



SUSTAINABLE
ENERGY FOR ALL

LIBERIA: Rapid Assessment and Gap Analysis

Final Report - May 2013

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OBJECTIVE

The purpose of Rapid Assessment and Gap Analysis is to provide:

- A quick brief look of the energy situation in the country (Section 1) within the context of its economic and social development and poverty eradication
- A good review of where the country is in terms of the three SE4ALL goals (Section 2), and
- A good estimate of the main challenges and opportunities vis-à-vis the three goals of SE4ALL where the major investments, policies and enabling environments will be required (Section 3)
- A sound basis and background for an Action Plan that may follow as part of the SE4ALL activities in the country

EXECUTIVE SUMMARY

General context.

The UN Secretary General established the Sustainable Energy for All Initiative (SE4ALL) in order to guide and support efforts to achieve universal access to modern energy, rapidly increase energy efficiency, and expand the use of renewable energies. Three goals are identified as follows:

- Ensuring universal access to modern energy services.
- Doubling the global rate of improvement in energy efficiency.
- Doubling the share of renewable energy in the global energy mix.

The first step for triggering the SE4ALL initiative is to perform an analysis of the situation of the energy and electricity sector and to determine the existing gaps which are impediment to the achievement of the three above goals. The current report illustrates the findings of a rapid assessment and gap analysis initiated in Liberia in July 2012.

A rapid overview of the basic socio-economic data of Liberia was conducted, gathering information on population, GDP/capita, key economic sectors, poverty rate (current and trend) confirming that Liberia is a low income country heavily reliant on foreign assistance for revenue. It is estimated that 76% of the population live below US\$1 a day (an increase from 55% in 1997) and 52% live in extreme poverty of under US\$ 0.50 a day. However, GDP growth was estimated at 6.8% in 2011, a constant increase from 5.6% in 2010 and 4.6% in 2009. GDB growth is forecast at figures of a similar level (6 to 9%) for the next years.

On the aspect of energy, Liberia's lack of electricity access (currently nearly 1 percent access) and reliable services, and the high cost of electricity service (52 cent/kWh) remain key obstacles to the country's sustainable economic growth. 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 mainly in the area of Monrovia serviced by the national electricity company LEC. The most recent report (2011) on the electric energy demand projections up to 2040 was issued by the World Bank and AFTEG in the report titled: *Options for the Development of Liberia's Energy Sector*. The evolution of electricity demand according to low and high growth scenarios would result in max 240 MW or min 112 MW of installed capacity in 2015. The threshold would be max 543 MW or min 302 MW for the year 2020. This has to be put in perspective with the current installed capacity of LEC totalling 20 MW.

The share of the energy sector in GDP is currently extremely marginal as per the available data. For the future, the National Energy Policy NEP assumes the implementation of proposed energy sector reforms with a major aim of providing access to modern energy to the population. However to date (2012) there has not been significant move from policy to legislation and ultimately regulation. The lack of implementation of this policy is viewed as an impediment that needs to be overcome in order for this adequately written policy to become effective. Energy is the third

category of expenditure for households, with charcoal accounting for 26% of households expenditures incurred for energy. During meetings with officials in September and October 2012, GoL confirmed that it is their priority to accelerate the expansion of electricity access to the population and improve supply of reliable services essential for economic growth. Currently, the part of renewable energy in the energy mix of Liberia is negligible. However, renewable energy technologies are particularly well suited to an off-grid, distributed generation scenario, and Liberia is endowed with significant renewable energy resources, including solar, biomass, and hydropower resources.

Main findings

The main findings resulting from the Gap Analysis are that the Liberian energy/electricity sector has not received due attention during the long period of conflicts and wars that have affected the country and is therefore in very bad conditions. Fortunately, improvements have been observed these recent years since the community of international donors have supported initiatives and funding for rehabilitating the system (generation, transport and distribution). Nevertheless due to the very poor prevailing conditions of assets after the wars the rehabilitation took time and progress were slow. To date a very small fraction of less than 2% of the population has access to modern energy.

Thanks to improvements in the operations and management of the National Electricity Company (Liberia Electricity Corporation – LEC) people living in the Monrovia area have access to the LEC services. The rate of new connections is however slow due to various constraints of technical, financial and organisational natures. In the rural areas, the availability of modern energy is very limited through off grid systems with small capacity and low quality/efficiency. Rural populations mostly rely on fuel wood and charcoal for their domestic use and from small generators and batteries for powering modern devices like phone sets, computers, radio and TV's and small electrical appliances in households or at their working places. The Government has an ambitious strategy/plan to provide access to electricity for 70 % of the Monrovia population and 35% of the rural population by 2030.

With an annual average growth rate of 3.0%, the 2012 Liberian population will be multiplied by 1.65 in 2030 reaching nearly 6.6 millions inhabitants (assuming that the demography is confined to a net 3% growth rate during the period). With an average of 7 persons per households their number will be approximately 1 million units. Projecting that 40% will be living in urban areas (Monrovia and other cities developing till 2030) the total number of connections will be 280'000 and 210'000 for urban and rural households respectively in 2030. To date the number of connections in Monrovia is 11'000 (LEC data August 2012) broadly installed over a period of one year. LEC projection is to have 87'000 customers/connections by 2015. This means that the rate for new connections should be in the tune of 25'000 to 27'000 per year and must stand at this level for the next 15 years for achieving the targeted rate of access of 70% and 35% in Monrovia (and urban areas) and rural areas respectively. As this is roughly 3 times the recorded best rate attained during the last year(s), one can easily measure the challenge facing the sector and the national operator in achieving such goals.

As a consequence, achieving the goals of the SE4ALL initiative will be equally challenging. It will require various sets of measures and actions. The main issue that the Gap Analysis identified as critical for the Liberian energy/electricity sector to progress in the right direction and in a timely manner to possibly achieve goals at the 2030 deadline is relating to the current lack of adequate capacities of the sector and its line ministries, agencies and institutions. Shortage of capacities has been identified in the institutional, organisational, human resources, operational and financial domains. It is a pre-requisite that these issues are addressed at the earliest.

One specific section of this report, presented under the format of a matrix (Annex 2) suggests the ways forward for taking adequate measures for each of the domains above. This matrix serves as a conclusion to the Gap Analysis/Rapid Assessment. It intends to prepare the next step of development/implementation of the SE4ALL initiative which is the establishment of an Action Plan

recommending a road map to be followed (by the country authorities) to assure that the 3 goals of the SE4ALL will be achieved in 2030. The establishment of the Action Plan is not included in the scope of this Gap Analysis. Nevertheless, the matrix provides a valid basis for developing the Action Plan under the next phase. In this regard, the ToR for this next step have been submitted to the MLME together with the possibility for its funding by the EU under the Framework contract Commission 2011 running till the 15th of January 2013. This is a unique opportunity for the Government (MLME/DOE) for assuring that there is no lapse/waste of time between the completion of the Gap Analysis/Rapid Assessment and the preparation of the Action Plan.

On the aspect of needed resources for achieving the SE4ALL goals in 2030, the necessary investments in the energy/electricity sector, including capacity building, support to reforms and technical assistance for the sector management ranges from 1'150 to 1'785 US \$ millions, this corresponds to an average of 64 and 100 US \$ millions per year for the next 18 years. Figures are indicative only because they depend on multiple intricate factors. The magnitude of the needs poses a serious concern regarding the absorptive as well as the mobilization capacities of the country in allocating its public resources as most of the sectors have huge needs. Projects, programs and initiatives already engaged or about to be engaged have received commitments for funding by the international donors community for approximately US \$ million 750. This is a significant and encouraging move which nevertheless requires to be pursued. It is important to note that the private sector is marginally involved in these projects, the institutional environment being still not enabling enough. The gap analysis also emphasized the need for the government officials to become conversant and familiar with the various/numerous funding facilities, programs and initiatives specifically designed to support the SE4ALL initiative. They offer significant resources for complementing limited national public resources.

The Gap Analysis/Quick Assessment is only the first step for engaging into the SE4ALL initiative. The matrix of gaps identification and recommended steps and measures (Annex2) tentatively captures all aspects and contextual framework currently prevailing in Liberia. It then articulates suggestions and actions that the government has to engage with various degrees of priority for being on tracks for attaining the targeted goals in 2030. The details of these engagements including their timeframe and corresponding financing resources will be incorporated in the next phase to come: SE4ALL Action Plan.

Section 1. Introduction

The UN Secretary General established the Sustainable Energy for All Initiative (SE4ALL) in order to guide and support efforts to achieve universal access to modern energy, rapidly increase energy efficiency, and expand the use of renewable energies. The SE4ALL initiative has the objective to catalyse major new investments to speed the transformation of the world's energy systems, pursue the elimination of energy poverty, and enhance prosperity. The three core objectives are:

- Ensuring universal access to modern energy services.
- Doubling the global rate of improvement in energy efficiency.
- Doubling the share of renewable energy in the global energy mix.

In April 2012, representatives from the Liberian Government (Led by the Honourable Minister for Lands, Mines and Energy) attended a meeting on SE4ALL in Brussels. It was agreed that a joint scoping mission (EU, UN, World Bank and Norway) would be planned for June 10th to 13th in order to gauge the Government's interest in opting for the initiative and for holding initial consultations with key local stakeholders. At the completion of the mission, the Government has formally conveyed to the UN and the EU its strong intention to join the initiative. Furthermore a first Energy Sector coordination meeting was organized by the Ministry on the 17th of July to present a comprehensive overview of all initiatives undertaken by the Government and to brief all partners on the 2012 – 2030 Access Plan. The objectives of the SE4ALL initiative are fully in line with those of the Access Plan.

The first step for triggering the SE4ALL initiative is to perform an analysis of the situation of the energy and electricity sector in Liberia. This is the purpose of the present report which aims at illustrating the findings resulting from a Rapid Assessment and Gap Analysis conducted in Liberia. This report is prepared by the Ministry of Lands, Mines and Energy with the cooperation of various parties, including the international donors' community. Its initiation is supported by a technical assistance through the assignment of an Expert funded by the EU.

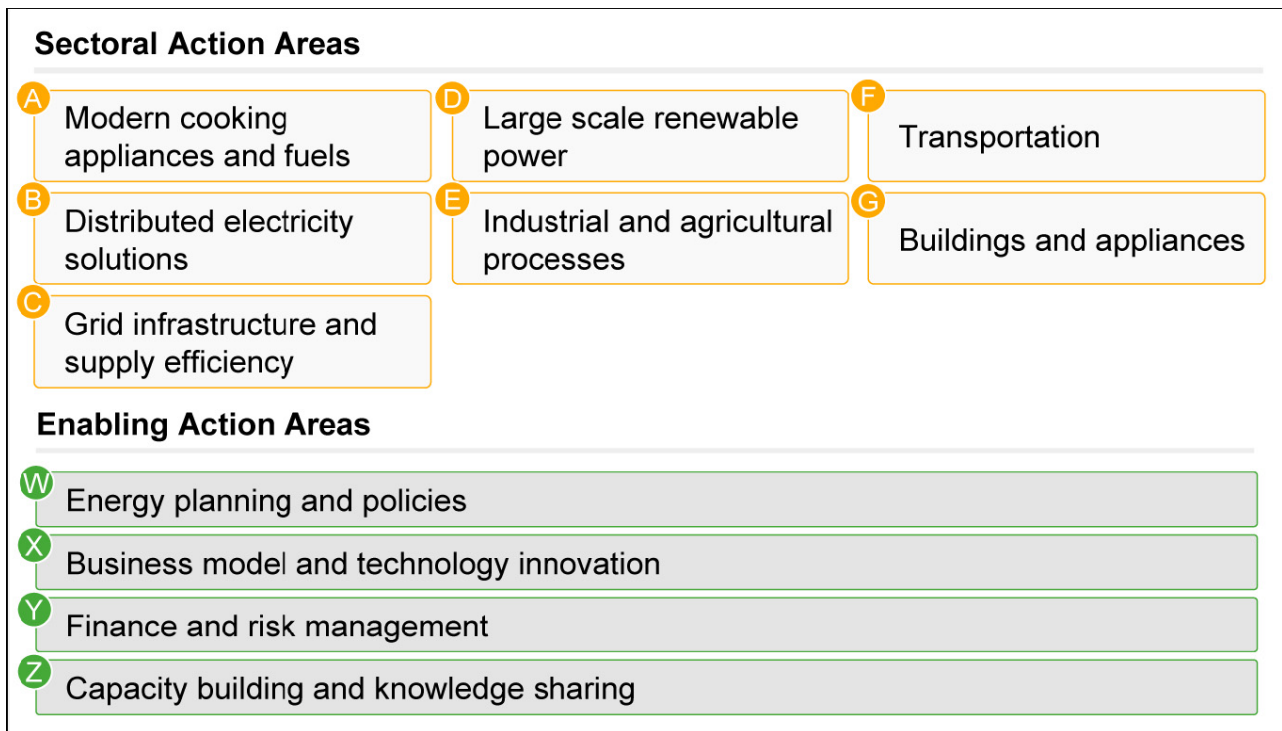
The ultimate objective of the assessment and gap analysis is to determine and prioritize the actions to be undertaken by the Government in various areas. These actions are defined in the SE4ALL initiative stating that national governments as the first stakeholder must design and implement a set of integrated country actions to drive transformative change of the world's energy systems. The other 2 stakeholders are the Private Sector and the Civil Society.

To make the vision of SE4ALL actionable, the three core objectives have been disaggregated into 11 Action areas. These are intended to provide:

- A framework for identifying high-impact opportunities and cataloguing existing and potential initiatives that can further the three objectives.
- A way to organise multi-stakeholder actions across all relevant sectors of the economy toward the objectives.
- A tangible entry point for stakeholders interested in taking action in specific areas of interest.

The Action Areas are grouped into two categories—sectoral and enabling as illustrated in the figure below:

- The seven sectoral Action Areas address both power generation and the three principal sectors of energy consumption - industry and agriculture, transport and buildings.
- The four enabling Action Areas include cross-cutting mechanisms designed to support effective sectoral action, address existing obstacles, and catalyse rapid scaling.



The Gap Analysis was performed in four steps. A first step in July 2012 consisted in collecting the up to date information and data regarding the country economic indicators. It also covered the description of the energy and electricity sector largely derived from the study and embedded end-users survey performed in April and May 2012 under the funding by the European Union for the analysis of their past and present interventions in the Liberian Electricity sector.

The second step of the analysis was conducted from July to October 2012, with the support of a local staff recruited under the EU contract as a focal point for coordination with the Expert based in Europe. The support staff was based at the premises of the MLME and was therefore at arm length of the Ministry team in charge at the Department of Energy. The second step of the study consisted in acquiring the information and data on the energy/electricity sector enlarged to crosscutting subjects of relevance to the SE4ALL initiative standard scope. These subjects were: institutional framework, private sector potential, business associations, local banking system and access to credit, renewable and biomass potential and the charcoal production and trading sectors, this resources accounting for more than 95% in the energy use by households in Liberia for cooking. In parallel with this second step relating to the crosscutting subjects, a third step was conducted in identifying the gaps which are impediments for attaining the SE4ALL initiative goals at the planned term of 2030.

The fourth and last step of the Gap Analysis is a set of conclusions and recommendations for filling the identified Gaps, with suggestions for the mobilization of corresponding needed resources of financial, organizational, political, institutional and human capacity/skills natures.

It is worse noting that several studies or diagnostic activities are conducted at the same time or in parallel by other donors on the electricity and energy sector in Liberia. The Access Plan under progress funded by the World Bank is of particular interest as it reviews most of the aspects of the sector and suggests some ways forward.

The Gap Analysis also came to conclusions and suggestions that are fully in line with those of the WB report study. There was no duplication of efforts or activities by the respective teams of consultants as the approach for the 2 actions were from 2 different perspectives. The Gap Analysis was performed within the frame of the SE4ALL initiative which is to prepare the country to adhere to some of the goals of the SE4ALL initiative and to take actions necessary to achieve them. This means that the conclusions and recommendations of the 2 studies (the Gap Analysis and the Access Plan Study) will be mainstreamed in order to provide to the government and the agencies responsible for the energy sector a clear and coherent road map for the near future up to the horizon year 2030.

The Gap Analysis allowed identifying loopholes (Gaps) in the current situation/organization of the sector, most of them being unsurprisingly also found in the WB report. (Note: at the time of editing the present report on the gap analysis, the WB study report is not yet officially released in its final version. Nevertheless, the Gap Analysis team had the opportunity to consult its first draft version.)

1.1. Country Overview

Liberia covers an area of 111'369 sq. km and has currently a population of 3'887'886. It has boundaries with Guinea 563 km, Cote d'Ivoire 716 km, Sierra Leone 306 km and a coast line of 579 km. Its GDP is projected at US\$ 1.353 billion for 2012. 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, poor trade links with neighbouring countries and the high dollarization of the economy. Liberia used the United States dollar as its currency from 1943 until 1982 and continues to use the U.S. dollar alongside the Liberian dollar. Liberia is a low income country heavily reliant on foreign assistance for revenue. Civil war and government mismanagement destroyed much of Liberia's economy, especially the infrastructure in and around the capital, Monrovia. 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 favourable to agriculture, Liberia has been a producer and exporter of basic products, primarily raw timber and rubber and is reviving those sectors. Local manufacturing, mainly foreign owned, has been small in scope.

1. Basic socio-economic data: population, GDP/capita, key economic sectors, poverty rate (current and trend)

Poverty in Liberia over the last quarter of a century has spread and deepened, with thousands losing their livelihoods and becoming displaced. It is estimated that 76% of the population live below US\$1 a day (an increase from 55% in 1997) and 52% live in extreme poverty of under US\$ 0.50 a day. Poverty exists in all the rural and urban towns, with only a slight improvement in Monrovia. Having a very young population (50% under 18) and much of the youth has migrated to the towns and cities, specifically Monrovia, leaving an elderly population in the rural areas. Therefore, poverty is most acute in these areas (86% of the rural population live in poverty and 64% live in extreme poverty).

Table 1: *Basic Economic Data*

	Annual percentage change unless otherwise stated								
	2010 Prel	2011 5th Rev	2011 Proj.	2012 5 th Rev.	2012 Proj.	2013 Proj.	2014 Proj.	2015 Proj.	2016 Proj.
Population (Millions)	3.8	4.0	3.9	4.1	4.0	4.1	4.2	4.3	4.4
Real GDP growth	5.6	8.8	6.8	11.7	9.6	7.8	5.8	9.5	5.1
Nominal GDP (millions of US dollars)	989.1	1'054.1	1'153.9		1'353.0	1,488.1			
Nominal GDP per capita (US dollars)	261.8	265.8	297.7		340.2	364.7			
Consumer Prices – end of period (%)	6.6	4.6	6.1	5.0	5.4	5.0	5.0	5.0	5.0
Foreign direct Investments net (million \$)	398	602	431		821	903			
Consumer Prices – average (%)	7.3	4.2	8.1	4.8	5.8	5.2	5.0	5.0	5.0
Consumer Prices – US dollars denominated, year-on-year (%)	1.3	0.8	3.6		3.0	1.1			
Fiscal Balance. Incl. grants (% of GDP)	0.6	-0.5	1.3		-1.1	-3.5	-4.6	-5.4	-5.4
Fiscal Balance. Excl. grants (% of GDP)	-0.8	-6.4	-2.2		-4.2	-7.1	-8.2	-9.0	-9.0
Current Account Balance – Incl. grants (% of GDP)	-43.5	-59.2	-37.8		-62.9	-64.6	-44.8	-7.0	-0.2
Current Account Balance – Excl. grants (% of GDP)	-142.4	-149.3	-121.6		-127.8	-117.7	-90.2	-39.3	-28.6
Broad Money (M2)	33.5	5.4	15.2		16.5	103			
Reserve Money (annual percentage change)	32.0	8.8	7.2		13.4	11.8			
Public External Debt (% of GDP)	11.3	15.6	10.9		11.7	13.7	17.4	19.6	22.4
Central Government Domestic Debt (% of GDP)	31.4	29.7	27.3		24.3	22.3	21.7	20.7	19.8
Gross official reserves (millions of US dollars)	391.4	329.8	425.1		452.0	462.0	483.8	488.2	488.3
Gross official reserves (months of imports cover*)	3.4	2.0	2.7		2.1	2.1	2.3	2.5	2.4

* Excludes UNMIL service imports.

