaluation objectives included the following:

(i) Identifying and assessing progress toward achieving each LESSP objective;

(ii) Identifying unexpected implementation obstacles and the program's responses;

(iii) Identifying which aspects of the program worked, which did not, and why;

(iv) Assessing the effectiveness of the program's grant component;

(v) Analyzing the relationships between resources available, resources used and results achieved to determine the specific cost-effectiveness of USAID's programming in each objective, as well as the program as a whole; and,

(vi) Making specific recommendations for the final two years of the program, including eventual modification of the program.

METHODOLOGY

The evaluation commenced in early September 2012, with field work in Liberia from September 24, 2012 to October 26, 2012. During the five-week period, the assessment team reviewed contract deliverables and other relevant documentation, interviewed several key informants, conducted focus group discussions with beneficiaries, visited rural pilot project sites and surveyed stakeholders. Information collected through document reviews and interviews were compiled and triangulated to draw conclusions and provide recommendations.

MAJOR FINDINGS AND CONCLUSIONS

The evaluation team's findings suggest the following:

Objective 1: Strengthen the government of Liberia's (GOL) capacity to implement plans for rural electrification as expressed in the National Energy Sector Policy.

Winrock is successfully building the capacity of the Rural and Renewable Energy Agency (RREA). RREA staff members informed the assessment team that they use skills acquired through LESSP capacity building activities to perform their job responsibilities. Most contract deliverables under Objective 1 were delivered on time.

Objective 2: Establish commercially viable pilot plants that provide renewable energy services to population centers in Bong, Lofa and Nimba counties.

The program has made some progress toward increased clean energy access in rural areas, but significant challenges remain. Each of the four pilot renewable energy projects mandated by LESSP is behind schedule. Construction of both hydro pilot plants is delayed. The Waywayah plant has slipped by a year, and the Mein River plant will not be operational until Fall 2015 – nearly a year after Winrock's contract expires. In addition, construction of both biomass plants has been delayed. The Sorlumba palm oil combustion plant has been delayed due to issues related to identifying a proper engine to combust palm oil. LESSP claims that the Lister-type engine is appropriate for this application and is now in the procurement process. The Cocopa project has been terminated due to the inability to secure private sector commitments, despite a signed MOU in which the Cocopa plantation promised to provide US $1.0M of co-financing. That project has been replaced with the Kwendin biomass project, which could be completed with current funds and in the current period of performance, barring unforeseen delays. LESSP has successfully encouraged the formation of local rural cooperatives at the Wayavah Falls and Sorlumba communities. Wayavah Falls has formed an electric cooperative with elected leadership and technical staff, however, significant additional capacity building will be needed to ensure successful project implementation and sustainable operation. Formation of a rural cooperative for the Mein River hydro project and newly identified Kwendin biomass project are still in progress.

Presently, there are insufficient funds, particularly private sector funds, to construct all four pilot renewable energy plants. The Mein River hydro project will not be operational within the program's period of performance. Over 30% of the construction budget for these projects has been spent, yet no infrastructure has been built at any of the sites. Apart from the UN Industrial Development Organization (UNIDO) partnership on the Mein River hydro project, no private sector investment is forthcoming. The current investment climate in Liberia does not favor private sector investment.

Objective 3: Collaborate with other international donors for the expansion of Monrovia's power distribution network.

No work has been performed under Objective 3 due to a conflict between World Bank and USAID procurement procedures. A contract amendment is required to realign USD $4.6M in funds targeted for activities under this objective.

RECOMMENDATIONS

The assessment team recommends the following broad actions to increase energy access, improve the investment climate and build capacity in the sector:

- The energy law currently before the legislature is on the critical path for all LESSP objectives. LESSP leadership must redouble efforts to advocate for passage of the law by engaging proactively with relevant ministers and other stakeholders.
- Objective 2 is over budget and behind schedule. If necessary, resources should be realigned to ensure that the most feasible projects have adequate funding for construction and capacity building during the final two years of the performance period.
- The LESSP team should expand their successful RREA capacity building campaign to include staff that have joined the agency since the original skills assessment.
- The contract should be formally amended to reflect the scope's evolution since Winrock's award in 2009. For example, funds under Objective 3 should be reallocated to new initiatives in coordination with the Liberia Electricity Corporation (LEC).
- USAID/Liberia should lead coordination efforts among donors and lenders in the energy sector by sponsoring periodic meetings.

INTRODUCTION

Since 2003, Liberia has been slowly rebuilding its electricity generation, transmission and distribution systems, which were severely damaged by decades of civil war and subsequent looting. Modest progress has been achieved, but the country still suffers from an acute energy access crisis. The World Bank (WB) reported in 2011 that fewer than 1,500 households in Monrovia are connected to the electricity grid. Outside Monrovia, electricity infrastructure is scarce. The 2008 Poverty Reduction Strategy (PRS) states that "less than 2 percent of rural residents and 10 percent of urban residents have access to electricity." High-cost generators running on imported fuel generate most of the grid energy at costs that are among the highest in the world. Off-grid consumers pay even more on a per-kilowatt hour (kWh) basis to power small and inefficient generators with gasoline and other fuels. Over 80 percent of Liberia's household energy needs are met through biomass; nearly one million trees are felled each year to generate charcoal. This phenomenon is leading to erosion and threatening habitat and biodiversity throughout the country.

USAID is one of the donors in Liberia contributing to interventions that will result in increased access to electricity. Winrock International is USAID's energy sector contractor implementing LESSP. The program's goal is to leverage early successes with energy sector development to create and rehabilitate energy infrastructure and facilitate Liberia's macroeconomic development strategy as set forth in the PRS. LESSP goals are:

- Strengthen the capacity of the Ministry of Lands, Mines and Energy (MLME), supporting RREA with technical and management training;
- Promote clean energy development in Liberia with four pilot hydropower and biomass electric power projects;
- Support energy regulatory, policy and legislative changes that will improve the private investment climate in Liberia for clean and renewable energy development;
- Strengthen the capabilities of local government, civil society and the private sector in managing, operating, monitoring and regulating renewable energy projects; and,
- Benefit the citizens of Liberia through strengthened economic development and improved access to social services, resulting from access to electricity.

The purpose of this mid-term evaluation is to conduct a full, independent review of LESSP activities and results from October 2010 to October 2012. As requested by USAID/Liberia, this review includes:

- Identifying and assessing progress toward achieving each of LESSP's objectives;
- Identifying unexpected implementation obstacles and the program's responses;
- Identifying which aspects of the program worked, which did not, and why;
- Assessing the effectiveness of the program's grant component;

- Analyzing the relationships between resources available, resources used, and results achieved to determine the specific cost-effectiveness of USAID's programming in each objective, as well as for the program as a whole; and,
- Making specific recommendations for the program's final two years, including eventual modification of the program.

This report addresses the evaluation questions related to the evaluation objectives (see Annex A for Scope of Work).

The evaluation started in early September 2012, with field work in Liberia from September 24, 2012 to October 26, 2012. The evaluation was conducted by a team of three dTS evaluators: Zahid Khan, Team Leader, David Riposo, Capacity Building Expert, and Jackson Dunor, Evaluation Specialist.

The report is organized as follows: The next section presents the evaluation objectives and methodology, and is followed by a discussion on the status of Liberia's energy sector. Key findings and conclusions are then discussed, and recommendations for USAID are presented. Appendices provide information that is pertinent to the evaluation and referenced in this report.

SCOPE AND EVALUATION METHODOLOGY

A. EVALUATION OBJECTIVES

Evaluation objectives presented in the task order Statement of Work include the following:

1. Assess progress toward achieving each of the three objectives.
2. Identify any unexpected obstacles to implementation and evaluate how effectively the program has responded to those obstacles.
3. Identify deficiencies in the design of the program and weaknesses in implementation (what worked, what did not, and why) and propose adjustments to current program strategy as necessary.
4. Assess the effectiveness of the program's grant component in the achievement of intended results.
5. Analyze the relationships between resources available, resources used and results achieved to determine the specific cost effectiveness of USAID's programming in each objective, as well as for the program as a whole.
6. Lead to specific recommendations for the final two years of the program, including eventual modification of the program.

B. EVALUATION QUESTIONS

As stated in the scope of work, evaluation questions for the assessment include the following:

1. Capacity development of the GOL Ministry of Lands, Mines and Energy (MLME), RREA and the Liberia Electricity Corporation (LEC)

- Is there evidence of increased, sustainable technical, managerial and regulatory capacity among MLME, RREA and LEC?
- Has the technical and managerial capacity of RREA staff been enhanced in order to support the development of viable rural electrification programs by the public and private sector?
- Is the program exhibiting progress toward increasing energy access in Monrovia and the three rural counties identified?
- Is the program theory complete in providing and supporting both necessary and sufficient activities to promote success?

2. Community-based Operation and Management of Renewable Energy Systems

- How successful was LESSP in building local technical capacity to manage and operate renewable energy systems toward sustainable community-based operational entities?

3. Renewable Energy Production Capability

- Is the program exhibiting progress toward increased clean energy access in both rural and urban areas?
- Are the resources provided sufficient to meet the targets per objectives?
- How has the program performed in identifying and engaging with investors from the planning stage of the development of pilot plants, arranging meetings with local technical experts and encouraging the formation of local energy program management companies, providing capacity building support, sharing business plans for pilot plants, and utilizing an effective public-private/global development alliance (GDA) strategy to bring in private investment?
- What was the program's experience in attracting additional support for pilot projects with private sector investment in renewable energy?

4. Improved Policy and Regulatory Enabling Environment

- Is there evidence of improved legal, institutional and regulatory frameworks?
- What are the policy changes, both regulatory and legislative, that have occurred or may still be needed, and as per whose perspective?

5. Coordination, Accountability and Adaptive Management

- How effectively has the program coordinated with other donor program activities related to energy sector?
- Do the Performance Management Plan (PMP) indicators for LESSP accurately indicate success in achieving the program's intended results? If not, why? Are the targets for those indicators realistic and attainable in the timeframe of this program?
- What legislative, political, budgetary, economic and/or other factors influenced program implementation (positively or adversely), and how did the implementing partner respond?

C. METHODOLOGY

The evaluation team used various methods including document and data review, personal interviews with key informants, focus group discussions, Likert data analysis and pilot project site visits. Conclusions were reached after careful analysis of all received information.

The evaluation started with a thorough document and literature review, then proceeded with initial key informant interviews conducted by the core team members and targeted follow-up meetings utilizing a survey/questionnaire to serve as backup information.

A list of documents reviewed is shown in Annex C. Nearly 20 key informants were interviewed, including relevant local government officials, leaders of rural cooperatives and other private sector entities, and key Monrovia-based stakeholders such as government officials, the NGO community and energy sector donors

(see Annex D). Four focus group discussions were held with project staff and LESSP project trainees including the Booker Washington Institute (see Annex E). Evaluation activities and purpose are described in Table 1.

TABLE 1: **DESCRIPTION OF EVALUATION ACTIVITIES**

Activity	Purpose
General document review	Analyze program activities and program deliverables. Collect information on the program structure and achievements, construct list of key informants, partners, etc. Determine overall environment for program implementation. Record documented program outcomes and impacts at the regional and country levels.
Key informant interviews	Collect information about the program, validate evaluation methodology and tools, collect expert opinions of LESSP effectiveness. Collect information about program activities, deliverables and cooperation with main stakeholders. Collect expert opinions about project outcomes and impact at the regional and country levels.
Meeting with RREA to discuss capacity building program	Collect primary data on the impact of the ongoing LESSP capacity building effort. Prepare surveys for capacity building participants. Survey participants engaged in the capacity building program.
Meeting with Winrock to discuss the four pilot plant feasibility studies	Gather information about the program activities, deliverables, schedules, and cooperation with main stakeholders.
Meeting with USAID/Liberia management	Gather information about the program activities, deliverables and cooperation with main stakeholders. Collect expert opinions about project outcomes and impact in Monrovia.
Meeting with GOL/MLME - Renewable energy production capability	Evaluate clean energy programs, and Technical and resource capability.
Meeting with MLME- Improved policy and regulation	Collect information on regulation and/or policy changes since 2010.
Meeting with GOL/MLME - Coordination and adaptive management	Check whether PMP and LESSP objectives have been met. Check whether gender issues have been addressed.
Meeting with Winrock/MLME	Determine overall LESSP impact on gender inequality.
Evaluation and analysis	Collect information about the program structure and performance of the LESSP program.

Two meetings were also held with the USAID technical COR and Evaluation Management Advisor. A PowerPoint presentation providing the evaluation team's preliminary findings was shared on both occasions. USAID representatives in attendance included the Economic Growth Officer, Program Management Officer and the Contracting Officer.

LIMITATIONS OF THE EVALUATION

Liberia is still a challenging environment in which to conduct evaluations due to logistical constraints typical of post-conflict and developing countries and limited local human resources. There were some logistical issues that precluded the team from examining a few evaluation questions to the fullest extent. For example, the prolonged rainy season restricted travel in remote rural areas of Liberia. The lack of accessibility and poor road conditions during rains in part led the team to cancel site visits to the Sorlumba and COCOPA communities – instead, information was gathered on the communities through key informant interviews. While local consultant Jackson Momo Dunor provided translation services, language barriers confronted the evaluation team at times, particularly in rural areas where dialects were slightly different. Language challenges prolonged the interview time and led to some shortening of questions that were less crucial. Some important key informants were unavailable until late in the evaluation process. For example, RREA Executive Director Agustus Goanue was unavailable until the final week of the evaluation. His early availability could have provided valuable insights that could have been used in subsequent interviews with other key informants to obtain more information. Finally, key documents pertaining to the project were unavailable or available only in draft. For example, the LESSP team submitted several draft versions of the project management plan to the evaluation team. It was not clear which plan was guiding the project until the final days of the evaluation.

The evaluation team, nonetheless, was able to manage through several of the challenges and complete the evaluation on time.

OVERVIEW OF ENERGY SECTOR IN LIBERIA

A. ENERGY SECTOR OVERVIEW

Liberia is approximately 111,369 km^2 and currently has a population of 3.9 million. 2012 GDP is projected at US $1.353B. GDP growth was estimated at 6.8% in 2011, a constant increase from 5.6% in 2010 and 4.6% in 2009. Current impediments to growth include a small domestic market, lack of adequate infrastructure, high transportation costs and poor trade links with neighboring countries. Liberia used the United States dollar as its currency from 1943 until 1982, and continues to use it alongside the Liberian dollar.

Liberia is a low-income country that is heavily reliant on foreign assistance for revenue. Civil war and government mismanagement destroyed much of its economy, especially the infrastructure in and around Monrovia, the capital. Liberia has the distinction of having the highest ratio of direct foreign investment to GDP in the world. Richly endowed with water, mineral resources, forests and a climate favorable to agriculture, Liberia has been a producer and exporter of basic products – primarily raw timber and rubber – and is reviving those sectors.

The current energy situation is characterized by a dominance of traditional biomass consumption and low access to poor-quality and relatively expensive modern energy services. Over 95% of the population in the low-income category relies on firewood, charcoal and palm oil for energy needs. Modern energy services based on electricity and petroleum products are predominantly used for economic production and transportation; such services are mainly confined to the Monrovia area.

LEC has historically been responsible for the generation, transmission and distribution of electricity in Liberia. However, three decades of civil strife resulted in the significant loss of technical and management capability for this electrical utility.

The International Finance Corporation (IFC) recommended a five-year management contract to allow the selected operator sufficient time to implement:

- A minimum of 33,000 new connections are expected to be set up during the contract, which should result in an additional 150,000 people in Monrovia having electricity for the first time since the war.
- Losses are expected to decrease from 25% to 12%. Collection rates are expected to increase by 5%.
- Capacity building will result in LEC's ability to sustain improved operational performance over the long term.

Manitoba Hydro International (MHI) won the five-year LEC management contract that was initiated in July 2010. Presently, outside Monrovia, LEC operations are nonexistent; all commercial, residential and governmental electricity users rely on small, individual diesel generators.

