



National Energy Efficiency Action Plan (NEEAP)
(REPUBLIC OF LIBERIA)
Period [2015-2020/2030]

**Within the implementation of the
ECOWAS Energy Efficiency Policy (EEEP)
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AA	Action Agenda
CAGR	Compound Annual Growth Rate in percent of Energy Intensity Improvements as calculated by the GTF
CLSG	Côte d'Ivoire-Liberia-Sierra Leone-Guinea WAPP Transmission Line
CRSOs	Collection & Recycling Service Organizations
DOE	Department of Energy
DSM	Demand Side Management
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EE	Energy Efficiency
EEEP	ECOWAS Energy Efficiency Policy
EEP	ECOWAS Energy Policy
ELI	Efficient Lighting Initiative
EPA	Environmental Protection Agency
EPC	Energy Performance Certificate
ERB	Energy Regulatory Board
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für internationale Zusammenarbeit
GOL	Government of Liberia
GTF	UN SE4ALL Global Tracking Framework
HFO	Heavy Fuel Oil generators
IPD	Independent Power Distribution companies
IPT	Independent Power Transmission companies
LCD	Low-consumption devices
LCL	Low-consumption lights
LEC	Liberia Electricity Corporation
LERC	Liberia Electricity Regulatory Commission
LRA	Liberia River Authority
LRMC	Long Run Marginal Cost
MCC	Millennium Challenge Corporation
MDG	Millennium Development Goals
MEPSS	Minimum Energy Performance Standards
MLME	Ministry of Lands Mines and Energy
NCPEE	National Contact Point for Energy Efficiency
NEC	National Energy Committee
NEEAP	National Energy Efficiency Action Plan
NEPL	National Energy Policy of Liberia
NREAP	National Renewable Energy Action Plan
NTA	National Transport Authority
PPP	Public Private Partnership
RE	Renewable Energy
REFUND	Rural Energy Fund
RESCO	Rural Energy Service Company
RFP	Request for Proposal

RREA	Rural Renewable Energy Agency
S&L	Standards and Labels
SDG	Sustainable Development Goals
SE4ALL	Sustainable Energy for All
SMSEs	Small-Medium Scale Enterprises
SPRA	Saint Paul River Authority
TVA	Tennessee Valley Authority
UN	United Nations
UNIDO	United Nations Industrial Development Organization
WAGP	West Africa Gas Pipeline
WAPP	West Africa Power Pool
WB	The World Bank

EXECUTIVE SUMMARY

The NEEAP for Liberia presents the potentials, targets and required measures, policies and legislative enabling environment as well as institutional capacity and framework for achieving the measures of the Action Plan. The NEEAP report begins with the presentation of the current national energy efficiency policies, strategy and objectives. The current renewable institutional framework and achievements in terms of EE developments are reviewed and key policy issues and actions for moving the EE program forward are outlined. The report further presents the grid and off-grid power development potentials for electricity generation, transmission, distribution and sales opportunities and resources and options available for the long-term development of power in Liberia.

Liberia's energy intensity and potentials for EE are presented along with targets and trajectories for energy efficiency in domestic cooking, the building sector, as well as the industry and transportation sector are reviewed. The nexus between EE and Gender-mainstreaming, Education, Health and Agriculture among others are highlighted and measures defined.

Having quantified the projected targets for the planning period, the required measures and actions, along with the enabling environment, legislations and institutional capacity as well as the financial investments required to accomplish the measures and targets are discussed in detail.

The report further presents the required technical, managerial, capacity and public awareness programs and the financial incentives and investments necessary to implement the action plan.

The value of the set of EE measures is also presented and comparative scenarios are discussed at length for the scenarios.

The NEEAP discusses the comparative impacts of EE measures on the availability of electricity and the financial returns, energy access for lighting and productive uses and issues of efficient lighting devices. With the implementation of the EE measures for domestic and public lighting alone, 12% of the total consumption could be saved equivalent to 3,057 GWh over the 20-years period or an average of 153 GWh per year. Other savings of electricity will be gained through reduction of losses in the electric grid, reduction of consumption in buildings and savings in the industrial sector. The overall EE program could result in 9,230 GWh of electricity savings over the 20-years period.

The required total investments for the EE measures amount to \$1.22 Billion for the 20-years horizon at the average investment of \$61.5 Million per year. Among others, the overall targets for the EE policies for Liberia include but are not limited to the following which will bring financial savings of \$6.64 Billion at an average of \$332 Million per year.

The main objectives to be achieved with the NEEAP are:

- (a) To implement efficiency measures that free-up 1,054 MW of power generation capacity by 2030. At an average of 53 MW per year.
- (b) Phase out inefficient incandescent lamps by 2018.
- (c) Reduce average losses in electricity distribution from the current levels of 28-40% to the world level of 10% by 2024.

1.0 INTRODUCTION

The ECOWAS Commission has developed the ECOWAS Energy Efficiency Policy (EEEP) which includes targets, measures, standards and incentives for energy efficiency (EE), to be implemented at both regional and national levels. It was adopted by the ECOWAS Heads of State and Government in July 2013. According to the EEEP, all fifteen ECOWAS countries including Liberia should have adopted their National Energy Efficiency Action Plan (NEEAP) that contribute to the achievement of the regional ECOWAS targets in the next two decades.

The four pillars of the mandate of ECREEE are the followings ones:

- Political support;
- Capacity strengthening;
- Knowledge management;
- Investment and business promotion.

The overall objective of the Energy Efficiency Policy by 2030 is to improve energy efficiency in Liberia to levels of international standards.

The NEEAP of Liberia has been prepared in accordance with a template provided by ECREEE. The NEEAP includes baseline data on the status of energy generation and efficiency development in Liberia, and proposes attainable measures and energy efficiency targets, including gender disaggregated indicators, based on Liberia's potentials and socio-economic assessments. Moreover, an overview of concrete laws and enabling legislative, policy and institutional environment, incentives and measures to be implemented by the country to achieve the targets are included. The implementation of the NEEAP will be monitored by the Ministry of Lands, Mines and Energy (MLME), the Rural and Renewable Energy Agency (RREA) of Liberia and the ECREEE on behalf of the ECOWAS Commission through a continuous consultative process. It is the policy of the Government of Liberia (GOL) to link its long-term energy policy with that of the ECOWAS region. The ECOWAS Energy Protocol constitutes a key building block of Liberia's national energy policy. For this reason, Liberia's goals on energy access are in line with the ECOWAS goals and will move the country toward achieving the 2015 Millennium Development Goals and the successor UN Sustainable Development Goals (UNSDG) as well as the UN Sustainable Energy for All (SE4ALL) action agenda. The NEEAP template was prepared with technical assistance of ECREEE and UNIDO. The NEEAP development process has been supported by a broad range of partners such as the GEF Strategic Program for West Africa, GIZ, the Governments of Austria and Spain.

2.0 THE CURRENT NATIONAL ENERGY EFFICIENCY POLICY

2.1. OVERVIEW OF EXISTING NATIONAL ENERGY EFFICIENCY POLICY

Liberia presently does not have a standalone National Energy Efficiency Policy; however, the main legal policy document is the 2009 National Energy Policy of Liberia (NEPL). The NEPL addresses some of the strategic issues that are implied in the principal policy objectives aligned with national energy efficiency. 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 (universally accessible)**. The NEPL also addresses the policy objectives of institutional reforms and the plans to create the enabling social-economic environment that are relevant for national energy efficiency.

The energy policy principles provide a “**vision**” for moving forward Liberia’s energy sector and the accompanying economic and social sectors on the basis of universal access to affordable, sustainable, and environmentally friendly modern energy services. They address the strategic issues and objectives of electricity access, quality of service, manpower capacity development, avoidance of corruption, cost reduction, cost-recovery, provision of subsidies, institutional framework, equitable treatment of all stakeholders, private investment, etc. All these objectives are relevant to the National Energy Efficiency Action Plan (NEEAP).

2.2. STRATEGY AND OBJECTIVES OF THE NATIONAL ENERGY POLICY

Current Status of Liberian Electricity Access

The NEPL describes the current status of Liberian access situation as, about 10% of urban residents and less than 2% of rural residents have access to electricity largely only from self-generation using expensive imported fossil fuel. The Liberia Electricity Corporation (LEC) generated grid power has not extended outside of the greater Monrovia area in the past ten years. By 2015, in line with the Millennium Development Goals as adopted by the Economic Community of West African States (ECOWAS), the Government, through the NEPL, has committed to achieving the following targets:

- 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 centers in rural areas shall have access to modern energy services to meet the same basic needs.

The NEPL indicates that beyond 2015, the long-term strategy is to make Liberia a carbon neutral country by 2030. The GOL will seek to leverage the country’s biomass resources as a source of carbon credits for energy development. The GOL will promote the use of renewable energy such as solar, hydro and wind systems in power plants, industry and agriculture and in all large commercial facilities such as supermarkets, hotels, restaurants, entertainment centres, hospitals, and large retail shops and stores.

The GOL supports the collective global effort to control harmful greenhouse gas (GHG) emissions responsible for climate change and will seek to balance the environmental costs and benefits of all energy programs. The GOL expects to achieve its access goals for 2015 while reducing greenhouse gas emissions by 10%, improving energy efficiency by 20%, raising the share of renewable energy to 30% of electricity production and 10% of overall energy consumption, and increasing the level of bio-fuels in transport fuel to 5%.

2.2.1. The Main Actions to Boost Energy Efficiency in Liberia

The GOL is committed to establishing **energy efficiency standards** for all government and commercial buildings and industrial facilities and for importation of fuel-efficient vehicles and energy-efficient light bulbs and home appliances. It is the policy of the GOL to minimize and eliminate electricity and fuel losses, power theft, and corruption and to promote international best practices in wholesale and retail energy transactions and in the granting of licenses and concessions. In all cases, the public trust must be protected and honored by all; corruption in any form will not be tolerated, integrity must be demonstrated by all private and public officials and staff in the energy sector spectrum.

Other Strategic Lines of Action and Policy Objectives are to:

- Establish energy service delivery through public private partnerships (PPPs) with regulatory oversight;
- Establish an independent and transparent regulatory process;
- Establish quality standards for all energy products and services;
- Have the Liberia Electricity Regulatory Commission (LERC) and the Bureau of Standards monitor and enforce quality standards;
- Least-cost development of energy that takes consideration for financial, economic, social, gender and environmental costs.
- Stakeholders consideration in service delivery;

2.3. CURRENT ENERGY INSTITUTIONAL FRAMEWORK

There is as yet no GOL institution focusing specifically on EE, however, to achieve independence and transparency, the NEPL provides that the institutional framework must avoid conflicts of interest and overlapping roles by separating policy setting, regulatory oversight, and policy implementation and operations. In this regard:

- The GOL has designated the Ministry of Lands, Mines and Energy, as the GOL institution mandated to define and review energy policies. The Government shall establish a Grid Power Session or Bureau within the Department of Energy (DOE) within the Ministry of Lands, Mines and Energy (MLME) responsible for policy-setting functions for grid-based electricity.
- The Electricity Law of Liberia has provision for the appointment of the Liberia Electricity Regulatory Commission;
- The GOL has plans to reorganize the MLME to elevate the Department of Energy (DOE) to discharge its oversight role over the efficient development of the energy sector as a whole;
- The GOL plans to eliminate distortions in energy-related markets through application of transparent, predictable and stable oversight;
- The GOL established an autonomous Rural Renewable Energy Agency (RREA) dedicated to the commercial development and supply of modern energy services to rural areas with an emphasis on locally available renewable energy resources;

- The Government-owned energy corporations shall continue to operate but shall be restructured to remove all policy making and policy monitoring functions and to improve operational performance through sound commercial business practices and changing the legislation establishing the LEC.

The Government will encourage and support investments in the power sector by independent power producers (IPPs) and independent power transmission and power distribution companies (IPTs and IPDs). The Government will also encourage large commercial and industrial facilities to utilize co-generation schemes and to increase the scale of their power sources to provide power for neighbouring communities.

3.0 PAST ACHIEVEMENTS IN TERMS OF EE DEVELOPMENT

3.1. RURAL AND RENEWABLE ENERGY AGENCY (RREA)

The GOL on July 6, 2015 fulfilled its commitment to facilitate and accelerate the economic transformation of rural Liberia by establishing a wholly government owned autonomous Rural and Renewable Energy Agency (RREA) dedicated to the commercial development and supply of modern energy services to rural areas with an emphasis on locally available renewable resources. The RREA Act also established by Law the Rural Energy Fund (REFUND).

The RREA's mandate includes integrating energy into rural development planning; promotion of renewable energy technologies; facilitating delivery of energy products and services through rural energy service companies (RESCO) and support for community initiatives.

3.2. ESTABLISHMENT OF OFF-GRID, AND MINI-GRID DEPARTMENT AT RREA

The Government shall establish an Off-Grid Power and Mini-Grid Rural Energy Unit in the RREA (within the Division of Rural Electricity and Renewable Energy) which shall be charged with the responsibilities to provide technical assistance, training and provide the special support required for remote and low income communities utilizing the Rural Energy Fund (REFUND). The actual delivery of services will be undertaken by the public and private sectors, and community developers, with the regulatory oversight of the LERC.

3.3. THE 2015 ELECTRICITY LAW OF LIBERIA

On October 23, 2015, the Legislature of Liberia approved an act to amend chapter 85 of the 1973 Public Authorities Law creating the Liberia Electricity Corporation (LEC) and amendment thereto, to establish the 2015 Electricity Law of Liberia, which was duly signed, printed and published by authority of the Ministry of Foreign Affairs on October 26, 2015. The purpose and scope of the Electricity Law shall be to establish the legal and regulatory framework for the generation, transmission, distribution and sale of electricity within the territory of the Republic of Liberia and the import and export of the electricity and to facilitate the implementation of the National Energy Policy.

3.4. LIBERIA ELECTRICITY REGULATORY COMMISSION (LERC) **(“REGULATOR”)**

The 2015 Electricity Law of Liberia provides for the appointment by the President, a Liberia **Electricity Regulatory Commission (LERC) (“Regulator”)** which shall consist of a chairperson and two members, appointed by the President with the consent of the Senate.

The Regulator shall have the authority beginning three (3) years after the electricity Law comes into effect (i.e. by October 2018) with functions including to investigate alternative forms of regulation such as flexible tariffs, incentive based regulations, and the use of competitive markets.

The LERC shall initially reside within the MLME for administrative purposes and shall be independent with respect to its budget, management, staffing and in the exercise of its duties and authorities.

3.5. GOL 2009 STRATEGIC VISION FOR ENERGY SECTOR DEVELOPMENT

The Government in 2009 adopted a three-pronged strategy towards the realization of the vision expressed by the principal objective of the NEPL – the short term (**emergency phase**), the medium term (**capacity building phase**) and the long term (**development phase**). The Government summarized the strategic roadmap with the phrase “Small light today, big light tomorrow.” The NEPL paved the way from the small light today to the big light in the future.

The emergency phase was launched in January 2006 as a cornerstone of Liberia’s post-conflict stabilization and redevelopment program following 14 years (1990 – 2003) of civil war in Liberia. This phase lasted from 2006 to 2008. Several pilot projects were implemented to serve as the foundation for the rebuilding of the country’s energy system and provided lessons for the development of the NEPL in 2009. The medium term, capacity building phase lasted from 2008 to 2015, during which the country’s institutional capacity for policy implementation has been developing. During this phase, the Government extended the emergency phase pilot projects and also facilitated the first set of major private sector investments in power generation. The RREA, REFUND and Electricity Law were enacted during this period and action plans were developed.