The following table illustrates a broad SWOT analysis evidencing the most critical challenges for Liberia to achieve socio economic progress but it also quotes the potential advantages that could be explored for positioning the country on a positive path to become an emerging nation:

Strengths	Weaknesses
<ul style="list-style-type: none"> • Strong Nation Brand • Expanding labour force • Low Debt to GDP ratio (approx.12%, 2011) • Strategic geographic location • Coast line favourable for maritime infrastructure • Abundant natural resources (Mineral resources, water resources, agricultural lands, Oil and Gas) • High mobile phone penetration • Available renewable energy resources • Vibrant civil society 	<ul style="list-style-type: none"> • Pockets of potential insecurity and sub regional conflicts • Low per capita incomes • High rate of violent crimes and delinquency • Limited student outcomes • Low productivity across economic sectors and industries • High proportion of untrained workforce • Inefficiencies and inequities in justice system • Weak compliance with and enforcement of laws • Weak institutional framework and constraints in private business environment • Degradation of road transportation network • High cost of energy • Degradation of key ecosystems
Opportunities	Threads
<ul style="list-style-type: none"> • Increasing access to regional and world markets • Development of a green economy • Large and wealthy Diaspora • Strong relationships with international development partners 	<ul style="list-style-type: none"> • Impacts of fluctuations in global economy in currency and commodity markets • Regional illegal drugs and gun trades • Impacts of globalization and regional integration on uncompetitive sectors and industries • Inadequate political will, weak capacities and skills and social partnerships to implement transformation • Corruption • Increased likelihood of cross border turmoil and conflicts due to displaced population issues

1.2. Energy Situation

During meetings with officials in September and October 2012, GoL confirmed that it is their priority to accelerate the expansion of electricity access to the population and improve supply of reliable services essential for economic growth. Building up on the National Energy Policy (NEP) and the initial results achieved in rebuilding the electricity systems destroyed by the war, the GoL has an ambitious strategy to reach electricity coverage of 70 per cent of the population in Monrovia, and 35 per cent nationwide by 2030.

Liberia's lack of electricity access (currently 1 percent access) and reliable services, and the high cost of electricity service (53 cent/kWh) remain key obstacles to the country's sustainable economic growth. The currently installed generation capacity has reached 22.6 MW of diesel-generated power in October 2012, of which about 16-18 MW are effectively available. The Government aims to reduce the cost of electricity through a progressive shift of the generation mix away from diesel plants towards HFO and renewable energies.

2. Energy supply (energy mix, export/import)

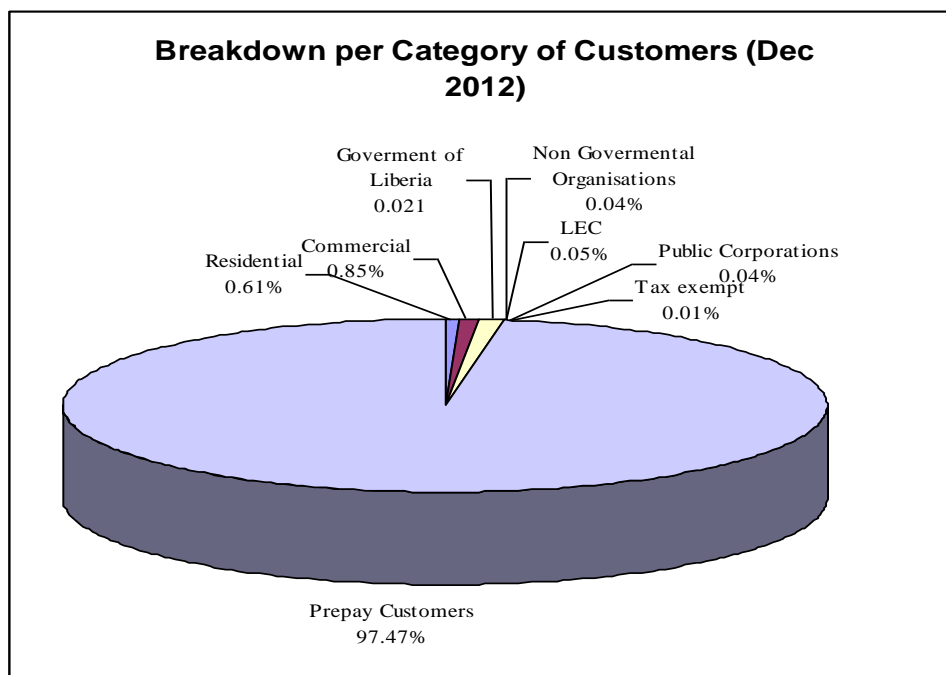
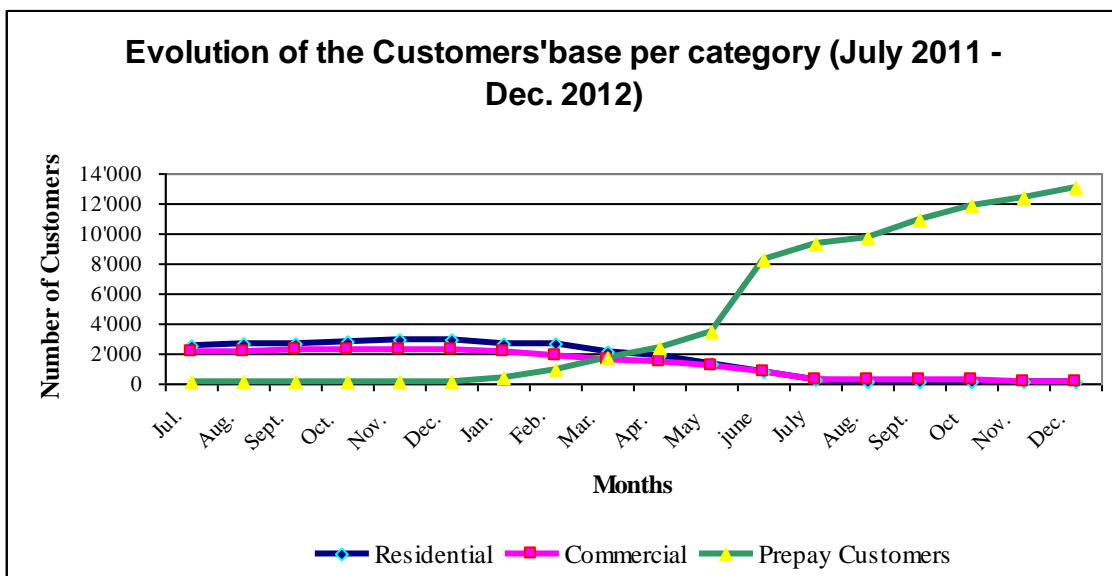
- Primary energy sources

The current energy situation in Liberia 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 of the low income category relies on firewood, charcoal, and palm oil for their energy needs.

Modern energy services based on electricity and petroleum products are predominantly used for economic production and transportation, thus mainly in the Monrovia area.

- Power sector (installed capacity, annual generation, import/export)

The most updated information on the electricity sector is available through the most recent reports issued by LEC. They are the Quarterly report for the period September 30th to December 31st 2012 and the Status Monthly report for December 2012. In summary, during the period from March to December 2012, the customer base has grown from 5'710 to 13'347, the percentage of prepay customers reaching 97.47% as illustrated in the graphs below.



Projections show that anticipated connections will reach 87,000 new customers by 2015. In addition, 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 \$5 million to US \$13 million.

On financial aspects, the Monthly Status Report for December 2012 submitted by LEC, states that revenues were \$ 1'889 for the sale of 3. thus corresponding to an average revenue of US \$ 0.538 per kWh. Interesting to note that yearly revenues (total charged for kWh used) were Million US \$ 10.60, 16.86 and 19.93 for a total yearly usage of 23, 31 and 36 GWh for years 2010, 2011 and 2012 respectively. Both generation/usage and revenues are increasing since the enter into force of the Management Contract.

Production cost is still in the tune of US \$ 0.50 per kWh. However, it is anticipated that the Mount Coffee hydropower plant of 64 MW total capacity (with the first unit re-powered in December 2015 with an estimated potential of 10 MW), will provide energy (GWh) at approximately \$ 0.23/kWh, therefore less than half the current cost.

Monthly figures (generation, revenues and losses) on the period of 3 years (2010 – 2012) are fluctuating showing influences from various factors. The trend is however positive as a result of improvement in management/operation activities and the commissioning of new equipment.

The last report from LEC confirms that reducing losses is highly challenging. After adjustment, they are 22% in December 2012. A peak at nearly 36% was recorded in October 2012. These figures are far from the target of 12%. LEC reports that a recent LEC System Model Update and Review indicates that technical losses on the system, as of December 2012 are in the range of 9.1 to 9.5%. All other losses are non-technical losses and reflect theft and unmetered/unaccounted for energy. Non-technical losses were therefore 12.6% for the month and around 19.7% on a cumulative year to date basis at end December 2013.

On the aspect of exchange of power (Import/export), to date there is no trading of power with neighbouring countries. However, 2 important interconnection projects are materializing: i) **The Cross Border Rural Electrification project** which will connect the Côte d'Ivoire network to 3 counties on the Northern and Eastern part of Liberia. The project, foreseen to be completed mid 2013 will provide electricity to 130'000 people. ii) **The CLSG project** implemented by the WAPP, financed by several donors is progressing well, all funding arrangements and legal issues having been resolved. The project will bring up to 18 MW of power and will allow the connection of urban centres and rural areas along the route of the High Voltage line.

3. Energy demand (overview of main consuming sectors, industry, residential, agriculture, transport)

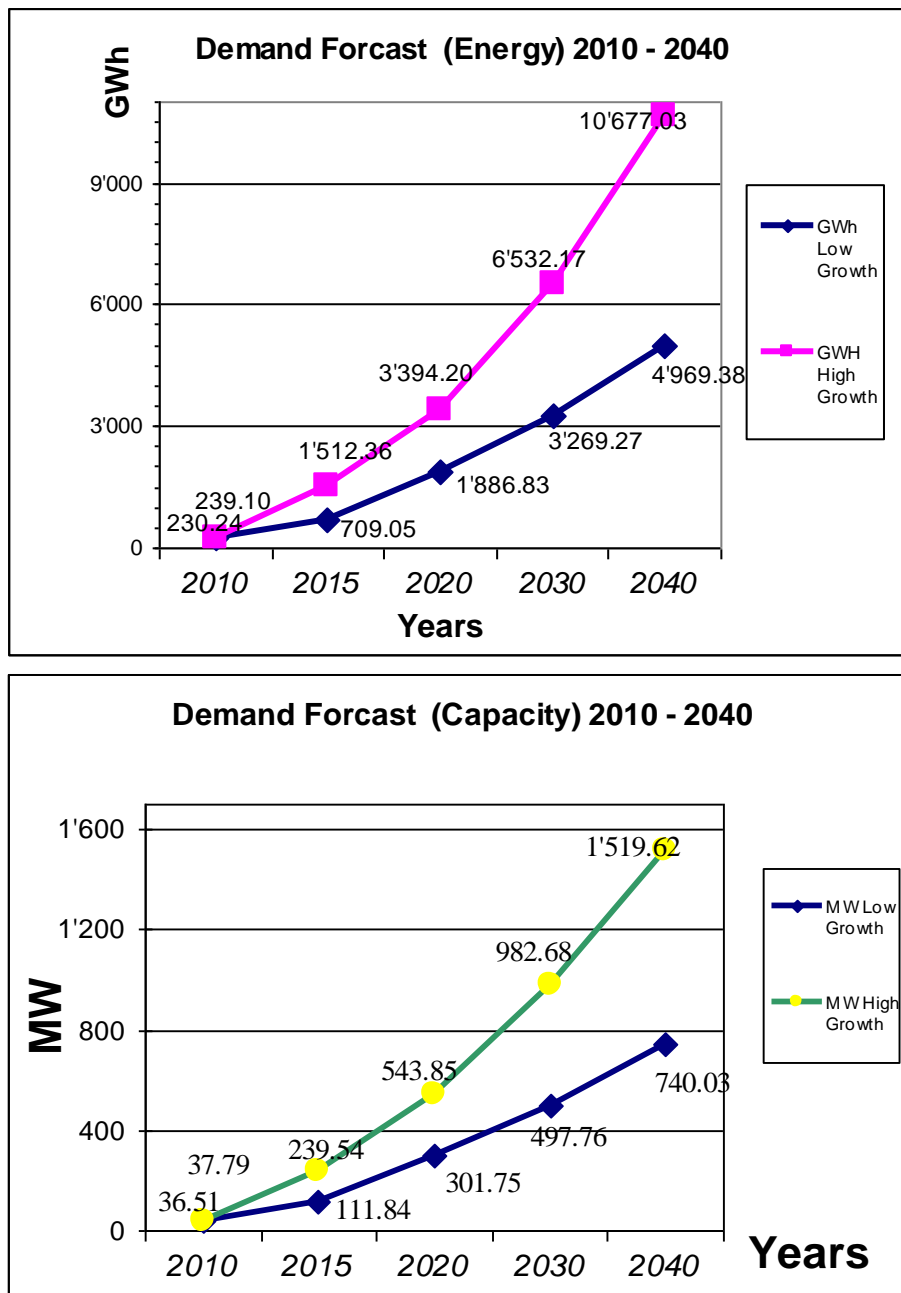
The most recent report (2011) on the electric energy demand projections up to 2040 was issued by the World Bank and AFTEG in the report titled: *Options for the Development of Liberia's Energy Sector*. The table below illustrates the two scenarios which were considered for computing the future demand up to 2040.

Table 2: Scenarios for future demand up to 2040

Scenario	2010	2015	2020	2030	2040	Scenario	2010	2015	2020	2030	2040
Slow Growth						High Growth					
MW						MW					
Monrovia Grid	18.66	34.30	41.98	63.15	127.28	Monrovia Grid	19.66	54.50	75.58	149.99	417.78
Other On-Grid	0.37	1.70	2.51	5.00	9.54	Other On-Grid	0.44	3.97	5.09	12.06	28.60
Urban and rural Off-Grid	0.98	4.84	7.26	14.61	27.62	Urban and rural Off-Grid	1.19	10.07	13.18	30.63	70.65
Non Monrovia Industrial: Off-Grid	16.50	71.00	191.00	324.00	443.47	Non Monrovia Industrial: Off-Grid	16.50	121.00	341.00	574.00	770.47
Non Monrovia Industrial: Potential On-Grid	0.00	0.00	59.00	91.00	132.12	Non Monrovia Industrial: Potential On-Grid	0.00	50.00	109.00	216.00	232.12
Total On-Grid	19.03	36.00	103.49	159.15	268.94	Total On-Grid	20.10	108.47	189.67	378.05	678.50
Total Off-Grid	17.48	75.84	198.26	338.61	471.09	Total Off-Grid	17.69	131.07	354.18	604.63	841.12
Grand Total	36.51	111.84	301.75	497.76	740.03	Grand Total	37.79	239.54	543.85	982.68	1'519.62
GWH						GWH					
Monrovia Grid	117.46	216.80	268.70	553.18	1'114.95	Monrovia Grid	123.59	340.75	474.74	1'313.94	3'659.73
Other On-Grid	2.98	14.46	21.51	43.29	82.99	Other On-Grid	3.89	34.82	44.56	105.64	250.53
Urban and rural Off-Grid	8.62	42.42	63.62	128.02	241.91	Urban and rural Off-Grid	10.44	88.22	115.50	268.31	618.88
Non Monrovia Industrial: Off-Grid	101.18	435.37	1'171.21	1'986.77	2'719.38	Non Monrovia Industrial: Off-Grid	101.18	741.97	2'091.01	3'519.77	4'724.54
Non Monrovia Industrial: Potential On-Grid	0.00	0.00	361.79	558.01	810.15	Non Monrovia Industrial: Potential On-Grid	0.00	306.60	668.39	1'324.51	1'423.35
Total On-Grid	120.44	231.26	652.00	1'154.48	2'008.09	Total On-Grid	127.48	682.17	1'187.69	2'744.09	5'333.61
Total Off-Grid	109.80	477.79	1'234.83	2'114.79	2'961.29	Total Off-Grid	111.62	830.19	2'206.51	3'788.08	5'343.42
Grand Total	230.24	709.05	1'886.83	3'269.27	4'969.38	Grand Total	239.10	1'512.36	3'394.20	6'532.17	10'677.03

The graphic representation shows the evolution of the demand (Power and Energy) for the Low and High growth scenarios.

Table 3: Evolution of electricity demand : low and high growth scenarios



The share of consumption by the industrial sector is very low, most of the industrial enterprises having their own generators. Nevertheless, the forecasts for the future (derived from Table 2 above) show that for 2015 the demand (MW) from the industrial sector (on grid and off grid) could amount to 161 MW in the case of the high growth scenario and 71 MW for the slow growth scenario. This would amount to 575 MW and 302 MW respectively for the year 2040, most of these capacities required by the mining sector, then the industries and the agro sector. The current data for the actual breakdown amongst these 3 sectors are not available. In terms of energy for the year 2015, these 3 sectors would represent 69% and 61% of the electricity consumed for the slow and high growth scenario respectively. These figures would amount to 69 and 57% for the year 2040. This translates the trend that the share of the industrial sector would progressively stabilize, the share of (mostly domestic) consumption in urban and rural areas reaching 42% in 2040 in the case of the high growth scenario. In the meantime this is an indicator that access to electricity and per capita consumption by the population is increasing. Currently the share of domestic consumption (at the country level but mainly represented by the Monrovia city figures) is in the range of 40%. In the case of the high growth scenario, the domestic consumption in 2040 would be 9.7 times the 2015 consumption when the industrial consumption would

increase only 7 times during the same period. For the slow growth scenario, these growth indicators would be more than 5 times for the domestic consumption while the industrial consumption would increase 8 times. This indicates that the high growth scenario is obviously more favourable to the population than to the industrial sector.

The next graphs of Table 5 illustrate the breakdown of electricity supply/billed per type of customers at the date of December 31st, 2012 comparing to March 2012 for the Monrovia Grid (which is the most representative picture of the country patterns).