MHI claims that over the last two years, connections have increased over 400% from about 2,000 to nearly 8,200. The installed generation capacity has increased from 9 MW to 22 MW, with availability increasing from

less than 10 hours a day to 24 hours per day. Distribution losses have decreased; annual revenues have increased from US $5M to US $13M.

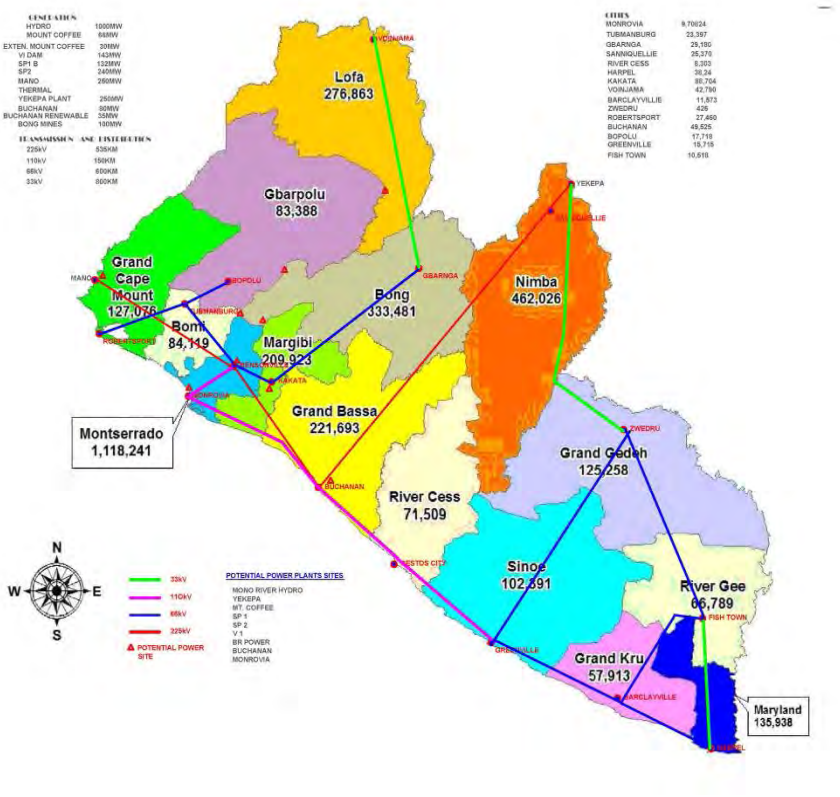
The tariff is about US $0.57/kWh. This tariff is the highest in Africa, and was contractually set at US $0.42/kWh (when the fuel price was US $2.83/gallon) at the commencement of the MHI management contract. It is adjusted quarterly, 30 days in advance, by accounting for the fuel component of the generation cost, changes in LEC's distribution O&M costs, and reduction in losses.

Infrastructure investments are required to make needed improvements in training, systems and capacity building. Under a management contract arrangement, the private operator is paid a pre-agreed fixed fee to manage the utility with partial transfer of operating risk, but no financial exposure through investments. Performance targets with associated bonus and penalty payments are built into the contract. The targets were based on four indicators: number of new connections (at least 20,000 over five years), improvements in collection rates, improvements in operational efficiency, and reduction in losses. As the operator was also tasked with rebuilding the electricity distribution system and expanding access to electricity services in Monrovia, IFC included competing incentives in the management contract to encourage the operator to balance the rapid expansion of services with improvements in LEC's financial viability.

IFC also designed the management contract as a framework agreement between the operator, the government and donors, with references to bilateral agreements between donors and the government for the provision of investment funds, as well as the amount of funds available each year.

Power is not currently traded with neighboring countries. However, two important regional interconnection projects are being implemented: i) *The Cross Border Rural Electrification project,* which will connect the Côte d'Ivoire network to three counties on the Northern and Eastern part of Liberia via a 66 kV transmission line. This project is scheduled to complete in mid-2013, and will provide electricity to about 130,000 dwellings; and, ii) *The Cote d'Ivoire/Liberia/Sierra Leone/Guinea (CLSG) project,* implemented by the West African Power Pool (WAPP) and financed by several donors. All funding arrangements and legal issues related to this project have been resolved. The exact MW capacity of the CLSG line is still unknown, however, the project will transmit sufficient power and will allow the connection to urban centers and rural areas along the route of the 220 kV high voltage line. LEC's long term plan for a countrywide grid is shown in Figure 1.

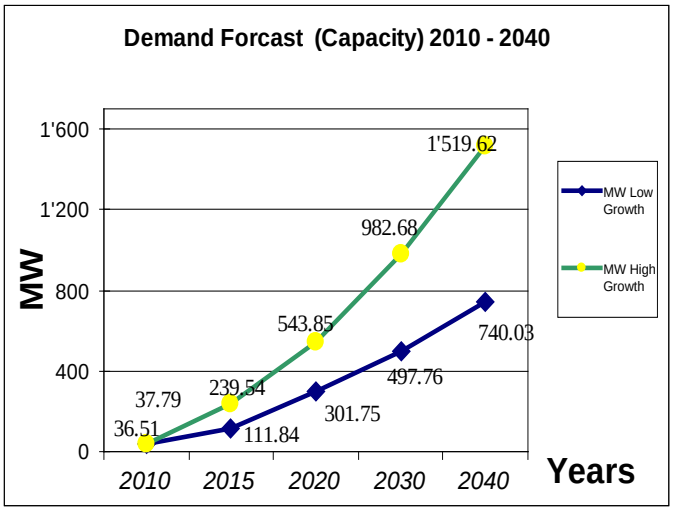
FIGURE I. LEC PLAN FOR A COUNTRYWIDE GRID



Source: LEC

The most recent 2011 report, *Options for the Development of Liberia's Energy Sector* (see Figure 2), shows that in 2015, the electric demand forecast for Monrovia under the low-growth scenario is about 65 MW, and about 100 MW under the high growth scenario.

FIGURE II. MONROVIA'S DEMAND FORECAST



B. POLICY AND REGULATIONS

The government, through MLME, established a National Energy Policy (NEP) in May 2009 with technical and financial assistance from USAID. The principal objective of NEP is to ensure universal access to modern energy services in an affordable, sustainable and environmentally friendly manner in order to foster the economic, political and social development of Liberia.

NEP assumes the implementation of proposed energy sector reforms founded on three essential features:

- Demonstrating the government's resolve for good governance and ensuring financial transparency in all sector transactions;
- Overcoming significant obstacles to private sector investment in energy supply; and,
- Creating the requisite institutional and legal framework and an independent regulatory regime.

One policy objective is to ensure affordability through least-cost. The government is committed to the provision of energy services on a full cost-recovery basis to those who are able to pay, and on a targeted, subsidized basis to those who can only afford to pay a portion. Another policy objective is to establish an adequate delivery process for energy products and services through a public-private partnership where investment in new infrastructure and services is provided by the private sector to the greatest extent possible, with the public sector providing the supporting policy environment and regulatory oversight.

With USAID support, an energy law has been drafted and presented to MLME, however, as of yet, there has not been a significant move from policy to legislation – or ultimately, regulation. The lack of implementation is viewed as an impediment that must be overcome in order for this adequately written policy to become effective. The establishment of an independent, transparent regulatory process will be essential to creating an investment environment that is conducive to increased private sector involvement in the energy sector.

C. RREA AND RENEWABLE ENERGY

RREA is an independent GOL agency established in January 2010 to facilitate and accelerate the economic transformation of rural Liberia by promoting the commercial development and supply of modern energy products and services to rural areas through the private sector and community initiatives, with an emphasis (but not necessarily exclusive reliance) on locally available renewable resources. RREA also will manage a Rural Energy Fund (REFUND) that facilitates financing for rural electrification programs. REFUND will be fully funded once the energy law is enacted by the legislature.

RREA is governed by a nine-member Board of Directors appointed by the President of the Republic of Liberia. The Board is responsible for formulating RREA's policies and guidelines. Operational responsibility for implementing RREA policies and programs is vested in its Executive Director, who is the Chief Executive Officer and Principal Administrator of the agency. The Executive Director is assisted by a number of senior directors, each heading a unit within the agency.

Presently, in spite of the availability of vast biomass resources throughout Liberia, power generation by utilizing woody waste as a fuel is negligible. The 64 MW Mount Coffee hydropower plant located about 35 miles from Monrovia was destroyed during the civil wars. Now, with the help of donor funding, this hydro

plant is being rehabilitated and is expected to be operational by 2015. Most of the power generated will be transmitted to Monrovia via a 33 kV transmission line. Funding for the line is already in place.

Wind energy does not constitute an attractive alternative in Liberia due to the very limited sites where wind speed can satisfy the required design criteria (minimum wind speed of 7m/s) for this type of power plant.

Solar energy is marginally exploited through small isolated photovoltaic (PV) systems that supply electricity to individual buildings (dispensaries, clinics and schools). There are no planned large-scale solar generation plants.

D. DONOR INTERVENTIONS

Major energy sector donors and lending institutions are:

a) USAID

USAID has been actively involved in assisting Liberia's energy sector through various means, including the following programs:

The Emergency Power Program (EPP). USAID participated in this GOL and multi-donor effort, whose aim was to reestablish electricity services and streetlights to portions of Monrovia. In 2009, USAID shifted emphasis from emergency response to sustainable development. Programs concentrated on establishing a stable democracy, changing the culture of impunity, systematic corruption and poor governance, closing severe gaps in access to quality education and health care, expanding economic opportunity through agricultural enterprise and natural resources management, and helping rebuild essential infrastructure and sources of renewable energy.

The Liberia Energy Assistance Program (LEAP). In 2006, USAID began helping the post-war government create a national energy policy, including a strategy to reach the most underserved. In two years, LEAP showed the benefits of low-maintenance solar technologies at 19 sites in schools, clinics, small businesses and public buildings supported by other USAID programs.

The Liberia Energy Sector Support Program (LESSP). This is the current program, which runs through October, 2014. The budget for this program is US $18.962M. LESSP's primary goal is to increase access to sustainable, affordable clean energy and electricity for rural and urban communities and commercial operations in Liberia. The scope of work is a mix of institutional support and specific electricity generation pilot projects, as well as support for increasing the number of connected customers in urban and rural areas. The ultimate objective is to benefit Liberian citizens through strengthened economic development and improved access to social services resulting from access to electricity.

The key components of LESSP are:

- Strengthening the capacity of MLME;
- Supporting RREA with technical and management training;
- Strengthening the management capacity of LEC;
- Improving the enabling environment for private sector participation and investments;

- Promoting clean energy development in Liberia with four pilot hydropower and biomass electric power projects;
- Supporting energy regulatory, policy and legislative changes that will improve the private investment climate in Liberia for clean and renewable energy development;
- Strengthening the capabilities of local government, civil society and the private sector in managing, operating, monitoring and regulating renewable energy projects; and
- Increasing LEC's customer base.

b) European Union (EU)

The EU is funding 50% of the Cote d'Ivoire cross-border project. The other 50% will be funded by Cote d'Ivoire and GOL. This project will connect approximately 130,000 dwellings by June 2013. The total cost for this project is an estimated €9.65M. In addition, the EU has supported the following energy sector-related programs:

- Provided a €1.5M grant for RREA capacity building over three years;
- Contracted with Medical Emergency Relief Initiative (MERLIN) for €2.25M;
- Funded a Gap Analysis Report prepared for GOL; and
- May fund some initial work on the proposed reservoir for the Mount Coffee project.

c) The World Bank Group (WB)

In the specific sector segment relating to access to electricity (in the Monrovia area), in December 2011, the World Bank, acting as administrator for the Global Partnership on Output-Based Aid (GPOBA), approved a grant of US $10M to connect approximately 80,000 people (approx. 17,000 households) to Monrovia's electricity grid, raising the electricity access rate in Liberia's capital from 0.6% to 8%. GPOBA funding will supplement capital allocations from various donors to install connections, initially targeting 21 priority, low-income neighborhoods.

The scheme will be implemented by LEC. *The project will help make access to electricity more affordable by subsidizing the cost of connection and greater inclusive by explicitly targeting the poor.* GPOBA will pay LEC a capital subsidy of US $595 for each connection installed. The connections made through the output-based aid (OBA) scheme will increase the LEC customer base and secure resources for further investments in access programs.

The utility will also be able to speed its goal of reducing tariffs, and subsequently energy expenditure for Liberian households. LEC estimates that for every 10,000 new customers acquired, tariffs will reduce by US $0.03 - 0.04. Ultimately, the savings experienced by households will help make more spending available for other commodities and education, thus achieving the objective of improving the population's living conditions and opening opportunities to reallocate saved resources to productive activities or other socio-

economic improvements like better access to health and education services, and reduction of gender inequalities.

The GPOBA project is part of the Liberia Electricity System Enhancement Project (LESEP). The scheme will be financed jointly by GPOBA (US $10M), the Government of Norway (US $5.8M) and user contributions (US $0.8M). LESEP is funded through a US $29M grant from the Government of Norway, a US $10M IDA credit from the World Bank, and a US $2M grant from the World Bank's Africa Renewable Energy Access (AFREA) program. The World Bank will also continue (through LESEP) to support the five-year management contract signed in July 2010 with MHI.

WB is supporting a variety of other energy sector projects that include:

Liberia Electricity System Enhancement

- Rehabilitation of the distribution system;
- Expansion and connection of the distribution system to 17,000 low-income customers;
- Overhaul of existing generation and synchronization of the national grid;
- Rehabilitation of heavy fuel oil (HFO) storage and off-loading infrastructure;
- 10 MW thermal power plant; and
- Technical assistance and training to LEC, MLME, EPA and RREA.

West Africa Power Pool (WAPP) Power System Development Project

- Implementation of the 1350 km, 220 kV CLSG transmission line and substations connecting the sub-region.

WB is participating on the CLSG Interconnection Project implemented by WAPP. During the preparation phase of the project, WB provided a Project Preparation Advance of US $1.95M to support, among other things, establishment of the Special Purpose Company (SPC), a prerequisite for properly structuring this multinational project. The WB (IDA) will then contribute US $136.63M to project implementation.

Catalyzing New Renewable Energy in Rural Liberia

- Rehabilitation of a 60 kW micro hydro plant in Yandohun, Lofa County; and
- Lighting Lives in Liberia (LLL) Program.

LLL Scale-up Phase

- An expanded solar lighting program.

Scaling Up Renewable Energy Program (SREP) in Low-income Countries

SREP operates under the Climate Investment Funds. It is jointly funded by AfDB and WB, and demonstrates low-carbon methods.

Access Action Plan

This plan aims to expand coverage of electricity to 70% in Monrovia and 35% countrywide by 2030. The first draft of this plan is with the GOL.

d) Kreditanstalt fur Wiederaufbau (KfW)

The only potential intervention identified by KfW, a German international development financial cooperation, is a pledge to participate in the Mount Coffee Rehabilitation project (Phase 1) with a grant of US $25M that was officially announced to MLME on 09 December, 2011. KfW also supported the pre-investment studies for the CLSG interconnection project implemented by WAPP, funded by the EU-Africa Infrastructure Trust Fund through EIB ($1.55M).

e) Norwegian Water Resources & Energy Directorate (NVE)

The Norwegian government focused support on Liberia's energy sector early in 2007 via funding for the Emergency Power Program (EPP) II. Cooperation was expanded in 2010, when Norway entered into four cooperation agreements related to electricity generation, distribution and transmission, energy planning and institutional development. Around NOK 50M was donated for procuring and installing 7 MW of diesel generators and a small grid for distributing the power. In 2010, Norway entered into several cooperation agreements with GOL (see Table 2).