The GOL long term, beyond 2015, development phase is planned for the country to have the objective of vision realization and will be focused on the development of the country’s large hydropower and other renewable resources. This NEEAP along with the accompanying SE4All Action Agenda (AA) and NREAP are intended to delineate the roadmap for action in the RE and EE sectors from 2016 to 2030.

4.0 LIBERIA’S NATIONAL ENERGY KEY POLICY ISSUES

The GOL has outlined the following principles as the foundation of Liberia’s National Energy Policy:

- Leveraging enhanced energy access for improvements in education, health, and economic development;
- Providing access to modern energy (fuels for industry, transportation, services and commerce and households cooking and electricity) with special attention for previously neglected rural consumers;

- Enhancing transparency and accountability at every stage of energy operations: wholesale and retail transactions; granting of electricity concessions, and other management contracts; collection of payments from consumers; the granting of licenses to providers of energy services throughout the economy; and timely adjudication of cases of official corruption, power theft, and the adulteration of petroleum products and lubricants;
- Ensuring the long-term financial viability of electric utilities, service providers and other energy companies;
- Ensuring the affordability of all energy forms for poor consumers;
- Balancing the environmental costs and benefits of all energy programs, taking into account the collective global effort to control harmful greenhouse gases (GHG) responsible for climate change;
- Maximizing **energy efficiency** throughout the production to consumption chain and demand-side management (DSM) to minimize the financial and environmental costs of energy development;
- Ensuring the involvement of the private sector to the greatest degree possible, including local and international players throughout the energy sector; and
- Ensuring that Liberia takes all requisite actions (political, economic, technical and financial) on a timely basis to integrate its domestic energy policies into the ECOWAS Protocol and attendant, the West African Power Pool, the West African Gas Pipeline, the Cross border electricity program and the CLSG transmission line and other planned or existing international commitments, policies, standards, and obligations.

The GOL is committed to providing the political will, competent people, and appropriate institutions, necessary to create and enforce the legal and regulatory environment that will attract the private sector investments needed for improved energy access to support economic growth. The Government recognizes that these reforms represent a major cultural shift. However, the recent enactments of the RREA Act and the Electricity Law demonstrate the GOL strong support that provides a unique opportunity for successful implementation of the reforms and the NREAP-NEEAP-SE4ALL. Information, advocacy and awareness raising measures will be undertaken for EE project developers and operators to understand the nexus between renewable energy and energy efficiency and energy access including holding workshops and seminar training. Easy access to required information is necessary to attract investment.

4.1. POLICY ACTIONS FOR THE ELECTRICITY SECTOR

- The Government shall accelerate electrification by facilitating the unbundling of the manufacture, generation, transmission, distribution, and retail sale of electricity and encouraging the sale of excess generating capacity from private facilities to neighboring communities and increasing local and international private sector investments in the electricity supply industry;
- The Government shall under appropriate licensing encourage and support the development and sale of excess electricity generating capacity by private investors including industrial, agricultural and mining concessions, for the benefit of neighboring communities, as part of their corporate social responsibility;
- The Government shall promote regional cooperation in electricity through the establishment of a wholly or partly publicly owned and efficiently managed national grid company that shall actively participate in the West African Power Pool (WAPP) and other regional and international activities designed to enhance international trade in electricity.
- The Government as provided for in the 2015 Electricity Law of Liberia shall appoint a transparent and independent Liberia Electricity Regulatory Commission (LERC) that will ensure the safe, secure, reliable, and environmentally-friendly production and efficient use of electricity at cost-reflective but affordable prices.

- The Government shall promote the least-cost development and efficient utilization of the electricity facilities, taking account of the economic, financial, social, and environmental factors and the special need to ensure access by the poor through use of targeted and transparent capital subsidies.

5.0 GRID POWER

Access to the Grid

The Government, with technical assistance from LEC, shall develop a grid development master plan to facilitate the orderly development of the power system by the public, private sector, and local communities. The grid master plan shall complement the rural energy master plan being developed by the RREA and the NREAP-NEEAP-SE4ALL being guided by ECREEE based on off-grid and renewable energy technology investments in accordance with the EEP. The Government shall make maximum use of opportunities for cross-border connections to take full advantage of the Cross-Border project and the CLSG transmission line project at the distribution level to accelerate the electrification of communities along the country's borders.

The Government shall allow access to the grid by licensed generators and distributors on terms and conditions designed to incentivize private investment capital.

Quality of Grid Design

The national grid shall be designed and operated to allow safe, secure, and reliable operation when interconnected with neighbouring countries. The interconnection must meet international standards.

Financial Viability

The Government shall ensure the long-term financial viability of efficiently managed electric utilities by allowing full-cost recovery from those who are able to pay and providing explicit subsidies targeted at those with limited ability to pay. The Government shall undertake long run marginal cost (LRMC) studies as a tool for the least-cost development of the power system. Operators shall be free to set their own prices, subject to costs allowed by the regulatory board. Where feasible the Regulator shall encourage free and fair competition to enable consumers to get the best prices.

The short-term emergency power has been made possible through grant funding and the Government's own limited funds. In contrast, the bulk of the funds required for the planned and ongoing heavy fuel oil generators (HFOs) and Hydro projects will come from loans borrowed from banks. Therefore, while the emergency power has been a result of political and commercial decisions, the sustainable development of large-scale power projects will be the result of decisions by banks. A decision to commit grant or equity funds is based on commerciality standard of proof beyond reasonable doubt. The focus of the NEEAP and NREAP is to create the environment for bankable projects that will stand the exacting scrutiny and analysis by lenders.

Because of the monopoly nature of the national grid and the inter-governmental relationships involved in regional cooperation activities it shall be necessary, for the foreseeable future, for the Government to maintain significant ownership of a restructured, operationally efficient, and financially viable LEC as the national grid company. In this capacity the LEC will be the country's utility representative in the West Africa

Power Pool (WAPP) and other regional and international forums for cooperation in electricity. With this strategy the country will position itself to develop its large hydropower potential.

5.1. ELECTRICITY GENERATION, TRANSMISSION, DISTRIBUTION AND AS SOURCES OF POWER LOSSES

Power Generation

The annual average electricity generation during the period 2010 to 2015 was approximately 332 GWh per year for the six year period. With the introduction of NREAP-NEEAP-SE4ALL AA, this generation is expected to average 1,470 GWh per year for the 20 years period, 2010-2030. In order to achieve this more than 4.4 times increase in the annual generation average, major investments must be undertaken as proposed in the action plans. The GOL has therefore made a number of plans and commitments in this regard.

The LERC shall issue investment and operating licenses for independent power producers and independent power transmission and distributors companies whose operations shall be monitored by the LERC. The LERC shall be resourced adequately to perform its mandate of monitoring of costs, review of plans, and quality standards and promotion of fair competition, including dispute resolution among stakeholders.

To facilitate the involvement of the private sector in generation, distribution and retail functions – the competitive aspects of LEC’s business – the Government shall consider and implement several privatization options, which shall include but not be restricted to, management contracting, BOT (Build, Operate, and Transfer), BOO (Build, Own, and Operate), and BOOT (Build, Own, Operate, and Transfer). Liberia is participating in cross-border rural electrification projects that benefit up to 18 communities in the counties of Maryland, Grand Gedeh, River Gee, and Nimba along the border with Côte d’Ivoire. A major WAPP transmission interconnector called the CLSG Transmission Line is planned that will assist Liberia in re-establishing a national grid that will be linked to Côte d’Ivoire, Guinea, and Sierra Leone.

In the gas sector, construction is nearly complete of the West African Gas Pipeline, bringing Nigerian gas to Benin, Togo, and Ghana. The Nigerian gas is being flared or vented currently and represents a relatively low cost and plentiful source of energy which will be used by the recipient countries for power generation.

6.0 ENERGY INTENSITY

As a proxy for energy efficiency, the global tracking framework takes the compound annual growth rate of energy intensity of gross domestic product (GDP) measured in purchasing power parity (PPP) terms, complemented by supporting analysis of underlying factors as well as sectoral disaggregation. 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 GDP 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 by the SE4All Global Tracking Framework (GTF) data for 1990 to 2010 to be 53.8MJ/\$ equivalent to 14.94kWh/\$ and a 20-year rate of change has been 0.97 percent compound annual growth

rate (CAGR) between 1990 to 2010 for Liberia. This means that for the period studied by the GTF, Liberia has been expending so much energy just to earn \$1 of GDP value, suggesting very high inefficiencies in energy productivity together with a deteriorating trend.

7.0 NATIONAL ENERGY EFFICIENCY TARGETS AND TRAJECTORIES

In this section, Member States are required to set their national sectorial energy efficiency targets in 2020 and 2030. The set targets will contribute to the achievement of the EEP's targets. Efficient targets for lighting, buildings, appliances, electricity losses, industry and transport are discussed in this section. Also included are the trajectories that Liberia expects to see in each sector between 2010, 2015, 2020, 2025 and 2030 as computed by the use of the ECREEE Scenario Tool.

7.1. ENERGY EFFICIENCY POTENTIALS

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 **SE4ALL 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.

Power generation assumes efficiency in the range from 30% to 40%, which cannot be achieved for small units. For small units prevalent in Liberia, the efficiency for thermal power plants is in the range from 17% to 25% depending on the available cooling source. There is room for considerable efficiency gains in the power generation, transmission and distribution operations in Liberia.

Considering all losses including generation, transmission and distribution and non-technical losses in the electric power sector of Liberia, as well as the losses in the consumption by appliances, (especially air conditioners, stoves, heaters, etc.) the average annual losses are estimated to be around 45% of power generation for the period 2010 to 2015. There are currently no programs or initiatives for the demand side management in Liberia except efforts from LEC to inform customers on ways to better utilize electricity. Several opportunities therefore exist in the household cooking and traditional energy production and use, in the electric power generation, and transportation operations.

Additionally, opportunities for energy efficiency gains are many in the agriculture and industry sectors in Liberia. An example in point is the current methods for firewood and charcoal production – such as burning in the ground which is not efficient. The technologically available kilns with high efficiencies are neither being utilized nor promoted. The process is labour-intensive and hazardous to the health of the producers. Secondly, the cost of production is high because of a loss of 25% of biomass during this process resulting in reduction of income to producers. The indicator relating to energy intensity for Liberia shows that energy efficiency is low.

Energy efficiency which is strongly based on the combination of technological improvements and good and responsible practices and behaviors is unfortunately not a priority for the population and the households 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. There is therefore a need to undertake public awareness programs for energy efficiency.

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 not widely spread in Liberia. There is a need for public awareness programs on building energy efficiency.

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 uses of timers or automatic switch-off devices are not developed.

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

7.2. TARGETS TO MAXIMIZE ENERGY EFFICIENCY, MINIMIZE COSTS AND ENVIRONMENTAL IMPACTS

In line with the international community, and based on the principles of extending energy access to all Liberians through careful consideration of the environmental costs and benefits, and with the goal of maximizing efficiency to minimize costs and any adverse environmental impacts, the Government of Liberia states the targets discussed in the sections below as follows:

- Reduction of losses in the electric grid;
- Reduction or losses in domestic and public lighting;
- Reduction of losses in the building sector; and
- Reduction of losses in the industry sector.

7.3. ENERGY EFFICIENCY VIS-À-VIS GOAL OF SE4ALL

With the implementation of the above stated SE4ALL goals in section 7.1 above, it is expected that savings resulting from the implementation of the action plan will average 461 GWh per year, versus the baseline case scenario when only limited number of energy efficiency measures are undertaken. Detailed sources of losses, savings and targets and trajectories are discussed further below.

7.4. ENERGY EFFICIENCY TARGETS FOR DOMESTIC COOKING AND OTHER APPLICATIONS

In summary, the following targets have been outlined for Liberia:

- ◇ Ensure universal access to improved cook-stoves to 100% by 2020;
- ◇ Increase the share of the population served with modern fuel alternatives including LPG for cooking to 36% by 2020 and 41% by 2030;

- ◇ Increase the share of efficient charcoal production to 60% by 2020 and 80% by 2030;
- ◇ Increase the share of solar water heating (SWH) technologies for sanitary hot water and preheating for commercial and industrial processes as prescribed in this action plan document;
- ◇ Increase blending ratios for ethanol/bio-diesel in transport fuels of 5% by 2020 and 10% by 2030;
- ◇ Conduct research on the use of ethanol and other fuels as domestic cooking fuels;
- ◇ Create instruments for financing sustainable energy, including carbon finance by the end of 2013 and in the longer term, establish a regional fund for the development and implementation of sustainable energy projects.

7.5. TARGETS FOR EFFICIENT LIGHTING

7.5.1. Baseline Scenario ("Baseline") for Efficient Lighting

The Baseline Scenario refers to the electricity demand for lighting if energy efficient technologies in the lighting sector are not introduced. For example, in the case of on-grid lighting the baseline will likely be a mix of incandescent lamps, compact fluorescent lamps and linear fluorescent lamps. The Scenario tool calculates the number of lighting devices and electricity consumption for the baseline case. In the case of off-grid lighting, the baseline will be a mix of kerosene lamps, battery-powered torches and/or candles which is the current situation in most homes in the rural and peri-urban areas of Liberia.

The introduction of low consumption light bulbs in households is targeted to commence in 2016 and by 2018 will completely replace the number of remaining incandescent light bulbs. At an average consumption of 648 kWh/household/year for lighting, and 9 lighting devices per household; it is projected that the baseline energy consumption for lighting will increase annually by an average of 5.78 GWh/year. The projection shown in table 1 below estimates the baseline electricity consumption (in GWh/year) for 2010 as 6 GWh and 7 GWh in 2015. This number will dramatically increase to 192 GWh by 2020; 417 GWh in 2025 and 685 GWh in 2030.

7.5.2. Scenario With Measures to Introduce Grid Connected Low-Consumption Light Bulbs (LCLs) for Domestic Use

The implementation of the NEEAP with measures to introduce grid connected low-consumption lighting (LCL) devices is targeted to commence in 2016 and by 2018, completely replace incandescent light bulbs in the grid. The annual electricity consumption for domestic lighting is projected to decrease by 60% in each year representing savings in electricity consumption of 115 GWh for 2020, 250 GWh for 2025 and 411 GWh for 2030 when implementing appropriate measures. Total savings due to LCLs introduction in public Lighting for the period 2020 to 2030 is projected to average 263.5 GWh per year.

7.5.3. Scenario With Measures to Introduce LCLs for Public Street Lighting

It is projected that the targets for the introduction of LCLs in public street lighting will result in a reduction of consumption by 11.1% (from 9 GWh to 8 GWh) in 2020, and 20% reduction each in 2025 and 2030.

TABLE 1: EFFICIENT LIGHTING					
<i>Year</i>	<i>2010</i>	<i>2015</i>	<i>2020</i>	<i>2025</i>	<i>2030</i>
Baseline scenario ("Baseline") for efficient lighting					
Number of electrified households (000)	10	11	297	643	1,058
Number of lighting devices installed (000)	86	95	2,673	5,786	9,519
Consumption for Lighting, GWh	6	7	192	417	685
Scenario with measures to introduce grid connected low-consumption light bulbs (LCLs) for domestic use					
No. of remaining incandescent light bulbs (000)	86	95	0	0	0
No. of low-consumption light bulbs distributed/sold acc. to the NEEAP (000)	0	0	0	0	0
No. of LCLs in households (000)	0	0	2,673	5,786	9,519
No. of LCLs distributed/sold to replace used lamps (000)	0	0	668	1,447	2,380
Savings, GWh/year	0	0	115	250	411
Scenario with measures to introduce LCLs for public street lighting					
"Baseline" consumption of public street lighting (GWh)	2	4	9	20	45
Consumption of public lighting, with EE measures (GWh)	2	4	8	16	36
Savings, GWh/year	0	0	1	4	9
Savings, percent	0.0%	0.0%	11.1%	20.0%	20.0%
Overall economic balance for lighting: domestic lighting (non-directional household lamps) + public lighting					
Savings, GWh/year	0.0	0.0	116.5	254.0	420.1

The measures to distribute or sell low-consumption light bulbs as an access incentive to the poor will take place in the years 2016, 2017 and 2018 during which programs and measures will be taken for electricity distribution networks and the corresponding education on electricity losses and introduction of 191 thousand, 521 thousand and 871 thousand LCDs each year respectively. Following this kick-off program period, it is projected that the general public will be sensitized to continue the energy savings measures through the use of LCDs. See table 2 below.