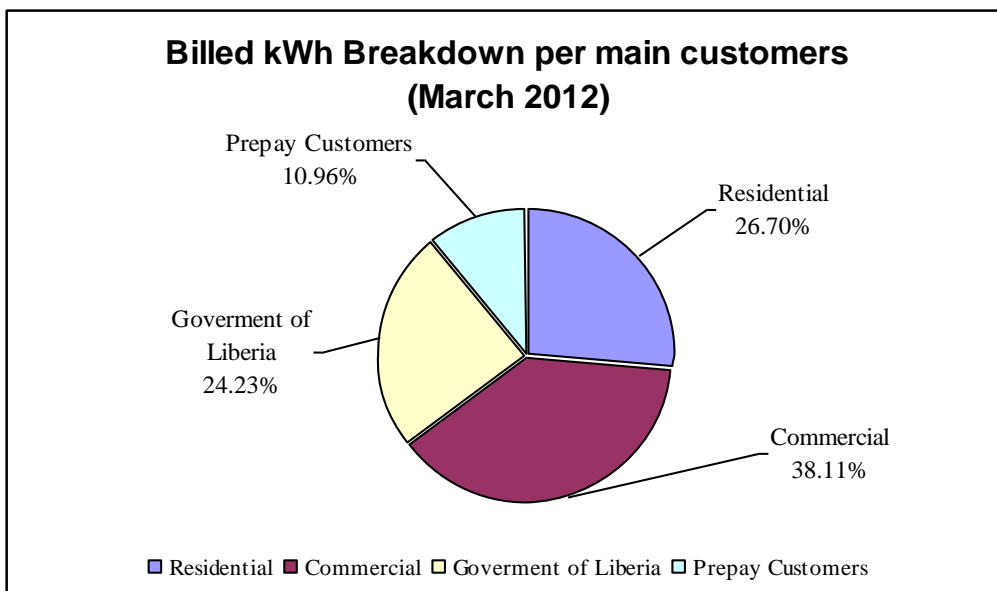
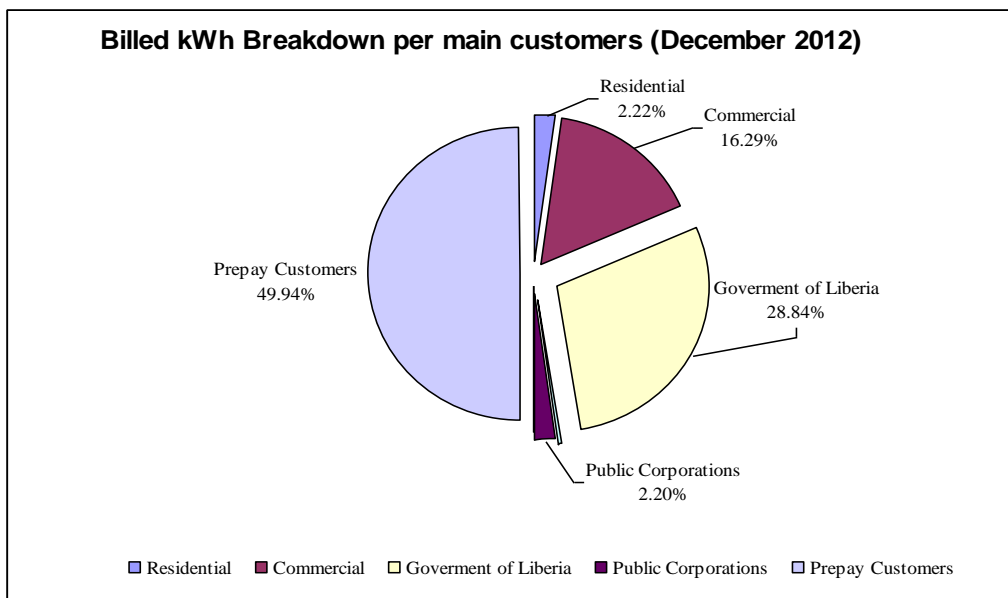


Table 4: Breakdown of billed energy per type of customers



It is important to note that the domestic customers (comprising Prepay, commercial and residential) are the main source of revenues for LEC. The comparison between graphs also shows that the part of prepay customers has significantly increased during this 9 months period. This illustrates the efforts of LEC to install prepaid meters.

4. Energy and economic development:

The share of energy sector in GDP is currently extremely marginal as per the available data. The key available indicator is the Government of Liberia - GoL annual subsidy to LEC. It amounted to US \$ 25'000 for the period 2011/2012. The GoL has also a budget allocation to the MLME, Department of Energy (DOE) of US \$ 186'000 in 2009/2010 and US \$ 187'000 in 2010/2011. This

is less than 1% of the MLME budget for each of the fiscal year. A similar trend has prevailed in the overall energy sector budget allocation in the GoL national budget.

5. Energy strategy and relevant targets (access, capacity, generation, energy security)

The Government, through the Ministry of Lands, Mines and Energy (MLME) has established a National Energy Policy - NEP - (An Agenda for Action and Economic and Social Development) in May 2009 with the technical and financial assistance from USAID.

The principal objective of the National Energy Policy 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.

The 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 the significant obstacles to private sector investment in energy supply; and
- Creating the requisite institutional and legal framework and an independent regulatory regime.

The NEP addresses the following strategic issues that are implied in the principal policy objective:

- access,
- quality,
- cost, and
- institutional framework.

These issues refer to the need for the various technologies and delivery options for energy products and services to be available, acceptable, affordable, and adequate.

ACCESS

The policy objective is to ensure availability of modern energy services for all Liberians, in both the urban and rural areas. By 2015, the Government expects to achieve the following goals:

- 40% of Liberian citizens living in rural and peri-urban areas and using traditional biomass for cooking shall have access to improved stoves and kerosene or efficient-gas cookers in order to reduce indoor pollution;
- 30% of the urban and peri-urban population shall have access to reliable modern energy services enabling them to meet their basic needs (lighting, cooking, communication, and small production-related activities);
- 15% of the rural population and 25% of the schools, clinics, and community centres in rural areas shall have access to modern energy services to meet the same basic needs.

Beyond 2015, the long-term strategy is to make Liberia a carbon neutral country by 2050.

QUALITY

The policy objective is to ensure acceptability of energy products and services by adopting standards that are consistent with international best practice.

COST

The policy objective is to ensure affordability through least-cost production and utilization of energy services.

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 of the cost.

INSTITUTIONAL FRAMEWORK

The policy objective is to establish an adequate delivery process for energy products and services through a public and 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 as well as regulatory oversight.

The establishment of an independent and transparent regulatory process will be essential for the creation of an investment environment conducive to increased private sector involvement in the energy sector.

However to date (2012) there has not been significant move from policy to legislation and ultimately regulation. The lack of implementation of this policy is viewed as an impediment that needs to be overcome in order for this adequately written policy to become effective. During consultation with the Department of Energy (DOE) it was confirmed that the DOE has done the initial analysis needed to transform the stated actions into program activities and a budget. However, legal reforms and amendments are the pre-requisites. The technical assistance provided by the Norwegian government includes this topic in its scope of work. There is a serious concern that sub-sector based unilateral efforts of law reform are cropping out without recourse to coordination through MLME and non-consideration of the need to have the energy sectoral laws well founded on sound policies. A coordination mechanism or protocol needs to be developed and the DOE needs to be empowered as the energy sector coordinator, with clout and resources for monitoring and evaluation.

Section 2. Current situation with regard to SE4ALL goals

2.1. Energy Access vis-à-vis Goal of SE4ALL

6. Overview and assessment

The current rate of access to modern energy/electricity stands at less than 2% of the Liberian population; the per capita consumption of electricity being in the tune of 100 kWh per year. This is one of the lowest access rates in the world. The majority of the population and households rely on fuel wood and charcoal for the domestic use for cooking and heating. The transition through a more extensive use of electricity will be a complex and lengthy process requiring drastic changes in the institutional framework, generation capacities, network development and tariff policies for the next decades.

7. Modern energy for thermal applications (cooking, heating)

In April-May 2012, an End Users survey was conducted in Monrovia within the scope of a Consultancy contract funded by the EU. A sample of 354 households was selected reflecting various patterns of the population status, level of incomes and behaviour toward electricity usage. This survey provides a fair and realistic view on the electricity access situation as well as population habits. It can be assessed that it represents the majority of the Liberian population of middle class and low class and poor class categories.

The tables below illustrate the findings. It can be noted that the use of electricity (modern cooking) for cooking is less than marginal. When cross checked with the table reporting the findings on the households' expenditures per category, the expense for charcoal is quite high, thus confirming the extensive and systematic use of this fuel for cooking. In average charcoal accounts for 26% of households expenditures incurred for energy.

Table 5: Use of Electricity whatever the source (grid or off grid) by order of priority

Use	1st Use	2nd Use	3rd Use	4th Use	5th Use
Lighting	180	23	7	1	0
TV/Radio	16	147	33	11	3
Fans	5	21	123	12	1
Refrigeration	3	10	15	20	1
Cooking	0	0	0	1	1
Other appliances	5	8	32	70	25
Na	2	2	1	96	180
	211	211	211	211	211
Use	1st Use	2nd Use	3rd Use	4th Use	5th Use
Lighting	85%	11%	3%	0%	0%
TV/Radio	8%	70%	16%	5%	1%
Fans	2%	10%	58%	6%	0%
Refrigeration	1%	5%	7%	9%	0%
Cooking	0%	0%	0%	0%	0%
Other appliances	2%	4%	15%	33%	12%
Na	1%	1%	0%	45%	85%
	100%	100%	100%	100%	100%

Table 6: Monthly household energy spending by category of energy expenditures and by Quartile

QUARTILE	ELEC TRICITY*	LPG	DIESEL	GASO LINE	DRY CELL BATTERY	KERO SENE	CHAR COAL	CANDLE	TOTAL ENERGY
	USD	USD	USD	USD	USD	USD	USD	USD	USD
Q1	11	0	0	0	2	0	8	1	23
% on total Q1	48%	0%	0%	2%	10%	0%	37%	3%	100%
Q2	27	0	0	0	2	0	11	0	41
% on total Q2	67%	0%	0%	0%	5%	0%	28%	0%	100%
Q3	37	1	0	2	2	0	12	0	54
% on total Q3	68%	2%	0%	3%	3%	0%	23%	0%	100%
Q4	51	1	1	7	1	0	19	0	80
% on total Q4	64%	1%	1%	9%	1%	0%	24%	0%	100%
Average on total	31,4	0,4	0,2	2,4	1,8	0,0	12,7	0,2	49,2
% on total	64%	1%	0%	5%	4%	0%	26%	0%	100%

*LEC, IPP, Own generator, solar households

- Availability/quality of supply: status of domestic supply chain

With approximately 20/10MW of installed/available capacity, LEC is the main supplier of electricity in the Monrovia area. The recent End Users survey confirms that LEC is constantly improving the quality of its services despite there is still room for progress. LEC tariffs though very high (US \$ 0.57 par kWh) are lower than the prices applied by Independent Power Providers (IPP's) or the costs of operating small individual generators.

The supply chain for other sources of energy and various fuels is relatively well organized in the Monrovia area, but constrained by transportation issues on the country side. Liquid fuels like Gasoline and Kerosene are available at various gas stations and through the retail market vendors' network which is extending throughout the country.

Charcoal supply is contingent to the transportation facilities from the production places which are usually far from the capital city. The charcoal market and the distribution network are relatively well organized by producers associations. The NACUL (National Charcoal Union of Liberia) represents the interests of the various players of the sector. NACUL works also in close collaboration with the Forestry Development Authority (FDA) created by an act of the Government in December 1976 amended and completed in July 1988. NACUL has a new office in Monrovia inaugurated on the 17 of October 2012. The building has been financed 75% by Buchanan Renewable as one of its social responsibilities to the people of Liberia.

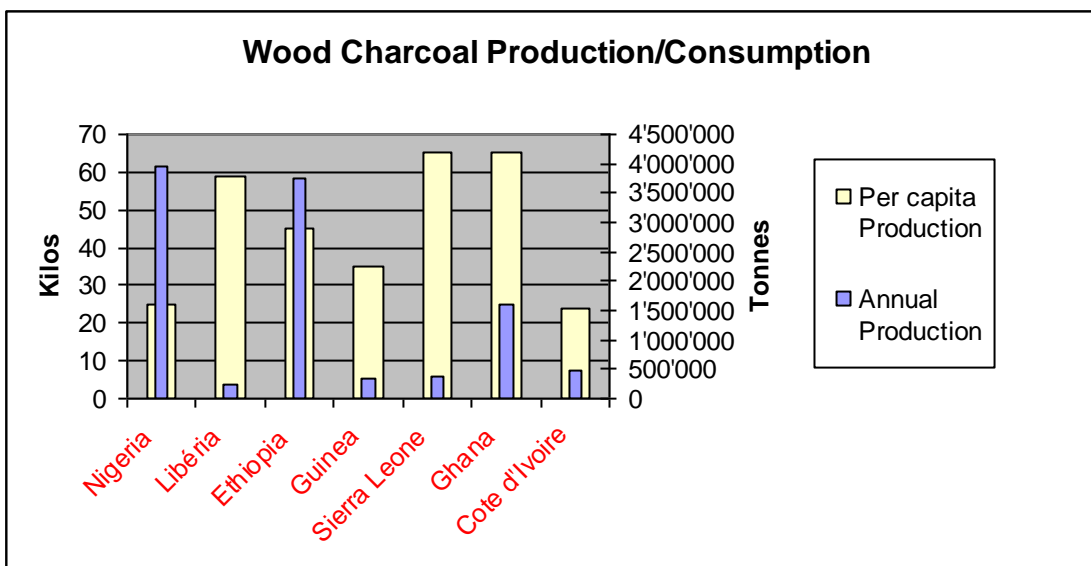
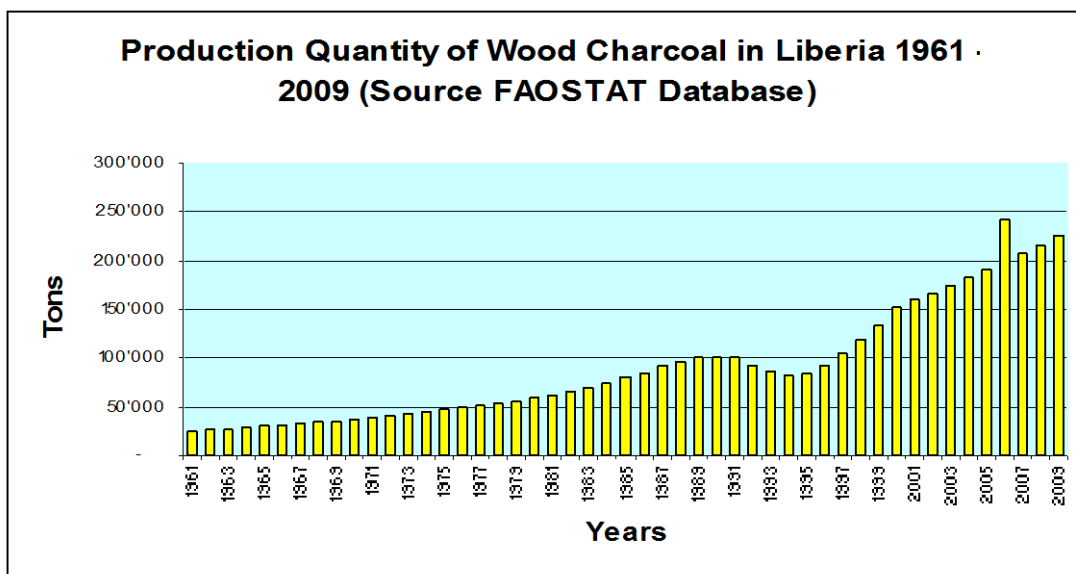
For the charcoal sector, FDA issues waybills for movement of forest products and makes sure all taxes are assessed and paid, thus allowing building statistics on the production, transport and trade of charcoal. During meetings held with FDA in October 2012, they confirmed that they are also planning actions for sensitization of the operators of the charcoal industry to improved production techniques which could reduce the pressure on forests. The current methods for producing charcoal are not efficient. The utilisation of kilns with high efficiency is neither developed nor promoted. However, there are problems with the present method of production used – burning in the ground. This process is labour-intensive and hazardous to the health of the producers. Secondly, cost of production is high because of a loss of 25% of biomass during this process resulting in reduction of income to producers.

The End Users survey conducted in April 2012 confirmed that all households utilize charcoal for cooking. The part of expenditures for this type of energy amounts in average to US \$ 12.7 per month equivalent to 26% of the total expenses incurred for energy. However, the survey could not evidence the use of improved stoves or any initiative or program for promoting them.

The analysis of the energy sector cannot be complete without considerations on the use of fuel wood and charcoal. The annual world production of charcoal was 47 million tons in 2009 with Africa producing 63% of this quantity (29.4 million tons). This subject is of particular importance for Liberia where more than 95% of the population utilizes this type of resource for cooking. The following table shows the production/consumption of charcoal in Liberia with a quantity currently

estimated between 235'000 and 285'000 tons for the year 2010. As a matter of comparison with other neighbouring countries, the next table bellow shows that the per capita production/consumption for Liberia, at 59 kg per year is amongst the highest in the region, confirming the prominent role of this form of energy for domestic use.

Table 7: Wood Charcoal Production in Liberia



The significant use of wood charcoal as a source of energy is associated with the issue of forestation and degradation as in addition to wood charcoal; a significant volume of fuel wood (firewood not transformed into charcoal) is also utilized by households, mainly in rural areas. The per capita quantity is estimated at 1 m3 per person per year. Assuming that most of Liberians use these energy sources, this amounts to more than 3 million m3 of wood, a number far higher than the lumber that Liberia exported at the peak of the forestry sector output in the early 2000s. Even if firewood and charcoal can be made from wood that would be rejected for timber export or from deadwood, the number should be put in context.

The FDA informed that currently, only 25% of the charcoal is produced from by-products of the logging sector or from refusals generated by the rubber trees processing into wooden chips for export. Nevertheless, the potential impact of firewood and charcoal demand as a driver of deforestation should not be ignored. At first the suppliers of charcoal to the city of Monrovia were producing charcoal from old rubber trees, right within Monrovia and its environs. However, since 2005 many of the rubber farmers have sold out all their trees depleting all the trees nearby.

Today, the charcoal producers have cleared all the lowlands and secondary forest and are now in search for trees in high forest cover areas which is going to lead to a faster rate of depletion of the Liberian forest leading to forest degradation and deforestation. Because of the shortage of charcoal on the local market there has been a 100 per cent increase in the charcoal business since the beginning of the rainy season.

The use of forestry products as a source of energy poses the issue of carbon dioxide emissions. The report from the study “Economic Analysis of a Low Carbon Economy in Liberia” dated November 2009, (by the organization: Conservation International) states that approximately 2.3 million tons of CO₂ are released every year from the firewood consumption. If Liberia’s fuel wood sector could be made twice as efficient, then 1.15 million tons CO₂ could be saved each year. Over 25 years, this would amount to 28.5 million tons CO₂ emissions averted. Amongst actions described within a low-carbon development strategy suggested by the report, “*one area where the fuel wood sector can be made more efficient with a relatively simple intervention is at the level of the end user*”.

Energy-efficient stoves that use charcoal and fuel wood have been developed in other African countries. These stoves can be produced locally creating jobs and skills. Their use also reduces indoor air pollution thus improving comfort and a healthier environment in households. Availability of improved stoves was not identified on the market except information regarding an initiative by EVN (Under the Norwegian cooperation) offering 300 improved stoves to women within the program Gender component for women empowerment in Liberia. However, the programme was not supervised under the perspective of assessing its impact and outcomes on the aspects of benefits derived from the utilisation of these stoves. The programme was not utilized for promoting the dissemination of these stoves through sensitization and demonstration campaigns or support for the development of a small industry for manufacturing the stoves locally. However, EVN has a plan for the dissemination of 1’000 clean cook stoves in the near future.

The Conservation International study from 2009 reports that efficient stoves could be produced locally for a few US dollars. Computations show that each stove can prevent the emission of 1.25 tons of CO₂ per year. In addition, manufacturing stoves at a larger scale would contribute to the local economy by creating employment and skills. Some of the cost could be passed on to the consumer avoiding money and time expenditures for fuel wood purchase or collection. On the side of charcoal production, better efficiency could be easily achieved by utilizing kilns. A variety of kilns with different level of efficiency and price have been experienced in various countries. Such experience and expertise could be replicated in Liberia with the support of appropriately designed programs and initiatives.

The prices of charcoal and fuel wood significantly vary depending on the location – prices are of course higher in Monrovia than in rural areas - and the season - prices can be double during the rain season. For the same weight, (bags and bundles of approximately 25 kilos) the price of charcoal is 3 to 5 times higher than the price of fuel wood.