TABLE 2: **NVE-FUNDED PROJECTS**

Project	Objective	Cost NOK (M)	Timeframe
Project Gaps	Financial support to LEC to procure and install 3 MW new capacity and expand the distribution network in Monrovia.	81.9	2010 – 11
LEC Management	Rebuild LEC and strengthen electricity services in Monrovia through a five-year management contract with MHI as LEC Operator.	86	2010 – 15
Investment Funding	Financing the annual investments plans of LEC (LEC Operator) to reach the goal of 33,000 new connections by 2015.	203	2010 – 15
Institutional Cooperation	Strengthening of MLME through an institutional cooperation with NVE.	51.4	2010 – 15

Norway has announced that a grant of US $70M will be made available for rehabilitation of the Mount Coffee hydropower plant. The following are some existing NVE energy-related interventions in Liberia:

- NVE is providing assistance to GOL in the following areas:
  - Legal, including formulating the legal framework;
  - Capacity building, including training in management activities, costing, and risk analysis, markets, financing, etc.;

- LEC funding activities, related mainly to the Mount Coffee project;
- Hydrological services including training MLME staff in areas of, flow measurements, flow evaluations, power generation estimates and seasonal fluctuations;
- Renewable energy: by Summer 2013, NVE will complete a countrywide renewable energy project that will identify biomass, micro hydro, wind and other biofuel projects; and,
- Gender issues, including gender mainstreaming and scholarships for women to attend universities. The budget for this task is approximately US $200,000/year.

f) Japan International Cooperation Agency (JICA)

As far as the energy/electricity sector is concerned, JICA announced the launch of the Basic Study for Rehabilitation of Monrovia Power System. In the framework for this study, JICA will implement a basic study to investigate the possibility of implementing the Rehabilitation Project of Monrovia Power System, which would cover the addition of a 10 MW (2 x 5 MW units) HFO-operated diesel engine plant at LEC Bushrod Island main generation facilities. The project would also encompass equipment for a substation, MV/LV transformers, and equipment for HV line extension.

JICA conducted a survey mission at the beginning of 2012 for identification purposes and discussions with LEC and GOL. The timeframe for implementation can be anticipated at the 2013 horizon, depending on the procedures for completing the transaction. Government of Japan Cabinet approval was expected by December, 2012. JICA continues to have a strong concern about completion of the HFO off-loading and storage facilities at the Bushrod premises for assuring the projected plant's fuel supply. Bidding documents for rehabilitation of the HFO storage infrastructure at Bushrod Island are being finalized under WB funding, and the bidding process to conduct an ESIA for these facilities is underway. The project cost for this 10 MW HFO power plant is expected to be around US $25M. This translates to approximately $2.5M/MW – on the high side of what appears to be typical for bids on related projects in Liberia.

g) African Development Bank (AfDB)

AfDB is supporting development of the CLSG transmission line. The total cost of the project is estimated at US $493.92M. The breakdown per donor and beneficiary country is shown in Table 3; routing of the CLSG line is shown in Figure 3.

TABLE 3: FUNDING OF CLSG INTERCONNECTION PROJECT

Donor	Amount in US $M	Beneficiary Country
AfDB	190.30	Liberia: $34.38M Ivory Coast $51.76M Sierra Leone $41.44M Guinea $62M
World Bank	136.63	Liberia
EIB	105.47	Sierra Leone
KfW	43.43	Liberia
Contribution by impacted country governments	18.07	Four beneficiary countries listed above

FIGURE III. CLSG 220 KV TRANSMISSION LINE ROUTES

Source: LEC

CLSG transmission line funding includes four substations, one each in Yekepa, Buchanan, Monrovia and Mano.

h) United Nations Industrial Development Organization (UNIDO)

UNIDO is involved in supporting several sectors in Liberia, including infrastructure, environment, fisheries and energy. In September 2012, UNIDO funded and completed the installation of two solar projects, one in

Ganta and one in Harper. In Ganta, the Ministry of Youth and Sports was the recipient of a 15 kW solar installation. This included a 5 kW single-phase system and 10 kW 3-phase generation system designed for a light commercial income generating operation. The total capital cost for this 15 kW system was around $200,000 ($13.3/watt). UNIDO selected a Laos-based contractor after receiving international bids. Equipment is from Sun Labob, a German company.

Operations training was conducted in Sierra Lone by UNIDO staff. The Ministry of Youth and Sports will employ a full-time Maintenance Supervisor at a salary of US $125/month. A similar 20 kW solar installation was erected at a Science University in Harper. This solar plant has been operational since August 25, 2012.

UNIDO has provided US $1.6M in funding for the 1.0 MW Mein River project, a LESSP hydro project. This money was previously dedicated for a planned 10 MW hydro plant in northern Lofa County at the Guinean border. That project did not proceed to implementation, and funds were redirected to Mein River.

i) Private Sector Projects

ArcelorMittal needs a capacity of 450 MW to process the iron ores from its concession. The project has remained at status quo since 2008, corresponding to the worldwide financial crisis and a declining demand for steel in China and other growing economies. The ArcelorMittal decision or timeframe to pursue implementation of a large-scale captive power generation plant is unknown.

Buchanan Renewable Power Inc. (BRP) could provide 36 MW of capacity with a rubber wood chip-fueled plant. The US Overseas Private Investment Corporation (OPIC) has approved a loan of up to US $112M for the project, with the remaining amount funded by equity. Negotiations for the agreements are complex and currently at a standstill in the absence of a comprehensive energy law.

To minimize risk, BRP reportedly demanded a "lockbox" arrangement in the Power Purchase Agreement (PPA), wherein revenues earned by LEC are paid directly into an escrow account from which BRP is paid first. GOL attorneys and advisors are concerned that the arrangement with the proposed stringent "security package" would discourage other potential investors in the power sector. GOL is also concerned that competitive hydro power may be much more affordable.

Donor intervention activities are summarized in Table 4.

TABLE 4: SUMMARY OF ENERGY SECTOR DONOR INTERVENTIONS

Name	Project Description	Sub-sector	Units	Capacity	Location	Cost US$ (M)	Financiers	Status
Liberia Electricity System Enhancement project (LESEP)	Expansion of Monrovia's distribution network; Rehabilitation of HFO storage/offloading facilities; Generation overhaul; LEC capacity building	Distribution Generation	Urban households	33,000	Monrovia	48	NORAD, GPOBA, IDA	Ongoing
Liberia Electricity System Enhancement project (LESEP)	Establishment of Rural and Renewable Energy Agency. Provision of micro-hydro, solar energy to off-grid users	Rural Electrification	Rural households	9,000	Lofa, Bong	3	AFREA TF	Ongoing
Rural Energy Master Plan and SSMP	Development of Liberia's rural energy master plan; Pilot rural SSMP	Rural Electrification	Rural households	4,000	Lofa	2	EU	Funding secured
Cross Border Rural Electrification	Cross Border Rural Communities Electrification project (Côte d'Ivoire - Liberia)	Rural Electrification	Population	130,000 (25,000 house-holds)	Nimba, Grand Ghede and Maryland counties	11.7	WAPP (50%) EU (50%)	Funding secured
Buchanan Renewable Energy	Biomass energy plant using rubber wood chips	Generation	MW	31 – 35	Kakata	170	BR, OPIC	Planned
The Liberia Energy Sector Support Program (LESSP)	Four pilots to create micro-grids in rural areas based on biomass and hydro sources	Rural Electrification	Rural households	N/A	Lofa, Bong, Nimba	6	USAID	Funding secured
Diesel Generators	Additional generators for Monrovia	Generation	MW	3	Bushrod (Monrovia)	2	NORAD	Complete
Diesel Generators	Additional generators for Monrovia	Generation	MW	10	Bushrod (Monrovia)	6	USAID	Complete
HFO-fired Generation Plant	Additional generators for Monrovia	Generation	MW	10 - 20	Bushrod (Monrovia)	15-30	JICA	Planned
WAPP CLSG	Cote d'Ivoire, Liberia, Sierra Leone, Guinea (CLSG) West	Transmission	Kms MW	510 100 Through	Yekepa - Buchanan -Mt. Coffee -	494	EIB, EU, IDA, KfW	Funding secured

	Africa Power Pool (WAPP) interconnection and sub-stations			interconnection	Monrovia-Foya			
Mt. Coffee HEP	Rehabilitation of pre-war hydro-electric plant of Mount Coffee	Generation	MW	64	St. John River	162	Norway, KfW, EIB, (AfDB, WB)	Funding pledges received
Foya River HEP	New hydro-electric plant	Generation	MW	50	Foya River (Liberia-Sierra Leone border)	143		Funding unsecured
St. Paul River	New hydro-electric plants	Generation	MW	198	St. Paul River	879		Funding unsecured

LESSP PROGRAM ANALYSIS AND FINDINGS

A. PROGRESS ACHIEVED TOWARD EACH OF THE THREE OBJECTIVES.

Each objective and each task within the objective is examined separately and reported as follows:

Objective 1: Strengthen GOL capacity to implement plans for rural electrification as expressed in the National Energy Sector Policy

Task #1: The Contractor shall conduct a skills assessment of human resources within the Ministry of Lands, Mines and Energy (MLME). The Contractor shall utilize the skills assessment as the basis for developing a training plan that will help build technical and managerial capacity of the MLME to implement its plans for rural electrification.

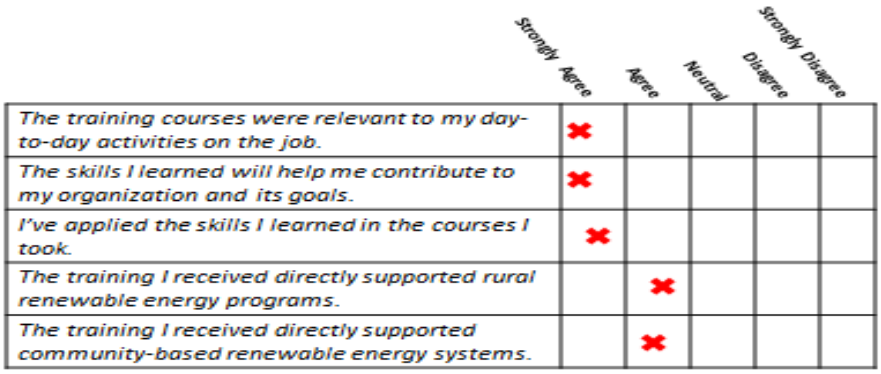
LESSP COP Russell Brown informed the assessment team that MLME was not the target of capacity building activities due to an informal bilateral arrangement negotiated between NVE and the LESSP team. The assessment team confirmed this information with Thor Henning Gulbrandson of NVE.

Winrock's subcontractor, Energy and Security Group (ESG), conducted a skills assessment of RREA staff during the first quarter. ESG met with six RREA technical staff and reviewed their CVs, the terms of reference for their positions, and the organizational chart. The assessment team interviewed five of the six staff from the original group to discuss the skills assessment and subsequent training. Each RREA interviewee regarded the skills assessment process highly.

Task #2: The Contractor shall develop and execute a training plan on the basis of results from task #1. A prime focus under this task will assist the MLME in building capacity of staff associated with the fledgling Rural Renewal Energy Agency (RREA) and the Renewal Energy Fund (REFUND) as elaborated in the National Energy Policy.

Based on the skills assessment exercise, ESG generated a deliverable for the agency that summarized skills, identified gaps and charted a course for training in Year 1. Project management and financial planning were identified as key areas for capacity building for the entire group. The Swaziland-based Development Training Institute (DTI) was subcontracted to train all six staff in financial planning and project management best practices. Each received tailored trainings germane to their job responsibilities. For example, Stephen Potter, Director of Technical Services, is presently pursuing a Master's Degree in Renewable Energy Technology funded by LESSP. Responses to Likert scale surveys suggest staff regarded the training highly and regularly use information learned (see Figure 4 and Annex G).

FIGURE IV. RREA STAFF CAPACITY BUILDING SURVEY



	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The training courses were relevant to my day-to-day activities on the job.	✖				
The skills I learned will help me contribute to my organization and its goals.	✖				
I've applied the skills I learned in the courses I took.	✖				
The training I received directly supported rural renewable energy programs.		✖			
The training I received directly supported community-based renewable energy systems.		✖			

Task #3: The Contractor shall develop an action plan for an electricity commission. The establishment of an independent regulator will reduce government interference/control and therefore improve the enabling conditions for private sector participation in the energy sector. The Contractor's technical assistance shall result in a detailed action plan that GOL can use to create this important institution.

In September 2011, Tetra Tech ES published a draft Energy Regulatory Board (ERB) Action Plan that addressed the key steps, decision points and enabling instruments required to establish and develop an ERB. GOL has not taken action to create this institution; the draft energy law mandates that the ERB has yet to be created.

TABLE 5: **OBJECTIVE 1 RESULTS SUMMARY**

Objective	Status	Comments
National Energy Policy for renewable energy implemented. This would include establishing a legal and regulatory framework for private sector participation and investments in renewable energy.	Not implemented	Policy implementation is beyond project scope.
The technical and managerial capacity of staff forming RREA and managing REFUND will be built and deployed to expand energy services in rural areas.	Capacity built	Training well regarded by RREA staff.
Public and private sector support for RREA and REFUND will enable the expansion of viable rural electrification projects.	Private sector not engaged	Development risk is too high to attract private investment.
An action plan for the development of electricity regulatory commission established.	Plan established	Advocating for creation of ERB is a critical next step.

Objective 2: Establish commercially viable pilot plants that provide renewable energy services to population centers in Bong, Lofa and Nimba counties.

Task #1: The Contractor shall establish at least two hydroelectricity power systems. One mini hydroelectricity system with a minimum output of 100 kW and maximum 5 MW, and one micro hydroelectricity system with a maximum output of 100 kW are to be established. Preferably, these systems should be designed to supply electricity through an auxiliary source when water levels are their lowest. The auxiliary system must use a renewable energy source.

LESSP is developing two hydroelectricity projects. On the Wayavah River in Salayea District, Lofa County, a 15 kW facility is expected to be constructed by mid-2013 that will provide power to the small township of Gbarnway and nearby communities. An electric cooperative has been established to administer the facility, and an executive board has been elected. Although significant additional technical and administrative capacity building is required, selected co-op members have received some training on the fundamentals of electrical wiring, generator maintenance and pole climbing. Tender documents for the construction, testing and commissioning of this facility were issued in September 2012. Due to cost and technical considerations, the feasibility of auxiliary renewable energy generators was not considered.

On the Mein River in Suakoko District, Bong County, Winrock is planning a 1.0 MW facility that will supply power to about 250 commercial and 2,500 residential consumers in the district, including Cuttington University and Phebe Hospital. A technical feasibility study has been completed, including a topographical survey and high-level demand assessment.

Updated construction schedules for the Mein River and Wayavah hydro plants as provided by LESSP are included as Annex H and Annex I, respectively. Best estimates indicate the Mein River hydro plant will be operational by September, 2015. The Wayavah hydro plant is expected to be operational in July, 2013. Auxiliary sources for low water flow periods have not yet been identified for the Wayavah hydro project. In the case of Mein River, existing generators located at the University and the Phebe Hospital near Gbanga could be used.

Task #2: The Contractor shall establish at least two biomass-powered electricity systems.

LESSP completed feasibility studies for the following two biomass projects:

- 35 kW Sorlumba Biomass Project, Lofa County
- 240 kW Cocopa Biomass Project, Nimba County
- 60 kW Kwendin Biomass Project, Nimba County

The 35 kW Sorlumba biomass plant involves combustion of Crude Palm Oil (CPO) in an internal combustion engine to generate power. Technical issues still need to be resolved, as CPO has the potential of gumming up a traditional diesel-fired engine. LESSP is looking at two options: (1) pretreatment of CPO; and (2) use of a Lister-type engine. The bidding process has been delayed due to this issue; the project may not be online until October 2013.

The Liberia Rubber Corporation (LIBCO) was recruited as a private sector partner for the 240 kW Cocopa biomass plant, however, the organization has formally withdrawn support, most likely, due to an inability to raise the USD $1.0M in private sector capital required. The project is financially infeasible without LIBCO support.

The Cocopa biomass project has now been replaced with the 60 kW Kwendin biomass project which, barring any unforeseen issues, could be completed with current funds and in the current period of performance. Construction schedules for the Sorlumba and Kwendin biomass plants are shown in Annexes J and K. A synopsis of the characteristics of all four pilot plants is presented in Annex L.

Task #3 If funds permit, the Contractor shall produce two additional power systems using any of the following technologies: solar, biofuels, wave, geothermal or wind.

This task was contingent on funds availability. There has been no activity.