7.5.4. Targets for Energy Efficient Lighting

The penetration rate of **on-grid** energy efficient lighting devices was 0% of the total electricity lighting fixtures in 2015. This will rise to 33% of the total lighting LCLs devices in 2016 and it will increase to 67% in 2017 and by 2018 onwards, all the lighting devices in the households are projected to be LCLs. The **off-grid** will achieve the 100% penetration of LCLs by 2020, two years later than the on-grid. The percent of public street lights utilizing LCLs is predicted to achieve 100% penetration by 2016, two years earlier than the households. See table 2 below.

	YEAR	2015	2016	2017	2018	2019	2020
Penetration rate of on-grid, energy efficient light (%)		0	33%	67%	100%		
Penetration rate of off-grid, energy efficient lights (%)		0	17%	35%	75%	90%	100%
Percentage of public street lights that are high efficiency (%)		0	100	100	100%		

7.5.5. Targets for High Performance Distribution of Electricity

The grid power losses during the planning period are predicted to be 28% of power generation per year for the baseline scenario. When the energy efficiency measures are introduced, the grid power generation losses are projected to decrease by 2 percentage points in 2016 to 26% and progressively continue to decrease by 2% per year until the minimum target rate of 10% of power generation is achieved by 2024 and stabilizes to the 10% of power generation thereafter due to unavoidable technical losses. A breakdown of the grid power losses between transmission, distribution and non-technical losses is shown in table 3 below.

YEAR	2010	2015	2020	2025	2030
Total of losses in the power system, including technical and non-technical losses, in both transmission and distribution (% of power available: generation + balance of imports and exports).	28	28	18	10	10
Transmission losses (%)	6	6	6	5	5
Total distribution losses (%)	4	4	4	4	4
Sub-Technical losses (%)	10	10	10	9	9

YEAR	2010	2015	2020	2025	2030
Non-technical losses (%)	18	18	8	1	1

7.6. TARGETS FOR ENERGY EFFICIENCY STANDARDS AND LABELS

A number of energy efficiency standards and labels are required for a successful enforcement of measures for national energy efficiency action plans. Sub-Annex 1A below presents a listing of options for standards and labelling actions for GOL decision and enforcement. In this regard, the GOL is committed to introduce and put into force a number of Labels for action by the target year of 2018 onwards. These include the introduction of the following:

- Energy efficiency standards for power generation equipment, appliances and lighting devices.
- Efficient lighting standards for both on-grid and off-grid street lighting
- Standards for appliances such as air conditioners, refrigerators, washing machines, electric water heaters, fans, transformers, power consumption meters, etc.
- Energy efficiency labels of electricity power generation equipment, electronic equipment, and other electric power consumption appliances
- Labels for efficiency, quality and durability of grid and off-grid lighting devices

The table (table 4) below lists the planned target years for the introduction and enforcement of standards and labels in force for Liberia.

TARGET YEAR	BY 2018	BY 2020	BY 2025	BY 2030
Introduce and enforce a number of energy efficiency standards in the country	yes	yes	yes	yes
Introduce efficient lighting standards (on-grid / off-grid and street lighting)	yes	yes	yes	yes
Introduce and enforce appliances standards (refrigerators, air conditioners, washing machines, electric water heaters, fans, transformers, etc.)	yes	yes	yes	yes
Introduce and enforce energy efficiency labels	yes	yes	yes	yes
Introduce and enforce efficient lighting labels (on-grid / off-grid and Street lighting)	yes	yes	yes	yes
Introduce and enforce appliances labels (Refrigerators, air conditioners, washing machines, electric water heaters, fans, transformers, etc.,...)	yes	yes	yes	yes

7.7. TARGETS FOR ENERGY EFFICIENCY IN BUILDINGS

7.7.1. National 2020 and 2030 Targets and Estimated Trajectories for Energy Efficiency in Buildings

The baseline scenario predicts the annual power consumption in buildings to be 40% of power generation per year for the 20-year planning period. With the introduction of energy efficiency measures by the year 2016, the percent consumption begins to return to an average annual savings of 13.5% over the years; beginning with savings of 1.9% in 2016, 9% in 2020, 19% in 2025 and 28% in 2030. Table 5 below presents the annual electricity generation and the power consumption for the baseline case followed by the corresponding projected consumption in buildings for the baseline situation versus consumption in the building sector when EE measures are implemented. Energy savings of 12 GWh are targeted for the year 2020 representing 4% of power generation. The savings for 2025 and 2030 are targeted to be up to 30 GWh and 57 GWh respectively which corresponds to 8% and 11% of power generation in those years.

To achieve the below tabulated targets, the GOL shall in addition to other measures, support programs and energy efficiency performance certification for public buildings, in accordance with the ECOWAS directive on Energy Efficiency in Buildings (EDEEB)

TABLE 5: ENERGY EFFICIENCY IN BUILDINGS					
YEAR	2010	2015	2020	2025	2030
Baseline scenario ("Baseline") for EE in buildings					
Annual electricity generation GWh	190.00	242.49	309.49	395.00	504.13
Consumption in the building sector (GWh)	76.00	97.00	123.80	158.00	201.65
Scenario with measures to improve the energy performance of buildings					
Consumption in the building sector, with EE measures (GWh)	76.00	97.00	112.19	128.37	144.94
Savings, GWh/year	-	-	11.61	29.62	56.71
Savings, percent	0%	0%	9%	19%	28%
Annual value of savings (000 000 Liberian Dollar)	-	-	501.37	1,279.79	2,450.06
Annual investment (000 000 Liberian Dollar)	-	-	596.87	914.13	1,361.14
Cash flows (000 000 Liberian Dollar)	-	-	(95.50)	365.65	1,088.91
Total investment (000 000 Liberian Dollar)	12,250.28				

7.8. TARGET FOR ENERGY EFFICIENCY IN INDUSTRY

Liberia has a very low or negligible industrial sector, consisting mainly of small-medium scale enterprises (SMSEs). It has been shown in some literature that the mining and construction industries in Liberia are now being classified under industry sector. In this view, Liberia's mining and construction industries along with the SMSEs are projected to significantly contribute to the total annual energy consumption for the country. Energy consumption in industry is predicted to be 20% on average of power generation annually for the 20 year planning period. With the implementation of energy efficiency measures electricity consumption in industry will decline to 17% of generation per year by 2030, beginning with a 2.1% reduction in industrial electricity consumption in 2016, 11.% reduction in 2020, 21% in 2025 and 30% in 2030. See table 6 below.

TABLE 6: ENERGY EFFICIENCY IN INDUSTRY					
Year	2010	2015	2020	2025	2030
Baseline scenario ("Baseline") for EE in Industry					
Annual electricity generation GWh	190	242	309	395	504
Consumption in the industry sector (GWh)	38	48	62	79	101
Scenario with measures to improve EE in industry					
Consumption in the industry sector (GWh)	38	48	55	62	71
Savings, GWh/year	-	-	7	17	30
Savings, percent	0%	0%	11%	21%	30%
Annual value of savings (000 000 Liberian Dollar)	-	-	286	731	1,307
Annual investment (000 000 Liberian Dollar)	-	-	205	313	187
Cash flows (000 000 Liberian Dollar)	-	-	82	418	1,120
Total investment (000 000 Liberian Dollar)	3,920				
YEAR					
2010	2015	2020	2025	2030	
Percentage of electricity generation consumed in Industries (%)	20%	20%	20%	20%	20%
Percentage of energy saving in industry (%)	0%	0%	11%	21%	30%

7.9. TARGET FOR ENERGY EFFICIENCY IN TRANSPORT

There is currently a very high demand for transport vehicles owing to the complete destruction and deterioration of vehicles during the 14 war-years all of which are being rapidly replaced at a high rate annually. The transport sector of Liberia is dominated by imported used vehicles from Europe and America. These vehicles range in age from 10 to 20 years and contribute immensely to the losses in fuel due to inefficiency and pollution of the environment. While it may be difficult to conduct emission and energy efficiency testing and strictly enforce efficiency standards for transport vehicles based on engine performance, there are a number of measures that can be implemented for which the GOL has control over

to substantially improve the efficiency of the transport sector of Liberia. These measures include but are not limited to the following:

- Limiting the age of the vehicles that can be imported, beyond which the tax rate would be substantially higher as a disincentive for importing vehicles beyond (say 10 years old or 150 thousand miles, whichever is first);
- Repairs of streets, allays, and highways that will substantially, if not the most contribute to the efficient operation of transportation energy, the vast majority of losses can be attributed to bad roads;
- Improve the load carrying capacity of vehicles for a given fuel consumption/mile. This may not be a major source of savings as it is already evident that most transport vehicles in Liberia are either overloaded or overused;
- Another source of transport energy savings is through traffic system and flow dynamics. The better the traffic is routed to release traffic congestion, the better the fuel use efficiency.

The GOL will undertake measures and programs with the view to address the above measures to improve the transport energy efficiency.

8.0 GENERAL INDICATORS

The demographic and macro-economic indicators presented in tables 7 and 8 below reflect the fact that a large part of the country lacks basic infrastructure such especially electricity as result of civil wars and economic downturn. Yet, in recent years, Liberia's economy has been steady expanding as mining and rubber industries have been growing. More importantly, the Liberian government's efforts to fight reduce foreign debts, corruption and minimize bureaucracy seem to be succeeding as business activities are increasing especially during the 2009 and 2010 which is predicted to continue on to 2030. Liberia's energy intensity and per capita electricity consumption for the selected years are also presented.

8.1. DEMOGRAPHIC INDICATORS

Table 7: General Demographic Indicators	2010	2011	2012
Population	3,630,030	3,702,631	3,776,683
Population Growth rate (%)	2.0	2.0	2.0
Family size	5.10	5.10	5.10

8.2. MACRO-ECONOMIC INDICATORS

The annual per capita electricity consumption in KWh, Capita/year is targeted to increase from 52kWh/Capita in 2010 to 93 kWh/Capita in 2030 when the electricity access rate will reach 100% of the population served. See table 8 below.

TABLE 8: MACRO-ECONOMIC INDICATORS					
TARGETS FOR THE FUTURE, WHERE PERTINENT (DEFINE YEARS)					
Indicator	2010.	2015	2020	2025	2030
Annual Electricity consumption (kWh/capita/year)	52.34	60.50	69.94	80.85	93.46
Electrification rate (%) (the ratio between the population served and the total population of the area)	1.4%	1.4%	34.2%	67.1%	100.0%

TABLE 9: MACRO-ECONOMIC INDICATORS 2006									
Indicator	BEST AVAILABLE DATA					Targets for the future, where pertinent (define years)¹			
	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2015	Year 2020	Year 2025²	Year 2030
Primary energy intensity (Total Primary Energy Consumption/GDP) kWh/US\$ of GDP									
	0.18	0.17	0.16	0.16	2	3	6	12	22
Final energy consumption per year (kWh/capita/year)									
	52	51	53	54	52	113	635	1,362	2,174
Annual Electricity consumption (kWh/capita/year)									
	52	51	53	54	52	113	244	525	1,133
Electricity intensity (final electricity consumption/GDP kWh/US\$ of GDP)									
	0.18	0.17	0.16	0.16	2	3	17	31	43
Electrification rate (%) (the ratio between the population served and the total population of the area) ²									
	0.4%	0.5%	0.5%	1%	1.4%	1.4%	34.2%	67.1%	100.0%

8.3. SUMMARY OF EFFICIENCY TARGETS

The above energy efficiency targets and trajectories are summarized as follows:

6,787 339.33

The total electricity generation of 6,787GWh for the 20-year period at an average of 340GWh per year. With the implementation of EE initiatives, the total electricity savings over the planning period are at least 9,230 GWh at the average of 461 GWh per year which will be made available to replace additional generation requirements. The impact of energy efficiency would be the electricity generation that would be avoided and thus, generation plants that do not have to be built.

¹ Projection is based on the calculated rate of increase between 2006 and 2010 at all levels and all things being equal the rate was applied between 2015 and 2020.

² Since electrification rate will be 100% by 2020, no projection was made beyond this date

Table 10 below presents the summary of power generation for the years 2010, 2015, 2020 and 2030 respectively and the corresponding electricity efficiency savings through generation, transmission and non-technical losses reduction in the electric grid; reduction in domestic and public lighting consumption; and reductions in the building, and industry sectors consumption.

YEAR	2010	2015	2020	2025	2030
Baseline scenario ("Baseline") for the power sector of Liberia					
Annual electricity generation (GWh)	190	242	309	395	504
Scenario NEEAP					
Savings through the reduction of losses in the electric grid (GWh)	-	-	31	71	91
Savings in domestic and public lighting (GWh)	-	-	116	251	413
Savings in the building sector (GWh)	-	-	12	30	57
Savings in the industry sector (GWh)	-	-	7	17	30
Total savings in electricity consumption (GWh)	-	-	165	369	590

Total electricity available with the combine measures for RE-EE-SE is shown in the table 11 below. The combined implementation of the measures for RE, EE and SE4ALL results in a large set of GWhs of electricity available over the planning period through RE and EE scenarios implemented singularly. The energy efficiency savings of 165GWh in 2020, 369GWh in 2025 and 590GWh in 2030 will be enough to replace or avoid the remaining fossil fuel generation by 61% in 2020 and more than 100% replacement or avoidance of fossil fuel generation before or by 2025 and onwards to 2030 and beyond. See table 11 below.

YEAR	2010	2015	2020	2,025	2030
BASELINE	190	242	309	395	504
of which Fossil Based Generation	150	202	269	355	464
ADDITIONAL RE	0	0	2,175	4,350	4,350
EE	0	0	165	369	590
Percent of Fossil Based Generation	0%	0%	61%	104%	127%

9.0 MEASURES FOR ACHIEVING THE TARGETS

9.1. PUBLIC INSTITUTIONS FOR NEEAP IMPLEMENTATION

The Government's oversight of the energy sector is exercised through the Ministry of Lands, Mines and Energy (MLME). Under current legislation, there is no independent energy efficiency regulatory organ of the GOL. This is a situation where the MLME and other agencies of the energy sector play the role of referee and player at the same time.

The Department of Energy in the MLME has one Assistant Minister supported by one Director responsible for alternative energy. The Government therefore has limited manpower capacity to undertake energy efficiency policy as well as monitoring and regulatory functions. The MLME has no office that is solely dedicated to neither the electricity sector nor the Energy Efficiency and is in need of support for facilities to develop conception and implementation of information systems and software solutions to support the implementation of energy efficiency at different levels. In this regard, the GOL shall recruit permanent professional staff to be in charge of supervising and coordinating the Government's energy efficiency and renewable energy programmes and measures.

The GOL shall establish a public entity or unit within the Department of Energy (DOE) responsible for the modernization of the industrial sector by undertaking energy efficiency programs in their operations. The EE Unit will put in place appropriate energy efficiency policy tools and programs including Capacity Building, Awareness Raising, Dissemination of efficient lighting, promotion of efficient cook stoves, refrigeration and air conditioning efficiency policy and environmental impact and mitigation, guidelines on EE policies, strategies, programs and projects, support for EE markets and feasibility studies, data collection, etc.