8. Access to electricity:

- Physical access: grid connection, urban/rural areas, target group: areas/category of population with minimum level of physical access [official statistics exist]

Liberia has the lowest rate of access to electricity in Africa with 1% of the population connected to the national network or other off grid systems. The “national grid” operated by LEC is limited to the Monrovia area. In rural areas or other urban centres there are no grids as such. Projects like the Cross Border rural electrification (supply from Côte d’Ivoire) or the CLSG will create local systems for the connection of new customers at short and medium terms.

- Availability and reliability of supply: frequency/duration of black-outs, load shedding (if officially practiced)

Most of the interviewed customers quote irregularity in the power supply as a main source of dissatisfaction with the LEC services. But this is also true with the electricity supply from IPP’s. Worse to note that some blackouts have technical reasons, LEC facing operational constraints in the management of its generation capacity and its transport/distribution system which has still some bottlenecks.

- **Affordability:** tariffs, share of utility bills in household incomes, subsidies [data available for most countries via national household survey]

Currently, tariffs are the highest in Africa with US \$ 0.57 (including taxes) per kWh for LEC customers. IPP's are billing \$ 1.2 per kWh in average. The LEC Average Retail Tariff was set contractually at US \$ 0.42/kWh (when the fuel price was at US \$2.83 per gallon) at the commencement of the Management Contract and is required to be adjusted quarterly, thirty days in advance for taking into account the fuel component of the generation cost and the changes in LEC's distribution O&M costs, reductions in losses (presumably both technical and non-technical and cash collections), and Liberian inflation.

The next table illustrates the levels of revenues of the population (in Monrovia) established during the End Users survey performed in May 2012.

Table 8: Level of households revenues in Monrovia

	All respondents	LEC customers	IPP customers	Own generator	Without electricity
	US \$	US \$	US \$	US \$	US \$
Average	422	508	426	542	323
Median	372	437	427	514	288
Q1	266	333	296	356	194
Q2	372	437	427	514	288
Q3	535	642	506	684	408
Q4	1227	1227	751	1072	953

The next table shows the sharing of households' monthly expenses. Energy is the third category of expenditure. It covers the expenditure of lighting and cooking. It accounts for 12% on average of the households' total monthly expenditure. This category represents an expenditure of US \$ 20 per month for the households of Q1 – households of the category "without electricity", some being customers of IPPs – the main part being for cooking.

The expenses for energy are US \$ 41 to US \$ 54 for households of Q2 and Q3 – the related households are mainly customers of IPPs and LEC and some operate their own generator – in the last Q4 quartile, the energy category for lighting and cooking represents an average expense of US \$ 80 per month for the households belonging to Q4 – this relates to households having an electric generator and the wealthiest LEC households customers.

Table 9: Breakdown of households expenditures in Monrovia

Quartile	Food	Mobility Transport	Energy	Water	Rental	School/ education	Medical care	Communication	Various	Total %	Total USD*
Q1	53%	7%	12%	2%	2%	5%	6%	6%	5%	100%	188
Q2	43%	9%	13%	2%	2%	8%	6%	8%	8%	100%	316
Q3	37%	12%	12%	2%	2%	11%	6%	9%	8%	100%	447
Q4	32%	16%	11%	2%	2%	11%	8%	8%	10%	100%	743
% on total	37,5%	12,6%	11,6%	2,3%	2,0%	9,9%	7,0%	7,8%	9%	100,0%	
Average on total US \$	158,5	53,4	49,2	9,9	8,6	41,9	29,5	33,0	38,2	422,4	

On the aspect of affordability and willingness to pay, the survey revealed that the majority of the population and interviewed households (of the medium and low income category which is by the way the majority of the population) are ready to pay for the connection costs to become a LEC customer. The population is generally aware that electricity and associated services have a cost. Most of them confirmed that they are or will definitely incorporate such costs and expenses in their budget.

- **Sustainability:** share of renewable energy sources (RES) in power

For the time being, the share of renewable energy sources in the power mix is not significant. The LEC generation capacity is currently totally based on fossil fuels. The hydropower potential expected from the rehabilitation of the Mount Coffee power station is only expected to come on line in 2015 at the earliest. At that time, the 64 MW (minimum) of installed capacity will drastically

improve the share of renewable energy sources in the country mix. This will even be increased when the CLSG project is operational, the energy supplied through this regional interconnection being foreseen to be from hydropower resources (in Côte d'Ivoire). The progress of the rehabilitation project for the Mount Coffee power plant is on tracks. The tender for the Owner's Engineer services contract has been issued by the PIU, bids being expected for the 19th of November 2012. International firms have been invited, all with proven track records in the domain. The expected date for the re-commissioning of the first unit is planned for December 2015. If the schedule is respected, the added capacity as well as the electricity generated from the first unit will dramatically increase the share of renewable energy in the Liberia energy mix close to 50%. Ironically, with the Mount Coffee recovering its capacity (min 64 MW) the third goal of the SE4ALL initiative "Doubling the share of renewable energy in the global energy mix" will be fully attained for Liberia, even before the 2030 deadline.

9. Modern energy for productive uses:

Information and data relating to the use of energy/electricity for productive activities are very scarce. There are no reliable sources of information which could provide accurate figures or estimates. What can however be assessed when observing the industrial sector, is that factories, SME's and industries of noticeable dimensions rely on their own energy generation facilities, thus impeding the possibility to consolidate statistics. Large compounds like mining sites, large agro industries are producing their own energy mostly through off grid thermal/diesel power plants.

2.2. Energy Efficiency vis-à-vis Goal of SE4ALL

10. Overview and Assessment

The indicator relating to energy intensity for Liberia shows that energy efficiency is low. The utilization of energy is not optimized. There are currently no programme or initiatives for the demand side management in Liberia except efforts from LEC to inform customers on ways to better utilize electricity. The only obvious measure contributing to more efficient use is the availability of low consumption bulbs for lighting. Their use is popular and widely spread in Monrovia and in rural areas where electricity is available.

In the housing and building industry, standards and practices as far as insulation is concerned are very low for the existing constructions, thus resulting in high consumption of electricity for air conditioning. It also appears that the use of timers or automatic switchers-off devices is not developed.

For cooking, the use of charcoal by more than 95% of the households would deserve that improved stoves are adopted. Unfortunately, these stoves are neither popular nor available on the local market. Marginal initiatives and information (by the Forestry Development Authority) have been attempted but their results and impacts are not significant.

11. Energy intensity

Energy intensity is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP. It shows the amount of energy it takes to produce a US \$ of GNP for a given country.

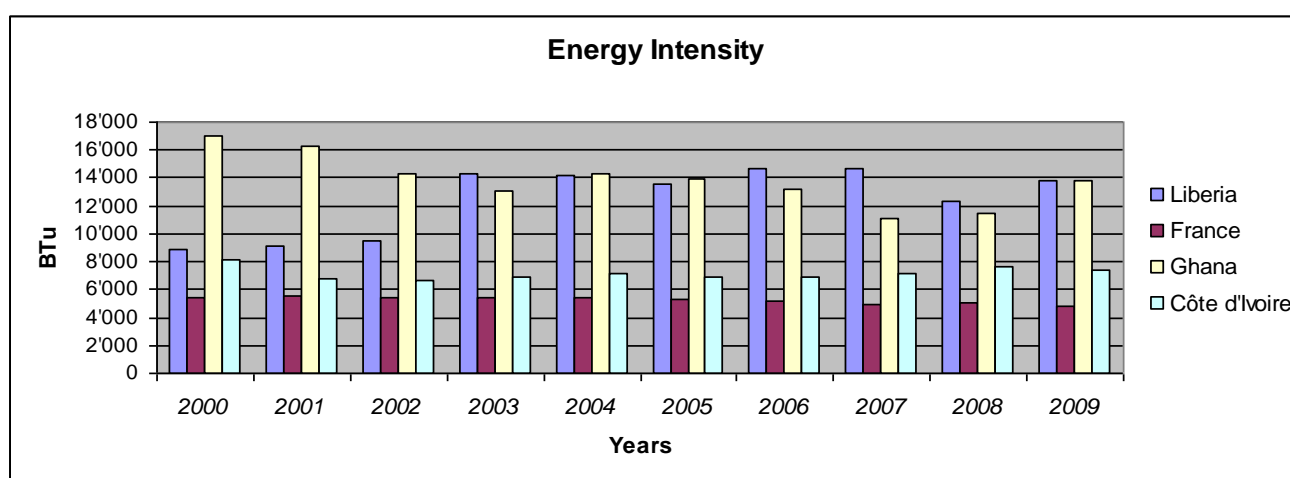
- High energy intensities indicate a high price or cost of converting energy into GDP.
- Low energy intensity indicates a lower price or cost of converting energy into GDP.

As per the available data (EIA US Energy Information Administration 2005 - 2009), the Energy Intensity of Liberia is reported in the following table. For the sake of benchmarking, Energy Intensity for Côte d'Ivoire, Ghana and France is also reported and graphed.

Table 10: Total Primary Energy Consumption per Dollar GDP.

Btu's per year 2005 Dollar										
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Liberia	8'890	9'140	9'539	14'315	14'117	13'578	14'627	14'665	12'269	13'819
France	5'485	5'508	5'405	5'405	5'374	5'293	5'179	4'980	5'018	4'861
Ghana	17'053	16'255	14'328	13'072	14'303	13'918	13'149	11'041	11'510	13'869
Côte d'Ivoire	8'157	6'751	6'671	6'895	7'111	6'901	6'961	7'187	7'681	7'458

TEP per year 2005 Dollar										
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Liberia	0.353	0.363	0.379	0.568	0.560	0.539	0.580	0.582	0.487	0.548
France	0.218	0.219	0.214	0.214	0.213	0.210	0.206	0.198	0.199	0.193
Ghana	0.677	0.645	0.569	0.519	0.568	0.552	0.522	0.438	0.457	0.550
Côte d'Ivoire	0.324	0.268	0.265	0.274	0.282	0.274	0.276	0.285	0.305	0.296



2.3. Renewable Energy vis-à-vis Goal of SE4ALL

12. Overview and Assessment

Currently, the part of renewable energy in the energy mix of Liberia is negligible. Despite the country is endeavoured with significant hydropower resources, these are not exploited. The Mount Coffee hydropower plant which was the only power station with 64 MW of capacity was destroyed during the wars. Contingent to the availability of funds from donors and the government it will be rehabilitated and might come on line in 2015. With the rehabilitated increased capacity and once commissioned, it will contribute to a significant share of the generated energy in the country. Worse to note that its energy output could be dramatically increased when upstream projects like the Via reservoir scheme are materialized for improving the regulation of the river flow during the year thus increasing the hydropower output during the dry season. The hydropower potential that Liberia could technically and economically exploit is estimated at 1'000 MW.

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

Solar energy is currently mainly but marginally exploited through small isolated photovoltaic (PV) systems for the electricity supply of individual buildings (dispensary, clinics, and schools). Large scale solar plants (of PV or CSP types) are neither economically nor technically feasible, Liberia being at a latitude where insolation factors are not typically favourable for this type of technologies.

13. On-grid and off-grid renewable energy

Renewable energy technologies are particularly well suited to an off-grid, distributed generation scenario, and Liberia is endowed with significant renewable energy resources, including solar, biomass, and hydropower resources. Table below provides an overview of the renewable energy applications that are available as an alternative to the conventional fossil-fuelled or grid based approach, and the needs they meet. There is no single technology that is most suitable for providing rural energy services in Liberia. Determining the appropriate technology, supply, and delivery options will require economic, financial, and technical considerations.

Table 11: Renewable energy services for off-grid applications

Energy services	Renewable energy applications	Conventional alternatives
Lighting and other small electric needs (homes, schools, street lighting, telecommunications, hand tools, vaccine storage)	<ul style="list-style-type: none"> Hydropower (picot-scale, micro scale, small-scale) 	Candles, kerosene, batteries, central battery recharging, diesel generators
	<ul style="list-style-type: none"> Biogas from household-scale digester 	
	<ul style="list-style-type: none"> Small-scale biomass gasifier with gas engine 	
	<ul style="list-style-type: none"> Village-scale minigrids and solar/wind hybrid systems Solar home systems 	
Small industry	<ul style="list-style-type: none"> Small hydro with electric motor 	Diesel generators
	<ul style="list-style-type: none"> Biomass power generation and electric motor Biomass gasification with gas engine 	
Water pumping (agriculture and drinking)	<ul style="list-style-type: none"> Mechanical wind pumps 	Diesel pumps
	<ul style="list-style-type: none"> Solar photovoltaic (PV) pumps 	
Heating and cooling (crop drying and other agricultural processing, hot water)	<ul style="list-style-type: none"> Biomass direct combustion 	Liquefied petroleum gas (LPG), kerosene, diesel generators
	<ul style="list-style-type: none"> Biogas from small- and medium-scale digesters 	
	<ul style="list-style-type: none"> Solar crop dryers Solar water heaters Ice making for food preparation 	

There are indicative plans, as outlined in the “Five-Year Plan” and a few pilot projects (ref. USAID) are ongoing. The key tasks identified for the pending GOL/AfDB Power Sector Master Plan Study Project summarizes the vision; this being with the note the EU/RREA is also poised to implement a rural and renewable energy master plan study in Liberia.

In Liberia, the Rural and Renewable Energy Agency (RREA) has the mandate to facilitate and accelerate the rural electrification program, and to promote the use of renewable energy technologies all over the territory. The RREA is receiving support from the Norwegian Government for implementing its mandate as well as from other donors like USAID, UE. Various activities are planned but progress is slow. The last report from the USAID (on the LESSP) states that during 2012, some new staffs have been hired by RREA, but not on the senior management level. The RREA Executive Director has requested that new mid-level managers receive management training under the Year 3 of the programme. The Energy Law Review and draft ERB (Electricity Regulatory Board) Action Plan have been circulated but no comments have been received.

Hydro

Liberia has six major rivers, which drain 66 percent of the country’s water. These include the rivers Mano, Saint Paul, Lofa, Saint John, Cestos, and Cavalla. Short coastal waterways drain about 3 percent of the country’s water. This intensive drainage pattern indicates considerable potential for hydroelectric power in Liberia. A number of feasibility studies were carried out over the period 1976–1983. At least 14 large-scale schemes were identified in the 6 main rivers.

About 24 sites have been identified for small hydroelectric schemes. In 1988 the LEC sought investment capital to develop six mini-hydropower schemes with total installed capacity of about 20 MW, which was intended to supply 3 rural grids serving 14 major population centres in the northern half of Liberia. This proposal was disrupted by the civil conflict. The 24 potential sites identified are shown below, and span most of the country. These sites are still of interest for development of mini hydro plants.

Table 12: Potential sites for small hydroelectric development, (As reported in March 1988)

River basin	Region	Site	Design flow (m ³ /sec)	Head (meters)	Installed kW potential
Mano	Grand Cape Mount, Gbarpolu and Lofa	MR1	10.40	30.0	2,474
		MR2	9.47	30.1	2,252
		MR3	8.09	25.0	1,603
		MR4	3.61	20.0	572
		MR5	2.43	12.0	231
Lofa	Lofa, Gbarpolu and Grand Cape Mount	LR1	55.70	17.0	7,508
		LR2	37.10	20.0	5,884
		LR3	3.48	55.0	1,517
		LR4	3.42	10.0	271
		LR5	3.35	7.0	186
		LR6	3.25	6.0	153
Farmington	Margibi	FR1	16.90	15.0	2,010
Saint John	Bassa, Bong, and Nimba	SJR1	60.40	33.0	15,806
		SJR2	57.50	28.0	12,767
		SJR3	37.70	28.0	8,370
		SJR4	2.32	25.0	460
Timbo	Rivercess	TR1	6.51	12.0	619
Cestos	Grand Gedeh and Nimba	CR1	8.30	12.0	789
		CR2	7.35	10.0	582
		CR3	6.51	15.0	774
Sehnkweh	Grand Kru	SR1	5.78	12.0	550
		SR2	3.47	12.0	330

Source: LEC

Under the LESSP funded by USAID, commercially viable pilot plants that can provide Renewable Energy to populations in rural areas are developing in Bong, Lofa and Nimba Counties. The Mein

river project is progressing well and would be ready for call for bids for implementation under a turn key contract providing financing is available. These small hydropower projects of pilot type are opportunities to develop experience in the various domains and activities of hydro-project preparation and development phases. Aspects of river flow measurement and recording, legal consultations, creation and registration of independent Power Companies, environmental impacts, access roads and ancillary facilities have been covered by the USAID funded activities.

Solar

Liberia has high rainfall, annual solar insolation shows some prospects for the application of solar technologies such as PV and solar thermal systems of small capacities for health care, education, agriculture, community livelihood, and micro-enterprises. Despite the lack of national data on solar resources, global weather data obtained from RET Screen International of Canada and NREL show that the monthly average daily solar radiation on horizontal surfaces in Liberia is between 4.0 and 6.0 kWh/m²/day. During the summer months of the rainy season, insolation averages between 4.0 and 5.0 kWh/m²/day; during the winter months of the dry season it is higher—5.0 to 6.0 kWh/m²/day. Inland areas of Liberia receive slightly greater insolation than coastal areas. In average the DNI (Direct Normal Irradiance) is 1'602.74 kWh/m²/year in Liberia. This is far below the value of 2'635kWh/m²/year measured at the location of the world biggest Concentrated Solar Power project currently under construction in Ouarzazate in the southern part of Morocco. This DNI of more than 2'600kWh/ m²/year was the optimum value justifying the technical, financial and economic feasibility of this large scale project (ultimately 2'000 MW). The comparison confirms that large scale solar energy projects would face difficulties for being feasible in Liberia.

Other sources

There are few data available on wind speeds in Liberia since no assessment has been performed. However, global and regional wind maps show a poor resource for West Africa. Mechanical turbines for water pumping could nevertheless be well suited for Liberia. There does not appear to be a geothermal resource in Liberia. Though higher heat flow values are found offshore to the south and west in the Guinea and Sierra Leone Basins, and are attributed to possible tectonic activity, the thermal effects of the activity are not thought to extend inland to the Liberian territory.

The Rural and Renewable Energy Agency (RREA) under its mandate to facilitate and accelerate the rural electrification program, and promote the use of renewable energy technologies is developing its first master plan for renewable and alternative energy and runs two small demonstration projects (micro hydro of 60kW and solar which are intended to be replicated and sealed up with the engagement of private sector. RREA targets off-grid communities (schools, clinics, police stations, etc). Current programs are the following:

Catalyzing New Renewable Energy in Rural Liberia (CNRERL).

This two phased project funded by the World Bank aims to assist establish RREA as a functioning agency that is able to mobilize new renewable energy services and investment for rural areas to meet demand in a technically reliable and affordable manner. The program is closely connected to the LESEP and covers (a) Sustainable Solar Market Packages (SSMP), (b) Rehabilitation of Yandohun Micro-hydro Power, and (c) Technical Assistance and Capacity Building of the RREA.

Developing and Demonstrating a Rural Energy Strategy and Master Plan for Liberia

This is a 3 years program financed by ACP-EU Energy Facility under the 10th European Development Fund to support the development of Liberia's Rural Energy Master Plan and implementation of a complementary solar market facilitation effort.

Institutional Capacity Building and Strengthening of the Energy and Water Resources

The Program is funded by the Norwegian Government for the period from 2010 to 2015 and aims at contributing to the economic and social development of Liberia through assistance to develop, monitor and manage water and energy resources. Although the MLME is the main recipient of the program, RREA is receiving support in the area of rural and renewable energy programs in Liberia.

Liberia Energy sector Support Program (LESSP)

The Liberian Energy Sector Support Program (LESSP) is funded by the USAID. Within this program, RREA receives support in the area of training and capacity building for its management staff and for the finalization of the draft REFUND Operating Guidelines.

Program for Scaling Up Renewable Energy in Low Income Countries (SREP)

This program is led by the World Bank jointly with the AfDB financed by the Climate Investment Funds (CIF). The RREA has been designated as the GOL focal point for SREP for the preparation of an Investment Plan for Renewable Energies to be submitted to the SREP Sub Committee by the 4th quarter of 2013.