> *Sub-task 3.3.1: Post-award, the Contractor shall undertake appropriate feasibility studies and economic analyses based on actual site condition, and present plans for USAID's approval before the implementation of proposed renewable power pilots.*
>
> Feasibility studies for five projects (two hydro and three biomass) have been completed. The evaluation team was informed that the feasibility study for the Kwendin project has recently been completed.
>
> *Sub-task 3.3.2: Upon approval by USAID, the Contractor shall develop the terms of reference for an EPC-type (Engineering, Procurement and Construction) contracting mechanism to build these facilities. Under an EPC contract, the Contractor will design the installation, procure the necessary materials and construct the installation, either through its own labor or by subcontracting the work.*
>
> LESSP has prepared tender documents for procurement of the Wayavah hydro project and Sorlumba biomass project. The procurement document for the Mein River hydro project will be completed once the environmental work is certified.
>
> *Task #4: The Contractor shall develop a program that will establish community-based organizations and/or assist local businesses to operate and manage LESSP power systems.*
>
> LESSP was successful in delivering a high-level electrical systems overview to selected beneficiaries in the Wayavah Falls community. Significant additional technical, managerial and administrative capacity building will be required in order to ensure a sustainable outcome and a successful pilot program. Capacity building activities were targeted at the Sorlumba and Cocopa communities, however, the Cocopa project has since been terminated. No capacity building activities have been targeted at the Mein River community or the newly identified Kwendin project. Significant additional resources will be required to establish sustainable community-based organizations to operate and manage LESSP power systems.
>
> *Sub-task 4.4.1: The Contractor shall assess and create a database of organizations involved with community and cooperative development in target areas.*
>
> In August 2011, LESSP published the Database of Organizations Involved in Community/Cooperative Development in the LESSP Pilot Project Areas in Bong, Nimba and Lofa counties. Based on surveys conducted in each pilot project area, this database provides a comprehensive list of organizations in the targeted counties.

Sub-task 4.4.2: The Contractor shall provide training and material support (e.g. business plan development, accounting training and software, equipment, and equipment maintenance training) for cooperatives and/or businesses operating power systems.

Although basic technical capacity building activities have been targeted to three of the four communities, significant work remains to prepare the technical staff to operate and maintain LESSP power systems. Resources have not been invested in administrative and managerial capacity building such as business plan development, financial management or accounting. LESSP has likewise not made investments in software or equipment.

Sub-task 4.4.3: The Contractor shall provide short-term technical assistance to strengthen centers of higher education (e.g. vocational education schools, universities, colleges) in the science and engineering of renewable energy technologies. The Contractor shall also update curricula at vocational schools and other centers of higher education to enhance the programs' objectives and results.

In Q3 2012, LESSP sponsored a one-week seminar on renewable energy technologies at the Booker Washington Institute (BWI) in Kakata, Margibi County. The scope of the course included hydro resource measurement, renewable energy system modeling with RET Screen software and engineering best practices. The assessment team spoke with several beneficiaries of this course at BWI including electrical engineering instructor William Toe, who said, "…the course made me eager to learn more about renewable energy technologies and how to incorporate them into the classroom."

In March 2012, LESSP published the *Renewable Energy Technologies Curricula Strengthening for Vocational and Higher Education Institutions*. This document establishes a roadmap for expanding renewable energy curricula at BWI, Liberia University and other centers throughout the region.

Sub-task 2.4.4: The Contractor shall pursue Global Development Alliances (GDA) with nontraditional resource partners (companies, foundations, etc.) to leverage USAID funds in expanding the delivery of renewable energy. See section C.2.4 Other Technical Considerations below for more background on GDAs.

LESSP obtained US $1.6M of conditional funding from UNIDO for the Mein River hydro project. There is no other reported GDA-related activity.

TABLE 6: **OBJECTIVE 2 RESULTS SUMMARY**

Anticipated Results	Status	Comments
Two hydroelectric plants (one mini and one micro) will be rehabilitated or constructed.	Feasibility studies complete	Infrastructure work remains at both sites. Technical and administrative capacity building critical at both sites.
Two biomass plants will be constructed.	Feasibility studies complete	One biomass project has been terminated. A replacement project has been identified.
Additional renewable energy system based on availability of funds.	No additional systems being developed	Funds are insufficient for additional projects.
Liberian human resources in the renewable energy sector will be strengthened laying the foundation for rapid future growth with private sector investments in renewable energy technology. In addition, each rural power system will have community and or private sector management and an agreed upon cost-recovery program.	RREA strengthened, rural electric cooperatives formed	Significant additional training required to build capacity of RREA and rural electric cooperatives.
By the end of four years, access to electricity outside of Monrovia will increase from 2% to at least 10% in target geographical areas.	Target not met	This anticipated result was unrealistic given development challenges in the country.
Technical capacities of centers of higher education in science, engineering and renewable energy technologies strengthened.	More work is needed	A single, week-long training at Booker Washington Institute was executed; plan for additional support was drafted by LESSP team.

Objective 3: Collaborate with other international donors for the expansion of Monrovia's power distribution network.

Task #1: 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.

> *Sub-task 3.1.1: The Contractor shall work with the contractor of a 5 year management contract (MC) (hereafter known as the "MC contractor") 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 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.*

This objective was never initiated due to a perceived conflict between WB and USAID procurement procedures. As LEC had initiated material procurement procedures utilizing the WB process prior to the signing of the LESSP contract, USAID decided to halt all Objective 3 activities.

TABLE 7: **OBJECTIVE 3 RESULTS SUMMARY**

Anticipated Results	Status	Comments
In Monrovia and environs, the MC contractor will be supported to expand connections to middle and low-income customers. The distribution grid will be expanded to cater to at least 5,000 low-income customers.	Not applicable	Work has stopped under Objective 3.

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B. UNEXPECTED OBSTACLES ENCOUNTERED DURING PROGRAM IMPLEMENTATION.

Unexpected obstacles for all three objectives are delineated below.

Objective 1 - Strengthen GOL capacity to implement plans for rural electrification as expressed in the National Energy Sector Policy.

Unexpected obstacles relative to this objective have been:

- Energy law has not been enacted due to GOL inaction.
- Energy Regulatory Board has not been established due to MLME inaction.
- Perceived risks for private sector involvement are very high, especially in light of the absence of an energy law.

Objective 2 - Establish commercially viable pilot plants that provide renewable energy services to population centers in Bong, Lofa and Nimba counties.

Unexpected obstacles relative to this objective have been:

- LESSP delays in implementation of both hydro plants.
- LESSP delays in implementation of both biomass plants.
- CFR 216-related environmental issues as well as Liberian EPA requirements (especially for the Mein River hydro project) were not well thought through, resulting in construction delays.
- Responses to international tender documents for both the hydro and biomass plants have been suboptimal.
- Bid costs received to date by LESSP are substantially higher than expected, leading to lack of construction funding for the pilot plants.

Objective 3 - Collaborate with other international donors for the expansion of Monrovia's power distribution network.

Unexpected obstacles related to this objective were:

- Procurement-related conflict with other donor agencies and multilateral banks.
- Lack of donor coordination in designing the program.

C. DEFICIENCIES IN PROGRAM DESIGN AND WEAKNESSES IN IMPLEMENTATION.

As defined in the LESSP contract, the purpose of this program is to increase access to affordable, renewable energy services in focused rural and urban areas in order to foster economic, political and social development. The change that USAID/Liberia expects to see in targeted areas upon assessing the completed work includes:

- Increased, 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; and
- Policy changes that improve the investment climate for the energy sector.

It is possible that the impacts above can be achieved by the completion of the four-year LESSP contract, however, at this mid-term point, none have been observed.

Some deficiencies in the program's design include:

- Lack of renewable energy-related training in vocational and engineering schools;
- Underestimating renewable energy pilot plant construction costs in Liberia;
- Affordability and sustainability of renewable energy plants;
- Small-scale renewable energy plants do not benefit from economies of scale; the projected US $0.20-0.40/kWh tariff is fairly high for rural communities; and
- Lack of donor coordination, for example, for Objective 3 – LEC procurement.

Some weaknesses in LESSP implementation include:

- Not aggressively interacting with MLME to encourage enactment of the energy law;
- Not initiating any capacity building efforts with selected MLME staff;
- Not identifying issues related to pilot plant construction at the feasibility study stage;
- Not maintaining schedules for pilot plant construction; the 1.0 MW Mein River hydro plant may not be operational until one year after the LESSP contract ends;
- Not aggressively pursuing private sector investment in the energy sector; and

- Not creating back up generation plans for hydro plants during low water flow periods.

D. EFFECTIVENESS OF THE PROGRAM'S GRANT COMPONENT IN THE ACHIEVEMENT OF INTENDED RESULTS.

Based on information received from LESSP, the program's grant component work has not been established or exercised to date.

E. PERSONNEL

In order to successfully accomplish this LESSP contract, the following four key long-term technical assistance (LTTA) contractor personnel were requested:

- Chief of Party
- Deputy Chief of Party
- Energy Sector Reform Specialist
- Private Power Producer Specialist

Three of the four key personnel (LTTA) are present in Monrovia (see Table 8).

TABLE 8: **KEY PERSONNEL LTTA TEAM**

Name	Title
Russell Brown	Chief of Party
Bhola Shrestha	Deputy Chief of Party/Hydro Power Specialist
Energy Sector Reform Specialist	Utilizing STTA
Leel Wicklemarachchi	Private Power Producer Specialist

Overall, Winrock has a well-qualified team in Monrovia and capable STTA responsible for training RREA staff and energy law review. However, much needs to be accomplished quickly on sustainability issues around the pilot plants. For example, both hydro plants (LESSP Objective 2, Task 4.0) have the following activities still outstanding:

- The Contractor shall provide training and material support (e.g. business plan development, accounting training and software, equipment and equipment maintenance training) for cooperatives and/or businesses operating power systems.
- The Contractor shall provide short-term technical assistance to strengthen centers of higher education (e.g. vocational education schools, universities, colleges) in the science and engineering of renewable energy technologies. The Contractor shall also update curricula at vocational schools and other centers of higher education to enhance the programs' objectives and results.

- The Contractor shall pursue Global Development Alliances (GDA) with nontraditional resource partners (companies, foundations etc.) to leverage USAID funds in expanding the delivery of renewable energy.

The above efforts may require more personnel.

F. MID-TERM LESSP BUDGET

Based on information received from LESSP as of August 2012, the LESSP budget shows the following (Tables 9 and 10):

TABLE 9: PERCENTAGE OF REMAINING BUDGET FOR EACH CLIN

CLIN	CLIN Description	Original Budget (USD)	Spent as of August 2012 (USD)	Remaining (USD)	Remaining %
1	Energy Sector Policy Implementation	3,809,789	1,902,610	1,907,179	50%
2	Distribution Network Expansion (Monrovia)	4,610,037	101,744	4,508,293	98%
3	Electrification of Population Centers outside of Monrovia with RE	1,916,684	1,115,321	801,363	42%
4	Construction Costs (including EPC or turnkey)	7,526,108	2,320,528	5,205,580	69%
5	Grants Under Contract/GDA	1,099,330	31,122	1,068,208	97%
Total Budget		**18,961,948**	**5,471,325**	**13,490,623**	**71%**

TABLE 10: **BREAKDOWN OF BUDGET BY OBJECTIVES**

Objective	Budget Allocated (US $M)	Spent (US $M)
Objective 1 – Energy Sector Policy	$3.8	$1.9
Objective 2 – Renewable Energy Pilot Plants	$10.5	$ 3.47
Objective 3 – Distribution Network Expansion	$4.6	$0.1

At the contract midpoint, approximately 50% of Objective 1 funds have been expended on training RREA staff and revising the energy law document. Objective 2 calls for construction of four renewable energy plants, however, no construction has been started. Objective 3 also remains to be initiated.

G. LESSP CONTRACT DELIVERABLES

Table 11 shows the 13 LESSP contractual deliverable schedules and their status.

TABLE 11: **PROGRESS TOWARD CONTRACT DELIVERABLES**

	Deliverable	Due	Status
1	MLME/RREA skills assessment	Q2	Completed April 2011
2	Training plan	Q2	Completed April 2011
3	ERB action plan	Q4	Completed September 2011
4	Feasibility studies	Q2	Completed July – October 2011
5a	Micro-hydro system	Q8	May be complete by Q12
5b	Mini-hydro system	Q12	Will not be complete by Q16
6a	Biomass plant 1	Q8	Will not be complete by Q16
6b	Biomass plant 2	Q12	Will not be complete by Q16
7	Add'l plants based on funds availability	TBD	Not applicable
8	Database of CBOs	Q2	Completed August 2011
9	Training plan for CBOs	Q8	Was not completed

10	Update higher education curricula	Q8	Plan developed March 2011; no curricula have been rolled out
11	Quality control plan	TBD	Not applicable
12	Construction schedule	TBD	Not applicable
13	At least one GDA	Q8	Was not completed

H. PROGRESS TOWARD GOALS AND INTERMEDIATE RESULTS

Progress to date is provided below:

TABLE 12: PROGRESS AND INTERMEDIATE RESULTS

DO/IR: Results Statement	Indicators	Has the implementer met expectations as of Q1 13?
LESSP Goals		
A Liberian energy sector with strengthened capacity to promote rapid, sustained and broad based growth.	Capacity constructed or rehabilitated as a result of USG assistance	No
A Liberian energy sector with strengthened capacity to promote rapid, sustained and broad based growth.	Total public and private dollars leveraged by USG for energy infrastructure projects	Partially
A Liberian energy sector with strengthened capacity to promote rapid, sustained and broad based growth.	The Liberia Electricity Corporation (LEC) procurement system and financial policies and procedures compliant with USAID standards	Not Applicable
LESSP Intermediate Results		
IR 1: Strengthened GOL capacity to implement plans for rural and renewable energy *Sub IR 1.1: Improved MLME technical and managerial capacity to implement plans for rural electrification*.	Number of policy reforms/laws/regulation and administrative procedures drafted and presented for public/stakeholder consultation to enhance sector governance and/or facilitate private sector participation and competitive markets as a result of USG assistance	Yes
IR 1: Strengthened GOL capacity to implement plans for rural and renewable energy *Sub IR 1.1: Improved MLME technical and managerial capacity to implement plans for rural electrification.*	Number of government officials trained in human resources, energy policy and regulation and other related practices	No

DO/IR: Results Statement	Indicators	Has the implementer met expectations as of Q1 13?
IR 1: Strengthened GOL capacity to implement plans for rural and renewable energy. *Sub IR 1.2: Action plan for a new electricity regulatory board (ERB) developed.*	ERB action plan fully developed.	Yes
IR 1: Strengthened GOL capacity to implement plans for rural and renewable energy. *Sub IR 1.3: Technical capacities of centers of higher education in science, engineering and renewable energy technologies strengthened.*	Number of centers of higher education and vocational education strengthened with curricula in renewable energy disciplines.	No
IR 2: Increased access to sustainable and affordable electricity for rural populations. *Sub IR 2.1: Commercially viable pilot plants in Bong, Nimba and Lofa counties.*	Number of people in targeted load centers accessing modern energy services as a result of USG assistance.	No
IR 2: Increased access to sustainable and affordable electricity for rural populations. *Sub IR 2.1: Commercially viable power plants in Bong, Nimba and Lofa counties established.*	Percentage of people in targeted districts accessing to modern energy services.	Not applicable
IR 2: Increased access to sustainable and affordable electricity for rural populations. *Sub IR 2.1: Commercially viable power plants in Bong, Nimba and Lofa counties established.*	Number of pilot hydro, biomass or alternative renewable energy systems built or renovated.	No
IR 2: Increased access to sustainable and affordable electricity for rural populations. *Sub IR 2.2: Community based organizations and businesses to operate pilot projects supported.*	Number of community members trained in construction, maintenance or management of new power systems.	Partially
IR 2: Increased access to sustainable and affordable electricity for rural populations. *Sub IR 2.2: Community-based organizations and businesses to operate pilot projects supported.*	Number of community-based management entities established and trained.	Partially
IR 3: Increased access to sustainable and affordable electricity for urban populations through the expansion of the Monrovia power grid. *Sub IR 3.1: Electricity distribution to low and middle-income customers connected to Monrovia grid increased.*	Number of people in targeted distribution centers in Monrovia with access to modern energy services.	Not applicable
IR 3: Increased access to sustainable and affordable electricity for urban populations through the expansion of the Monrovia power grid. *Sub IR 3.2: Increased quantity (MW) of operational electric generation capacity through LESSP actions.*	Quantity (MW) of operational electric generation capacity provided through LESSP-funded LEC subcontracts.	Not applicable

RESPONSE TO EVALUATION QUESTIONS

CAPACITY DEVELOPMENT OF GOL MINISTRY OF LANDS, MINES, AND ENERGY (MLME), THE RURAL AND RENEWABLE ENERGY AGENCY (RREA), AND THE LIBERIA ELECTRICITY CORPORATION (LEC)

Is there evidence of increased, sustainable technical, managerial and regulatory capacity among the MLME, RREA and LEC?