In view of the need for inter-agency and sectorial coordination and the participation of a number of stakeholder groupings, the GOL shall establish a National Energy Committee (NEC) for coordination efforts of various donors and to facilitate planning of a more formalized policy and planning process on National Energy Efficiency Policy and Program.

The GOL shall establish the LERC which will be responsible to issue investment and operating licenses for independent power producers and independent power transmission and distributors companies whose operations shall be monitored by the LERC. The LERC shall be responsible to monitor costs, and review plans, targets and quality standards and promotion of fair competition, including dispute resolution among stakeholders.

The RREA shall be responsible for managing the REFUND through which it shall provide technical and financial support for the implementation of EE measures and RE projects.

The GOL as a policy shall support RREA in its mandate for the implementation of energy efficiency initiatives through pilot projects, including the dissemination of high efficiency lamps and adoption of standards and labels such as for lighting equipment and refrigeration, air conditioning, home appliances, etc.

The GOL shall support and enforce the implementation of the following additional measures and actions for the capacity building of public and private institutions in the energy efficiency programs:

- Train permanent professional staff of the Energy Efficiency Units in renewable energy and energy efficiency, including RE and energy efficiency technologies, policy and programme formulation and monitoring and evaluation of programmes;
- Ensure that adequate incentives are instituted and maintained so as to retain a sufficient level of trained staff;
- Educate staff and professionals in the process of managing administrative procedures for Energy Efficiency Technology e.g. construction permits, user permits;
- Train industry staff in possible EE measures and EE project financing;
- Train staff in the fundamentals of renewable energy technology, the principles of energy efficiency, energy policy and carbon markets;
- Set up a train the trainers programme covering all aspects of EE;
- Provide capacity building opportunities for planning and implementing large off-grid and on-grid programmes (Operation & Management), Information, advocacy and awareness raising measures for RE and EE project developers; understand the nexus between renewable energy and energy efficiency and energy access.

9.2. EFFICIENT LIGHTING INITIATIVE (ELI)

In addition to the distribution of Low Consumption Lights (LCLs) and Low consuming devices (LCDs), described above, the GOL shall introduce standards for labelling publicly sold and distributed lighting devices and light bulbs. As part of the efficient lighting initiative, incandescent light bulbs will be banned from importation by 2018 and all public offices and facilities will be required to use LCL by 2016. Other measures to be undertaken as part of the efficient lighting initiative include actions in the four components of the lighting initiative, namely:

- Minimum Energy Performance Standards
- Supporting policies and measures
- Monitoring, Verification and Enforcement
- Environmentally sound management

9.2.1. Minimum Energy Performance Standards (MEPS)

In keeping with the projects on lighting Minimum Performance Standards (MEPS) on-grid and off-grid the GOL shall cooperate with the ECOWAS experts who will undertake validation to insure that the GOL has approved and adopted the ECOWAS recommended MEPS with the aim of developing and implementing programs for energy efficiency policy/tool, capacity building, awareness raising/information and financial/fiscal programs.

The target group for the MEPS programs shall include public administrators who enforce energy efficiency policies, private residence owners, educators and commercial service providers and vendors of lighting devices and light bulbs.

In addition to Lighting, energy efficiency measures shall also be targeted for the Residential, Transport, Industrial, Tertiary (commercial and services), Energy Supply, Agriculture and fisheries and Education and Health sectors as discussed further in this report.

9.2.2. Supporting Policies and Measures

Standards and Labelling Initiative

The GOL shall undertake measures as part of the energy efficiency standards and labelling initiative for lighting. This includes, among others:

- Conducting consumer research/feasibility studies on efficiency label design options. Evaluating local/regional socio-cultural factors.
- Developing and introducing programs to encourage or require public-sector and large-scale private-sector procurement of energy efficient lighting products.
- Design and implementation of complementary policy, regulatory and educational measures that support the enforcement of standards and labelling programs for lighting.

This lighting standards and labelling initiative with its supporting policies are (predominantly) an energy efficiency policy/tool, capacity building, and awareness raising/information measures and will target lighting devices retailers/suppliers and the public administration. Sectors that will benefit very highly are the residential, industrial, public lighting and commercial sectors.

9.2.3. Monitoring Verification and Enforcement

Measures and programs shall be undertaken to insure verification of conformity to minimum energy efficiency standards on the efficient lamps and other appliances. These include periodic inspection of importers, distributors and vendors supplies and registration of vendors and verification from consumers. A data base of the lighting devices manufactured or imported in the country will be a part of this process.

9.2.4. Environmentally Sound Management

The disposal of spent lighting devices and batteries shall be a major issue of concern for the LCDs, PV batteries and other lighting fixtures. A coordinated disposal system and information campaign shall be put in place. Strategies and targets, including legal and regulatory mechanisms for the sound management of the environmental effects of the Effective Lighting Initiative (ILI) shall be developed.

- Supporting policies and measures
- Monitoring, Verification and Enforcement
- Environmentally sound management

9.3. FINANCIAL/FISCAL MEASURES

The GOL shall support and encourage the development and introduction of innovative instruments to finance energy efficient equipment. These may include customer credit schemes, demand-side-management by utilities, changes to the tax systems, etc. to provide incentives for energy efficient products or increases in duties for inefficient products. Other options for financial and fiscal measures also include

fiscal incentives, tax exemptions, soft loans, subsidies, rebates, investment deduction schemes, etc. The GOL shall decide which option to implement on a case-by-case basis. This measure shall include banks, financial institutions, and the RREA and other GOL institutions. The donor community shall also be engaged to support the energy efficiency program of Liberia. In addition investors, end users, public administration, planners, architects, installers, equipment manufacturers, retailers, and energy suppliers etc. shall be targeted as necessary participants in these programs.

9.4. SUPPORTING POLICIES AND MEASURES

For the implementation of the above targets, policies and measures, a number of supporting measures and targets have been identified which shall be enforced by the GOL. These shall include: public awareness campaigns; mandatory labeling and certification; installation of efficient lighting in all new social housing projects; etc.

- **Create public awareness of the benefits of on-grid and off-grid efficient lighting:**
 - Organize public education and awareness campaigns on the advantages and benefits of efficient lighting in national and local languages on radio and television, on posters and in newspapers, and at local events.
 - Organize special education programs for the youth in schools on the advantages and benefits of efficient lighting through radio and television programs, and posters.
- **Demonstrate to stakeholders the advantages and benefits of efficient lighting (compared to incandescent lamps):**
 - Implement free distribution of on-grid and off-grid lighting products or at subsidized cost to carefully selected communities (with retrieval and destruction of replaced incandescent lamps).
 - Facilitate development of financing schemes to cover the upfront cost of on-grid and off-grid lighting products (e.g. on-bill financing).
 - Facilitate bulk procurement of on-grid and off-grid lighting products through bulk procurement (e.g. through reducing import duties).
 - Promote installation of efficient lighting in all new social housing projects of national governments.
- **Create public awareness of the mandatory labels of on-grid and off-grid efficient lighting products:**
 - Educate the public and explain the information displayed on the mandatory labels of on-grid and off-grid efficient lighting - in national and local languages on radio and television, on posters and in newspapers, and at local events.
 - Organize special training programs for relevant staff of Standards authority and Customs agency on the interpretation of the mandatory labels of on-grid and off-grid efficient lighting.
 - Organize special training programs for relevant staff of Standards authority and accredited institutions on the test methods for on-grid and off-grid efficient lighting.
- **Develop and adopt fiscal instruments to reduce prices of on-grid and off-grid efficient lighting:**
 - Conduct baseline market studies and cost-benefit analyses on on-grid and off-grid efficient lighting products in all ECOWAS countries to gather data for consultations with policy makers.
 - Conduct consultations with policy makers (including Parliamentary Select Committees) on the establishment of fiscal instruments (including incentives and reduced taxes) to reduce prices of on-grid and off-grid efficient lighting products.
 - Adopt reduced taxes (including import duties, VAT) for on-grid and off-grid efficient lighting products
 - Adopt incentive schemes (including tax holidays) to support local manufacture of on-grid and off-grid efficient lighting products.

9.4.1. Policies and Tools on S & L

The Policies and Tools which the GOL shall implement in the process of Standards and Labelling (S&L) to be jointly implemented by the Ministry of Commerce, the Bureau of Standards and the MLME Department of Energy and other relevant agencies of government shall include among others include:

- Conduct market assessment of key energy-using appliances. The market assessment would include collection and analysis of data on pricing and sales, market penetration, leading brands, baseline performance of energy-using equipment, efficiency improvement potential, usage characteristics, etc.
- Collect additional market data and baseline usage as well as performance data for selected product categories, as necessary to inform a decision on efficiency performance levels, for instance through field surveys (e.g. end-use metering studies) and laboratory testing.
- Conduct impact assessment of the costs and benefits of the proposed standards (energy and money savings, environmental benefits etc.) and assessment of energy efficiency improvement potential for selected appliances.

9.4.2. Capacity Building for standards and labels

- Identify the needs for technical support by local manufacturers of lighting products, ovens, fans and motors.
- Develop capacity-building materials for Standards and Labels (S&L) program managers and stakeholders.
- Training and informational workshops to educate and build capacity among stakeholders:
 - Training workshops to build capacity on standards and labelling in the national standards bodies and energy authorities.
 - Training workshops in certification procedures, compliance monitoring, and enforcement programs.
 - Training of importers, retailers and other relevant stakeholders such that they actively support the initiative.
- Strengthen and enhance national institutions. Institutions must have a mandate, an adequate budget, a well-trained staff, and sufficient resources to effectively oversee the development and implementation of the programs. In this context, the cooperation between energy authorities and authorities in charge of standards shall be strengthened.

9.4.3. Awareness Raising

- Develop concepts for a communication and outreach strategy based on international experience and best practices, with a particular focus on disseminating information about the benefits of using new products instead of second-hand ones.
- Conceive and conduct awareness raising campaigns for national authorities, manufacturers, distributors, specialized professionals such as engineers and technicians, teachers, professors and the general public. For example, messaging may be directed to: governments, institutions, and other stakeholders about the benefits of S&L, obligations and expectations about the process; to consumers

to raise awareness and understanding of the efficiency label; to manufacturers and importers to encourage a culture of compliance.

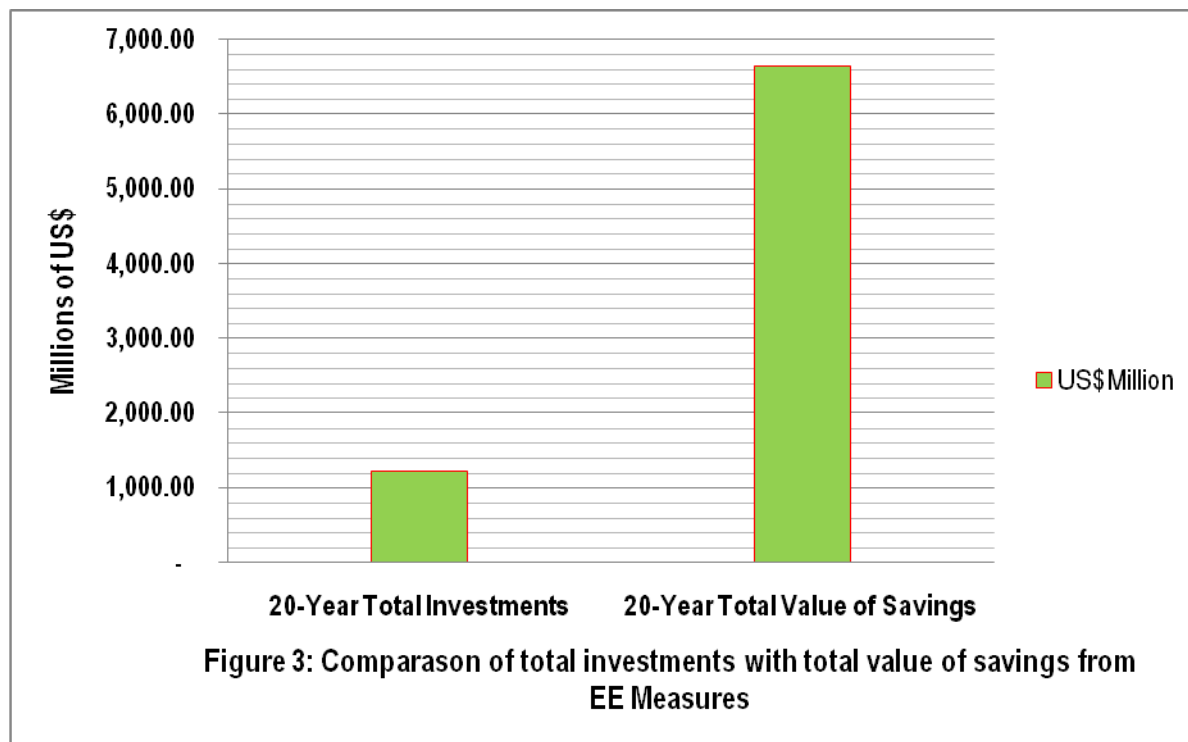
10.0 COST OF INVESTMENTS AND VALUE OF FINANCIAL SAVINGS OF ENERGY EFFICIENCY MEASURES

The total financial savings accrued from all the energy efficiency measures over the 20 years period is calculated to be approximately US\$6.64 Billion at an average of US\$332 Million per year. The total investments required for all the types of Energy Efficiency Measures for the 20-year period is estimated to be US\$1.22 Billion, significantly less than the value of savings. This amount averages to US\$61.5 Million per year. For the selected years 2020, 2025 and 2030 the annual investments are US\$42.53 Million, US\$119.58 Million and US\$224.31 Million respectively. Investments in reducing the grid power generation losses are expected to end in 2025 and thereafter will not need additional investments.

Table 12 below gives the required EE financial investment and the value of savings by type of EE Scenario and the below graph Figure 3 demonstrates the large difference between the costs and savings.

TABLE 12: VALUE OF SAVINGS AND REQUIRED ANNUAL INVESTMENTS FOR ENERGY EFFICIENCY

TYPE OF ENERGY EFFICIENCY SCENARIO	ANNUAL INVESTMENTS FOR THE SELECTED YEARS (Million US\$)					EE INVESTMENTS (Million US\$)		EE SAVINGS (Million US\$)	
	2010	2015	2020	2025	2030	20-Year Total Investments	Annual Average Investments	20-Year Total Value of Savings	Annual 20-Yr Average Value of Savings
<i>Scenario With Measures to Reduce Power Generation Losses</i>	0	0	18.39	40.46	0	220	11	2,398	120
<i>Scenario With Measures to Improve EE in Industry</i>	0	0	5.32	23.41	72.10	216	11	337	17
<i>Scenario With Measures to Improve the Energy Performance of Buildings</i>	0	0	14.74	47.38	137.09	676	34	599	30
<i>Scenario With Measures to Introduce Grid Connected Low-Consumption Light Bulbs (LCLS) For Domestic Use</i>	0	0	1.34	2.89	4.76	35.7	1.8	1,624.0	81.2
<i>Scenario With Measures to Introduce LCLS For Public Street Lighting</i>	0	0	0.70	1.27	2.80	19.2	1.0	26.6	1.3
<i>Sub-total - Overall Economic Balance for Lighting: Domestic Lighting (Non-Directional Household Lamps) + Public Lighting</i>	0	0	2.04	4.17	7.56	54.9	2.7	1,650.6	82.5
TOTAL EE INVESTMENTS AND VALUE	0	0	42.53	119.58	224.31	1,221.8	61.5	6,635.2	332



10.1. FINANCING MECHANISMS FOR ACCESS TO THE POOR

The Government shall adhere to the policy of cost-reflective but affordable pricing for electricity and other energy sources. Operators shall be free to establish their own prices subject to costs allowed by the LERC and pricing principles designed to facilitate access by the poor. Appropriate financing mechanisms will need to be established to support all economically and socially acceptable rural energy projects regardless of financial viability. Targeted subsidies in the form of grants, low interest loans or guarantees shall be utilized to allow access by the poor. The RREA, which shall be responsible for managing the REFUND, shall provide technical and financial support for rural electrification and standalone energy system programs.