14. Use of renewable energy sources (RES) for thermal applications (cooking/heating)

With the majority of the installed capacities based on diesel fuel and the unavailability of the Mount Coffee hydropower plant, the use/contribution of renewable energy for thermal applications is inexistent in Liberia. The use of fuel wood and charcoal is the common practice in Liberia for domestic cooking and heating. Other chapters of this report are detailing the characteristics of this sector.

15. Use of RES for productive activities

To date, industries, small businesses and domestic initiatives which are engaged into productive activities are mainly energized from fossil fuel sources. In the great Monrovia area there are few businesses which are connected to the LEC grid. For the time being, it appears that industries, hotels, residential and office/business compounds, large shopping centres prefer to rely on their own generators, arguing that cost is not so high compared to LEC tariffs with the invaluable plus that they have not to suffer unplanned outages. This also means that there is no use of Renewable Energy Sources for productive, business or commercial activities.

16. Consolidated Summary:

Energy access is an endemic issue in Liberia. Nevertheless, progresses are recorded for the great Monrovia area thanks to government and donors initiatives to rehabilitate the national grid operated by LEC allowing the urban population to gradually access to modern electricity. At the date of December 31st 2013, the consumer base of LEC has reached more than 13'300 connections. For more conventional/traditional energy sources like charcoal, liquid fuels (kerosene, oil) and batteries, their availability and prices remain contingent to the market and the transportation facilities. This is compounded in remote and rural areas of the country.

Energy efficiency which is strongly based on the combination of technological improvements and good/responsible practices/behaviours is unfortunately not a priority for the population and the households agendas except for the use of low consumption bulbs which are available on the market at retail stores. Nevertheless, these bulbs massively imported from China are of medium to poor quality, not lasting more than 10'000 hours of function as advertised on packaging.

Efforts for improving the construction standards and norms for thermal insulation in view to reduce temperature fluctuation and the abusive use of air conditioning are marginal. There are no comprehensive study results quantifying the gains involved from better insulation in the construction industry. Worse also to note that modern insulation materials, environmentally friendly are very expensive as they need to be imported. The domestic market does not justify the development of a local production industry. ..

With an estimated technically and economically feasible hydropower capacity of 1'000 MW, Liberia must envisage tapping this renewable resource for targeting an appreciable energetic independence avoiding the possible shocks induced by the fluctuations of the fossil fuels market prices. This orientation although requires rapid and in advance actions as hydropower projects need long gestation periods for their proper design, due environmental considerations and mobilization of funds/capital. This can be achieved when the combination of a strong political will, adequate regulatory framework and a vibrant participation of the private sector are effective.

Other renewable energy sources like PV, mini and micro hydro, biomass have also their legitimate place in the future energy mix of the country. Nevertheless their development at large scale will not be economic due to technical and operational constraints. Their implementation must target isolated off grid needs. USAID is supporting some small projects using CPO (Crude Palm Oil) to be implemented with the participation of private sector partners.

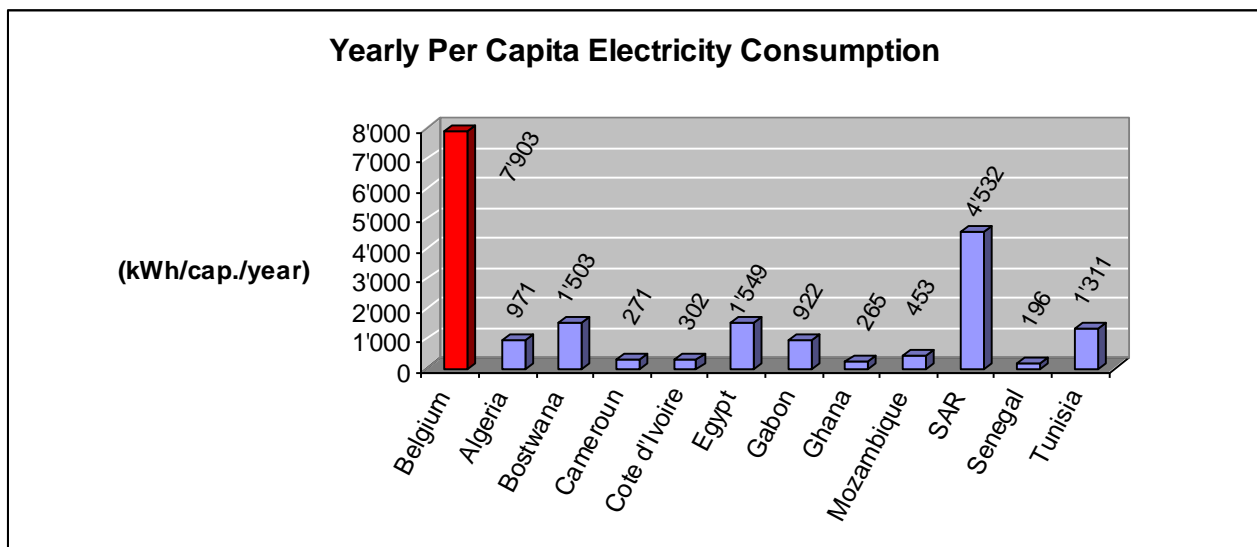
2.4. SE4All goals

17. Goals

- Energy access
- Energy efficiency
- Renewable energy

With the support from the World Bank, the Government (MLME) is currently performing a study on the “Liberia Energy Access Plan”. A first draft of the report has been issued in June 2012. Observations, analysis, comments and recommendations from the study team are well in line with those of the present Gap Analysis/Rapid Assessment. Critical issues identified are emphasizing the needs for reinforcing the capacities of the sector and the skills of its agencies/actors. For achieving SE4ALL access features (70% and 35% of urban and rural population respectively) of the population to sustainable and modern energy at the year 2030 horizon, the current estimates articulate the figure of more than US \$ 750 million of investments for the transmission, distribution and management activities of the electricity system only. This does not take into account the needed investments in the segment of generation which could amount to approximately US 1.5 to 2.5 billion for installing the additional 700 to 800 MW of additional generation capacity depending of the actual growth scenarios. At this term, and with this system capacity, the per capita use of electricity will be around 1'000 kWh per year. For the sake of comparison and benchmarking, the table below illustrates the current situation for a series of African countries. (Energy Statistics IEA, World Development Indicators 2009).

Table 13: Electricity Consumption in African Countries

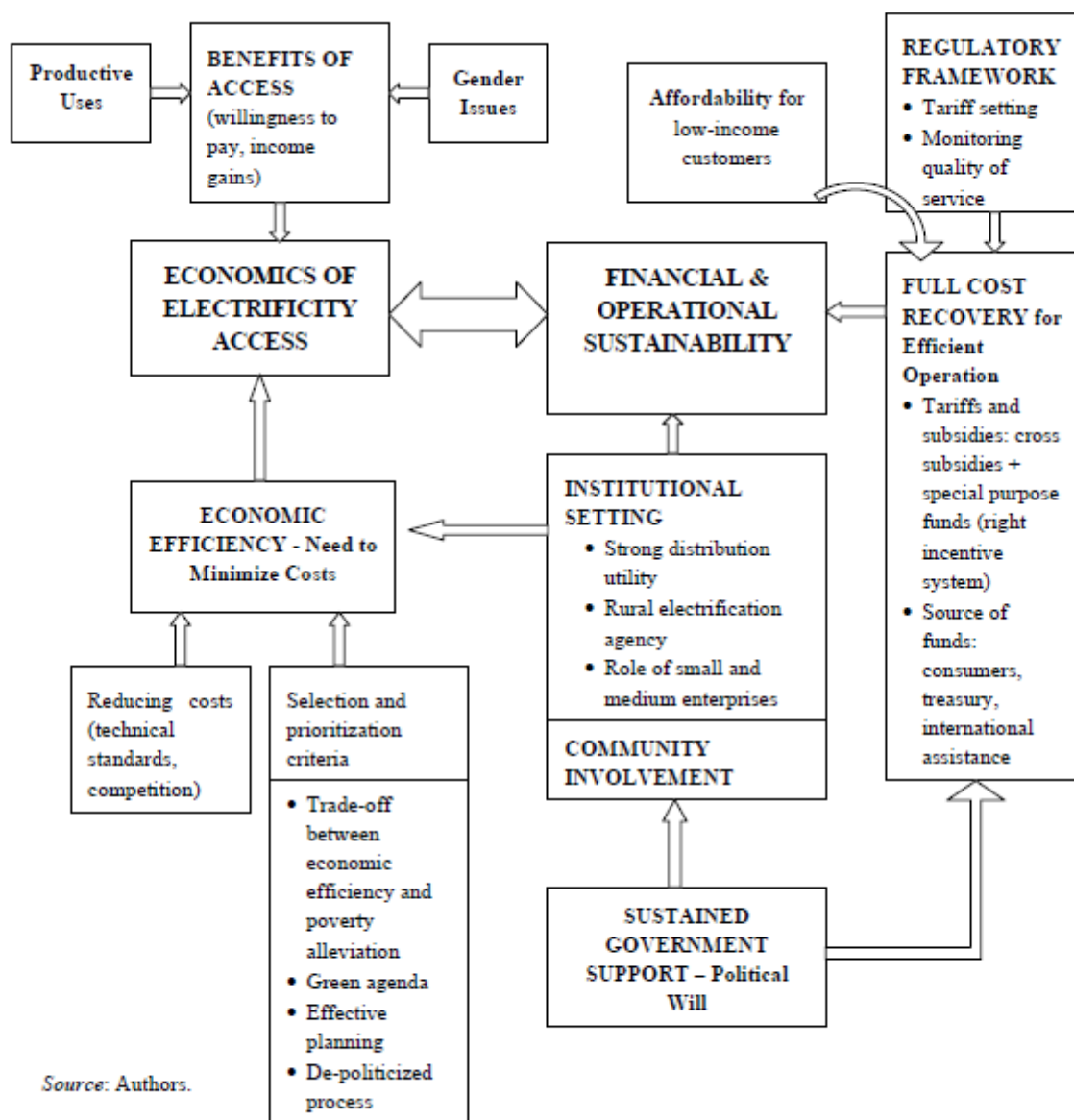


Section 3. Challenges and opportunities for achieving SE4ALL goals

3.1. Institutional and Policy Framework

When preparing its Energy Sector Strategy in June 2010, the World Bank illustrated the complexity of the challenges for increasing the access to electricity/energy in developing countries through the next flow chart. This chart is still valid and applicable today for Liberia, showing the various issues which have to be tackled in various domains which are in turn deeply intricate.

Table 14: Electricity access challenges



Source: Authors.

Gaps identified during the assessment exercise are reported in the matrix attached (Annex 2) to the report.

18. Energy and development:

The sector of energy is adequately covered in the national development and poverty reduction strategies and plans of the country. The institutional arrangements, allocating responsibilities to various ministries and agencies are adapted and follow most of the models applied elsewhere in developing countries. In this respect, it is important to note that there is no universal model which can fit to all situation and countries. Arrangements and frameworks are peculiar to every country.

3.2. Programs and Financing

This section provides an overview of on-going/planned programs, further details such as project titles, financing and partners are provided in Annex 1 and Table 17 below).

The following paragraphs are derived from the report established in May 2012 during the evaluation mission of the EU interventions in the electricity sector up dated with the information collected from the minutes of energy donors' dialogue meetings. . Therefore it reflects the situation at the date of December 31st 2012.

Donors interventions and programmes

The description of donors' interventions below only refers to the electricity sector though they may be active and strongly involved in Liberia in other domains.

The description of, past, current and future interventions reflects the situation and the accuracy of information available at the date of December 2012. The calendar for the actual implementation of new projects, specifically in the field of new generation capacities must be considered as tentative and subject to further changes as a result of various constraints embedded in the respective donors' agendas and procedures. Nevertheless the prospects for the next five years (up to 2017) can be considered valid and reliable for assessing the situation of the Liberia Electricity sector at the same term.

The World Bank Group

The World Bank portfolio at the end of 2010 consisted of 12 projects totalling \$226 million in commitments. Disbursement was at \$101 million or 46 percent, with a disbursement ratio in fiscal year 2010 of 20%. The average project age is 2 years. Six projects are in their final year of implementation and 2 projects are in their first year of implementation. The sectoral distribution is as follows: Infrastructure at \$164.4 million (primarily transport); Social Protection at \$26.3 million, economic and public sector governance capacity building at \$19 million; Agriculture at \$7 million; and Health at \$8.5 million. Projects were rated as satisfactory or moderately satisfactory on development objective and implementation progress in 2009, with ratings for procurement and financial management generally lagging behind. Main challenges were: (i) projects were prepared rapidly without appropriate capacity pre-building and; (ii) project staff lack familiarity with Bank fiduciary policies and procedures. The World Bank proposed to provide more in-depth training on fiduciary issues as well as increase Bank staff capacity to support project procurement on an on-going basis, by placing full-time procurement staff in-country.

In the specific sector segment relating to access to electricity (in the Monrovia area) the World Bank, on December 2011, acting as administrator for the Global Partnership on Output-Based Aid (GPOBA), has approved a grant of US\$10 million to connect about 80,000 people (equivalent to approx. 17'000 households) to Monrovia's electricity grid, raising the electricity access rate in Liberia's capital from 0.6 percent to 8 percent. GPOBA funding will supplement capital allocations from various donors to install connections, initially targeting 21 priority low-income neighbourhoods. The scheme will be implemented by the Liberia Electricity Corporation (LEC). The project will help make access to electricity more affordable by subsidizing the cost of connection and more inclusive by explicitly targeting the poor. GPOBA will pay LEC a capital subsidy of US\$ 595 for each connection installed (reminder: Current connection cost for LEC is approx. US\$ 1'000). The connections made through the output-based aid (OBA) scheme will increase LEC customer base and secure resources for further investments in access programs.

Also, the utility will be able to speed up its goal to reduce tariffs and subsequently energy expenditure for Liberian households. In its plans, strategy and projections, LEC estimates that for every 10,000 new customers it acquires, tariffs will reduce by US\$ 0.03-0.04. Ultimately, the savings made by households will help make more spending available for other commodities and education thus achieving the objective of improving the living conditions of the population and opening opportunities for re-allocation of the saved resources to productive activities or other socio-economic improvements like better access to health and education services and reduction of gender inequalities. LEC will receive the subsidy payment in two phases and in accordance with the OBA approach, only after independent verification of household connections. 80 percent will be paid after a connection in a priority neighbourhood is made and verified; and the remaining 20 percent will be paid upon verification of proof of three months satisfactory service delivery to target households. The GPOBA project is part of the Liberia Electricity System Enhancement

Project (LESEP). The scheme will be financed jointly by GPOBA (US\$10 million), the Government of Norway (US\$5.8 million), and user contributions (US\$0.8 million). As a reminder, LESEP is funded through a US\$29 million grant from the Government of Norway, a US\$10 million IDA credit from the World Bank and US\$2 million 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 Manitoba Hydro International (MHI) by providing investment funds so that the targets in the Management Contract can be reached. (The WB does not directly funds the management contract)

In the field of regional interconnection potentially bringing additional power to the Liberian grid, the WB is also participating Cote d'Ivoire, Liberia, Sierra Leone and Guinea (CLSG) Interconnection Project implemented by the WAPP. During the preparation phase of the project, the WB provided a Project Preparation Advance of US\$1.95 million to support among others, the establishment of the Special Purpose Company (SPC) which was a necessary prerequisite for the proper structuring of such a multinational project. The WB (IDA) will then participate in the funding of the project implementation with US\$ 136.63 million.

The World Bank (in venture with the AfDB) is involved in the Scaling-up Renewable Energy Program in Low Income Countries (SREP). The tentative amount of funding for Liberia is US \$ 50 million. A joint scoping mission took place in Liberia in September 2012. The resulting Aide-Memoire confirms that the actual status is at the identification stage. The GoL (RREA) has to prepare the SREP Investment Plan (IP) which is scheduled to be endorsed by November 2013 after passing through the various review and approval steps of the SREP procedures.

KfW

The only potential intervention identified under KfW (Kreditanstalt für Wiederaufbau - German Financial Cooperation) refers to a pledge to participate to the Mount Coffee Rehabilitation project (Phase 1) with a grant of US\$ 25 million, officially announced to the Ministry of Lands, Mines and Energy on 09 December 2011. The funds were confirmed at the date of November 2012, the project being on tracks for the re-commissioning of the first unit in December 2015.

KfW also supported the Pre-investment studies fully funded by EU-Africa Infrastructure Trust Fund through EIB (1.55 Million) for the Cote d'Ivoire, Liberia, Sierra Leone and Guinea (CLSG) Interconnection Project implemented by the WAPP. KfW participates to the CLSG project with US\$ 43.43 million of grant to Liberia. The project is in its execution phase at the date of November 2012.

Norway

The Norwegian Government focused its support to Liberia's energy sector early in 2007 through funding to the Emergency Power Program (EPP) II. The cooperation was expanded in 2010 when Norway entered into 4 cooperation agreements related to electricity generation, distribution and transmission, energy planning and institutional development. Around NOK 50 million were donated for procuring and installing 7 MW of diesel generators and a small grid for distributing the power. In 2010 Norway entered into the following cooperation agreements with the Liberian Government (GOL).

Table 15: Norway funded projects

Project	Objective	Cost NOK Million	Time Frame
Project Gaps	Financial support to LEC to procure and install 3 MW new capacity and expand the distribution network in Monrovia	81.9	2009 – 11
LEC management	Rebuild LEC and strengthen electricity services in Monrovia through a 5 year management contract with Manitoba Hydro International (MHI) as LEC Operator	86	2010 – 15
Investment funding	Financing of the annual investments plans of LEC (LEC Operator) to reach the goal of 33,000 new connections by 2015	189 + 60	2010 – 15
Institutional cooperation	Strengthening of Ministry of Lands, Mines and Energy (MLME) through an institutional cooperation with Norwegian Water Resources and Energy Directorate (NVE).	52	2010 – 15

In addition, Norway has confirmed a grant of US\$ 70 million for the rehabilitation of the Mount Coffee hydropower plant as well as funding of the PIU.

JICA

The Japan International Cooperation Agency activities in Liberia are managed from their office in Ghana and can be traced from 2007. They were concentrated on the medical/health sector and the restoration of urban facilities through various initiatives. As far as the energy/electricity sector is concerned, JICA announced the launching of **Basic Study for Rehabilitation of Monrovia Power System**. In the framework of this study, JICA will implement a basic study to see the possibility to implement the Rehabilitation Project of Monrovia Power System which would cover the addition of a 2x5MW Heavy Fuel Oil Operated Diesel Engine Plant at LEC Bushrod main generation facilities. The project would also comprise 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 the Government. The corresponding amount of financing is not yet available but a budget of US \$ 25 million is articulated was later confirmed by the Japanese Cabinet in December 2012. The time frame for implementation can be anticipated at the 2015 horizon depending on the procedures for completing the transaction. JICA continues to have a strong concern about the completion of the off-loading and storage facilities for HFO at the Bushrod premises for assuring the fuel supply of the projected plant. Bidding documents for rehabilitation of the HFO storage infrastructure at Bushrod Island are being finalized under funding from the World Bank, and bidding process for conduct of an ESIA for these facilities is underway.

African Development Bank

The African Development Bank operations in Liberia are guided by the Liberia Joint African Development Bank/World Bank Assistance Strategy 2008-2011 (JAS) and Eligibility to the Fragile States Facility approved in December 2008. The overarching aim of the JAS is to support Liberia's transition from post conflict recovery to long-term development. The JAS was designed to support Liberia's first full Poverty Reduction Strategy (PRS) April 2008 - June 2011, which is built around four pillars: (i) Peace and Security, (ii) Economic Revitalization, (iii) Governance and Rule of Law, and (iv) Infrastructure and Basic Services, with gender equity, peace-building, environmental sustainability, HIV/AIDS, children and youth, and Monitoring & Evaluation (M&E) cross-cutting themes.