MLME was not the target of capacity building activities due to an informal bilateral arrangement negotiated between NVE and the LESSP team. LEC was not the target of capacity building activities due to a stop-work order issued by USAID on all Objective 3 activities.

Empirical evidence suggests an increased level of technical, managerial and regulatory capacity at RREA. During focus group discussions, key RREA staff members described to the assessment team examples of how they had used skills acquired through LESSP capacity building activities in a professional context. For example, Procurement Officer Lester Kronda noted that his exposure to procurement best practices and supply chain management assisted him in his day-to-day professional responsibilities. Financial department manager Madia Warner discussed a short course on Financial Management which informed her design of internal financial controls at RREA.

The assessment team issued a survey to five of the six capacity building beneficiaries at RREA that revealed that staff strongly agree training courses were relevant to job responsibilities and applicable to the mission of the agency. All five survey respondents expressed that they would be eager to participate in additional capacity building exercises sponsored by LESSP.

Has the technical and managerial capacity of RREA staff been enhanced in order to support the development of viable rural electrification programs by the public and private sector?

RREA staff cited several examples of how LESSP-sponsored capacity building activities directly and indirectly supported RREA's mission of supporting rural electrification programs. For example, Madia Warner noted that the grant management expertise she acquired through LESSP-sponsored training will help her administer funds for rural and renewable energy ventures once the REFUND facility is fully established.

Is the program exhibiting progress toward increasing energy access in Monrovia and in the three rural counties identified?

Energy access is increasing in Monrovia, but the linkage to LESSP capacity building activities and increased access in the capital city is tenuous. Additional business and residential connections in Monrovia have been sponsored by LEC, which has not been a significant LESSP beneficiary. Access has not been substantially expanded in Bong, Nimba or Lofa counties, although the Mein River hydropower project has the potential to substantially increase access in Bong County once it is completed.

Is the program theory complete in providing and supporting both necessary and sufficient activities to promote success?

The program theory proscribed in the contract differs from the activities implemented by Winrock. Substantial capacity building activities were targeted to RREA rather than LEC or MLME. Capacity building activities targeted to RREA were necessary and sufficient to position the original beneficiaries for success in their positions. The original group of LESSP beneficiaries at RREA included six staff members. Since the original skills assessment was completed in Year 1, the agency has grown threefold. A new skills assessment and subsequent capacity building activities are required to promote sustainable success at RREA.

COMMUNITY-BASED OPERATION AND MANAGEMENT OF RENEWABLE ENERGY SYSTEMS

How successful was LESSP in building local technical capacity to manage and operate renewable energy systems toward sustainable community-based operational entities?

LESSP targeted local technical capacity building activities at electric cooperative members associated with: (i) the Sorlumba Biomass Power Project, Lofa County; (ii) the Cocopa Biomass Power Project, Nimba County; and (iii) the Wayavah Falls Micro-hydropower project, Lofa County. Selected individuals from these communities attended 10-week training seminars at the Booker Washington Institute (BWI) in Kakata, Margibi County. The purpose was to provide students with the basic technical knowledge required to administer, operate and maintain a renewable energy facility. These activities were conducted in Q3 and Q4 of 2012

The assessment team traveled to Kakata to inspect the BWI facilities and meet with Principal Mulbah Jackolie, the Instructor of Electrical Engineering, William Toe, and his colleagues. The syllabus for the LESSP-sponsored seminar stated the objective was to enhance "technical capacities in basic electrical wiring and transmission system service and maintenance." Key modules of the course addressed topics such as: (i) safety; (ii) using electrical tools and materials; (iii) basic electrical symbols and diagrams; (iv) different types of wires; (v) wiring best practices; (vi) concepts of power transmission; and (vii) power system testing and evaluation. Each module featured a blend of theory and hands-on laboratory exercises. The assessment team toured various laboratories throughout the campus. Each was well equipped to accommodate the scope and scale of training described in the syllabus. This training seminar was not tailored to the specific needs of the LESSP beneficiaries, but it did provide a useful high-level overview of basic electrical concepts for a population of students that have had little exposure to household wiring, large generators or transmission infrastructure. Mr. Toe was knowledgeable and exhibited a command of his subject.

The assessment team conducted focus group conversations with the Wayavah Falls Electric Cooperative to gauge their level of capacity to operate and maintain the micro hydro facility once it is built. Of the 20 co-op members and community stakeholders who attended the focus group discussion, four trained at BWI. Each stated that s/he felt their community was ill-prepared to operate and maintain the micro hydro facility that is due to come online in 2013. Although they lauded the training received at BWI, they noted that it did not go into fine-focus detail regarding generator maintenance, nor did it feature tailored laboratory exercises that would prepare them to maintain a hydroelectric generator. Each student noted that the training they received in the summer of 2012 will be stale by the time the micro hydro facility is commissioned in 2013. Finally, the assessment team observed that the elected administrative officers of the cooperative executive board will require significant project and financial management capacity building to foster stewardship of resources and ensure project sustainability.

The Sorlumba biomass power project has run into technical problems that jeopardize its timely implementation. LESSP has (rightly) terminated the Cocopa biomass project due to the inability to secure private sector commitments, despite a signed MOU in which the Cocopa plantation promised to provide US $1M in co-financing. The project has been replaced with the Kwendin biomass project, which could be completed with current funds and in the current period of performance. At this point, Kwendin biomass project cooperative members will require immediate training and instruction to ensure project sustainability.

No capacity building has been sponsored for stakeholders in the Mein River mini-hydropower project. Cuttington University, Phebe Hospital and other potential off-takers have yet to form a cooperative. Once formed, the LESSP team can target capacity building activities to selected technical experts.

LESSP was successful in delivering a high-level electrical systems overview to selected beneficiaries in the Wayavah Falls community, however, significant additional technical, managerial and administrative capacity building will be required in order to ensure a sustainable outcome and a successful pilot. USAID should anticipate and program for continued technical guidance and technical assistance to the Wayavah Falls community project. Significant capacity building activities remain at the Mein River community, and have yet to be initiated at Kwendin. At each location, once a cooperative is incorporated, technical, managerial and administrative capacity will need to be built to ensure project sustainability.

RENEWABLE ENERGY PRODUCTION CAPABILITY

Is the program exhibiting progress toward increased clean energy access in both rural and urban areas?

LESSP has made some progress toward increased clean energy access in rural areas, but significant challenges remain. Both the Mein River and Wayavah Falls hydropower projects are behind schedule and over budget. No infrastructure has been built at either location. Capacity building activities have equipped a group of trainees in Gbarnway with basic electrical and mechanical skills, however, significant additional capacity building will be required to ensure successful implementation and sustainable operation of the facility. Mein River stakeholders have not incorporated into an electric cooperative, and no capacity building activities have been targeted to these individuals. Environmental considerations threaten to substantially increase capital costs, delay delivery of the project beyond the LESSP period of performance, or both.

The Sorlumba biomass power project was designed to generate power from locally sourced CPO. A tender document was issued internationally for a CPO combustion engine. Vendor feedback received by LESSP during this procurement process revealed that unrefined CPO in Lofa County is poorly suited for combustion in an engine. The unique chemical constituents of this oil and its high viscosity cause poor engine performance and lead to high operating costs. Presently, the LESSP team is considering pre-treatment of the crude oil as well as purchasing a small Lister-type generator that may be able to burn the fuel at low efficiency. The project is estimated to begin in September 2013.

The Cocopa project has been terminated due to an inability to secure private sector commitments, despite a signed MOU in which the Cocopa plantation promised to provide US $1M in co-financing. The Liberia Company representing the Cocopa Rubber Plantation was enlisted early in the project lifecycle as an off-taker and capital investor, but the organization has formally withdrawn support and the project is financially infeasible without a private investor. This project has been replaced with a 60 kW Kwendin biomass project, scheduled for completion in April 2014.

LESSP has not made progress toward increasing energy access in urban areas. Objective 3 of the LESSP program was designed to target interventions at the LEC, which is focused on access expansion in Monrovia.

Are the resources provided sufficient to meet the targets per objectives?

Resources will not be sufficient to complete four pilot projects. As shown in Table 7 above, over 30% of CLIN 4 funds have been spent, but no construction has started on any of the pilot projects. Construction costs at Mein River alone will likely exceed the remaining funds under CLIN 4. Development risk is very high in Liberia due to the lack of an energy law, so major stakeholders in the Mein River project have been unable to mobilize their own financing. LESSP has secured additional funding from UNIDO, however, there will still be a funding gap.

Construction of the Wayavah Falls project will be less expensive, so the budget will be sufficient to support capital costs. Significant additional investment will be required for technical, managerial and administrative capacity building among Wayavah Falls stakeholders to ensure project sustainability.

Funds under CLIN 4 are insufficient to address the anticipated expenses associated with the two hydropower projects. There are still technical risks associated with development of the biomass projects during the final two years of the program.

How has the program performed in identifying and engaging with investors from the planning stage of the development of pilot plants; arranging meetings with local technical experts and encouraging the formation of local energy program management companies; providing capacity building support; sharing business plans for pilot plants; and utilizing an effective public-private/GDA strategy to bring in private investment?

The program has engaged with investors and potential private sector partners, but no private sector funds have been leveraged to support renewable energy. For example, the LESSP team identified the Liberia Corporation (LIBCO) as a potential private sector partner and captive off-taker for a biomass-fired power plant. The investor withdrew support in 2011 due to unknown reasons The LESSP team has engaged stakeholders in the Mein River power project in discussions on private investments, but so far none have been secured. As an example, Phebe Hospital administrators have cited difficulty accessing financing due to Liberia's uncertain energy policy and regulatory regime.

LESSP has successfully encouraged the formation of local rural cooperatives at the Wayavah Falls and Sorlumba communities. Wayavah Falls has formed an electric cooperative with elected leadership and technical staff, however, significant additional capacity building will be needed to ensure successful project implementation and sustainable operation.

UNIDO has offered US $1.6M in conditional support to the Mein River project, but there has been no private sector investment; the investment climate in Liberia does not favor private sector investment at this time.

What was the program's experience in attracting additional support for pilot projects with private sector investment in renewable energy?

LESSP has not successfully attracted private sector investment. The investment climate in Liberia's energy sector is characterized by high levels of risk due to uncertain policy and regulatory regimes, systemic corruption, the post-conflict landscape, and a variety of other factors. As a result, there is scant private sector investment anywhere in the country. Phebe Hospital Lead Administrator Kerson K. Saykor told the

assessment team that the hospital has been unable to obtain financing to support the Mein River project due to the development risk associated with the lack of an energy law.

IMPROVED POLICY AND REGULATORY ENABLING ENVIRONMENT

Is there evidence of improved legal, institutional and regulatory frameworks?

The legal, institutional and regulatory frameworks have not been improved as a result of LESSP activities. The energy law first drafted in 2009 remains mired in the legislature, despite its critical importance to private investors with interest in the energy sector. LESSP met is contractual obligations of submitting an Energy Regulatory Board Action Plan and a revised draft energy law, but no perceivable change has been occurred as a result of these actions.

What are the policy changes, both regulatory and legislative, that have occurred or may still be needed, and as per whose perspective?

Policy and regulatory changes have not yet occurred. An energy law is required to improve the private investment climate and drive down development risk in the energy sector.

COORDINATION,ACCOUNTABILITY AND ADAPTIVE MANAGEMENT

How effectively has the program coordinated with other donor program activities related to the energy sector?

LESSP has bilateral relationships with certain parallel energy activities sponsored by other donors and lenders. For example, NVE collaborated with LESSP on capacity building activities. UNIDO is collaborating with LESSP on the Mein River hydro power project. There is no central forum for coordination among donors and lenders in the energy sector, however. This presents USAID with an opportunity to exhibit leadership by sponsoring a working group with representatives from each active donor and lender in the sector. The Energy Access Plan that will soon be issued by MLME could serve as a useful framework for such a group. This plan will prioritize Liberia's infrastructure and capacity building needs in the sector.

Do the Performance Management Plan (PMP) indicators for LESSP accurately indicate success in achieving the program's intended results? If not, why not? Are the targets for those indicators realistic and attainable in the timeframe of this program?

Table 12 summarizes progress toward PMP indicators and contract deliverables. The PMP shows 12 indicators for Objectives 1 and 2 (see Table 10). Objective 3 was not initiated.

What legislative, political, budgetary, economic and/or other factors influenced program implementation (positively or adversely), and how did the implementing partner respond?

Based on the evaluation team's findings, three areas have adversely impacted the program: (i) legislative considerations; (ii) budget; and (iii) lack of donor coordination.

Lack of an energy law has a negative impact on the investment climate. The assessment team understands that a prior MLME Deputy Minister had a different approach to enacting the energy law and did not actively pursue the LESSP approach. Ultimately, it is MLME's responsibility to advance an energy law through the parliament, and then establish an Energy Regulatory Board. It is difficult to engage the private sector in renewable energy projects until GOL has a law and subsequent regulations in place.

LESSP experience has shown that all equipment and construction bids are much higher than budgeted. This most likely pertains to the fact that equipment vendors and contractors are not familiar with Liberia, so inflated bids to compensate for unknown risks.

In discussions with LESSP, there appears to be a general lack of coordination between donor agencies and multilateral banks. Routine monthly or bi-monthly meetings between MLME and all energy sector donors are needed to review and discuss energy sector issues and schedules.

GENDER DISPARITIES AND IMBALANCES

LESSP data shows that participation by women in project implementation was fully encouraged.

Under Objectives 1 and 2, the LESSP team used gender among their selection criteria when determining which community members should be trained. Under Objective 1, two female staff at RREA were trained in financial and project management.

In May and July, 2011, LESSP and its sub-contractors (Center for Sustainable Energy and Technology, and Lutheran Training Institute) conducted socio-economic surveys at various project locations of Bong, Nimba and Lofa counties to collect information on socio-demography, demand for loans, ability and willingness to pay for electricity, community capability to contribute in the construction and management of the pilot power plants and to collect baseline data. During this process, the survey team screened and selected enumerators from lists of candidates recommended by community leaders such as women heads (community chairladies) and youth chairpersons. The number of males and females recruited per project site is presented in Table 13.

TABLE 13: ENUMERATORS RECRUITED FOR SOCIO-ECONOMIC SURVEYS, BY GENDER

Project Site	Male	Female	Remarks
Gbarnway	9	7	All Youth
Cocopa	7	3	All youth
Mein River	12	3	All youth and 2 elders
Sorlumba	5	3	All youth
Wozi (Zorzor)	7	3	All youth and 1 elder

The surveys in Cocopa and Gbarnway were conducted by local subcontractors. Under LESSP's direction and guidance, women and youth were included as enumerators.

At each project site, a two-day training workshop was conducted with community enumerators to explain interview questions and data entry guidelines. In addition, guidance on identifying a balance of respondents among male and female, youth and elders were thoroughly explained. Winrock claims that in each fiscal quarter, 12 youth and 12 elders – equally split between males and females – are targeted for the focus groups at each active project site to discuss issues relating to project implementation.

LESSP stated that to integrate cross cutting issues such as gender into the project, Winrock voluntarily proposed to target and strive to involve women and youth at every stage of project implementation activities.