The GOL as a policy shall support the implementation of energy efficiency initiatives through pilot projects, including the dissemination of high efficiency lamps and adoption of standards and labels such as for lighting equipment and refrigeration. The RREA has started a project on Lighting Lives for Liberia (LLL) but this is basically focused on distribution and sales of Solar Lights that is yet at its initial stages with the involvement of a few certified private sector vendors. The GOL shall support the expansion of this program to involve larger private sector players in partnership with the local vendors, and empowering vendors to directly import from the manufacturers abroad.

The target group for access to the poor shall be the poor or low income people especially in the rural and peri-urban areas.

10.2. ENVIRONMENTALLY SOUND MANAGEMENT AND ENERGY EFFICIENCY

From an environmental perspective, energy production and use can harm human health and the environment if not efficiently and sustainably undertaken. The inefficient use of traditional woody biomass by over 95% of the population poses environmental threats and health problems through deforestation and indoor air pollution. At the same time, the unsustainable use of forest resources at an alarming rate for the production of energy poses a growing and serious threat to the environment and the country's ecosystem, including the future viability of the country's hydro resources. Demand for charcoal and firewood will continue to grow in the absence of electricity and energy efficiency measures.

Fossil fuel based electric power generation and transport energy consumption and deforestation constitute two of the major sources of greenhouse gases in Liberia. The UN has developed mechanisms for reducing greenhouses gas emissions and encourages the harnessing of non-fossil fuel energy sources. Liberia subscribes to the international requirement and processes for the Sustainable Development Goals (SDGs) which replace the Millennium Development Goals (MDGs) and several multilateral environmental agreements, recognizing that obligations under these instruments are necessary to address environmental conservation and sustainable use of resources. Liberia's Environmental Protection Agency (EPA) has been given the mandate to supervise, coordinate, and consult on all environmental activities in the country. The GHG inventory program by the EPA is in progress with international support. This program shall be encouraged by the GO and shall provide accounting of the GHG of the power generation and energy efficiency programs.

The long-term energy policy of Liberia must take into account the reality of global warming with the concomitant acceptance by our nation of its part in the collective responsibility to reduce emissions and protect the environment. Liberia currently has a large reserve of tropical forests which serve as a carbon sink for greenhouse gases. Liberia is therefore committed to protecting these resources as its contribution to the benefit of all humankind. In fact, the nation's valuable renewable hydro, biomass, wind, and solar resources may allow Liberia to lead the way in becoming one of the least carbon dependent nations in the world.

Energy efficiency also focuses on actions to collect and safely dispose used lighting fixtures. The GOL shall introduce the following programs:

- Create public awareness of the environmentally sound disposal of on-grid and off-grid efficient lamps and batteries;
- Organize public education and awareness campaigns on the rationale behind and methods for environmentally sound disposal of spent efficient lamps and batteries - in national and local languages through radio, television, newspapers etc.;
- Organize special education programs for the youth in schools on rationale behind and methods for environmentally sound disposal of spent efficient lamps and batteries;
- Develop and adopt national regulation for environmentally sound disposal of spent on-grid and off-grid efficient lamps and batteries;

- Adopt and implement ECOWAS Regional Regulation for environmentally sound disposal of spent efficient lamps and batteries, application of Extended Producer Responsibility principle and setting up CRSOs or integrate in existing regulation on disposal of hazardous waste;
- Develop and implement national collection systems established for spent on-grid and off-grid efficient lamps and batteries;
- Conduct national consultations with utilities, selected shops, schools and other stakeholders;
- Invite bids and select consultant for development of technical specifications, design and business plan of commercially viable recycling and disposal facility for spent on-grid and off-grid efficient lamps and batteries;

These measures are mainly an energy efficiency policy/tool, with emphasis on with the target groups being mainly the general public end users awareness raising and administrators.

10.3. ENERGY EFFICIENCY IN THE TRANSPORT SECTOR

The GOL shall take all necessary measures to reduce losses of lives due to road accidents, and reduce fuel and energy losses. The planned or adopted measures in the transport sector shall be but are not limited to the following. For instance:

Energy Efficiency Policies and Tools

- Measures to improve energy efficiency in public transport (e.g. changing of vehicle fleets, rationalisation of transport routes).
- Urban planning to shorten distances and reduce the number of daily trips.
- Favour the use of fuel-efficient vehicles, for instance through vehicle standards and controls on imports of used vehicles.
- Develop and enforce public procurement guidelines for the acquisition of low-consumption vehicles in the public sector.
- Measures to increase the attractiveness of public transport (e.g. creation of special lanes for public transport, improvement of services, real time information at stops, online information on travel schedule, improvement of infrastructure, park and ride and bike and ride schemes).
- Designated low-traffic areas.
- Control transportation prices and tariffs
- Control fuel prices for transportation
- Open up blocked roads and alleys for the free flow of traffic subject to appropriate environmental and social impact considerations.
- Improve and decentralize the system of vehicle registration and licences of vehicles and drivers
- Monitor and ensure standards of transport fuel filling stations, fuel measuring or pumping equipment and the quality of fuel on the market.
- Introduce other transport modes including air, rail and sea for travel across the country where applicable.

Capacity Building

- Develop and implement transport demand management and mobility management programs.
- Improve safety and organize training workshops on safety and traffic rules for operators of taxis, busses, private and government vehicles, bicycles, motorbikes, barjars and pedestrians, for promoting safe space for all modes of transportation.
- Establish or strengthen entities responsible for the planning, regulating and implementing sustainable transport including the National Transport Authority (NTA).
- Invest in facilities for inter-modal transfer to create fast and efficient transport chains including bus terminals, and training for the operators of the Transport Unions across the country.

Awareness Raising

- Encourage walking, bicycle and motobike use.
- Encourage eco-driving through awareness raising campaigns

Financial/Fiscal Measures

- Mobilize financial resources for investment in energy-efficient and environmentally friendly transport modes and technologies (e.g. bike-sharing programs, development of cycling lanes, public transport including rail).
- Introduce financing schemes / incentives to improve the fuel efficiency of passenger vehicles and/or freight vehicles.

These measures shall target the energy efficiency goals and the capacity building, awareness raising/information or financial/fiscal. Financial and fiscal measures include fiscal incentives, tax exemptions, soft loans, subsidies, rebates, investment deduction schemes, etc.

11.0 CROSS-CUTTING ISSUES ON ENERGY EFFICIENCY

11.1. THE NEED FOR THE NEC IN ENERGY EFFICIENCY POLICY AND PLANNING

The National Energy Committee (NEC) was established in 1984 to facilitate stakeholder coordination for policy development and strategic planning for the energy sector. The NEC became dormant in the few years prior to the civil crisis and has not been convened since then. During the process of development of the NEPL in October 2006 there was a National Energy Stakeholders Forum but the NEC was not formally reactivated to continue this vital government function.

The GOL shall establish the NEC for coordination efforts of various donors and to facilitate planning more formalized policy and planning processes on National Energy Efficiency Policy and Program.

11.2. ENERGY AND GENDER (E-GEN) RELATED ISSUES

Although the GOL has a ministry dedicated to gender affairs, it has no program or capacity to address energy-related gender issues. The MLME, which should take a lead role in developing and implementing

appropriate policies to address these important considerations, does not currently have the necessary resources to do so. It is the policy of government to highlight the roles of women in the energy sector of Liberia by establishing a Section or Bureau with qualified professionals trained in the Department of Energy responsible for Gender Mainstreaming in the Energy Sector of Liberia.

One of the problems attributed to the limited access to modern fuels and electricity in Liberia is its contribution to gender inequality. Women and children are responsible for most household cooking, gathering firewood or making charcoal, and fetching water. This takes time away from other productive activities as well as from educational and social participation.

Economic productivity can increase significantly once women and children are free from the daily burdens of fetching firewood, making charcoal, and walking long distances to fetch water. They can become gainfully employed in industries such as tailoring, which make use of electric sewing machines, and other cottage industries such as small bakeries, canteens, and laundry services, which require very little electricity yet but can transform lives. Women can also become active in the development of rural energy services around the country, as well as carrying out marketing campaigns and teaching others about new lighting, cooking, and other technologies.

It is vital to identify and mitigate the negative impacts arising from the differentiated social and economic roles of men and women in the context of energy policy. Millennium Development Goal 3 addresses “promoting gender equality and women’s empowerment.” The Government will need to ensure that provision of energy services is targeted at narrowing the opportunity gap between men and women.

11.3. ENERGY AND HEALTH RELATED ISSUES

Improvements in health raise human productivity, which in turn raises incomes. Access to electricity also leads to significant reductions in maternal mortality. The GOL shall as a policy ensure the availability of health and safety guidance in relation to electricity supply to the public; as well as make it a priority for electricity to be supplied at relatively lower costs to community, private, public and district health centers, maternities and health institutions,

Access to modern fuels eases the domestic burden on women and children, reducing the strain on their health and allowing them to pursue educational, economic, and other opportunities. Modern energy services allow health clinics to refrigerate vaccines, treat patients at night, and educate health care providers via television and radio. The GOL shall additionally undertake Information Raising & Capacity Building programmes in the Nexus between renewable energy/energy efficiency and the health care sector; and disseminate information about the successful implementation and the economic and environmental benefits of retro-fitting hospitals with energy-efficient or RE-based technologies, especially in the urban health facilities. It shall be a commitment of the GOL that by 2020, all (100%) of community, private, public and district owned health centres maternities, health institutions and hospitals shall be supplied with electricity by either grid, off-grid or standalone power systems.

11.4. ENERGY AND EDUCATION ISSUES

Women and men who have no opportunity for school during the daytime can take advantage of night literacy classes, which require electricity to function. The GOL shall prioritize all schools, colleges, training centres and educational institutions for the supply of electricity to communities.

Vocational training schools and energy technology training institutions and technician's certification and licensing programs shall be developed and supported to develop the core of technicians and professionals to operate power supply (generation, transmission, distribution and maintenance) systems at all levels.

As a priority, the GOL shall ensure that electricity providers shall supply electricity for school, school kitchens, Boarding Schools, public and private schools at relatively lower tariffs. Information and training programs for energy conservation and energy efficiency awareness principles and standards shall be taught in schools and training programs compiled for capacity building.

11.5. ENERGY AND AGRICULTURE DEVELOPMENT

Agriculture is the second largest economic earner of exports and the largest employer as the vast majority of rural population labour is engaged in agricultural and related activities. The export of natural rubber, coffee, cocoa, oil palm and other agricultural crops entails significant energy consumption for transportation, processing and other operations. Increase energy efficiency in the agricultural sector power generation using agricultural waste, bio-diesel, biomass and waste wood, for efficient resource utilization. The GOL shall promote the use of solar energy, gasifiers, steam generators and other RE technologies by agricultural units and encourage making use of solar thermal energy for the drying of fruits (solar drying) or for water heating.

11.6. REGIONAL COOPERATION

Liberia is a member of the Economic Community of West African States which is working, among others, towards greater regional cooperation in energy. In January 2004, ECOWAS approved an Energy Protocol which has undergone various ratifications in member states including Liberia. It outlines principles for cross-border energy trade and investments. Liberia has also executed the Articles of the Agreement. The Protocol provides a ready-made framework for long-term energy sector cooperation among Member States, unimpeded energy transit, and increased cross-border energy trade. The West African Power Pool and the West African Gas Pipeline present opportunities for the long-term development of Liberia's large hydropower potentials. The GOL is committed to membership in these organizations and participation in these projects. Liberia's energy potential, particularly hydropower, once fully developed, is sufficient to meet the country's domestic power needs and has a large surplus for export for many years to come. Participation in these cross-border projects will provide opportunities for electricity export to generate valuable foreign exchange on a sustained basis.

11.7. ARTICULATION WITH REGIONAL INITIATIVES

The GOL shall, in the implementation of this NEEAP communicate, align and cooperate as well as seek support from the ECOWAS regional programs for Energy Efficiency in accordance with the regional policies of ECOWAS. The ECOWAS region has a series of on-going regional policies and initiatives in the field of energy efficiency:

- The ECOWAS Energy Efficiency Policy (EEEP)
- ECOWAS Energy Efficiency Program (SEEA-WA);

- The West Africa Clean Cooking Alliance (WACCA)
- The ECOWAS Program on Gender Mainstreaming in Energy Access (ECOW-GEN)
- The ECOWAS Solar Thermal Program
- Specific EE Initiatives
 - Standards and Labelling Initiative
 - Efficient Lighting Initiative
 - Energy Efficiency in Buildings Initiative
 - High Performance of Distribution of Electricity Initiative
 - Safe, Sustainable and Clean Cooking Initiative

A summary of these regional initiatives can be found in Annex I of this Plan.

Synergies between these programs and the proposed measures in this plan will be exploited and the country will actively participate in the regional initiatives.

11.7.1. Energy Efficient Buildings Initiative

The GOL shall undertake measures in support of the energy efficient buildings initiative, which shall include but is not limited to measures to encourage the setting up of energy performance certification program for public buildings, in accordance with the ECOWAS Directive on Energy Efficiency in Buildings (EDEEB). A critical component of this measure is capacity building, and instituting energy auditing and management programs, which shall include articulation with other programs and initiatives in the ECOWAS region.

It is important to highlight here the existing problem of many informal buildings/structures especially in the urban and per-urban areas which are characterised as “slum” communities with large population densities. Supplying electricity to such communities in an efficient manner requires special attention. The GOL shall organize community energy efficiency forums for these special communities for public information and education campaign on energy efficiency and to identify specific measures applicable to such communities aimed at power loss reduction, environmental safety, and efficient operations to ensure universal access as well as energy efficiency.

11.8. POLICIES AND TOOLS ON ENERGY EFFICIENCY IN BUILDINGS

There is a need for the GOL to develop compliance benchmarks, control procedures and enforcement measures for the national implementation of the EDEEB that are tailored to the situation on the ground to ensure feasibility and effectiveness. In this regard, the following policies and tools will be applied for national implementation of EE in Buildings.

- Common general framework for the calculation of energy performance of buildings
- Minimum requirements for energy performance of new buildings
- Minimum requirements for the energy performance of existing buildings subject to major renovation and requiring planning approval
- Energy performance certification of buildings; this energy performance certification measure is to initially concentrate on large public buildings as described by the EDEEB.
- Regular inspection of air-conditioning and water heating systems in buildings; this must be accompanied by long-term training of professionals (architects, engineers, energy professionals, etc.) to be able to compute and issue energy performance certificates (EPC)

- Control systems for energy performance certificates and inspection reports

11.8.1. Capacity Building on Energy Efficiency in Buildings

- Training on energy efficiency in buildings, in order to ensure the availability of qualified staff to design, construct and operate energy efficient buildings. This includes recruiting, contracting and training qualified staff and technicians for assessment, evaluation and enforcement of building codes at various levels of buildings and community.
- Development of qualification, accreditation and certification schemes for installers of energy-related building elements.
- Capacity building and institutional strengthening for public authorities:
 - in order to ensure that public authorities make informed decisions and are in the position to conceive, develop, implement and monitor policies and programs on energy efficiency in buildings.
 - Strengthening the capability of national authorities to enforce national standards and regulations in the buildings sector.