Bank assistance under the JAS was framed in terms of two pillars: (i) Rebuilding core state functions and institutions; and (ii) Jump-starting and facilitating pro-poor economic growth. The

second pillar encompasses improved access to key infrastructure services, improved agricultural and natural resource management in a way that generates pro-poor growth; and improved business and investment climate.

At the time of the last portfolio review performed by the bank in early 2011 there were ten (10) on-going projects at different stages of implementation with a total approved amount of UA 68.33 million (Approx. US \$ 106.7 million).

The electricity sector was not covered. As a result of debt relief and the improvement of its debt indicators from high to low risk of debt distress, Liberia now qualifies for 100% ADF (Africa Development Fund) loans. Liberia's indicative performance-based allocation under ADF 12 is UA 36.75 million. Proposed FSF (Fragile State Facility) supplemental support is UA 52.43 million and available FSF targeted support amounts to UA 4.7 million. Indicative total resources available are therefore UA 94 million (US \$ equivalent 146.8 million) for the period 2011-2012. Under these earmarked resources, since 2011, the Bank (with other donors - see detailed herein) has actively engaged in the Cote d'Ivoire, Liberia, Sierra Leone And Guinea (CLSG) Interconnection Project implemented by the WAPP West African Power Pool. The total cost of the project is estimated at US \$ 493.92 million with the breakdown per donor and beneficiary country indicated in the next table.

AfDB is also engaged in financing a study for a Power Master Plan in order that a Least Cost Rehabilitation and Expansion Plan (LCREP) for the Liberian Electric Power System could be further established. The PIU (composed of LEC and MLME officers) is in charge of supervising the Power Master Plan study. In order to fast track the implementation of the study, it has been integrated in the CLSG project. The approval by the AfDB Board was scheduled for the 5th of February 2013. The earmarked amount is equivalent to US \$ 1.817 million. However, as per the available information (February 2013) the progress of the study is slow, the GoL having failed to introduce the request for an advance procurement notice for the recruitment of the consultant. The existing Terms of Reference state that the master plan will include a Feasibility study (covering numerous aspects: distribution and transmission infrastructure; tariff, pricing, metering and billing, alternative sources of generation, ICT tools, load demand study; institutional reform options and strategy; regulatory requirements; financing and investment plan; capacity building and needs assessment for staff; media strategy to educate consumers; environmental audit ; feasibility for the distribution and transmission network in Monrovia; identification of bankable projects.) In addition, the Study will identify the institutional weakness of LEC and suggest ways and means to strengthen the power sector.

Table 16: Funding of CLSG interconnection project

Donor	Amount in US \$ Million	Beneficiary country
AfDB	190.30	Liberia: 34.38 Ivory Coast 51.76 Sierra Leone 41.44 Guinea 62.72
World Bank	136.63	Liberia
EIB	105.47	Sierra Leone
KfW	43.43	Liberia
Contribution by Governments	18.07	4 beneficiary countries

The AfDB is also involved jointly with the World Bank in the SREP. (See details under paragraph for World Bank activities)

USAID

USAID is active in Liberia since decades. Its involvement in the electricity sector started with the advent of peace in late 2003. USAID sought to support the comprehensive peace agreement with the objective to transition from emergency assistance to reintegration/recovery and democratization programs. In the electricity/energy sector, this assistance was developed through 3 operations:

The Emergency Power Program (EPP). The aim was the reestablishment of electricity services and streetlights to portions of Monrovia. USAID was a participant to this GOL and multi-donor effort. In 2009, USAID shifted its emphasis from response to emergency conditions to sustainable development. USAID programs was 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 to rebuild essential infrastructure and sources of renewable energy.

The Liberia Energy Assistance Program (LEAP). In 2006, the 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) to be implemented from September 27, 2010 to September 26, 2014. The corresponding budget is US \$ 18.962 Million. 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 as well in rural areas. The ultimate objective is to benefit the citizens of Liberia through strengthened economic development and improved access to social services, resulting from access to electricity.

Key components of the LESSP are:

- Strengthening the capacity of the Ministry of Lands, Mines and Energy (MLME);
- Supporting the Rural Renewable Energy Agency (RREA) with technical and management training;
- Strengthening the management capacity of the Liberia Electricity Corporation (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;
- Increasing Liberia Electric Corporation's (LEC) customer base from about 1'500 to about 2'500 within year one of the program and at an accelerated rate thereafter;

The on going activities are classified according to 3 objectives:

Objective 1: Strengthen the GoL's Capacity to Implement Plans for Rural Electrification as Expressed in the National Energy Policy. The objective will be achieved through the implementation of capacity building (training and courses) and institutional support activities. The Energy Law Review and draft ERB (electricity Regulatory Board) Action Plan have been circulated for comment. An expert is re-examining the energy law review and draft ERB Action Plan for comment.

Objective 2: Establish Commercially-Viable Pilot Plants that Provide Renewable Energy Services to Population Centers in Bong, Lofa and Nimba Counties. The objective is currently materialized through the implementation of Hydropower Pilot Projects. The preparation of RFPs for transmission and distribution line equipment and electro-mechanical and hydro-mechanical equipment for Wayavah Falls Micro Hydropower Project is in progress. Additional surveys along the penstock alignment on the Mein River and Weave Falls sites were carried out and some changes in the project layout are being made. Based on this the detailed engineering design and drawings for Mein River project will begin soon. Flow measurements of the Mein River and Wayavah Falls continued on a regular basis including gauge readings downstream of the lower Kpatawee Falls. The Sorlumba Community Electric Cooperative Society has been formally incorporated. The RFP for the importation of the SVO (Straight Vegetable Oil) generator has been finalized and the two RFPs for civil and electrical works are being prepared. Concerning the

Cocopa biomass projects, issues relating to the continuity of the concession may delay the possibility to develop the project in the immediate future.

Objective 3: Collaborate with International Donors for the Expansion of Monrovia's Power Distribution Network. This activity is currently on hold as requested by USAID. According to USAID, orientations will be given in September 2012, following the USAID mid-term LESSP project review which is planned for July/August 2012.

Other prospective projects

It is also worth to quote other prospective projects which may be materialized in Liberia.

ArcelorMittal needs a 450 MW capacity for processing the iron ores from its concession. The project has remained at a status quo since 2008, corresponding to the worldwide crisis and the declining demand for steel in China and other growing economies. The ArcelorMittal decision to pursue this project and the possible timeframe is not known.

Another project supported by Buchanan Renewable Power Inc. (BRP) could provide 36 MW of capacity with a rubber wood chips fuelled plant. The US Overseas Private Investment Corporation (OPIC) has approved a loan of up to US\$112 million for the project with the remaining amount funded by equity. However, the negotiations for the agreements are complex and protracted. To minimize risk, BRP reportedly demanded a "lockbox" arrangement in the Power Purchase Agreement (PPA) under which revenues earned by the LEC are paid directly into an escrow account from which BRP is paid first. Attorneys and advisors to the GOL are concerned the arrangement with the proposed stringent "security package" would discourage other potential investors in the power sector. The GOL is also concerned by the "affordability" of the power compared to long-term hydroelectric power. As a consequence, there are strong uncertainties concerning the materialization of this project in the near future.

Synthesis of donors interventions in the electricity sector

The following table illustrates the compilation of information relating to the various interventions, initiatives, projects and programmes announced by the various donors present in Liberia. For the purpose of assessing the future structure of the national electrical system, only the projects comprising physical works in the sub-sector of generation, distribution and access are listed, keeping in mind that the same group of donors is also implementing support on the institutional, legal, regulatory and capacity building aspects.

Table 17: Synthesis of donor interventions in the electricity sector

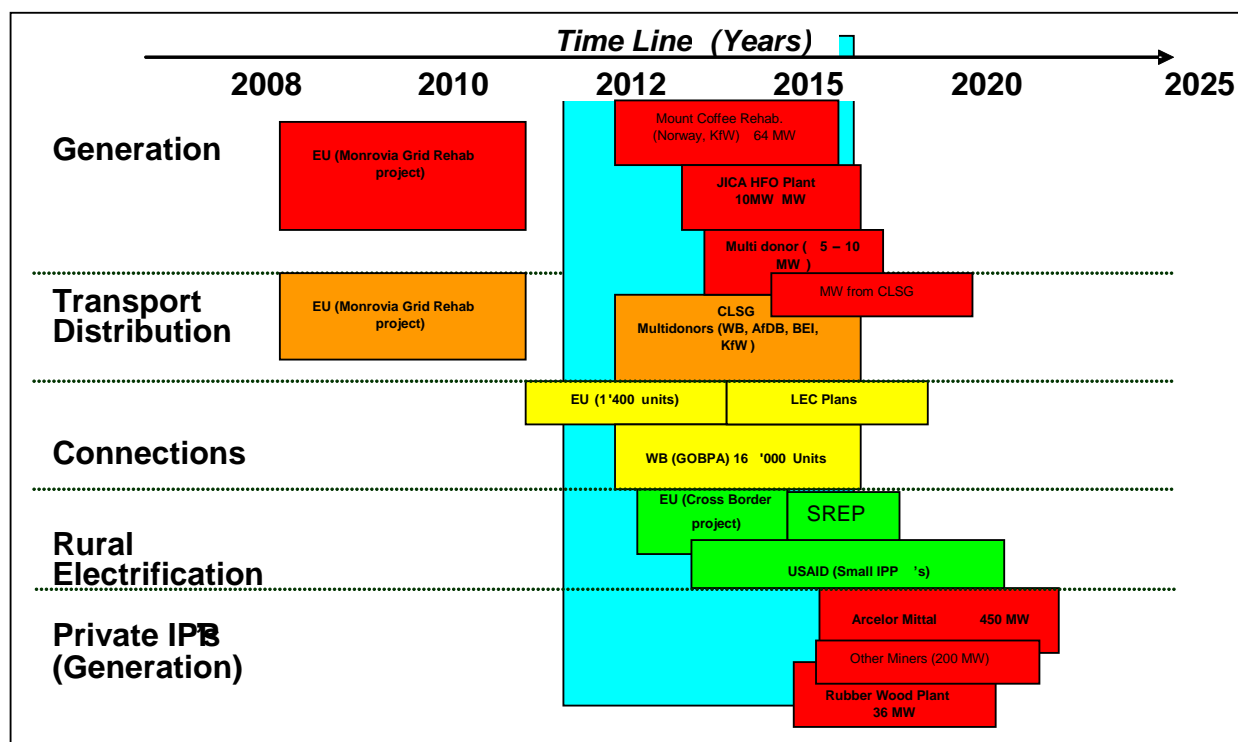
Name	Project Description	Sub-sector	Units	Capacity	Location	Cost (US\$m)	Financiers	Status
Liberia Electricity System Enhancement project (LESEP)	Expansion of Monrovia's distribution network; Rehabilitation of HFO storage/offloading facilities; Generation overhaul; Capacity building of LEC	Distribution Generation	Urban households	33'000	Monrovia	48	NORAD, GPOBA, IDA	On-going
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	On-going
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 households)	Nimba, Grand Ghede and Maryland counties	11.7	WAPP(50%) EU (50%)	On going
Buchanan Renewable Energy	Biomass energy plant using rubber wood chips	Generation	MW	31 - 35	Kakata	170	BR, OPIC, Mr.McBain	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		Lofa, Bong, Nimba	6	USAID	Funding secured
Diesel Generators	Additional generators for Monrovia	Generation	MW	3	Bushrod (Monrovia)	2	Norway	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 Africa Power Pool (WAPP) interconnection and sub-stations	Transmission	Kms MW	510 100 Through interconnection	Yekepa - Buchanan - Mt. Coffee - Monrovia-Foya	494	AfDB, EIB, EU, IDA, KfW	On going
Mt. Coffee HEP	Rehabilitation of pre-war hydro-electric plant of Mount Coffee	Generation	MW	64	St Paul River	200+ (162 funded by donors)	Norway, KfW, EIB, GoL	On going (Bids for Owner's Engineer services)
Foya River HEP	New hydro-electric plant	Generation	MW	50	Foya River (border Liberia/ Sierra Leone)	143		Funding unsecured
Via Reservoir project	Hydropower capacity increase	Generation	MW	30	St Paul River	215	EU to finance studies	ToR for studies
St. Paul River HEP1B and 2	New hydro-electric plants	Generation	MW	198	St Paul River	879		Funding unsecured
SREP	Scaling up Renewable Energy Program in Low Income Countries	Generation	Rural households		Countrywide	50	WB (Lead), AfDB	Investment Plan to be prepared
Power Master Plan Study	Study for establishing the Least Cost Rehabilitation and Expansion Plan for the Liberian Electric Power System	Generation/Transmission	Population		Countrywide	1.817	AfDB (Under CLSG funding)	Final ToR. PIU to recruit the Consultant

Even if this provides a relatively realistic picture of what will be the situation after 3 to 4 years from to date (March 2013), the actual materialization of targets will closely depends on 4 factors:

1. Political and socio-economic stability and consolidation of progress achieved to date in Liberia in the sectors of governance and re-enforcement of the institutional framework.
2. Economic growth to continue resulting in an increasing number of potential customers (demand) willing to access, pay and use electrical energy of good quality and at affordable price.
3. Respect of funding commitments from donors and proper arrangements for minimizing delays and administrative constraints in the various stages of the projects implementation. (Timely readiness of reports, realistic dates of their respective Boards acceptance, well and timely monitored procurement process, regular Monitoring and Evaluation activities, proper support with Technical Assistance and capacity building programme).
4. LEC as the only entity to implement and finally operate the projects is the key player for the success of all contemplated projects. Therefore LEC needs a drastic reinforcement of its capacities (human resources, tools and equipment, organization and management tools) together with capacity building and training program in order to leverage the full added-value of the current Management Contract. It is paramount that LEC can consolidate the relatively sound status that it has achieved to date, specifically on the aspect of prudent financial management.

The following table is a visual illustration of the planned interventions by donors in the sub-sectors of Generation, Transport and Distribution, Connections, Rural Electrification and private IPP's for the coming years. It shows that there is a concentration of activities for the period 2012 – 2020 in all the sub-sectors. By cross checking with the demand projections, the economic growth forecasts as well as the capacities of LEC to implement plans at an appropriate pace, it can be concluded that the planned projects will meet the needs. This opens the door for opportunities to initiate approaches for the next period (2020 – 2025) and to prepare the ground for projects and developments specifically oriented towards more environmentally friendly technologies and the utilization of domestic or regional natural renewable resources like hydropower.

Figure 1: Planned interventions of donors in the electricity sector



19. Thermal energy: programs and financing to improve access, efficiency and use of RES for cooking and other household needs

Other chapters of this report are depicting the situation concerning cooking and other household energy needs. They confirm that the main source is fuel wood and charcoal. Liquid fuels -

kerosene, candles and Chinese lamps are mainly used for lighting. Use of gas (gas cylinders) is extremely limited. One factory was operating in the past but suspended production during the conflicts period and did not resume its activities. Enquiries and interviews conducted during the study have shown that there are neither significant programs nor incentives for the development of manufacturing capacities along the supply chain of the energy sector. The main reasons given by the potential business actors are that the market is too small, the buying power of customers/population very low and the access to capital and credit extremely difficult. The sector of charcoal is important given the generalized use of this source by more than 95% of households. The Forestry Development Authority is the agency in charge of rationalizing the use and exploitation of forestry products. It records the quantities of fuel wood and charcoal which are traded in the country for statistical purposes. It also develops information campaigns and has plans for pilot projects for a more sustainable and environmentally friendly exploitation of forestry resources comprising improvement of charcoal production techniques, promotion of improved stoves, more sustainable logging techniques, re-plantation programs. As a member of various international organizations dealing with forest preservation, environmental protection and the like, the FDA receives permanent support from these organizations through technical assistance programs, pilot projects, financial support, knowledge transfer and capacity building initiatives.

20. Power sector: programs and financing to improve access, efficiency and use of RES for power supply

Table 17 illustrates the projects and programs which are currently financed and on going in Liberia in the power sector. They are all more or less targeting the improvement of physical access to power (electrification and connections), the increase of power availability (new capacities planed at short term to meet demand growth), a better reliability/quality of power supply (thanks to improvement of operations/maintenance and system modernisation by LEC). On the aspect of sustainability, Government agreed strategy/policy and actions in progress are certainly aiming at promoting investments in renewable energy which has a significant potential of hydropower resources. The flagship project is definitely the rehabilitation of the Mount Coffee power plant which is well engaged today, with the recruitment of the Owner's engineer, the full staffing of an operational and efficient Project Implementation Unit (PIU) and the full support from the Government and the donors community. Other projects are also progressing like mini hydropower projects, for which design, ESIA and documentation are completed. These projects are currently seeking funding from various sources, including the possibility for their implementation under PPP's. Basically off-grid (from the LEC network) they nevertheless could be further connected to the national grid when it is developed in the medium term for integrating the CLSG HV line, the Cross Border project with Côte d'Ivoire and the development of regional interconnections with neighbouring countries which are discussed at the level of the WAPP. Efficient use of energy is also of concern and duly considered by authorities as an important factor for improving the sustainability level of the energy sector. Nevertheless, access is the main priority, but programs and initiatives for the demand side management are contemplated in order to inform end users on ways and means to more efficiently use electric power. These actions are mainly conducted by LEC as part of its corporate operation and management philosophy.

21. Modern energy for productive use: programs and financing to improve access, efficiency and use of renewable resources in productive sectors

As already stated in previous chapters of this report, the productive activities by private sector operators in Liberia is still limited. The reasons are obvious and it will take time in the current global economic circumstances for industrialization and a vibrant productive private sector to become a significant pillar of the country economic growth. Various opportunities exist for local production and manufacture of goods and consumer products, but the market is narrow and the customers buying power low. These patterns of the market make difficult and risky for entrepreneurs to invest and to mobilize capital for relatively too long pay back periods. In addition, goods for mass consumption are imported from China and then offered on local markets at very competitive prices. Despite quality and durability is low and life span limited, consumption remains dynamic. For the time being, electric energy offered to industries by LEC reflects its current mix of generation plants, thus without renewable energy content. Enter into production of the Mount Coffee hydropower plant will modify this mix with energy produced at a cost nearly half the current one. The study and survey has not identified financial support schemes to improve affordability of modern energy technologies for industrial and agricultural enterprises, as well as build their knowledge and capacity. Initiatives remain the only decision of industrialists and entrepreneurs on

a voluntary basis. Their actions, when identified, are directly aiming at reducing their production and operation costs.

3.3. Private Investment and Enabling Business Environment

This section identifies critical gaps and barriers to private investment in energy access, energy efficiency and renewable energy, as perceived by local and international business community in Liberia. The various interviews and enquiries conducted on site lead to the conclusion that the private sector is not significantly engaged in support of the energy/electricity sector and more specifically the goals that the SE4ALL initiative is targeting. The reasons for this weak engagement are of diverse natures.

- The entrepreneurial culture in Liberia is currently low as it has been eroded by years of conflicts and instability and a drastic evasion of human resources abroad.
- The number of domestic entrepreneurs having the capacities and skills to enter the energy sector at a significant scale is very limited.
- The business community is currently more oriented in developing activities in connection with trading or transformation/production of goods and consumable with a short payback period.
- The investments in the energy sector require access to credit as their up-front capital component is high and the return on investment is on the long term.
- The local banks are still reluctant to extend loans with long maturities at reasonable interest rates.
- The regulatory and institutional framework is not yet adequate despite laws and rules have been drafted, but their ratification and application is still pending. This leads to a negative perception by foreign investors considering the Liberia risk as very high.
- In the absence of an official electricity sector national development master plan, investors cannot clearly identify priority projects.
- The public information on opportunities and projects in the electricity sector is volatile as more propagated by rumours than through accurate official media communications.
- The process of dealing with energy projects is still flawed by weak governance at the level of the government agencies. Nepotism and corruption are common.