Information provided by LESSP to the assessment team states that once the Gbarnway and Sorlumba electric cooperatives were established, community members were recruited for electrical and mechanical training at BWI. The recruitment process for the BWI training opportunity was accomplished via notices, an application, aptitude tests, and interviews. Unfortunately, female participation was very low; LESSP lists the following reasons:

- Lower educational attainment (compared to men) due to lesser educational opportunities for girls/women in rural areas;
- The few qualified women identified were not available due to domestic and other daily chores;
- Some women that met the criteria for training had limitations to travel to rural communities for training;
- Traditional and cultural issues were an impediment.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. It is critical for Winrock to work closely with MLME to move the energy law along so it is approved and enacted by the parliament.
2. Winrock should take a leadership role and sponsor donor meetings to avoid duplication of programs or conflicts during the design phase of the program.
3. Construction of both hydro pilot plants has been delayed. The Waywayah plant is delayed by a year and the Mein River plant will not be operational until Fall 2015 – nearly a year after Winrock's contract expires.
4. Construction of the Sorlumba and Cocopa biomass plants has been delayed due to technical and/or funding reasons. The Sorlumba palm oil combustion plant has been delayed due to technical reasons, as it has taken additional time to identify a proper engine (Lister type) to combust the palm oil. The Cocopa wood gasification project has been terminated due to the inability to secure private sector commitments, despite a signed MOU in which the Cocopa plantation promised to provide US $1.0M for co-financing. The 240 kW Cocopa biomass project has been replaced with the 60 kW Kwendin biomass project which, barring any unforeseen issues, can be completed with current funds and in the current period of performance. At the time of this evaluation, there were insufficient funds under Objective 2 – especially private sector funds – to construct all four pilot renewable energy plants.
5. Objective 3 was never initiated, as there was a conflict between WB and USAID procurement procedures. WB initiated its equipment procurement process for LEC before the LESSP contract was signed, therefore LEC decided to continue using WB procedures.
6. A contract amendment is required to realign US $4.6M in funds slated for Objective 3 activities.

RECOMMENDATIONS

The evaluation team's recommendations below are based on a review of documents, analysis of information gathered during the assessment, and USAID/Liberia's vision of achieving the following:

- Increased, sustainable access and affordable 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; and

- Policy changes that improve the investment climate for energy sector.

In order for the program to be successful, we recommend the following corrective actions be taken at the mid-point of the LESSP contract.

Objective 1: Strengthen GOL capacity to implement plans for rural electrification as expressed in the National Energy Sector Policy.

1. Advocacy: Immediate focus must be on advocacy for the energy law and formation of the Energy Regulatory Board. In doing so, significantly more cooperation and interaction is required between LESSP management and MLME.
2. Capacity building: Findings show that MLME, RREA and LEC all require significant ongoing capacity building and training. Greater coordination will be required among donors sponsoring capacity building activities.
3. Leadership: Under USAID/Liberia's leadership, LESSP should take the lead in sponsoring monthly or bi-monthly meetings with all energy sector donors in order to strategize future courses of action for major activities, including the Mount Coffee hydro plant rehabilitation, CLSG transmission line, cross-border interconnection, a least-cost generation study for Monrovia, and an energy access plan that are in development stages. USAID/Liberia will be in a better position to achieve Objective 1 if donor resources are pooled to provide the necessary capacity building efforts and training for MLME staff to hold leadership positions.

Objective 2: Establish commercially viable pilot plants that provide renewable energy services to population centers in Bong, Lofa and Nimba counties.

1. Support for hydro plant projects: LESSP successfully identified renewable energy pilot plant sites, conducted feasibility studies and initiated community involvement. The program, however, should take corrective measures in light of unexpected technical and/or budgetary constraints. Both hydro plants are behind schedule. Most likely, the Wayayah micro hydro plant will not operational until Summer 2013, and the Mein River hydro plant until Fall 2015. The assessment team believes that resources will be well spent in continuing support for both these projects. LESSP faces significant development challenges at Mein River, including environmental compliance, private investment and capacity building. Appropriate resources should be directed to this project to ensure positive outcomes.
2. Support for biomass project: The Cocopa biomass plant has already been terminated. LESSP has identified a replacement 60 kW Kwendin project, expected to be operational by April 2014. Technical issues have stymied the Sorlumba biomass project since palm oil fuel is not suitable for use in most traditional internal combustion engines. LESSP has determined that pretreating palm oil and employing a Lister engine will address this challenge. The evaluation team recommends continued development of the Sorlumba project. Updated information from LESSP states that the 60 kW Kwendin project is estimated to be online in April 2014. As this date is approximately four months before LESSP is completed, USAID is advised to closely monitor project development activities.

3. Resources for environmental compliance: The Mein River mini hydro power project has the potential to electrify thousands of homes and businesses and be a key component of LESSP's legacy. Environmental concerns are on the critical path to development at this site. Subcontractors operating remotely have managed environmental permitting and compliance hitherto. This has led to miscommunication and permitting delays. Increased staff resources should be dedicated to environmental compliance and permitting to ensure timely project development; these functions should be performed by the Winrock team in Liberia rather than by remote subcontractors.

4. Technical capacity building: Additional capacity building will be required at all four pilot plant sites. At Wayavah Falls, tailored technical capacity building will be required to prepare technical staff to operate and maintain the generator and transmission infrastructure. Administrative and managerial capacity building will be required to ensure the sustainability of operations. The LESSP team should anticipate sustained capacity building activities at Wayavah Falls through the end of the performance period.

   At Mein River, the LESSP team should assist stakeholders in forming a cooperative or other special purpose entity. Once this entity is formed, technical, managerial and administrative capacity building activities should be targeted at the relevant stakeholders to prepare this group to be stewards of the project once it is built.

   Continued training is required at the Sorlumba biomass project, similar to Wayavh falls. The Kwendin biomass project is new, and immediate attention is required to form a cooperative and conduct sustainability training.

Objective 3: Collaborate with other international donors for the expansion of Monrovia's power distribution network.

1. Reallocation of funds under Objective 3: Work on Objective 3 was never initiated due to conflicting procurement rules with WB. At this point, a contract amendment is needed to determine the use of funds. The US $4.6M allocated here could be used to cover the Mein River hydro project's funding deficiency or support LEC in capacity building activities.

2. Donor coordination: In the near future, LEC will be involved with new generation systems, including Mount Coffee and HFO units at Bushrod Island, new transmission systems including the CLSG line and cross-border project, and new distribution systems (mainly in Monrovia, outside in future years). Management, operation and maintenance of these upcoming generation, transmission and distribution systems will require significant new staff with technical skills to maintain them. It is recommended that USAID and other donor agencies discuss the most cost-effective means of assisting LEC both in the short and long term.

APPENDICES

ANNEX A - STATEMENT OF WORK

The objective of this evaluation is to conduct a full and independent mid-term review of LESSP activities and results from October 2010 to the present. *The evaluation will identify the results achieved by the program to date, report on the current status of program activities,* identify any implementation problems that need to be corrected, *and determine the conditions by which the implementer will meet all the targets and objectives set forth in the program's scope of work by the end of the performance period.*

Specifically, the evaluation will:

- Assess progress toward achieving each of the three objectives;
- Identify any unexpected obstacles to implementation and evaluate how effectively the program has responded to those obstacles;
- Identify deficiencies in the design of the program and weaknesses in implementation (what worked, what didn't, and why) and propose adjustments to current program strategy as necessary;
- Assess the effectiveness of the program's grant component in the achievement of intended results;
- Analyze the relationships between resources available, resources used, and results achieved to determine the specific cost effectiveness of USAID's programming in each objective, as well as the program as a whole; and
- Lead to specific recommendations for the final two years of the program, including eventual modification of the program.

PROGRAM BACKGROUND

The US Agency for International Development's (USAID) Liberian Energy Sector Support Program (LESSP) responds to the priority set by the Government of Liberia (GOL) of rehabilitating electricity infrastructure, which is an integral component of the nation's macroeconomic development strategy as set forth in the Poverty Reduction Strategy (PRS). Specifically, LESSP contributes to the following goals stipulated in the PRS: builds the capacity of a restructured Ministry of Lands, Mines and Energy (MLME); increases energy access in both Monrovia and three rural counties; launches Liberia's small, micro and mini hydropower generation capability and explores additional generation options from other renewable energy sources; and improves legal, institutional, and regulatory frameworks within the electricity sector.

OVERVIEW

The purpose of USAID's LESSP is to increase access to affordable, renewable energy services in geographically focused rural and urban areas in order to foster economic, political and social development.

The ultimate impact of the activity, that is, the change that is expected in targeted areas upon assessing the completed work, is anticipated to 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; and
- Policy changes that improve the investment climate for the energy sector.

USAID plays a leading role in building Liberia's energy sector. Its successful collaboration with GOL and other donors on the Emergency Power Program (EPP) and Liberia Energy Assistance Program (LEAP) has provided a strong platform and valuable lessons for expanding access and improving the affordability of electricity to urban and rural dwellers. LESSP strives to mobilize public and private sector partners in order to develop the country's diverse and plentiful renewable energy resources.

RELEVANT HISTORY

LESSP focuses efforts in three counties: Bong, Nimba and Lofa. Their selection was based on the fact that the majority of Liberia's population (outside of Monrovia) resides in these three counties. In addition, LESSP works to foster useful synergies with other USAID-assisted agricultural, health and education programs that are based in these counties.

USAID/Liberia, through LESSP, continues support to MLME, RREA and LEC to strengthen institutional capacity and expand the customer base in Monrovia.

USAID/Liberia, in consultation with GOL, the donor community and other stakeholders, identified renewable energy as an underutilized resource that could have tremendous impact on the country's development. In order to exploit these resources in the most cost-effective and expedient way, LESSP works with GOL to implement policies that create a conducive environment for foreign investors and Liberian entrepreneurs to participate in the growing market for "green" technologies and services. LESSP is establishing power stations that will demonstrate the viability of renewable energy, especially for rural communities. These stations will utilize a range of technologies including: mini (100 kW to 5 MW)/micro (up to 100 kW) hydroelectricity, solar energy, biomass, biofuel and energy conservation devices. These stations are intended to be replicated by other non-USG donors, GOL and private sector investors.

The establishment and management of these renewable energy models will involve public-private partnerships (possibly employing USAID's GDA model). LESSP pursues opportunities to partner with commercial-scale investors. Concurrently, LESSP supports the development of a skilled workforce capable of constructing, maintaining and sustaining infrastructure.

OBJECTIVES

Under the US Foreign Assistance framework's Economic Growth Objective, USAID/Liberia's assistance is used to increase access to modern energy services. USAID/Liberia pursues the following objectives, which are consistent with the USG assistance framework, the GOL PRS, Liberia's National Energy Policy, and the USAID-GOL bilateral assistance agreement.

For Objective 1, LESSP focuses on RREA capacity building activities in order to design, develop and implement individual training plans for senior management staff. The program's major policy-related task is updating the draft energy law and Energy Regulatory Board (ERB) action plan based on comments received from stakeholders. The stakeholder list includes government agencies, donors, county leaders, the private sector and other institutions involved in energy sector development. LESSP also supports MLME in its efforts to advance the energy law and ERB action plan for approval in coordination with other donors working in the energy area in Liberia (World Bank, Norwegian Water Resources and Energy Directorate, European Union, Japan, etc.).

For Objective 2, finalization of all four pilot project feasibility studies with approvals from USAID and GOL, including the Environmental Protection Agency (EPA), is the critical point to enable the program to proceed with procurement and construction. Relationships with the pilot site communities and partners via Memorandum of Understanding (MOU) agreements stating clear roles and responsibilities in the implementation and eventual ownership and operation of the pilot projects is an important next stage. The smaller size projects – Sorlumba Biomass Electricity Project (SBEP) and Wayavah Falls Micro Hydropower Project (WFMHP) – are planned to be completed in Year 2, contingent on receiving all required approvals. These projects will be owned, operated and managed by local electricity cooperatives; LESSP will help establish these groups and build their capacity to operate, maintain and manage the power plants. Cocopa Biomass Electricity Project (CBEP) and Mein River Hydropower Project (MRHPP) are expected to be public-private partnerships completed in Years 3 and 4 of the program.

In the original scope of work for Objective 3, the program's main task is to manage USAID/Liberia contributions for the procurement of electricity distribution materials (e.g. meters, wires, transformers, etc.) to connect low and middle-income customers to the grid. This includes establishing the technical specifications, competing subcontracts for the procurement of material, and overseeing quality control for the expansion of the distribution network. Development of a procurement system ensuring that all subcontracts receiving USAID funds will be competitively subcontracted is planned to be realized in cooperation with Manitoba Hydro, the LEC management contractor (MC). The results of this work will support system expansion to at least 5,000 low and middle income customers in and around Monrovia. In addition, LEC/MC will have a sound procurement plan, including standard procedures for Request For Quotations (RFQ), evaluation criteria, standard terms of business and procedures for monitoring and acceptance.

When LESSP started in October 2010, LEC/MC had already initiated a procurement program for providing electricity connection to 10,000 low-income households, and procurement decisions had been made without LESSP participation, which presented challenges to LESSP participation in supporting distribution expansion. USAID worked with LEC and LESSP to devise a procurement auditing strategy that would ensure USAID and Winrock International procurement compliance and enable LESSP to support LEC distribution procurement plans. In July 2011, LEC approached USAID and Winrock International and requested that LESSP support a comprehensive Training and Development Plan (TDP) for LEC employees instead of procurement of distribution equipment. LEC further informed LESSP that it had secured funding

resources from other donors to procure equipment, and that an equally important need was to build the manpower capacity of LEC employees. Without this manpower development, LEC would not likely be able to accelerate electricity connection to low-income households in Monrovia, even with all the equipment for distribution expansion. The request was discussed, and USAID agrees in principle with this alternative strategy to support LEC. USAID/Liberia is exploring new mechanisms to fund a comprehensive TDP for LEC employees with an additional host country capacity building component. These developments require additional discussion about the most effective use of USG funds under Objective 3 of this award.

EVALUATION QUESTIONS

Capacity development of the GOL Ministry of Lands, Mines, and Energy (MLME), the Rural and Renewable Energy Agency (RREA), and the Liberia Electricity Corporation (LEC)

- Is there evidence of increased, sustainable technical, managerial and regulatory capacity among MLME, RREA and LEC?
- Has the technical and managerial capacity of RREA staff been enhanced in order to support the development of viable rural electrification programs by the public and private sector?
- Is the program exhibiting progress toward increasing energy access in Monrovia and in the three rural counties identified?
- Is the program theory complete in providing and supporting both necessary and sufficient activities to promote success?

Community-Based Operation and Management of Renewable Energy Systems

- How successful was LESSP in building local technical capacity to manage and operate renewable energy systems toward sustainable community-based operational entities?

Renewable Energy Production Capability

- Is the program exhibiting progress toward increased clean energy access in both rural and urban areas?
- Are the resources provided sufficient to meet the targets per objectives?
- How has the program performed in identifying and engaging with investors from the planning stage of the development of pilot plants, arranging meetings with local technical experts and encouraging the formation of local energy program management companies, providing capacity building support, sharing business plans for pilot plants, and utilizing an effective public-private/GDA strategy to bring in private investment?
- What was the program's experience in attracting additional support for pilot projects with private sector investment in renewable energy?

Improved Policy and Regulatory Enabling Environment

- Is there evidence of improved legal, institutional and regulatory frameworks?
- What are the policy changes, both regulatory and legislative, that have occurred or may still be needed, and as per whose perspective?

Coordination, Accountability, and Adaptive Management

- How effectively has the program coordinated with other donor program activities related to energy sector?
- Do the Performance Management Plan (PMP) indicators for LESSP accurately indicate success in achieving the program's intended results? If not, why not? Are the targets for those indicators realistic and attainable in the timeframe of this program?
- What legislative, political, budgetary, economic and/or other factors influenced program implementation (positively or adversely), and how did the implementing partner respond?