11.8.2. Awareness Raising

- Energy efficiency in schools.
- Development of a marketing and awareness raising program: identify who are the major stakeholders, what are their main concerns and how they feel about energy efficiency programs; Carry out the program on marketing energy efficiency in buildings with actions such as:
 - Convince opinion makers to invest in their own energy efficient buildings (footballers, etc.).
 - Use the positive image of well-known personalities such as footballers or musicians, to promote energy efficiency.
 - Marketing of pilot projects that are accessible to the public.
 - Promote energy labelling of buildings to create awareness.

11.8.3. Financial Instruments for Energy Efficiency In Buildings

In order to facilitate investments in energy efficiency measures the GOL shall support activities to:

- Design and implement financial incentives for building owners at the national level.
- Provide technical assistance to key government bodies and actors in the financial sector. This includes building consumption evaluation, efficiency assessments, equipment specification, monitoring and development of internal building efficiency manpower capabilities.

11.9. ELECTRICITY DISTRIBUTION INITIATIVE

The following plans are adopted by the GOL as desirable measures to be implemented to incentivise energy efficiency in electricity distribution including but not limited to:

- **Diagnostic studies** to determine the level of losses, and identify key actions to reduce them. The Loss Reduction Program for Liberian Electricity Corporation through support from USAID PATRP program is currently in progress. This is expected to provide measures and recommended actions for loss reduction including technical and non-technical losses, as well as develop a transmission and

distribution monitoring system. This should lay the grounds for future power sector loss prevention and achieving the projected energy efficiency targets for the power generation sector.

- **Improved management practices** in power systems, notably in the field of maintenance and billing, for instance: This measure is in line with the Loss Reduction program mentioned above. In addition, the management system has been under study undertaken by the McKinley Company which has developed the various future management options for LEC operations and viability. The GOL is reviewing the various proposed options recommended by this study. Other management improvement processes shall include but are not limited to:
 - Optimised billing - for instance through pre-paid meters. The LEC has already adopted the Pre-Paid Metering scheme and is in full operation. The drawback of the current process of the pre-paid meters may be that they are contracted by ITRON Company of South Africa and so repairs and replacement of a customer's meter takes significant time under current arrangements. Other billing schemes being implemented by the LEC are in operation and are under study for further improvements as part of the Loss Reduction Program.
 - Regular inspection of grids to remove illegal, unsafe connections, and to encourage all users to become paying customers. A GIS mapping program is being introduced as part of the Loss Reduction Program and needs to be supported for full-scale implementation and application to the entire system including support for training of technicians that will operate the system.

Capacity Building: Preventive maintenance for all components of the distribution system. This includes, notably, upgrading of grids and transformers that are operating near capacity, that show signs of weakness or that are outdated and inefficient.

Awareness Raising: Build **awareness among stakeholders** of the issues, opportunities and obstacles in improving power distribution.

Financial/Fiscal Measures:

- Tariff measures to encourage power factor correction.
- Support for investment in high efficiency power system equipment that improves power quality and reduces theft.
- Improve and reduce the high tariff rate currently being implemented by LEC and other power producers in the country.

11.10. ENERGY EFFICIENCY IN THE INDUSTRIAL SECTOR

The measures undertaken in the industrial sector especially in the mining, agriculture and small-medium scale industrial enterprises must include but are not limited to the following Energy Efficiency Policies and Tools:

- Enhanced regulatory framework facilitating increased implementation of energy efficiency measures in the industrial sector, in both large as well as smaller industries.
- Implement energy management benchmarking and award programs.

- Pursue voluntary energy efficiency agreements between industry and government, through agreed upon target for energy savings, and agreements to supply excess power to adjacent communities of large industrial operations.
- Develop industrial energy database and energy consumption benchmarks:
- Develop national programs to implement an ISO-compatible Energy Management Standard (EnMS) for industry (ISO 50001):
- Undertake measurement and verification (M&V) of compliance with EnMS including establishing (voluntary) reporting programs on energy use in industry.

Capacity Building for Improving Energy Efficiency

- Providing incentives and qualify personnel for energy audits.
- Training of energy management experts from the public and private sectors.
- Training of systems optimization experts from the public and private sectors.
- Training on EE project financing for factory managers.
- Certification or accreditation schemes or equivalent qualification schemes (including, if applicable, training programs) for providers of energy services, energy audits and energy managers.

Awareness of Energy Efficiency

- Create awareness among SMEs and larger industries and policy makers of the benefits of energy efficiency in the industrial sector.
- Raise awareness on sources of financing for industrial energy efficiency and EE project financing (e.g. organise seminars and networking meetings on local sources of financing for industrial energy management and energy optimization projects).

Financial/Fiscal Mechanisms

- Adapt fiscal mechanisms and energy tariffs to encourage energy savings. These include but not limited to duty free importation of energy management equipment and soft ware, and ban of importation of incandescent light bulbs and reduction of import duties on LCLs and LCDs. Provision of loans for industries to refurbish inefficient equipment and tariff benefits for electricity saving measures.
- Assist financial institutions and banks in the creation of financial instruments for industrial energy efficiency.

12.0 STRATEGIC ROADMAP

In order for the NEEAP to successfully achieve its targets and the accompanying NREAP and SE4ALL initiatives, Liberia's power sector development must adhere to a strategic roadmap and timeline in the process for meeting the specific commitments delineated in the action plans. In this process, three strategic phases are clearly distinguished on the roadmap to the 2030 finish line.

12.1. TIMELINE FOR THE ACTION PLAN

The Government shall undertake all actions required to ensure visibility and maximum participation of all Liberian stakeholders in the implementation of the NEEAP. It is the policy of the Government to adopt an implementation timeline to serve as a reference for performance measurement in the implementation of the NEEAP and its accompanying action plans. See the timeline figure 3 for the three phases below.



Figure 3: Timeline Representation

12.1.1. Initial Kick-Off Phase

The **initial Kick-off phase** must be done through grant funding and technical managerial expertise provided by donors including USAID, Norway, Japan, EU, World Bank, etc., to develop the institutional capacity building including the provision of office equipment, training and staffing for the institutions as identified in this NEEAP; and preparation of the enabling environmental regulations, guidelines and standards. This phase is proposed to last for two years. The GOL is also committed to initiate the Kick-Off Phase by allotting an appreciable budget for the same purposes to demonstrate the GOL resolve for the NEEAP while making representation to donors for supplementary support.

12.1.2. Capacity Building Phase

The second phase is the **pilot implementation and capacity building phase**, expected to last for two years during which pilot projects for grid and off-grid as well as standalone programs are implemented at the same time other bankable projects and prospects including feasibilities and environmental considerations of projects are explored and portfolios of promotional packages developed. Road shows and bidding rounds are organized at this stage to attract credible investors, developers and entrepreneurs. Due diligence will be conducted for specific investors, companies and banking transactions. Local enterprises in the energy sector will also be identified and provided with structural and capacity building, and various mergers, linkages and partnerships of all types and sizes (local-foreign, public-private, and local-local) will be explored on the case by case basis for a full scale implementation program of the power sector action plan.

The Government will focus on developing local expertise and institutions to enable them to replicate the donor-funded managerial and technical expertise. They will be expected to sustain the programs by continuing on their own with minimum or no further donor assistance in several areas.

Other critical activities required to ensure the achievement of the targets that have been set are as follows:

Drafting and enactment of enabling legislation – Many of the policy recommendations require an enforceable legal framework and therefore, the immediate tasks have been to draft the appropriate laws

and accompanying regulations and policies and to get the Legislature to enact them at the earliest opportunity.

Setting up appropriately resourced institutions – This activity can progress in parallel with the development of detailed implementation policies, standards and regulations and other legislative work. The GOL has already established the RREA and the process of developing its technical capacity is ongoing with support from the Donor Community. With the creation of the LERC the setting up of its structures and recruiting the requisite qualified manpower with the appropriate resources is the next urgent task. The Rural Energy Fund created as part of the RREA now needs to be put into full operations. The process of fully resourcing these institutions with the skilled and experienced people is already in progress (e.g. the RREA BTG Program).

Development of energy master plans – Currently, there are donor-driven rural energy master planning activities in progress; this needs to be coordinated with the ECREEE supported NREAP-NEEAP-SE4All Action Agenda for Liberia. In addition, the LEC is also undertaking the planning of the Grid-transmission, and the WAPP CLSG project is also in full progress. The GOL is also planning for the Cross-Border project to extend its lines into central Liberia and possibly beyond. All of these planning processes must be coordinated to have the desired development impact. It is necessary to develop both grid and off-grid energy master plans, focused on both supply-side and demand-side options, in order to have an orderly and more effective national energy development program consistent with the principles and goals outlined in the NEEAP.

12.1.3. Development Phase

The third phase is the **long-term development phase**, the full-scale implementation of the realization of the action plan to the 2030 finish line. At this stage, a spectrum of actions and projects, capacity building, public awareness and training scholarships will be implemented concomitantly.

The projects and programs implemented during this phase will lead to improvements in energy access in the medium to long term. This expertise will then launch the country into the long-term development phase at which time the country expects to realize its vision of universal access to modern energy services with the participation of all Liberians. Once the system is stabilized and the economy resumes a reasonable rate of growth, the Government can look at longer-term options such as development of the country's large-scale hydropower potential, the creation of public-private partnerships for exploiting opportunities for imports and exports of electricity either directly with neighbouring countries or via the West African Power Pool, and the development of the country's other vast renewable energy resources.

12.2. MONITORING THE IMPLEMENTATION OF THE NEEAP

The Government of Liberia (GOL) is committed to the creation of EE standards and institutions with the appropriate qualified manpower capacity, institutional and legislative framework to develop, implement and enforce standards and programs for compliance by all players in the energy sector of the country.

The MLME especially the restructured DOE as specified above shall be charged with the responsibilities along with the RREA to implement the NEEAP and the measures, standards and regulations described in this action plan. The National Contact Point for Energy Efficiency (NCPEE) shall be the Energy Efficiency

Director appointed by the authorities who shall within the DOE have the authority to follow-up the National Energy Efficiency Action Plan. Monitoring indicators shall be determined by the DOE in addition to the indicators described below. The monitoring system shall be designed along the lines of but not limited to the verification and enforcement system described below.

12.2.1. Monitoring, Verification and Enforcement

This includes testing and certification, market studies, etc.

- Establish National Registries for on-grid and off-grid power consuming devices including refrigerators, air conditioners, freezers, heaters, heavy industrial electrical equipment and other lighting products, vendors and providers;
- Monitor on-grid and off-grid efficient electricity consuming appliances and lighting products at ports and markets and keep statistics of penetration rates;
- Conduct regular census of importers, wholesalers and distributors of efficient appliances, cooling, heating and lighting products;
- Conduct periodic checks on importers, wholesalers and distributors of efficient lamps and other electricity consuming appliances including but not limited to air conditioners, refrigerators, fans, heaters, and others to be decided by the implementing agency for the NEEAP;

The target group will include: importers, investors, end users, public administration, planners, architects, installers, equipment manufacturers, retailers, energy suppliers, etc. The focus sectors will include Tertiary sector (commercial and services) and Energy Suppliers

12.2.2. Performance Indicators

Key performance indicators for the desired cultural shift and success of the program will be monitored and reported, in order to track adherence to the NEEAP. Indicators will include:

- (1) On-time payment of electricity bills of Government ministries and other public corporations, agencies and commissions as well as those of individual senior Government officials;
- (2) The financial viability of the Liberia Electricity Corporation or any other public successor company in terms of profitability, improvements in billings and collections, cash management, reductions in technical and non-technical power losses, increased number of customers connected to the LEC grid and improvement in the Kilowatt hours (kWh) actually delivered to the customers, and adherence to LEC's published disconnection policy;
- (3) Operational autonomy of LEC as demonstrated by independent decision making Board of Directors and Management Team on issues such as transparent staff recruitment, selection and remuneration, and transparent procurement of goods and services,
- (4) A Liberia Electricity Regulatory Commission (LERC) will be appointed and operating on generally accepted commercial and technical practices of the industry;
- (5) Consistent quality and quantity, stability and security of electricity sold to the public;
- (6) Accuracy of meters and readings for customer billings at both wholesale and retail reduced tariff levels;
- (7) Share of power revenues received by the national treasury; and
- (8) Extension of power supply through the grid and off-grid operations throughout the country.

13.0 PREPARATION OF THE NEEAP FOR LIBERIA

This NEEAP for Liberia is being done along with the National Renewable Energy Action Plan (NREAP) and the SE4All Action Agenda, all of which have the objective of Liberia meeting the ECOWAS regional targets by 2020 and 2030. To support this planning process, ECREEE and its partners provided support for national and international experts to assist Liberia. The Liberian National Consultant, supported by ECREEE is Prof. Jacob S. Sandikie, working with a local counterpart team of professionals from the Department of Energy, MLME and the RREA. They were assisted by an international team of backstopping consultants. Other partners are also working with Liberia to support the Action Plans.

Upon completion of the final draft, and with support from ECREEE a national stakeholder validation workshop will be organized to involve public stakeholder consultation and local authorities and citizens for finalization and adoption as GOL NEEAP for Liberia.

ANNEX I – DEFINITION OF TERMS USED IN THE NEEAP

The terms described here have been organised alphabetically.

Bagasse: the fuel obtained from the fibre which remains after juice extraction in sugar processing

Biomass: biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste. The uses of biomass for energy are very diverse: from the traditional, low-efficiency burning of wood in open fires for cooking purposes to the more modern use of wood pellets for the production of power and heat, and the use of biodiesel and bio-ethanol as a substitute for oil-based products in transport.

BRT: Bus Rapid Transit Systems

Building: a roofed construction having walls, for which energy is used to condition the indoor climate; a building may refer to the building as a whole or parts thereof that have been designed or altered to be used separately; buildings' definition includes individual houses and multi-family houses, commercial buildings, public buildings.

Building envelope: it includes walls, roof, the bottom floor, windows, doors, all the elements that limits the inside and the outside of the building.

CFL: Compact Fluorescent Lamp

Charcoal: The solid residue from the carbonisation of wood or other vegetal matter through pyrolysis. The amount of biomass (usually fuel-wood) necessary to yield a given quantity of charcoal depends mostly on three factors:

- parent wood density – the principal factor in determining the yield of charcoal from fuelwood is parent wood density, since the weight of charcoal can vary by a factor of 2 for equal volumes
- moisture content - moisture content of the wood also has an appreciable effect on yields - the drier the wood, the greater is the yield - ; and
- the means of charcoal production: charcoal is produced in earth-covered pits, in oil drums, in brick or steel kilns and in retorts. The less sophisticated means of production generally involve loss of powdered charcoal (fines), incomplete carbonization of the fuel-wood and combustion of part of the charcoal product, resulting in lower yields.

Traditional non-efficient charcoal production methods: traditional charcoal production methods include open pits, oil drums and kilns with lower efficiencies. In the ECOWAS charcoal is mainly produced by traditional methods in the informal sector (e.g. open pits and kilns) which are inefficient (60-80% of the energy in the wood is lost) and has impacts on the health and on the environment.

Efficient charcoal production: efficient charcoal is the terminology used on this template for the charcoal produced by modern methods that are more efficient than traditional ones. The modern methods use sealed containers and have higher efficiencies and thus higher yields. Within the EREP, under the targets for domestic cooking, a target for efficient charcoal production is set: 60%/100% of the charcoal production should be by improved carbonisation techniques (yield >25% in 2020 and 2030, respectively. In this template the MS is asked to set out its target and trajectory for efficient charcoal production. This is calculated by dividing the quantity of charcoal produced by improved carbonisation techniques with yield superior to 25% in tonnes by the total charcoal production in tonnes.

Cogeneration (also known as combined heat and power) is the simultaneous production of electricity and process heat from a single dynamic plant.