Despite this sad reality, there are various opportunities which could be seized by the private sector for developing sound and profitable business in the energy/electricity sector in Liberia in connection with the goals of the SE4ALL initiative. This is particularly true for off grid projects for the generation of electricity or improvement of use of renewable sources in rural areas. Several mini hydro plants are identified and were the object of development studies including their technical design and socio-environmental impacts assessment. Solar energy powered systems are also well adapted in isolated areas for schools, dispensaries, water supply systems, small agro-products processing/transformation units. The common factor for those various opportunities to remain undeveloped and underexploited is the lack of strong entrepreneurship culture but overall the absence of financial support for seed money, loans and working capital.

A rapid overview of the banking industry in Liberia confirms the immaturity of this sector for adequately satisfying the requirement and the constraints of the private sector involvement in the development of capital intensive infrastructure projects.

The banking sector is currently composed of eight commercial banks:

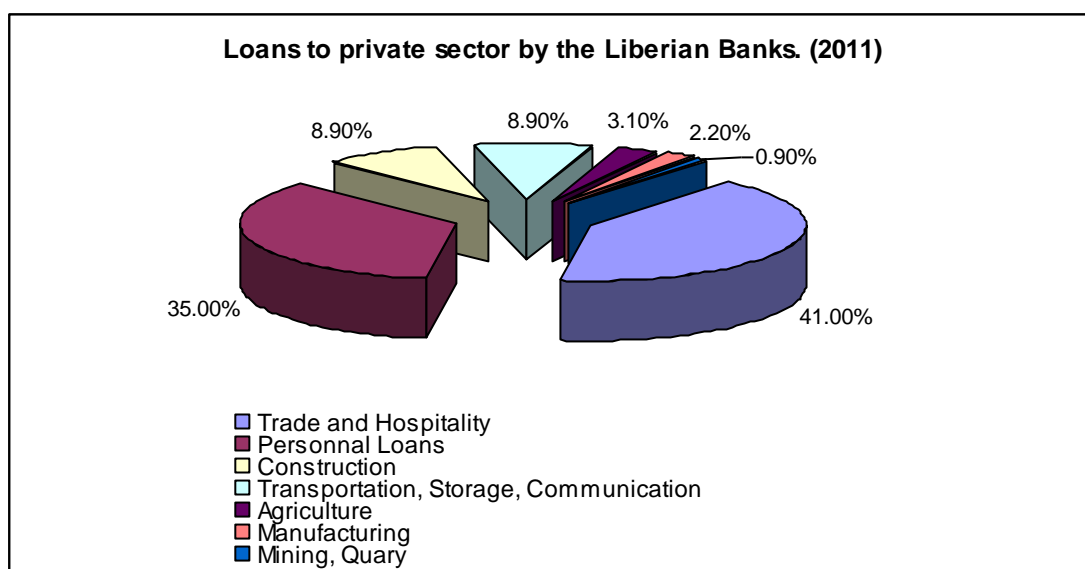
1. Liberian Bank for Development & Investment (LBDI)
2. Ecobank Liberia Limited (EBLL)
3. International bank Liberia Limited (IBLL)
4. Global Bank Liberia Limited (GBLL)
5. First International Bank Liberia (FIBLL)
6. United Bank for Africa Liberia Limited (UBALL)
7. Access Bank Liberia (ABL)
8. Guaranty trust Bank Liberia (GTBL)

According to official communications from the Central Bank of Liberia (CBL), in 2012, the Liberian banking sector continues to flourish, with strong growth pattern recorded in 2011 evidenced by the sector registering a record L\$51.7 billion in total assets. According to the Central Bank of Liberia's

(CBL) Annual Report covering 2011, total assets of the industry grew by 31.6 percent to L\$51.7 billion, compared with L\$39.3 billion at end-December, 2010. Total loans and advances increased by 22.2 percent to L\$15.4 billion, compared with L\$12.6 billion in 2010. Credit to private sector as a ratio of Gross Domestic Product (GDP) was 18.3 percent in the 11-month period to November of 2011, a slight improvement from 18.2 percent at end of December of 2010. According to the report, total capital of the industry also increased by 14.3 percent to L\$7.5 billion, compared with 2010. Deposits, which are the main source of financing for the bank's assets base, recorded a growth of 29.7 percent to L\$35.8 billion, from L\$27.6 billion in 2010.

Sectoral allocation of total credit shows that the trade and hospitality (restaurants, hotels and other accommodations) sectors constituted 41 %, the highest proportion of loans to the private sector. This confirms the prime interest of the private sector to invest in activities of opportunistic nature with rapid return on investment. This sector is followed by other sectors comprising personal loans, 35 %; construction 8.9 %; transportation, storage, and communication, 8.9 %; agriculture, 3.1 %; manufacturing, 2.2 %; and mining & quarry, 0.9 %.

Table 18: Breakdown of loans to private sector by Liberian banks



The above chart and figures show that the banks support to the private sector is quite limited as far as the infrastructure sector is concerned. The sad story is also that the percentage of Non Performing Loans (NPL) is quite high at 20.8 percent, compared with 25.1 percent in 2010 thus resulting in reluctance of the banks to easily extend credits and loans for complex projects like energy projects. Microfinance and its collateral forms are important in Liberia but there is scarce data on the size and number of providers specifically in the informal finance sector. Qualitative analysis suggests that it is an important part of the existing finance system but is still inadequate to satisfy demand. The type of informal lenders include "Susu" or rotating savings and credit associations, moneylenders, and legal power of attorney arrangements for salaried workers. A 2004 report estimates that interest through these mechanisms amount to 20-25% per month which is prohibitive for developing financially profitable business on the long run. In average, the prevailing interest rate for credits and loans to the private sector is in the tune of 14%.

Discussions with private sector operators also confirmed that the banking industry does not operate in full transparency. Credit and loans are still allocated irrelevant of the sole merits of the project but too often because the bank officer has vested interest in the project. Thus conducted to several cases which led to legal and judicial actions affecting the credibility of the industry. Despite these challenges the outlook of the banking sector for 2012 and beyond as provided by the CBL, depicts that the sector is bright and optimistic. This is supported by the growing trend and stable macroeconomic environment potentially offering opportunities to banks to finance profitable projects. In addition, "sanitization" measures in the banking sector are placing them in a stronger position to accommodate known and unknown risks inherent in their activities, to fund

growth in their assets, expand and improve services to the banking public, and undertake innovation in new financial products.

Another reason for future quality improvement of the banking industry for 2012 and beyond, according to the CBL, is the establishment of a Special Commercial Court, which took place already in 2011. With the establishment of this court, it is expected that there will be improvement in the credit culture in the country because the institution of the Commercial Court means that banks will now have a cost-effective remedy to collecting on their bad debts. The CBL also indicated that because of the shift in the supervisory regime at CBL from compliance-based to risk-based supervision, risk management in banks has heightened. The CBL also observed that the implementation of International Financial Reporting System (IFRS) by banks means that banks will now have to make lot more disclosures in their financial reporting than was previously the case. The IFRS provides an incentive for the managements of commercial banks to guide their actions by the highest standards of corporate governance, which will translate to greater productivity and performance in financial institutions. Finally, the CBL observed that the promotion of medium to long-term lending to targeted sectors of the economy including the agriculture, housing, small and medium size enterprises, and microfinance sectors, as well as current drive by the CBL to introduce treasury bills or instruments, will open up new markets and business opportunities for the banks and also an outlet for investing their excess liquidity and enhance their profitability.

3.4. Gaps and Barriers

This section is presented under the form of a matrix – Annex 2 - listing the gaps identified during the study in various domains broadly classified in the following main categories: Institutional, Organizational, Operational with indication of sub categories like Human Resources, Financial, Private Sector.... It outlines the possible recommended actions and specific comments. The last column tentatively qualifies the level of priority for the action. Critical level is the highest, meaning that recommended action is on the critical path as a pre-requisite for the SE4ALL initiative implementation and achievement of its 3 goals.

Annex 1 - Existing programs and corresponding financing for contribution to SE4ALL goals

1.1 On-going initiatives by the Government and development partners

Various initiatives, programs and projects are on progress as illustrated in the two following tables. The first table illustrates studies and technical assistance activities. These activities will result into projects in the medium and long terms. The second table is a listing of projects under implementation. (stage of final studies and design to stage of construction). The data are the most recent available as circulated amongst donors for their coordination meeting on the 23rd of November 2012.

Table 19: Studies and Technical Assistance

Name	Project Description	Sub-sector	Units	Capacity	Location	Cost US\$m	Financed by	Status
Evaluation of EU support to the Energy Sector in Liberia	Evaluation of interventions 2003-2012	Distribution	n.a.	n.a.	Monrovia	0.15	EU	Completed; report available under http://eeas.europa.eu/delegations/liberia/index_en.htm
SE4all Gap Analysis	Identify gaps towards 100% access in 2030	All	n.a.	n.a.	All of Liberia	0.05	EU	Final report and presentation to stakeholders planned for March 20 th , 2013
Access Plan	To elaborate on the GOL's vision and key ideas for the development of the energy sector	All			All of Liberia		World Bank	Ongoing; preliminary draft presented by MLME
Least Cost Power Generation Plan (LCPDP)	to develop the contents and propose a time sequence for a financially, politically and socially viable implementation of a (LCPDP)	Generation			All of Liberia		World Bank	Proposal from consultant being evaluated by MLME.
Mt. Coffee rehab. Tender Design	Detailed design and preparation of Tender documents	Hydro-power Generation	MW	64-80	St Paul's River	1.9	EU Infrastructure Trust Fund	Ongoing; client: WAPP
CLSG Tender Design	Detailed design and preparation of Tender documents	Transmission	Kms MW	510 100 Through interconnection	Yekepa - Buchanan - Mt. Coffee - Monrovia-Foya	1.9	EU Infrastructure Trust Fund	Ongoing; client: WAPP
Rural Energy Strategy & Master Plan	Development of Liberia's rural energy master plan;	Rural Electrification	Rural households	4'000	All of Liberia	2	EU Energy Facility	Started 2011; ongoing
Long Term TA to MLME		All	n.a.	n.a.	All of Liberia	7.5	Norway	Ongoing
LEC Management Contract		All	n.a.	n.a.	Greater Monrovia	14	Norway	Ongoing
SE4all Action Plan	Prepare framework to request SE4all funds for priority projects when they become available	All	n.a.	n.a.	All of Liberia	0.05	EU	Funds available; waiting for MLME request
Energy +	Norway's contribution to SE4all	All	n.a.	n.a.	All of Liberia		Norway	Starter being prepared in Oslo. Disbursements will be results-based. An Energy secretariat might be installed at MLME with funding from NORAD.
SREP	Scaling up Renewable Energy Program in Low Income Countries	Generation	n.a.	n.a.	Countrywide	50	WB (Lead), AfDB	Investment Plan to be prepared

Name	Project Description	Sub-sector	Units	Capacity	Location	Cost US\$m	Financed by	Status
Power Master Plan Study	Study for establishing the Least Cost Rehabilitation and Expansion Plan for the Liberian Electric Power System	Generation/Transport/distribution	n.a.	n.a.	All of Liberia	1.817	AfDB	AfDB Board Approval February 5 th , 2013. Study TOR finalized. Consultant to be recruited.
Via Reservoir Reconnaissance Study	Review earlier studies and if still valid, prepare TORs for Feasibility Study and Tender Documents	Hydro-power Generation	n.a.	Sufficient to run Mt. Coffee year-round	St Paul's River	0.25	EU	Funds available; waiting for MLME and NAO request

Table 20: Projects under implementation

Title	Lead Agency	Financiers	Relevant SE4ALL Goal(s) (Access/Efficiency/Renewable Energy)	Brief Description and time frame	Value (US\$m)	Sub-sector	Units	Capacity	Location
Liberia Electricity System Enhancement project (LESEP)	MLME, LEC	Norway, GPOBA, IDA	Access	Expansion of Monrovia's distribution network; Rehabilitation of HFO storage/offloading facilities; Generation overhaul; Capacity building of LEC	53	Distribution Generation	Urban households	33'000	Monrovia
Liberia Electricity System Enhancement project (LESEP)	MLME, LEC	AFREA TF	Access Renewable Energy	Establishment of Rural and Renewable Energy Agency. Provision of micro-hydro, solar energy to off-grid users	3	Rural Electrification	Rural households	9'000	Lofa, Bong
Monrovia Electricity Grid rehabilitation	LEC	EU	Access	Grid Rehabilitation in Monrovia area to be completed in November 2012	25	Distribution	Urban households		Monrovia
Renewable Energy for healthcare facilities	GoL	EU	Access Renewable Energy	Providing photovoltaic to health facilities	2	Electrification	Health care centres		All of Liberia
Rural Energy Master Plan and SSMP	RREA	EU	Access	Development of Liberia's rural energy master plan; Pilot rural SSMP	2	Rural Electrification	Rural households	4'000	Lofa

Title	Lead Agency	Financiers	Relevant SE4ALL Goal(s) (Access/Efficiency/Renewable Energy)	Brief Description and time frame	Value (US\$m)	Sub-sector	Units	Capacity	Location
Cross Border Rural Electrification	LEC, MLME	WAPP (50%) EU (50%)	Access	Cross Border Rural Communities Electrification project (Côte d'Ivoire - Liberia)	11.7	Rural Electrification	Population	130'000 (25'000 households)	Nimba, Grand Ghede and Maryland counties
Buchanan Renewable Energy	BRE	BR, OPIC, Mr.McBain	Access Renewable Energy	Biomass energy plant using rubber wood chips	170	Generation	MW	31 - 35	Kakata
The Liberia Energy Sector Support Program (LESSP)	MLEM	USAID	Access Renewable Energy	Four pilots to create micro-grids in rural areas based on biomass and hydro sources	6	Rural Electrification	Rural households		Lofa, Bong, Nimba
Diesel Generators	LEC	Norway	Access	Additional generators for Monrovia	2	Generation	MW	3	Bushrod (Monrovia)
Diesel Generators	LEC	World Bank	Access	Additional generators for Monrovia	6	Generation	MW	10	Bushrod (Monrovia)
HFO-fired generation plant	LEC	JICA	Access Efficiency	Additional generators for Monrovia	15-30	Generation	MW	10 - 20	Bushrod (Monrovia)
WAPP CLSG	MLME	AfDB, EIB, EU, IDA, KfW	Access Renewable Energy	Cote d'Ivoire, Liberia, Sierra Leone, Guinea (CLSG) West Africa Power Pool (WAPP) interconnection and sub-stations	494	Transmission	Kms MW	510 100 Through interconnection	Yekepa -Buchanan - Mt. Coffee - Monrovia-Foya
Mt. Coffee HEP	LEC, MLME	Norway, KfW, EIB, GoL	Access Renewable Energy	Rehabilitation of pre-war hydro-electric plant of Mount Coffee	220+ (162 by donors) 2	Generation	MW	64	St Paul River
Foya River HEP	RREA	USAID (?)	Access Renewable Energy	New hydro-electric plant	143	Generation	MW	50	Foya River (border Liberia/ Sierra Leone)
St. Paul River HEP1B and 2	MLME		Access Renewable Energy	New hydro-electric plants	879	Generation	MW	198	St Paul River
Energising Development (EnDev)	RREA/MLME	Germany, DGIS, Norway, DFID, AUSAID	Access Renewable Energy	Development of a market for pico PV products for installation of a pilot mini-grid for rural electrification to reach population and social institutions	0,586	Distribution (Rural)	5'500 people		Monrovia, Foya, Lofa

Title	Lead Agency	Financiers	Relevant SE4ALL Goal(s) (Access/Efficiency/Renewable Energy)	Brief Description and time frame	Value (US\$m)	Sub-sector	Units	Capacity	Location
EnDev		Norway	Access, Energy efficiency	Plan for dissemination of 1'000 clean cook stoves.		Energy efficiency	stoves	1'000	Monrovia Area

1.2 An estimate and order of magnitude, if available, of the costs and investment requirements for making progress on the three goals of SE4ALL.

The projects in the above table are totalling approximately US \$ 1'925 millions for their implementation (providing all are constructed) with approximately 700 millions firmly committed. All of them are contributing to the goals of the SE4ALL initiative. Globally and referring to existing benchmarks and ratios applicable at the level of prospective studies, an investment cost of US \$ 800 per capita can be used for providing access to electricity/modern energy (transport/transmission and distribution). It is estimated by the World Bank that annual required investment for universal electricity access by 2030 in Sub-Saharan Africa amounts at US \$ 11 billions. This corresponds to connecting 200 millions additional households over the period 2010 - 2030; therefore an investment of US \$ 1'100 per connection.

Achieving the cumulative figure of 490'000 connections (210'000 Urban – 280'000 rural) in 2030 would then require US \$ 540 million of investments for Liberia. Globally, satisfying the 3 SE4ALL goals in 2030: i) Ensuring universal access to modern energy services ii) Doubling the global rate of improvement in energy efficiency, iii) Doubling the share of renewable energy in the global energy mix will require the following investments breakdown according to low, medium and high estimates. The level of estimates closely depends and is highly sensitive to the retained basic assumptions like: Population growth rate, Number of persons per household, GDP growth rate, contractors' competition, equipment and material costs and other indirect factors nevertheless linked to the economic development.

Table 21: Investments for achieving SE4ALL goals (including non-assets investments/costs)

investments: US Millions:	Low	Medium	High
Additional connections (including transmission and distribution)	400	500	735
Additional generation capacity (500 to 700 MW)	750	900	1'050
Total	1'150	1'400	1'785

The above investments are ranging between average figures of 64, 78 and 100 US \$ million per year for the next 18 years till 2030 depending on the retained assumptions. Comparing with the amount of projects on progress (for approximately a cost of US \$ 700 millions) leads to the conclusion that the actual pace of investment is not sufficient to meet the requirements of the low case figure. If the other potential projects already in the above list are materialized, the medium case would be met.

These estimates are to be taken with high caution as they are for qualitative appraisal only, but they nevertheless confirm that achieving the SE4ALL goals - and the development of the Liberian energy sector to modern standards and patterns – will require a constant attention and the mobilization of adequate resources. An important aspect regarding these needs which may peak at higher figures for certain years is the absorptive capacity of the country. This concerns the aspect of national budget as well as capacities of institutions, agencies and their human resources to handle the activities for consolidating and developing the sector. This confirms that the issue of capacity building and transfer of skills which has been identified as the first/critical priority in this Gap Analysis report must be addressed at the earliest.

Annex 2 - Initiating a Sustainable Energy for All initiative in Liberia: Some suggested steps and measures

Matrix of Gaps analysis and recommended steps and measures.