GENDER DISPARITIES AND IMBALANCES

Gender disparities and imbalances are common in every sphere of Liberian life; in most cases, it is women who are disproportionally disadvantaged by these disparities and imbalances.[1] To reduce poverty and accelerate post-conflict development, there is no question that Liberia must engage the female half of its population more effectively. Women and girls play a central role in Liberia's economy as consumers and producers. Currently, these roles come principally through the informal sector, agricultural production and petty trade of goods and services in local marketplaces. Women remain absent in important sectors for reconstruction, such as public works and infrastructure. With regard to energy, women and men consume energy differently (for example, women use more firewood and charcoal, given their role in cooking, whereas men may be more responsible for purchase of flashlights and batteries for lighting) and serve in different roles for producing energy (for example, women may predominate in the production of biomass, whereas men may predominate in skilled labor that builds and maintains electricity systems).

The mid-term evaluation of the LESSP project will assess:

- The risks of leaving gender disparities and imbalances unaddressed as missed opportunities to expand the customer and production base for renewable energy, as well as a decreased probability of establishing commercially viable pilot projects. If energy service does not address women's energy needs, one can assume that half the population will not be motivated to pay for this service or support its management, operations and maintenance.
- Gender-based constraints that have the largest impact on LESSP include: GOL policies, plans, practices and procedures that have not factored the interests and needs of women; the absence of women's voices

[1] Liberia National Gender Policy, Ministry of Gender and Development, Liberia 2009

in community planning processes, and; a lack of women's access to training for the most profitable sectors of employment in Liberia.

SPECIFIC TASKS

Specific tasks to be undertaken by the evaluation team in carrying out the mid-term evaluation include, at a minimum:

- Review of the program's task order (original and modified)
- Review of all program reports and annual work plans
- Review of the program's pilot projects
- Review of the program's grants manual
- Review of the program's performance management plan (PMP)
- Review of USAID Liberia's proposed Country Development Cooperation Strategy and LESSP's role therein
- Review of GOL's Poverty Reduction Strategy (PRS) and draft/completed PRS II document
- Meeting with Winrock International's regional team in Washington, DC (via teleconference)
- Meetings with USAID/Liberia's Mission Director, Economic Growth Team Leader, Program Officer, LESSP COR and other related USG representatives
- Meetings and interviews with Winrock International's staff
- Meetings and interviews with GOL, donor and private-sector counterparts and partners
- Meetings and interviews with beneficiaries assisted by the program in each region of the country.

ANNEX B - LIST OF ENERGY SECTOR CONTACTS

First Name	Last Name	Title	Organization
David	Wah	Manager of Compliance and Enforcement	Environmental Protection Agency of Liberia
Moris	Contor	Assistant Coordinator of Environmental and Social Impact Assessments	Environmental Protection Agency of Liberia
Roland	Giddings	Senior Program Officer	Office of the President, Ministry of State for Presidential Affairs
Shahid	Mohammad	Chief Executive Officer	Liberia Electricity Corporation
Joseph	Mayah	Deputy Chief Executive Officer	Liberia Electricity Corporation
Agustus	Goanue	Executive Director	Rural and Renewable Energy Agency
Laura	Arntson	Performance Management and Environmental Compliance Advisor	USAID/Liberia
Danijel	Dasic	Infrastructure Advisor	USAID/Liberia
James	Whawhen	Deputy Chief of Party and M&E Specialist	Liberia Monitoring and Evaluation Program
Randal	Joy Thompson	Chief of Party	Liberia Monitoring and Evaluation Program
Lyn	Tan	Project Manager	UNIDO Liberia
Thor	Henning Gulbrandsen	Senior Advisor International Section, DG's Office	Norwegian Water Resources and Energy Directorate (NVE)
Kim	Chi Tran-Gulbrandsen	Senior Advisor International Section, DG's Office	Norwegian Water Resources and Energy Directorate (NVE)
Maki	Okusa	Head of Office	Japan International Cooperation Agency
Giorgio	Kirchmayr	Programme Manager - Infrastructure	Delegation of the European Union to Liberia
Momo	Jackson	Treasurer	Gbarnway Wayavah Electric Cooperative
Francis	Gborlewuah	Secretary	Gbarnway Wayavah Electric Cooperative
Clay	Balleh	Youth Leader	Gbarnway Wayavah Electric Cooperative
Jefferson	Gbelel	Member	Gbarnway Wayavah Electric Cooperative
Peter	Sumo	Member	Gbarnway Wayavah Electric Cooperative
Edward	Massaquin	Member	Gbarnway Wayavah Electric Cooperative
Moses	Lablah	Co-Chairman	Gbarnway Wayavah Electric Cooperative
George	Flomo	Adviser	Gbarnway Wayavah Electric Cooperative
Lawrence	Flomo	Member	Gbarnway Wayavah Electric Cooperative
Moses	Kitimillion	Member	Gbarnway Wayavah Electric Cooperative
Anna	Galumdolo	Community Mobilizer	Gbarnway Wayavah Electric Cooperative
Moloulolo	Juwee	Member	Gbarnway Wayavah Electric Cooperative
James	Badabu	Member	Gbarnway Wayavah Electric Cooperative
Garmari	Sammie	Member	Gbarnway Wayavah Electric Cooperative
Noah	Flomo	Member	Gbarnway Wayavah Electric Cooperative
Russell	Brown	Chief of Party	Liberia Energy Sector Support Program
Sekou	Kanneh	Operations Manager	Liberia Energy Sector Support Program
Varney	Sesay	Finance Manager	Liberia Energy Sector Support Program
Abou	Ben Diallo	M&E Specialist	Liberia Energy Sector Support Program
Bhola	Siutha	Deputy Chief of Party	Liberia Energy Sector Support Program
Leel	Wicklemarachchi	Private Power Producer Specialist	Liberia Energy Sector Support Program
Ram	Gobindajadar	Construction Support Engineer	Liberia Energy Sector Support Program
Freeman	Woahloe	Electrical Engineer	Liberia Energy Sector Support Program
George	King	Community Outreach Officer	Liberia Energy Sector Support Program
Koigbeh	Tamolu	County Statistics Information Officer	Bong County, Liberia
Cantos	Bornor	District Comissioner	Sanoyea District
Kerson	Saykor	Administrator	Phoebe Hospital
Sumo	Thornes	Maintenance Head	Phoebe Hospital
Benjamin	Voth	M&E Assistant	Ministry of Planning and Economic Affairs
Hassan	Sankary	Resident Engineer	Cuttington University
Clyde	Rusaul	District Comissioner	Sanoyea District
Joshua	Giddings	Vice President of Pulic Relations	Cuttington University
Lovette	Tuckel	Director of International Relations Department	Cuttington University
Theodora	Collins	Executive Assistant	Liberia Energy Sector Support Program

ANNEX C - LIST OF DOCUMENTS REVIEWED

Contract 669-C-00-00059-00, Liberia Energy Sector Support Program. September 18, 2009.

Energy Regulatory Board (ERB) Liberia - Action Plan. September 15, 2012.

USAID Liberia Energy Sector Support Program (LESSP): *Action Plan for Establishing the Energy Regulatory Board of Liberia*. PowerPoint presentation. September 20, 2011.

Draft Memorandum of Understanding between Winrock and Gbarnway Woeyah Electric Cooperative (GWEC) to facilitate collaboration among the organizations. December 1, 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Project Brief: Mein River Hydropower Project.*

USAID Liberia Energy Sector Support Program (LESSP), *Project Brief: Sorlumba Biomass Project.*

USAID Liberia Energy Sector Support Program (LESSP), *Project Brief: Wayavah Falls Hydropower Project.*

Database of Organizations Involved in Community/Cooperative Development in LESSP Pilot Project Areas in Bong, Nimba and Lofa Counties. August 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Year 1 Annual Progress Report: October 1, 2010 to September 20, 2011*. November 30, 2011.

Draft Memorandum of Understanding between Winrock and Liberia Company (LIBCO) to facilitate collaboration among the organizations. December 12, 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Rapid Assessment of Renewable Energy Options for Liberia: Solar, Wind, and Biomass Energy Resources Report*. June 2012.

USAID Liberia Energy Sector Support Program (LESSP), *Rural and Renewable Energy Agency (RREA) Staff Training Plan – FY 2011*. April 4, 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Draft Support Plan: Renewable Energy Technologies Curricula Strengthening for Vocational and Higher Education Institutions.* March 2012.

USAID Liberia Energy Sector Support Program (LESSP), *Detailed Project Feasibility Report Volume I – Main Report: Cocopa Biomass Electricity Project (240 kW), Cocopa, Nimba County*. October 3, 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Detailed Project Feasibility Report Volume II – Appendices: Cocopa Biomass Electricity Project (240 kW), Cocopa, Nimba County*. October 3, 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Mein River Small Hydropower Project (500 – 1500 kW), Bong County, Liberia: Draft Detailed Feasibility Study Report Volume I – Main Report*. September 26, 2011.

Draft Memorandum of Understanding between Winrock and the Sorlumba Community Electric Cooperative Society to facilitate collaboration among the organizations. January 24, 2012.

USAID Liberia Energy Sector Support Program (LESSP), *Sorlumba Biomass Electricity Project, Feasibility Report.* July 2011.

USAID Liberia Energy Sector Support Program (LESSP), *Wayavah Falls Microhydropower Project (15 kW), Lofa County, Liberia. Detailed Feasibility Study Report Volume I (Main Report).* December 2011.

USAID Liberia Energy Sector Support Program (LESSP), *The Draft Energy Law and Energy Sector Reform in Liberia.* PowerPoint presentation. August 29, 2011.

Draft Energy Law Review Volume I – Summary Report and Recommendations. August 15, 2012.

Draft Energy Law Review Volume II – Annotations and Revisions to the Draft Energy Law of 2009. August 15, 2012.

Energy Regulatory Board (ERB) Liberia - Action Plan. Updated August 15, 2012.

Initial Environmental Examination and Request for Categorical Exclusions and Threshold Decision. December 3, 2010.

USAID Liberia Energy Sector Support Program (LESSP), *Rural and Renewable Energy Agency (RREA) Skills Assessment – FY 2011.* April 15, 2011.

USAID Liberia Energy Sector Support Program (LESSP), Monthly Reports – October 2010 through September 2012.

USAID Liberia Energy Sector Support Program (LESSP), Quarterly Reports – March 2011 through July 2012.

Letter from Russell C. Brown to Tony Carvalho. Subject: Liberia Energy Sector Support Program Contract No. 669-00-10-00059-00; LESSP Activities and Milestone Timeline. January 21, 2011.

ANNEX D - LIST OF KEY INFORMANTS

LESSP Program Management

- Laura Arntson, LESSP Mid-Term Evaluation IQC Task Order COR, USAID/Liberia
- Danijel Dasic, LESSP COR, USAID/Liberia

Office of the President

- Roland Giddings, Senior Program Officer

MLME

- Henry Kimber, Program Manager MLME
- Gus Goanue, Executive Director RREA

Winrock International

- Russ Brown, COP
- Bhola Shrestha, DCOP
- Leel Wickremarachchi, Biomass Expert
- Bikash Pandey, Director Energy

LEC

- Shahid Mohamad, CEO
- Joseph Mayah, Deputy CEO

Other Donors

- Jenny Hasselton, Junior Professional Officer, The World Bank
- Giorgio Kirchmayr, Program Manager, EU
- Thor Henning Gulbrandsen, Senior Advisor, NVE
- Maki Okusa, Project Formulation Advisor, JICA
- Lyn Tan, Project Manager, UNIDO

Liberian Organizations

- Bong, Nimba and Lofa County representatives
- Liberian Energy Legislative Authority
- Hady Sheriff, Director, CSET

L-MEP

- Randall Thompson, COP

ANNEX E - FOCUS GROUPS

Focus group discussions were held with the following;

- 5 RREA staff in Monrovia
- 5 Wayawah hydro project trainees in Gbanga
- 12 Mein River hydro project trainees in Gbanga
- 4 Booker Washington Institute staff in Kakata

The assessment team conducted focus group discussions with five RREA members to determine the efficacy of capacity building activities and the group's future training needs. To supplement the results of these discussions, the assessment team administered a survey that addressed ongoing capacity building activities and training needs. Annex F illustrates the survey form that was distributed to the focus group discussion participants. The survey form features a Likert scale for training program evaluation, several multiple choice questions, and open questions regarding how the project could be improved. Few RREA staff were trained through the LESSP program. Though the sample size was small, survey results allowed the assessment team to analyze training efficacy on an individual level and disaggregate by gender.

Due to the small population of beneficiaries, the assessment team sought to interview the majority of beneficiaries rather than attempt a random sample. Five of the six RREA staff members who were trained through LESSP were interviewed, as were all but one member of the Wayavah River rural electric cooperative and nearly all the technical staff who trained at BWI. Although a formal electric cooperative had not yet been formed for the Mein River site, the assessment team was able to interview representatives from all stakeholders in this project, including tribal chiefs, county officials, and representatives from Phebe Hospital and Cuttington University.

ANNEX F - INTERVIEW QUESTIONS

The following provides a list of questions designed by the assessment team to guide team members through key informant interviews and focus group discussions. Rather than structured questionnaires, these guides provide interviewers with frameworks for their discussions. The purpose of the interview is to discuss a few issues in detail within 60 to 90 minutes, so questions are limited to a maximum of 15 in each section.

Questions for Central Government Officials

Capacity Building

1. Do you see evidence of increased managerial, technical and/or regulatory capacity among MLME, RREA, and LEC staff?
2. Has the technical and managerial capacity of RREA staff been enhanced in order to support the development of rural electrification programs?
3. Can existing staff make management decisions in the absence of expatriate support?
4. Is the LEC program exhibiting progress toward increasing energy access in Monrovia and in the three rural counties identified?
5. How can the training program be enhanced?

Rural Energy Production

1. Did LESSP build sufficient technical capacity to allow local partners to manage and operate renewable energy systems?
2. Has any interest been shown by local or international private investors in development of clean energy projects in Liberia?

Improved Policy and Regulatory Enabling Environment

1. Have USAID/Liberia's goals of improved policy and regulatory environment been met?
2. Is there evidence of an improved legal, institutional, and regulatory framework?
3. What are the policy changes, both regulatory and legislative, that are still needed?
4. What additional policy or regulatory changes are required to enable renewable energy projects to move forward?

Coordination, Accountability, and Adaptive Management

1. How effectively has the program coordinated with other donor program activities in the energy sector?
2. What resources were provided by donors and lenders in the energy sector during recent years?

Gender Disparities and Imbalances

1. What has your organization done to increase participation of women in decision making processes?
2. Besides USAID, which donors are addressing gender issues and what approach are they taking?

Questions for LESSP Implementer

1. In your opinion, are the LESSP project objectives achievable?
2. Are the implementer's project approaches and strategies suitable and adequate?
3. What have been the major challenges and obstacles in implementation of this project?
4. Are adequate resources available to execute the project management plan?
5. Are you on target with your burn rate and budget?
6. Characterize your communication with the counterpart agency RREA.
7. Describe the performance of your subcontractors.
8. Has the capacity building program improved the performance of the beneficiaries?
9. What is the status of the pilot plants, e.g., feasibility studies, permits, community input, land tenure issues.
10. How did you determine that the local community will be able to pay the tariff?
11. Were any projects deemed infeasible?
12. What is the potential for sustainability, replication, and scaling up of these pilot plants?
13. Please comment on the skill level among the rural cooperatives established under LESSP.
14. What steps have you taken to mitigate gender disparity?
15. Please provide a list of all capacity building beneficiaries.

Questions for Rural Electric Cooperative Focus Groups

1. When were you first contacted by Winrock? Who contacted you? Describe that initial meeting.
2. What capacity assessment did Winrock provide?
3. How was this assessment administered?
4. What are the types of training have you received?
5. How did you elect community members to participate in these trainings?
6. How would you rate the training courses in which you participated at Booker Washington Institute?
7. Did your instructors provide you with any reference materials upon completion of the course?
8. What academic credentials do you have?
9. What are your outstanding capacity building needs?
10. How did your community elect key decision makers?
11. What steps were taken to ensure women were represented on the executive board?
12. Describe the financial management structures you've prepared. How will revenue be collected and
13. What are your plans for the power that the new system will generate?
14. Do you have an organizational chart for your organization or can you describe roles and responsibilities?