CRSO: Collection & Recycling Service Organizations

Energy efficiency: It means the ratio of output of performance, service, goods or energy, to input of energy

Energy performance of a building: the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building, which may include, inter alia, water heating, cooling, ventilation, use of daylight, shadowing systems and components, as well as electricity consumption for lighting and other uses as computer, domestic appliances, etc. This amount shall be reflected in one or more numeric indicators which have been calculated, taking into account insulation, technical and installation characteristics, design and positioning in relation to climatic aspects, solar exposure and influence of neighbouring structures, own-energy generation and other factors, including indoor climate, that influence the energy demand;

Energy savings: means an amount of saved energy determined by measuring and/or estimating consumption before and after implementation of an energy efficiency improvement measure, whilst ensuring normalisation for external conditions that affect energy consumption

Energy efficiency: is a multidisciplinary concept which aims to increase energy savings from upstream to downstream in the energy chain. It is energy efficient to reduce energy consumption for the same type of product or service.

Energy service: It means the physical benefit, utility or good derived from a combination of energy with energy-efficient technology or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to result in verifiable and measurable or estimable energy efficiency improvement or primary energy savings

EEEP: ECOWAS Energy Efficiency Policy

Energy Intensity: energy efficiency means the ratio of energy use to economic output of goods and services. Energy intensity is generally considered to be a good macro-economic indicator of energy efficiency. It can be calculated for an entire nation, or for specific economic sectors. The unit of energy intensity is an energy unit divided by a currency value, for instance:

toe/GDP at year 2005 USD at purchasing power parity.

EREP: ECOWAS Renewable Energy Policy

Primary energy intensity: is the ratio between the Total Primary Energy Supply (TPES) and the Gross Domestic Product (GDP) calculated for a calendar year. The gross inland consumption of energy is calculated as the sum of the gross inland consumption of the different sources of energy. To monitor trends, GDP is in constant prices to avoid the impact of inflation, base year 2005.

EnMS: Energy Management System

Energy saving performance contracts (ESPCs): An energy savings performance contract is an agreement between a building owner and an energy services company (ESCO) for the identification, evaluation, recommendation, design and construction of energy conservation measures, including a design-build contract, that guarantee energy savings or performance.

Energy Service Company (ESCO): The ESCO approach combines a financial service with technical

services, thus simplifying energy savings for the user, by:

- choosing energy efficiency measures adapted to the user's needs;
- financing the purchase of necessary equipment;
- installing the equipment;
- in some cases, operating and maintaining the equipment;
- measuring the energy savings achieved, and billing the customer for a part of the savings.

Final Energy Consumption: is the total energy consumed by end users, such as households, industry and agriculture. It is the energy which reaches the final consumer's door and excludes that which is used by the energy sector itself. This includes electricity and fuels (such as oil, gas, coal, firewood etc.).

GDP: Gross Domestic Product. To monitor trends, GDP is in constant prices to avoid the impact of inflation, base year 2005.

Gigawatt-hour (GWh): 1,000,000,000 watt-hours.

Import and export: Import and export comprise quantities having crossed international boundaries.

Improved cook-stoves (also called clean/efficient cook-stoves): is a device that is designed to consume less fuel and save cooking time, convenient in cooking process and creates smokeless environment in the kitchen or reduction in the volume of smoke produced during cooking against the traditional stove; and thus addressing the health and environmental impacts associated with traditional cook-stoves. Traditional cook-stoves (open fires and rudimentary cook-stoves using solid fuels like wood, coal, crop residues and animal dung) are inefficient, unhealthy, and unsafe, and inhaling the acrid smoke and fine particles they emit leads to severe health problems and death. Traditional cook-stoves also place pressure on ecosystems and forests and contribute to climate change through emissions of greenhouse gases and black carbon.

Within the EREP targets are set for improved cook-stoves, as the pressure on the ECOWAS woodland will grow exponentially. Thus the policy includes the banning of inefficient stoves after 2020, enabling 100% of the population of the urban areas to use high efficient wood and charcoal stoves (with efficiencies higher than 35%) from 2020 onwards and 100% of the rural population to use high efficient charcoal stoves from the same date on. In this template the MS is asked to set a target for improved cook-stoves measured in terms of the % of the population that uses efficient cook-stoves. This is estimated by dividing the number of inhabitants that use improved cook-stoves by the total number of inhabitants of the country.

Informal building: Traditional buildings or buildings built without legal authorisation;

Kilowatt (kW): 1,000watts

Kilowatt-hour (kWh): 1,000watt-hours.

ktoe: thousand tonnes of oil equivalent

LED: Light Emitting Diodes

LPG: Liquefied petroleum gas

Major renovation: Renovation affecting the walls , roof and the bottom floor(for example wall insulation), the system (for instance a change of the air conditioning system) but also the addition of a new room with a useful area of more than 12 m².

Megawatt (MW): 1,000,000 watts

Megawatt-hour (MWh): 1,000,000 watt-hours

Modern fuel alternatives (for cooking): known as non-conventional or advanced fuels, these are any materials or substances that can be used as fuels for cooking, other than conventional solid fuels such as coal, fuel-wood and charcoal. These alternatives cover Liquefied petroleum gas (LPG), biogas, ethanol, solar power (e.g. solar cookers) and kerosene. In this template improved cookstoves are not considered within the modern fuel alternatives, as they are object of a separate analysis in this template.

MS: (ECOWAS) Member States

Non-technical electrical losses: in electricity distribution consist of theft and non-payment for electricity (including unpaid bills, absence of billing, billing calculation errors and accounting mistakes). Non-Technical losses are caused by actions external to the physical power system.

Purchasing power parities (PPPs): are the rates of currency conversion that equalise the purchasing power of different currencies by eliminating the differences in price levels between countries

REDD+: Reducing Emissions from Deforestation and Forest Degradation (REDD) is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. "REDD+" goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

Solar cookers: or solar oven is a device which uses the energy of direct sun rays (which is the heat from the sun) to heat, cook or pasteurize food or drink.

Solar thermal: use of solar thermal energy to produce heat, for instance for produce hot water, or to provide cooling services;

Technical losses in power system are caused by the physical properties of the components of the power system. The most obvious example is the power dissipated in transmission lines and transformers due to internal electrical resistance. Technical losses can be divided into transmission losses, occurring in the high voltage part of electricity grids, and distribution losses, occurring between the last power sub-station and the user's meter.

toe: tonnes of oil equivalent

Total Primary Energy Supply (TPES) is made up of: Indigenous production + imports - exports - international marine bunkers - international aviation bunkers +/- stock changes.

UNEP-GEF en.lighten initiative: The United Nations Environment Program (UNEP)-Global Environment Facility (GEF) en.lighten initiative was established in 2009 to accelerate a global market transformation to environmentally sustainable, energy efficient lighting technologies, as well as to develop strategies to phase-out inefficient incandescent lamps to reduce CO₂ emissions and the release of mercury from fossil fuel combustion. The en.lighten initiative serves as a platform to build synergies among international stakeholders; identify global best practices and share this knowledge and information; create policy and regulatory frameworks; address technical and quality issues; and encourage countries to develop National and/or Regional Efficient Lighting Strategies.

USD: US Dollars

Useful floor area: floor area of dwellings measured inside the outer walls, excluding cellars, non-habitable attics and, in multi-dwelling houses, common areas

VAC system: the equipment, distribution systems and terminals that provide, either collectively or individually the processes of ventilating or air conditioned to a building or a portion of a building

VAT: Value Added Tax

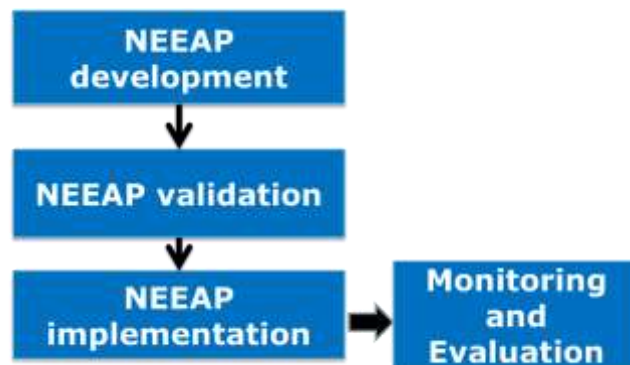
WACCA: West African Clean Cooking Alliance

Watt-hour (Wh): a measure of electric energy equal to the electrical power multiplied by the length of time (hours) the power is applied

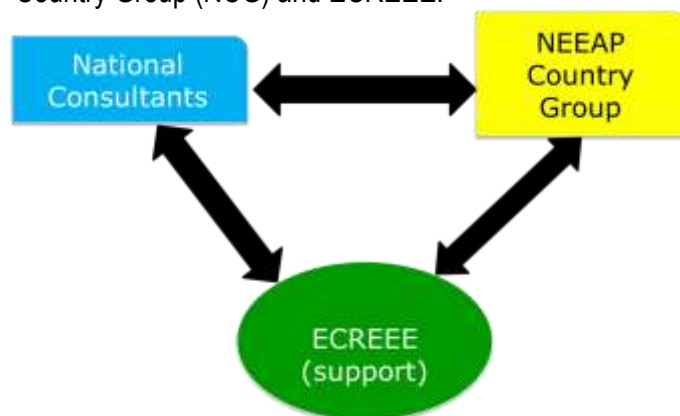
The purpose of the template is to aid ECOWAS countries in developing NEEAPs that are complete and cover all the recommendations defined in the EEEP. Use of this template will aid ECOWAS countries in developing plans that are comparable with each other. This will aid in monitoring the progress towards achievement of the EEEP targets, which ECOWAS countries will report in the future, through reports on implementation.

Additional information can be provided either in the prescribed structure of the Action Plan or by including annexes.

The main steps in the NEEAP process are outlined in the figure below. As part of the monitoring and verification.



The NEEAP will be developed as a collaborative and mutually supportive effort between the national consultants, the NEEAP Country Group (NCG) and ECREEE.



The NEEAP template considers national actions both at the level of the ECOWAS energy efficiency initiatives as well as at the level of energy consumption sectors. As guidance, the following matrix presents in an indicative manner the relationships between the EE initiatives and the different sectors considered here. Measures within a given initiative can encompass several sectors (e.g. EE Lighting or EE buildings cutting across residential, commercial/services and public sector). In their turn, measures in a given sector (e.g. residential) could encompass several initiatives.

	EE Lighting Initiative	EE Standards and Labeling Initiative	EE Buildings Initiative	High performance electricity distribution initiative	Safe, affordable, clean and sustainable cooking initiative
Residential sector	X	X	X	X	X
Tertiary sector (commercial and services)	X	X	X	X	X
Industrial sector	X	X	X	X	
Transport sector					X
Public sector	X	X	X	X	
Energy supply	X		X	X	
Other sectors					

ANNEX II - REGIONAL INITIATIVES AND ACTIONS IN ENERGY EFFICIENCY

1. ECOWAS ENERGY EFFICIENCY PROGRAM

The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) initiated the ECOWAS energy efficiency program by soliciting financial support from the European Union (EU). The EU sponsored program is dubbed Supporting Energy Efficiency for Access in West Africa (SEEA-WA). The SEEA-WA project is contributing to access to energy services in West Africa, through a regional program to improve energy efficiency. The project aims to overcome the technical, financial, legal, institutional, social, gender and capacity related barriers that hinder the implementation of cost effective energy efficiency (EE) measures and systems.

SEEA-WA focuses on the special interests and realities of poor women and men in urban and rural areas. Based within the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), SEEA-WA seeks to combine improved energy efficiency with ongoing work on renewable energy sources, in order to broaden energy access.

SEEA-WA OBJECTIVES

The overall objective of SEEA-WA is to improve framework conditions for access to energy services, by supporting the creation of a regional program on governance, related to energy efficiency and access.

The specific objective is to:

- Aid the Development of policies and regulatory frameworks necessary for the adoption of energy efficiency measures;
- Raise the awareness of policy makers, regarding the commercial actors in the key energy value chains.
- Build capacity at the regional and national level to facilitate implementation of the key energy efficient technologies.

2. SEEA-WA DESCRIPTION

2.1 Framework conditions:

SEEA-WA aims to support ECOWAS national authorities in creating a conducive regulatory and business environment to encourage women and men to adopt energy savings. Project team members will aid in choosing among the wide variety of possible policy tools (standards and labelling, regulations, educational tools, fiscal and tariff tools, special purpose EE financial tools, etc.) those that would be applicable and effective in the West African context.

Raising Awareness:

Many energy efficiency measures pay for themselves, through savings on energy bills. Capturing this potential for savings requires decisions by a myriad of individuals, organizations and businesses. The awareness raising aspect of SEEA-WA will reach out, on the one hand, to the commercial actors of the key energy value chains – the stove builders and charcoal producers, the electric appliance importers and sellers, the power utilities, the home builders – and on the other hand, to the women and men who use energy and make the decisions on purchasing (or producing themselves) the major energy using devices.

- SEEA-WA Project Technical Implementation Strategy: Work with competence Centres in West Africa to build capacity at the regional and national level in the implementation of the key energy efficient technologies.
- Encourage exchange of experience and the flow of information among energy practitioners in West Africa.
- Organize focused training on the areas designated by national authorities, bringing in high level regional and international expertise.

Regional action on energy efficiency will benefit both the minority in West Africa who currently have access to modern energy but are faced with high prices and unreliable services, as well as the majority, for whom gaining access to affordable modern energy depends on reducing costs so as to make access programs economically viable.

2.2. Main Activities:

- Energy Efficiency stock taking, diagnosis in ECOWAS countries.
- Regional level institutional capacity building, knowledge sharing.
- National level institutional capacity building, knowledge sharing, institutional change.
- Development of ECOWAS EE White Paper.
- Formulating gender-sensitive energy efficiency policies and programs.

2.3. Content and visual identity:

- Carry out national campaigns focused on key intermediaries.
- Carry out regional and national media campaign focused on general public.
- Regional and national capacity building on technical issues.
- Regional and national financial tools.

2.4. SEEA-WA Actions

2.4.1. Actions at the National Level

- Identification of a national Competence Centre for Energy Efficiency
- Stock taking of the current EE situation in the countries
- Supporting the identification and development of concrete EE actions
- Targeted Capacity Building

2.4.2. Actions at the Regional Level

- Energy Efficiency White Paper
- Development of policy tools (e.g. labels and standards)
- Establishment of a network (Exchange of information, best practice and lessons learned)
- Regional trainings on specific issues

3. THE EE POLICY (EEEP) AND TARGETS

The ECOWAS Center for Renewable Energy and Energy Efficiency (ECREEE), under the SEEA-WA project elaborated the ECOWAS Energy Efficiency Policy and set regional targets for energy efficiency measures in ECOWAS Member States. This policy has been adopted by the Heads of Government and authority of the ECOWAS Member States.

The ECOWAS Energy Efficiency Policy seeks to contribute to creating a favorable environment for private investments in energy efficiency, and spurring industrial development and employment through reduction of energy bills. Energy efficiency is considered as an integral part of the modernization and greening of West African economies. The policy aims to implement measures that free 2000 MW of power generation capacity and in the long term, more than double the annual improvement in energy efficiency, so as to attain levels comparable to those of world leaders. In effect, the amount of energy needed to produce a certain amount of goods and services would decrease by about 4% annually.

The specific targets of the regional energy efficiency policy are:

1. Phase out inefficient incandescent lamps by 2020;
2. Reduce average losses in electricity distribution from the current levels of 15 - 40% to the world standard levels of below 10%, by 2020;
3. Achieve universal access to safe, clean, affordable, efficient and sustainable cooking for the entire population of ECOWAS, by 2030;
4. Adopt region-wide standards and labels for major energy equipment by end of 2014;
5. Develop and adopt region-wide efficiency standards for buildings (e.g. building codes);
6. Create instruments for financing sustainable energy, including carbon finance, by the end of 2013, and in the longer term, establish a regional fund for the development and implementation of sustainable energy projects.