The following table summarizes the findings of the gap analysis and rapid assessment. It classifies gaps per domain (institutional, organizational, operational, private sector participation etc.), briefly describes the existing issues more extensively explained in the body of the report and then lists the actions and measures recommended. Some comments are added for guidance. The last column is designed for tentatively classifying the degree of priority of the recommended steps and actions. (Priorities will be fixed later in collaboration with the Government Authorities (MLME) in order that they are harmonized with those resulting from the National Access Plan implementation)

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
Institutional	Insufficient human resources in the governmental agencies	The MLME and specifically the DOE are the responsible entities for the management of the energy sector, however they are lacking adequate human resources	To commission an audit for the diagnosis of the current human resources and for determining the needs in line with responsibilities and tasks	The audit must also encompass diagnosis of logistic means (office space, office equipment, integrated computerized system, vehicles) as well as training courses and programs. Audit must be performed by an independent external specialized firm. Funding may be obtained within donors supported Technical Assistance programs.	
Institutional	Current organization does not fit with challenges and requirements of the national energy policy and strategy	The DOE should be staffed and organized taking into account the challenges, tasks and deadlines deriving from the plan and strategy retained by the Government	To review the decision chain and hierarchical links. To up date the organization chart and to review the organization documents: Procedures, Management Plan, Quality Assurance.	Analysis and assistance must be provided by a firm specialized in Business Administration and Management. Funding may be obtained within donors supported Technical Assistance programs.	
Organizational	Insufficient knowledge of donors community rules and procedures	DOE must incorporate an expert conversant with the procedures, guidelines and constraints of international and multilateral donors. He must keep up dated with all new initiatives, facilities; programs created by the donors and explore the opportunities	It is suggested that this is embedded into a Technical Assistance program. A first expert recruited internationally will train and transfer knowledge to a local staff. Supporting administrative staff and office resources must be mobilized simultaneously.	The knowledge of procedures in the fields of project appraisal, international procurement of goods and services, consultancy services contracts, tender documents analysis and bid evaluation is a must. This staff must be permanently based at the DOE and	

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
		offered for Liberia.		fully dedicated to the task of liaising with the community of donors.	
Institutional and operational	Lack of local new skills and human resources in the energy sector.	Further to several years of conflicts, the stock of Liberian technicians and engineers trained or graduated in the energy/electricity sector has drastically decreased.	Measures and strategies must be put in place by responsible authorities (Education) for preparing the replacement of staff who will retire soon from LEC or MLME. Investments in human capital development to be amongst top priorities.	Liberian universities and technical institutes should design appropriate academic programs in the sector of electrical engineering. Exchange with foreign universities and scholarships for students are an immediate good alternative together with training exchange programs with foreign electric utilities.	
Institutional and operational	Appropriation and ownership of skills and capacities by nationals are low.	Technical Assistance programs, consultancy services contracts (technical and design studies) do not emphasize enough the transfer of skills aspect.	To introduce appropriate clauses in funding agreements, technical assistance programs and consultancy services contracts imposing contractors' commitments and obligations to transfer skills and knowledge to local personnel.	Outputs and outcomes must be measurable through agreed indicators. Remuneration could be performance based.	
Organizational and operational	Uncertainty of LEC role and involvements in the implementation of the Government expansion plan and strategy	The LEC management contract will soon come to an end. There is uncertainty on how to capitalize what has been improved and achieved to date in order that it supports the implementation of plans for further development of the sector.	It is suitable that a management contract is re-conducted for another period. Terms and conditions have to be re-discussed in order to adjust them to the actual situation.	Ways of funding and remunerating the management contract must be explored at the earliest, in consultation with interested donors.	
Organizational and operational	The LEC capacities are insufficient to install connections required by the targets of the access plan announced by the Government and embedded in the SE4ALL set of goals.	Keeping the rates of new connections at approx 25'000 connections per year for the next decade to cope with the targets to achieve 70% and 35 % access in urban and rural areas respectively requires adequate resources	Deployment of a strategy and corresponding means based on connection forecasts is a must.	LEC has to perform a detailed analysis of the resources it needs: equipment, staff and corresponding investments and working capital. Enlarging the customer basis is one of the prerequisite for strong interest of private investors in the generation segment of the sector.	
Organizational and operational	LEC is currently concentrating its actions and activities mainly in the	LEC capacities in other regions (rural) are very limited. The cross border rural electrification project	To confirm that LEC is formally in charge of developing and operating the electric system/network out of	Review and analysis of the laws, bills and decrees ruling the LEC role and activities.	

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
	Monrovia area.	in progress as well as the CLSG interconnection project require that LEC has the authority and the resources to operate in the regions where these projects are located.	Monrovia area. Adjustment of LEC statutory role, function scope of tasks and responsibilities must be fixed at the highest level. (LEC Country-wide responsibilities)		
Organizational and operational	The use of electric energy is not optimized	There are limited actions, programs or campaigns for the demand side management.	LEC should implement demand side management tools in order to optimize the use of electric energy. This is also valid for smoothing out demand peaks and for reducing pressure for additional capacity.	Technical support and funding can be provided by donors.	
Institutional	The organization of the fuel wood and charcoal industries does not fit with the environmental and modern energy development challenges.	The use of biomass fuels by more than 95% of the population for cooking and heating is a threat for the environment and the health.	Sensitization campaigns must be planned in order to inform and educate the various actors of the sector.	There is a need for a study on the consequences of switching from the use of biomass energy to modern energy that the SE4ALL goals will ultimately bring to the populations.	
Institutional and operational	The use of biomass fuels (Fuel wood and charcoal) is not efficient.	The current production techniques and the end users practices are not optimized.	Campaigns and pilot projects must be organized in order to develop the use of kilns for the production of charcoal. The same should be implemented for the utilization of improved stoves by end users.	The Forestry Development Authority (FDA) must pursue its information actions for sensitization of actors of the industry on the aspects of forest management and more efficient production techniques.	
Institutional	Lack of strategy for replacement of biomass fuels by modern energy.	Biomass fuel and charcoal industries are currently providing activities and revenues to many people.	Strategy and measures should be designed in order to plan and manage the transition towards the use of modern energy.	Information and initiatives are needed in order for the actors to organize their re-conversion as long as the production and use of biomass energy will decrease.	
Private Sector participation	Limited capacity of the banking industry.	Local banks are reluctant to allow long maturity loans to private operators.	The banking industry should observe good practices and exercise strict governance in analyzing credit applications.	Loans and financing facilities must be extended according to the merits of the projects established through impartial due diligence.	
Private Sector participation	Limited number of potential private investors and operators for the energy sector	Potential investors and operators in the energy sector lack information and experience.	Seminars and information workshops should be organized for presenting business opportunities offered by the energy sector development.	Workshops and seminars should be jointly organized with the participation of the MLME, the local banks, the business associations	

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
				and the civil society.	
Private Sector participation	Lack of bankable projects.	The information on possible projects remains confidential or limited to a restricted number of actors. Reliability of information is often uncertain.	The Government/Authorities should maintain transparency and equity for the information relating to projects which may be of interest for private investors.	A clear sectoral development master plan is a prerequisite for the establishment of a credible list of projects and business opportunities.	
Private Sector participation	Lack of experience and practice in PPP's in the energy sector.	There are no recent projects with Private Sector Participation which could serve as a model/demonstration for officials to be conversant with the procedures and practices required for win-win deals.	To use selected transactions (those which are in the current pipeline) as training-on-the-job opportunities for government officials (on economical, financial, engineering, procurement and legal aspects.) with the support of external consultants.	The Technical Assistance facility offered by the EU as well as other initiatives (SEFA, SREP, GEF, IFC...) are providing resources for PSP transactions advisory services.	
Institutional and Private Sector participation	Lack of transparency and applicability of rules and laws.	The ratification of rules and laws governing the sector is still pending. The Regulatory entity is not yet in place.	Government must enforce, implement and make operational the laws and measures which are well defined and described in the National Energy Policy.	Despite the texts of laws and regulations are well written and theoretically adequate, their application is still an issue, thus not reassuring private investors.	
Institutional and Private Sector participation	Electricity tariffs are the highest in the region.	Even if tariffs are high due to real production costs it seems that there is an exaggerated perception of risks from investors.	A transparent analysis of costs and tariffs should be conducted in order to determine the true and fair price of electric energy in Liberia. Such an analysis would be a good promotion tool for capturing the interest of the private sector.	The perception of high risk results in biased financial evaluation of projects leading to prohibitive tariffs offered by potential investors/operators in the generation sector.	
Institutional and Private Sector participation	Environment is not enabling/conducive for Private Sector Participation in the energy/electricity sector.	There is neither experience nor regulations for structuring Private Public Partnerships.	Relevant laws and regulations as well as models for concession contracts, off-take agreements, tariff adjustment rules and tendering/award procedures must be updated finalized, ratified and enforced.	The creation of a Regulation Authority which is mentioned in the NEP is still pending.	
Institutional and Private Sector participation	Negative perception that private sector tariffs would be high.	The current experience with the local IPP's biased the perception as they operate in a kind of captive market without proper competition and enforced rules.	Sensitization and information campaigns have to be scheduled for explaining to the public that energy has an incompressible cost that the Government intends to reduce through various measures. Transparency in managing concessions awards, tariffs	Delegating generation to the private sector under appropriate rules and monitoring systems is one of these measures.	

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
			computations and operator remuneration must be translated into the regulatory framework and in the text of applicable laws.		
Operational	Due to high cost of electricity, expansion of access may become questionable.	The size of the existing system, hardly recovering from its bad conditions and the still low quality of services do not allow economy of scale which could result from a bigger customer base. This “chicken and egg” syndrome is detrimental to the access increase.	LEC and the Government must strongly encourage and promote projects which could improve the system energy mix with lower production costs expected from resources other than costly fossil fuels.	There is certainly an interim period when financial support by donors is required in order to soften the transition between a situation with reflecting high costs tariffs and the entering into production of less costly sources (Like hydropower). Going through subsidizing tools appears unavoidable for filling the gap accumulated during several years of miss-management in the sector.	
Institutional and operational	Lack of appropriate feasibility studies and socio-economic justification of planned projects.	New generation, transport and distribution projects are listed based on the obvious perception that they are needed to satisfy the future demand.	Intended projects for the development of the Liberian electric/energy system must be technically and socio-economically evaluated in compliance with good practices respecting the requirements, constraints and procedures of donors who may further finance these projects.	There is currently no consolidated development master plan for the sector providing a credible list of priority projects which could then be eligible for co-funding by the donor's community.	
Institutional and operational	Coherence between the grid expansion program and the access plan forecasts to be confirmed.	Uncertainty on the adequacy of the future circuits to carry their expected loads under various operational conditions, and to ensure voltage drop and technical losses are acceptable.	A rigorous technical design involving load flows, short circuit analysis, and reliability investigations should be performed. Such an exercise which remains to be done would have to confirm the adequacy of the expansion program.	Studies and development/master plans that donors intend to support should cover this aspect.	
Institutional and operational	Delays in preparing renewable energy project of significant size.	Despite large hydropower resources, there are delays in preparing the next generation of hydropower projects located in the various river basins of the country.	To accelerate the studies for the Via reservoir project which could ultimately increase the generation capacity at the re-commissioned Mont Coffee power station	The EU has submitted ToR for the reconnaissance study and the comprehensive feasibility study to the MLME as well has reassurance that the EU would finance both of them. It is also very important that in its	

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
				reorganization, MLME and the DOE incorporate a Hydropower specialist in their staff, given the increasing importance of this sector for the near future.	
Institutional and operational	Insufficient consideration of the hydropower sector on the long term	Data and information on the river basins (hydrology, land use, environmental issues) are out dating and should be refreshed according to the today's good practices and requirements.	River basins other than the St Paul river (St John, Mano rivers and others) must be the object of surveys and studies for identifying sites and feasible hydropower projects.	Such studies might be linked to the establishment of the national development master plan in order to prioritize the projects and establish projections regarding the resources they will mobilize from the Government itself and from donors and possibly private sector participants.	
Institutional and operational	Needs for reinforcement of coordination with regional and other international energy agencies.	Currently Government delegates must attend international meetings and conferences on short-notice, without adequate preparation and to the detriment of their normal daily duties and responsibilities. Delegates are not always the right person for attending and bringing back the best added value from such meetings.	Liberia must confirm its membership to regional organizations under the appropriate form (WAPP, other National Electric Utilities in neighboring countries). Delegates from the Government (MLME, DOE, LEC, MoF) must actively attend and participate to meetings and sessions for exchanging and sharing experiences and policies and develop synergies for the creation of a regional electricity market. Other energy sectors like gas must be discussed with next producing countries like Nigeria, Ghana and Equatorial Guinea.	Donors are strongly encouraging the regional integration in the sector of energy, providing financial support and technical assistance as well as resources persons for the organization of meetings, workshops and the establishment of regional policies and strategies. The African Union (UA) is currently piloting the PIDA (Plan for Development of Infrastructure in Africa) assisting member countries to prepare and promote regional projects.	
Operational and strategic	Delays in building facilities for HFO storage and handling.	In the interim period when HFO fuelled plants are an appropriate alternative for reducing the electricity production cost and at the same time bringing response to the demand increase and peaks installing facilities for HFO management is on the critical	To accelerate the implementation of the projects already in the agenda of the Government and potentially funded by various donors in order that new plants are commissioned at the earliest.	Rehabilitation of storage facilities are on progress nevertheless with acute issues on the aspect of pollution and environmental impacts. More modern solutions are contemplated for the transport of HFO by pipeline.	

Domain	Gaps and Issues	Description	Recommended actions	Comments	Order of priority
		path.			
Operational and Strategic	Lack of knowledge of facilities supporting the SE4ALL initiative.	Government and MLME officers are not fully conversant with the facilities specifically put in place for supporting the further stages of the SE4ALL initiative.	To acquaint with the terms and procedures for the utilization of a 400M€ grant blending facility allocated by the European Commission. Same for the assorted Technical Assistance Facility of 65M€. Other donors led initiatives like the SEFA (Sustainable Energy Fund for Africa by the African Development Bank) and many others are available.	These initiatives and tools are specifically designed in line with the 3 goals of SE4ALL. Liberia is fully eligible. Utilization is nevertheless on a “first come first serve” basis. This justifies that an officer specialist of these funding facilities and their procedures is permanently sited at the MLME or DOE.	

Annex 3: Slides of report presentation to stakeholders

The report and findings of the Gap Analysis were presented to various stakeholders during a meeting at the EU delegation in Monrovia on the 20th of March 2013. Were present representatives of the EU, The Ministry of Land Mines and Energy, the World Bank, the USAID, the Norwegian cooperation, the Millennium Challenge Corporation, the Liberia Electricity Corporation,

SCOPE OF THE GAP ANALYSIS

The Gap Analysis identified loopholes (Gaps) in the current situation/organization of the energy sector in various domains:

- ▶ Institutional,
- ▶ Organizational,
- ▶ Operational,
- ▶ Private Sector participation

- ▶ The ANALYSIS generated a list of 28 major GAPS classified by domain, briefly described in the table annexed to the report
- ▶ Recommended actions are also briefly described assorted with comments when relevant

▶ FOUR STEPS OF THE GAP ANALYSIS PERFORMED

- ▶ Collection - the up-to-date information and data regarding the country economic indicators;
- ▶ Collection of the information and data on the energy/electricity sector enlarged to crosscutting subjects of relevance (to the SE4ALL initiative standard scope)
- ▶ Identification of the gaps: impediments for attaining the SE4ALL initiative goals at the planned term of 2030:
Domain/Gaps and Issues/Description
- ▶ Recommendations to achieve the goals of the SE4ALL Initiative: Gaps and Issues/Recommended actions/Comments

- ▶ This list of GAPS is the starting point for the next phase of the process which is the **SE4ALL Action Plan**
- ▶ The Action Plan will allow to obtain financial and technical support from the donors who have adhered to the Initiative
 - ▶ 1.2 to 1.8 Billions US\$ for achieving SE4ALL goals in 2030

▶ **Main findings (GAPS)**

- ▶ Lack of HR, skills and capacities for managing the sector
- ▶ National Energy Policy/strategy not fully in force
- ▶ Challenges for LEC to develop the system
- ▶ Strategy and development plans not established
- ▶ Incomplete design of Potential projects
- ▶ Environment for Private Sector participation not conducive enough
- ▶ Strong but not enough coordinated support by donors
- ▶ Fuelwood and charcoal sector

▶ **GAP**

- ▶ National Energy Policy not fully in force

▶ **Remedy/action**

- ▶ Accelerate ratification/application
- ▶ Enlarging dialogue/information with stakeholders and civil society
- ▶ Advisory services from donors experts

▶ **GAP**

- ▶ Lack of HR, skills and capacities for managing the sector
 - ▶ Inadequate organizational arrangements
 - ▶ Not enough staff at the Department of Energy
 - ▶ Ditto for the RREA
 - ▶ Insufficient experience and practice
- ▶ Low appropriation of studies and programs outputs/results
- ▶ **Remedy/action**
 - ▶ Organizational reforms
 - ▶ Accelerate recruitment
 - ▶ Implement TA from donors
 - ▶ Acquaint with donors procedures
 - ▶ Implement training and capacity building programs

▶ **GAP**

- ▶ Challenges for LEC to develop the system
 - ▶ High non-technical losses
 - ▶ Financial fragility
 - ▶ Long procurement process
- ▶ **Remedy/action**
 - ▶ Continue support to the Management Contract
 - ▶ Materialize LEC involvements in rural areas
 - ▶ Training and capacity building programs
 - ▶ Budget support for information campaigns to users
 - ▶ Reinforce the PIU

- ▶ **GAP**
 - ▶ Sector development strategy,
 - ▶ Absence of an updated master plan
 - ▶ Potential projects not prioritized
- ▶ **Remedy/action**
 - ▶ Accelerate progress of on-going and planned studies (LCEP, Power Master Plan, Access Plan...)
 - ▶ Identify projects per energy sources
 - ▶ Familiarize with funding sources and facilities (SE4ALL, SEFA, ITF etc....)

- ▶ **GAP**
 - ▶ Environment for Private Sector participation not conducive enough
 - ▶ Too high perception of risks. No example of projects
 - ▶ Difficulty to appraise laws and regulations application
 - ▶ High cost of local financing
- ▶ **Remedy/action**
 - ▶ Adjust, adapt and clarify laws and regulations
 - ▶ Insure governance and transparency in procurement process
 - ▶ Enlarge dialogue with local banks and entrepreneurs
 - ▶ Inform on and promote potential projects
 - ▶ Require support and advisory services from "donors" Private Sector Windows

- ▶ **GAP**
 - ▶ Incomplete design of Potential projects
 - ▶ Insufficient experience and skills for preparing ToR and RFP
 - ▶ Analysis of bids and contract award are too long
- ▶ **Remedy/action**
 - ▶ Identify priority projects with practical and simple criteria in various energy sources domains
 - ▶ Perform FS, IAES, design with donors support
 - ▶ Start surveys and studies in the hydropower sector
 - ▶ Familiarize with funding sources and facilities (SE4ALL, SEFA, ITF etc....) procedures and conditions
 - ▶ Organize workshops and training on procurement (Services, works and supplies)

- ▶ **GAP**
 - ▶ Lack of coordination by donors
 - ▶ Overlap or unclear limits of interventions
 - ▶ Complex and lengthy procedures
- ▶ **Remedy/action**
 - ▶ Information and workshops by donors on funding procedures and procurement

► **GAP**

- Inefficient use of fuel wood and charcoal
- Pollution, impacts on forest, health issues

► **Remedy /Action**

- Improvement of charcoal production techniques and supply chain
- Control and management of extraction
- Production and dissemination of efficient stoves

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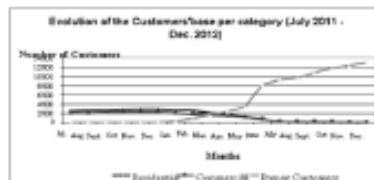
- The international donors' community is confirming its support to the Liberian electricity sector with significant commitments.

- Various funds, facilities and technical assistance programs are currently available for Liberia.
- Most of the needed strategic and sector studies are funded
- The electricity projects (Generation, transport and distribution) for the short and medium terms are financed.
- Studies and surveys for tapping the hydropower resources are inflated.
- The next phase of the SE4ALL Initiative (Action Plan) is potentially funded by the EU.

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► **On a positive note.....**

- LEC performance has improved with a constant increase of the customer base reaching 13'600 connections allowing access to electricity to more people.



- With the rehabilitation of Mount Coffee plant the share of RE in the energy mix will exceed 50% in few years.

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- Further to this presentation, comments and remarks from stakeholders will be incorporated in the final GAP ANALYSIS report.

Thank you for your attention

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