ANNEX G - SURVEY FORM: CAPACITY BUILDING EVALUATION

Name (Please print):
Training Course or Courses Taken:
Dates of Training:
Instructor:

For each item identified below, circle the number for the right that best fits your judgment of its quality. Use the scale above the table to select the quality number.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The training course was relevant to my day-to-day activities on the job.	1	2	3	4	5
2. The skills I learned will help me contribute to my organization and its goals.	1	2	3	4	5
3. I've applied the skills I learned in the course or courses I took.	1	2	3	4	5
4. The training I received directly supported rural electrification programs.	1	2	3	4	5
5. The training I received directly supported community based renewable energy systems.	1	2	3	4	5

Please check the box that best matches your position.

- ☐ Regulator
- ☐ Policy Maker
- ☐ NGO Representative
- ☐ Private Sector
- ☐ Other (Please define below)

_____

What is your highest level of educational attainment?

- ☐ Primary education
- ☐ Secondary education
- ☐ Bachelors Degree
- ☐ Masters Degree
- ☐ Doctorate
- ☐ Not applicable

Please check the box that best matches your position.

- ☐ Regulator
- ☐ Policy Maker
- ☐ NGO Representative
- ☐ Private Sector
- ☐ Other (Please define below)

_____

_____

What is your highest level of educational attainment?

- ☐ Primary education
- ☐ Secondary education
- ☐ Bachelors Degree
- ☐ Masters Degree
- ☐ Doctorate
- ☐ Not applicable

How many years have you been in your position?

- ☐ Less than one year
- ☐ 1 to 3 years
- ☐ More than 3 years
- ☐ Not applicable

What is your gender?

- ☐ Male
- ☐ Female

How would you rate your instructor?

- ☐ Excellent
- ☐ Very good
- ☐ Adequate
- ☐ Poor

Would you participate in additional capacity building exercises sponsored by LESSP?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

In the future, what types of courses would align best with your needs?

- ☐ Project Planning and Management
- ☐ Financial Planning and Budgeting
- ☐ Introduction to Renewable Energy
- ☐ Advanced Course on Renewable Energy Technology
- ☐ Other (Please define below)

_____

_____

_____

Have you participated in training sponsored by other donors?

- ☐ Yes
- ☐ No

If Yes, please name the donor that sponsored the training and identify the course title.

_____

_____

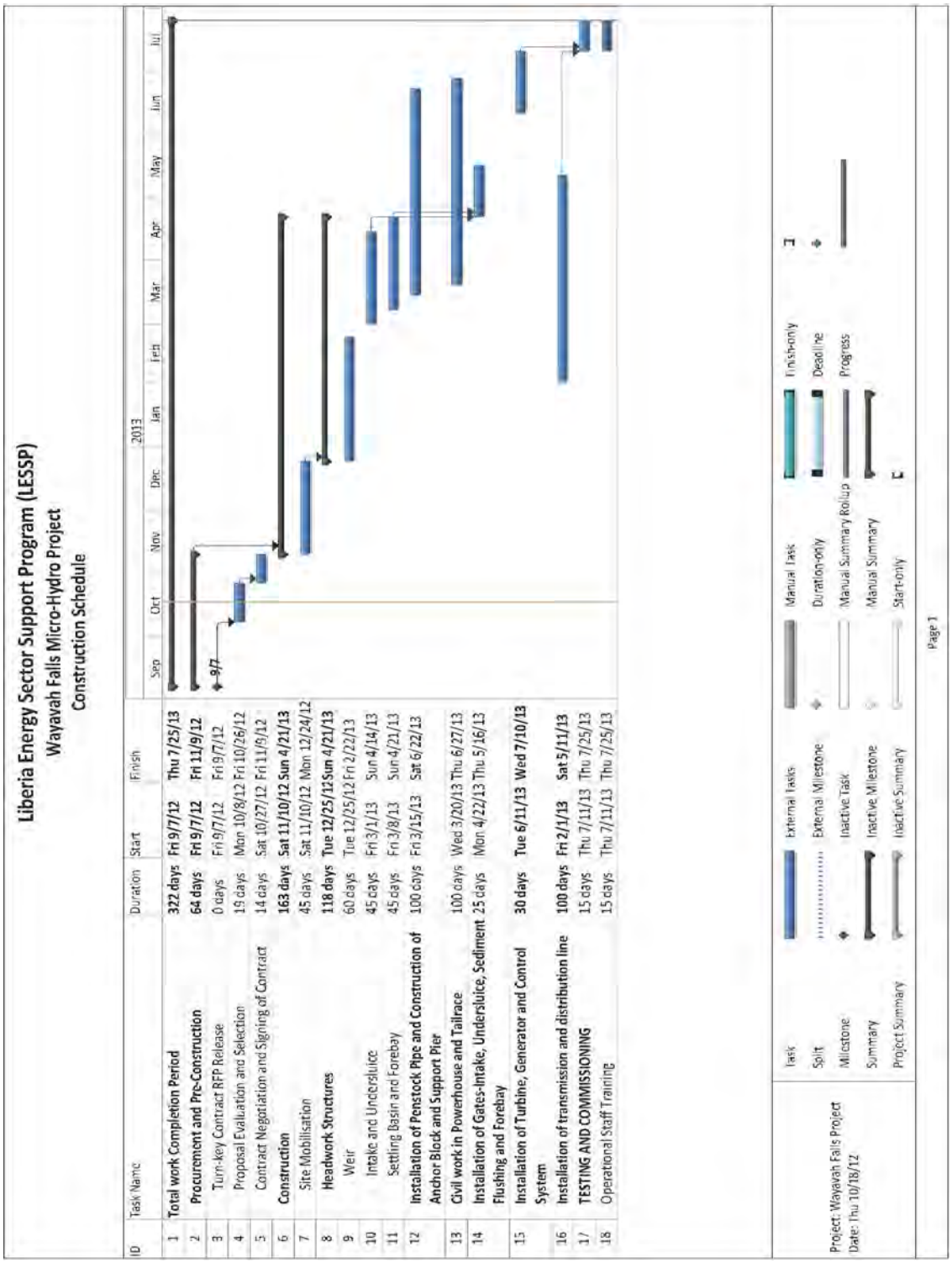
Do you have any other suggestions for how USAID can better meet your training and capacity building needs in the future?

_____

_____

ANNEX H - MEIN RIVER 1.0 MW CONSTRUCTION SCHEDULE

ANNEX I - WAYAWAH 15 KW CONSTRUCTION SCHEDULE



ID	Task Name	Duration	Start	Finish
1	**Total work Completion Period**	**322 days**	**Fri 9/7/12**	**Thu 7/25/13**
2	**Procurement and Pre-Construction**	**64 days**	**Fri 9/7/12**	**Fri 11/9/12**
3	Turn-key Contract RFP Release	0 days	Fri 9/7/12	Fri 9/7/12
4	Proposal Evaluation and Selection	19 days	Mon 10/8/12	Fri 10/26/12
5	Contract Negotiation and Signing of Contract	14 days	Sat 10/27/12	Fri 11/9/12
6	**Construction**	**163 days**	**Sat 11/10/12**	**Sun 4/21/13**
7	Site Mobilisation	45 days	Sat 11/10/12	Mon 12/24/12
8	**Headwork Structures**	**118 days**	**Tue 12/25/12**	**Sun 4/21/13**
9	Weir	60 days	Tue 12/25/12	Fri 2/22/13
10	Intake and Undersluice	45 days	Fri 3/1/13	Sun 4/14/13
11	Settling Basin and Forebay	45 days	Fri 3/8/13	Sun 4/21/13
12	**Installation of Penstock Pipe and Construction of Anchor Block and Support Pier**	100 days	Fri 3/15/13	Sat 6/22/13
13	**Civil work in Powerhouse and Tailrace**	100 days	Wed 3/20/13	Thu 6/27/13
14	**Installation of Gates-Intake, Undersluice, Sediment Flushing and Forebay**	25 days	Mon 4/22/13	Thu 5/16/13
15	**Installation of Turbine, Generator and Control System**	**30 days**	**Tue 6/11/13**	**Wed 7/10/13**
16	**Installation of transmission and distribution line**	**100 days**	**Fri 2/1/13**	**Sat 5/11/13**
17	**TESTING AND COMMISSIONING**	15 days	Thu 7/11/13	Thu 7/25/13
18	Operational Staff Training	15 days	Thu 7/11/13	Thu 7/25/13

ANNEX J - 35 KW SORLUMBA BIOMASS ELECTRICITY PROJECT - IMPLEMENTATION SCHEDULE

Task/Activity	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Prime Responsibility / Remarks
EPA Approval																						Leel W - Env. Consultant mobilized; Application made to EPA
USAID Bureau Environmental Approval																						Emily K - Prepare EMMP and submit to USAID LW will follow up
Procurement Strategy for each component																						
Prepare RFP for Gen Sets																						DW, LW - Winrock Procurement Office
Prepare RFP for Distribution System																						Surya Adhikari, LW/DW - Winrock Procurement Off
Prepare RFP for Civil Construction																						Maxine/LW/DW - Winrock Procurement Office
USAID COTR Approval for RFP																						Russ Brown, Leel W
Placement of PO for small lister type engine																						
Select consultant for technical services																						
Procure pre-treatment systems																						
Testing of small engine at BWI																						
Issue RFPs to Public																						Winrock Head Office / LESSP
Receive Responses and Evaluate Bids																						Winrock Head Office / LESSP
Select the Preferred Vendors for Gen Sets																						Winrock Head Office / LESSP
Select the Distribution System Contractor																						Winrock Head Office / LESSP
Select the Civil Contractor																						Winrock Head Office / LESSP
Receive USAID COTR Approvals for all Procurements																						Russ Brown/LW
Prepare Draft Quality Control Plan																						Winrock Head office / LESSP
Finalize QCP and seek USAID Approval																						LESSP
Receive USAID COTR Approvals for QCP																						Russ Brown/Leel W
Sign Procurement Contracts																						Winrock Head Office
Form Sorlumba Community Dev Asso.																						George King / LW
Appoint the Management Committee																						George King / LW
Formalize Land Lease to the Project																						George King / LW
Select Manager to the Power Plant																						George King / LW
Select Operators for the Project																						George King / LW
Provide exposure to Operators at LEC (Optional)																						LW
Appoint a Site Manager (S/T Consultant)																						Winrock Head Office/LESSP
Mobilize the Contractor for Power Plant																						Winrock Head Office/LESSP
Mobilize the Contractor for Distribution System																						Winrock Head Office/LESSP
Begin and complete Civil Construction																						Winrock Head Office/LESSP
Begin/complete Distribution System Construction																						Winrock Head Office/LESSP
Import Gen Sets																						Winrock Head Office/LESSP
Transport Gen Sets to Sorlumba																						Sekou/George King/Leel W
Installation of the Gen Sets																						DW/LW /Surya Adhikari/Site Manager
Commision the Plant and begin power generation																						DW/LW /Surya Adhikari/Site Manager
Formal Handing Over of the Power Project to SCECS																						Winrock Head Office/USAID

ANNEX K - KWENDIN 60 KW BIOMASS ELECTRICITY - PROJECT CONSTRUCTION SCHEDULE

	2012			2013											2014			
Task/Activity	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Jan	Feb	Mar	Apr
Approvals																		
USAID Approval for the Feasibility Report																		
EPA Approval																		
USAID Bureau Environmental Approval																		
Cooperative Formation																		
Formation of Electric Cooperative (KCECS)																		
Election of Board and Key Officials																		
Completed the Land Transfer from the Community																		
Trained Key Officials of KCECS																		
Identified Potential Operators from the Community																		
Provided Basic Training for the Selected Operators																		
Project Implementation																		
Issue the RFP for Gasifier Generators																		
Issue the RFP for Civil and Electrical Construction																		
Evaluate the bids for Gasifier Generators																		
Evaluate the bids for Civil and Electrical Works																		
Prepare Draft Quality Control Plan																		
Finalize QCP and seek USAID Approval																		
Receive USAID COTR Approvals for QCP																		
Submit Construction Schedule to USAID																		
Sign Procurement Contract for Civil and Electrical Works																		
Issue the PO to Purchase Gasifier Generators																		
Appoint a Site Manager (S/T Consultant)																		
Mobilize the Contractor for Civil and Electrical Works																		
Begin and complete Civil/Electrical Construction																		
Arrival of Generators in Monrovia																		
Transport of Generators to Sorlumba																		
Installation of the Gen Sets																		
Commission the Plant and begin power generation																		
Formal Handing Over of the Power Project to KCECS																		
KCECS	Kwendin Community Electricity Co-operative Society																	

ANNEX L - CHARACTERISTICS OF THE FOUR PILOT PLANTS

1.0 MW Mein River Hydro Project

Project Name	Mein River Hydro Project
Location	Suakoko District, Bong County, Kpatawee Falls
Size	1.0 MW
Estimated Capital Costs Includes generation and 11 KV distribution line	US $6.0M
Estimated O&M Costs	US $ 63,000
Proposed Tariff/kwh	US $0.15 - 0.22
Estimated Startup Date	July , 2015
Annual energy Production	5.4 GWH
Estimated Connections	2,200 with about 27 km transmission line
Sustainability	Two potential anchor off-takers: Cuttington University and Phebe Hospital. Formation of cooperation still in progress.
LESSP Training Effort	Selected Electrical and Mechanical Training at BWI, Kakata
Status as of Oct 15, 2012	The environmental report is on the critical path. Once the environmental report is approved then an EPC bid document will be released around April 2013. Contractor to be selected by October 2013. Startup estimated by July 2015.
Major Issues to be Resolved	- Funding deficit of around US $2.5M - Private investor/partner not yet secured

15 kW Wayavah Hydro Project

Project Name	Wayavah Falls Micro Hydro Project
Location	Salayea District, Lofa County, Wayavah Creek
Size	15 KW
Estimated Capital Costs Includes generation and 11 KV distribution line	US $0.2M
Estimated O&M Costs	US $ 5,000
Proposed Tariff	US $0.18/kwh
Annual Energy Production	50,000 kwh
Estimated Startup Date	July , 2013

Estimated Connections	135 about 1.25 km from power plant
Sustainability	Formed a local cooperative
LESSP Training Effort	Selected electrical and mechanical training at BWI, Kakata
Status as of Oct 15, 2012	- Feasibility report completed - Env. permit Issued - RFP for EPC contract being prepared
Major Issues to be Resolved	- None reported - Additional training required

35 kW Sorlumba Biomass Project

Project Name	Sorlumba Biomass Palm Oil Project
Location	Foya District, Lofa
Size	35 kW
Technology	Crude Palm Oil (CPO) Fuel
Estimated Capital Costs Includes generation and 11 KV distribution line	Not Provided
Estimated O&M Costs	Not Provided
Proposed Tariff	Not Provided
Annual Energy Production	111,000 kwh
Estimated Startup Date	September , 2013
Estimated Connections	208 approximately 2 km from power plant
Sustainability	Formed a local cooperative
LESSP Training Effort	Selected electrical and mechanical training at BWI, Kakata
Status as of Oct 15, 2012	- Feasibility report completed
Major Issues to be Resolved	- Pretreatment of palm oil , Lister engine application

60 kW Kwendin Biomass Project

Project Name	Kwendin Biomass Gasification Project
Location	Near Tappita, Nimba County
Size	60 kW
Technology	Wood Gasification
Estimated Capital Costs Includes generation and 11 KV distribution line	US $0.487M
Estimated O&M Costs	Not provided
Proposed Tariff	Approx. US $0.4/kWh
Annual Energy Production	The project will run for 5 hrs/day in the first year, 12 hrs/day in the second year, and 18 hrs/day from the third year forward.
Estimated Startup Date	April 2014
Estimated Connections	The town Kwendin has population of 2,305 and 248 houses. It has a school with 350 students, a health clinic and small commercial users. LESSP in process of estimating total connections
Sustainability	Formation of rural cooperative, training and capacity building still required
LESSP Training Effort	Replacement project; needs to be initiated
Status as of Oct 15, 2012	- FS approved by USAID - Environmental report near completion
Major Issues to be Resolved	None reported