3.1. The Policy Answer

- Adoption of the White Paper on Access to Energy in 2006
- Creation of ECREEE in 2007: ECOWAS Centre for Renewable Energy and Energy Efficiency
- The SEEA-WA project - financed by the ACP-EU Energy Facility, UNDP, ADEME - supported the development of a regional Energy Efficiency Policy. Approved in 2012 by the region's Heads of State.

3.2. The Policy Targets

A process that was initiated at the first meeting of the Regional Multi-sector Group (Bamako, May 2005) led to the adoption by ECOWAS-UEMOA Heads of State (Niamey, January 2006) of a strategy for improved access to energy services: the "White Paper for a Regional Policy For Increasing Access to Energy Services For Populations in Rural and Peri-Urban Areas in Order to Achieve the Millennium Development Goals". The White Paper contains the following ambitious numerical targets for access to modern cooking fuel, to mechanical power for productive activities, and to electricity:

- 100% access to a modern cooking fuel;
- 60% access in rural areas to productive energy services in villages, in particular mechanical power to boost the productivity of economic activities;
- 66% access to an individual electricity supply;
- 60% of the rural population will live in localities with:

- modernized basic social services - healthcare, drinking water, communications, lighting, etc;
- access to lighting, audiovisual and telecommunications service, etc.;
- The coverage of isolated populations with decentralized approaches.

4. THE ECOWAS PROGRAM ON GENDER MAINSTREAMING IN ENERGY ACCESS (ECOW-GEN)

In 2013, the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) launched a flagship program entitled ECOWAS Program on Gender Mainstreaming in Energy Access (ECOW-GEN). The program was established against the background that women's potential, in the ECOWAS region, as producers and suppliers of energy services is under-utilized and that empowering women to make significant contributions in the implementation of the adopted regional renewable energy and energy efficiency policies is necessary for the achievement of the Sustainable Energy for All (SE4ALL) goals in West Africa. Moreover, the program is founded upon the principles of the ECOWAS Gender Policy which emphasizes the "need to develop policies and programs to provide alternative energy sources which would contribute to women's health and also alleviate their time burden".

To stimulate the development of women-led business initiatives in the energy sector, ECREEE, through the support of the Spanish Agency for International Cooperation and Development (AECID), established the ECOWAS Women's Business Fund. ECREEE will work with Member States to identify and support, through the fund, innovative energy projects implemented by women groups and associations. In addition to this, ECREEE will assist Member States to establish similar funds in their respective

5. THE ECOWAS SOLAR THERMAL PROGRAM

The overall goal of the Solar Thermal Program (SOLTRAIN) in West Africa is to contribute to the switch from a fossil fuel based energy supply to a sustainable energy supply system based on renewable energies in general but based on solar thermal in particular. The overall project will be coordinated by ECREEE and technically implemented by AEE INTEC in cooperation with 8 institutional project partners from 7 West African countries (Cape Verde, Nigeria, Burkina Faso, Ghana, Mali, Senegal, Niger and Sierra Leone).

The ECOWAS solar thermal capacity building and demonstration program therefore aims to remove existing awareness, political, technological, and capacity related barriers which restrict solar thermal energy deployment in ECOWAS countries. The program will also contribute to increase the grid stability and save national power reserves as solar thermal systems will significantly reduce the stress on electric grids due to the shift from electricity to solar energy. The program links precisely to the goals of the regional policies on Renewable energy and energy Efficiency adopted by the ECOWAS Authority of Heads of State and Government in 2013. The regional policies considered solar thermal as a least cost sustainable energy technology and set specific targets for its use to meet sanitary and industrial hot water needs in the region.

The goals of SOLtrain West Africa are:

- Capacity Building by theoretical and practical Train-the-trainer courses to selected universities and polytechnic schools in the area of solar water heating and solar thermal drying
- Identify, monitor, analyze and improve existing solar thermal systems together with the partner institutions (practical training).
- Technical support of local producers.
- Design and Install solar thermal systems on the partner institutions for teaching and demonstration purposes.

- The partner institutions will offer trainings to national companies, installers, producers and further training institutions within their countries.
- Installation of 200 Demonstration systems at social institutions as schools and hospitals engineered by the partner institutions and installed by national practitioners
- Trainings to administrative, political and financial stakeholders in each country
- Solar thermal testing facility in one of the countries

The program will run from 2015 until 2018 and will strengthen the capacity of national actors and of existing partner institutions dealing with solar thermal energy such as polytechnic schools and universities in all 15 ECOWAS Member States.

6. PROSPECTS FOR THE FUTURE

To be able to achieve these policy targets, specific initiatives have been put in place in order to define the future prospects and the way forward for EE in the region. The step-by-step implementation of these initiatives is described below.

6.1. Specific EE initiatives

The policy elaborates specific programs that have been earmarked to achieve the ECOWAS EE. These programs are classed into (6) priority initiatives namely:

- Standards and labeling
- Efficient Lighting,
- High performance of Distribution of Electricity,
- Energy Efficiency in Buildings,
- Safe, Sustainable and Clean Cooking,
- Financing Sustainable Energy.

7. STANDARDS AND LABELING

The main components of the ECOWAS energy efficiency Standards and Labeling initiative are as follows:

- Regional cooperation on the development and implementation of ECOWAS regional standards and labels for energy using equipment (lighting, refrigerators, air conditioners, motors, cooking etc.) and coordination with international standards development, for example with clean cookstoves;
- Regional cooperation on the development and implementation of legislative, regulatory and other energy efficiency policies and tools such as product efficiency rating systems, the definition of multiple tiers of product performance and standardized testing and certification of equipment to verify performance and accuracy of labeling;
- Awareness raising for national authorities, manufacturers and the general public
- Capacity building of main stakeholders and training and qualification of staff
- Development and implementation of financial instruments to support the implementation of ECOWAS standards and labels. This refers both to securing funding for development and implementation of the S&L initiative and to the introduction of financial incentives to promote the adoption of efficient energy using equipment by end-users.

7.1. Key Actions on Standards and Labeling at Regional and National Levels

The main activities to be conducted in the framework of the ECOWAS energy efficiency standards and labeling initiative are listed as preparatory phase, design and development phase and implementation phase. This document will detail the implementation phase actions to enhance development of the various National Energy Efficiency Action Plans.

(See Sub-Annex 1a for standards and labeling implementation phase actions **)**

8. EFFICIENT LIGHTING

To ensure effective and self-sustaining transition to efficient lighting in all ECOWAS countries, a cohesive set of national and regional actions regarding on-grid and off-grid lighting have been designed for implementation in these countries. These actions cover the four parts of the integrated policy approach:

- Minimum Energy Performance Standards (MEPS);
- Supporting Policies and Mechanisms (SPM);
- Monitoring, Verification and Enforcement (MVE); and
- Environmentally Sound Management (ESM).

The scope and depth of these actions will vary from country to country depending on whether the country has: i) many or intensive MEPS/SPM/MVE/ESM activities underway or planned; or ii) some MEPS/SPM/MVE/ESM activities underway or planned; or iii) no MEPS/SPM/MVE/ESM activities.

In order to meet the objectives of this Strategy, it is intended that energy efficiency interventions will be implemented through a phased approach. The timing of the three Phases is as follows:

- Phase 1: July 2014 to December 2015;
- Phase 2: January 2016 to December 2016;
- Phase 3: January 2017 to December 2020

The key activities under the four thematic areas of the Strategy are summarized as follows:

8.1 Minimum Energy Performance Standards – Key Activities

- Conduct national consultations with policy makers and other stakeholders on the Harmonized MEPS of on-grid and off-grid efficient lamps
- Pursue the process of the ECOWAS Standards Harmonization Model (ECOSHAM) to adopt and publish ECOWAS Harmonized MEPS of on-grid and off-grid efficient lamps
- Adopt ECOWAS Harmonized MEPS of on-grid and off-grid efficient lamps (by each ECOWAS Member Country) and publish in national official journal.

Through stakeholder consultations, the Thematic Working Group on Minimum Energy Performance Standards developed Minimum Energy Performance Standards for Mains-Voltage General Lighting Service Lamps and Minimum Energy Performance Standard for Off-Grid Lighting Products. The key requirements under the Minimum Energy Performance Standards for Mains-Voltage General Lighting Service Lamps include:

Lamp Efficacy – lamps must have a minimal efficacy, measured in lumens per watt (lm/W) of the following:

Rated Lamp Wattage LP (W)	Minimum Efficacy (lm/W)
LP < 5	40
5 ≤ LP < 9	45
9 ≤ LP < 15	50
15 ≤ LP < 25	55
LP ≥ 25	60

- Lamp Lifetime – lamps shall have a rated lamp lifetime of 6000 hours or more, as measured according to the appropriate IEC test standard.
- Power Fluctuation Tolerance – lamps shall be able to operate within a voltage range of 160-260V.
- Power Factor – lamps shall have a power factor that is no less than the values shown

Rated Lamp Wattage	Minimum Power Factor
<25W	≥ 0,50
≥25W	≥ 0,90

- Light Quality – lamps shall achieve a color rendering index (Ra) of 0.80 or higher.
- Lamp Mercury Content – lamps shall contain no more than 2.5 mg of mercury.

The key requirements under the Minimum Energy Performance Standard for Off-Grid Lighting Products include:

- **Lumen Maintenance** –the light output of the product shall be ≥ 85% of specified light output at 2,000 hours AND ≥ 95% of specified light output at 1,000 hours(depreciated at highest setting) (draft)
- **Durability and Quality** – the off-grid lighting product must comply with the following quality standards:
- **Charger** – any included AC-DC charger must carry approval from an accredited consumer electronics safety regulator.
- **Battery** – must be protected by an appropriate charge controller that prolongs battery life and protects the safety of the user. No battery may contain cadmium or mercury at levels greater than trace amounts.
- **Water Protection**
 - Portable Separate Systems: IP x1
 - Portable Integrated System: IP x3
 - Fixed (outdoors) Integrated System – permanent outdoor exposure: IP x3
 - All PV Modules - permanent outdoor exposure: IP x3 AND circuit protection
- **Brightness** – At least one lighting level, which defines the “specified light output” in subsequent testing, must meet one of the following criteria:
- Light Output must be greater than 25 lumens or greater than 50 lux over an area of 0.1 m² under test conditions described in IEC TS 62257-9-5.

8.2 Supporting Policies and Measures – Key Activities

- Inform consumers, policy makers and other stakeholders of the advantages of efficient lighting products over the traditional lighting products – on radio, television, at public fora organized in various public places such as lorry stations, sponsored events at community centres, under the sponsorship of the traditional leaders (chiefs, elders and opinion leaders)

- Distribute free on-grid and off-grid efficient lighting products or at subsidised cost to carefully selected communities (with retrieval and destruction of replaced incandescent lamps)
- Implement of social housing projects fully equipped with efficient lighting
- Implement financing schemes to cover the upfront cost of efficient lighting products (e.g., on-bill financing)
- Implement harmonized mandatory labelling and certification for on-grid and off-grid efficient lamps in all ECOWAS countries

8.3. Monitoring, Verification and Enforcement – Key Activities

- Establish National Registries for on-grid and off-grid lighting products
- Monitor efficient on-grid and off-grid lighting products at ports and markets of ECOWAS countries
- Establish a Regional Test Laboratory for on-grid and off-grid efficient lighting; ensure this laboratory has international accreditation
- Establish National Test Laboratories for on-grid and off-grid efficient lighting or strengthen selected existing national laboratories; ensure this laboratory has international accreditation
- Make importers, wholesalers and distributors of efficient lamps and their customers aware of penalties for non-compliance of standards and labelling requirements

8.4. Environmentally Sound Management – Key Activities

- Create public awareness of the environmentally sound disposal of on-grid and off-grid efficient lamps and batteries
- Develop and adopt national regulation for environmentally sound disposal of spent on-grid and off-grid efficient lamps and batteries
- Develop and implement national collection systems established for spent on-grid and off-grid efficient lamps and batteries
- Develop and establish commercially viable recycling and disposal facility for spent on-grid and off-grid efficient lamps and batteries

9. ENERGY EFFICIENCY IN BUILDINGS

The Energy Efficiency in buildings has a policy and regulation prepared on the ECOWAS Directive on Energy Efficiency in buildings and submitted at the ECOWAS Energy Ministers meeting for approval.

9.1. General Activities of national interest

Other activities that could be incorporated into different national actions include:

- Identifying and analysing the real energy data consumption of buildings in ECOWAS countries in order to propose reference values on energy consumption, and also prepare regional standards and labelling for energy performance of buildings;
- Specifying the contents of existing building codes and legislations on energy efficiency in buildings in the 15 ECOWAS;
- Individual countries to revise or develop building codes and legislations on energy efficiency in buildings in order to transpose the regional directive into National building codes;
- Carrying out pilot projects of energy performance construction in countries (for example construction of bioclimatic schools showing experiences and local materials)

9.2. National training programs on EE in Buildings

- Train the trainer on thermal calculations tools and energy performance of buildings.
- Train the trainer for best building /construction practice and for energy audits in buildings

10. HIGH PERFORMANCE OF DISTRIBUTION OF ELECTRICITY

Electricity distribution systems are by nature local. It is however worth noting that, in some countries, cross border distribution can be advantageous. This means that the solutions adopted must be implemented by a local distribution company with the aid and cooperation of national authorities and international partners. While the actions to be carried out are local, WAPP and ECREEE can provide regional support to facilitate national action. The "Alliance for High Performance Distribution of Electricity" which brings together the activities of ECREEE and WAPP aims to provide this support through the following actions:

- Facilitating sharing of experience and best practices among West African distribution companies.
- Carrying out regional capacity building programs.
- Facilitating the sharing of human and technical resources among West African distribution companies.
- Creating a data base, through cooperation between WAPP and the ECREEE Energy Observatory, on the state of the electricity sector in the ECOWAS countries, including production, losses, tariffs, etc.
- Creating awareness among national political leaders on the issues, opportunities and obstacles to improving power distribution, through high level political events at the regional level.
- Creating a large West African market in high performance distribution equipment, so as to lower costs, through regional standards for equipment.
- Fostering regional production of high performance distribution equipment, to feed a regional market.
- Supporting the creation of a West African research network for power distribution, adapted to West African conditions.
- Facilitating financing of national upgrading programs, through regional meetings with development and finance partners.

11. SAFE, SUSTAINABLE AND CLEAN COOKING

11.1 Policy and Regulatory Framework

The Policy and Regulatory Framework on clean cooking calls for the development and adoption of national cooking policies, strategies, and targets, including, legal and regulatory mechanisms, in line with the existing ECOWAS regional policies and the SE4ALL initiative. It aims to reach market transformation towards modern and alternative fuels and efficient devices to reduce health and environmental impacts of traditional fuel use on the people.

11.2 Regional Initiatives to Support National Actions

The regional initiatives target the development of a national action plans for clean, safe, efficient and affordable cooking energy solutions including an assessment of the current situation (framework conditions/barriers, cooking habits, market for clean cook stoves, producers etc.), as well as targets and strategies to reach these targets.

A national action plan could be developed around the following intervention logic:

- Enhancing demand

- Strengthening supply
- Fostering an enabling environment
- Support the promotion of market-based solutions (including the private sector, NGOs, community-based organizations and microfinance organizations) and the enhancement of market mechanisms.
- Support the build-up of participatory, integrated institutional approaches, where communities play a key role. Community-based strategies can be helpful along the whole value chain from community-managed forests through modern supply channels and more efficient end-user equipment

11.3. Possible measures to develop LPG programs include, among others:

- Modernizing regulatory frameworks
- Formally adopting of international quality and safety standards
- Improving roads and port infrastructure and reducing port congestion
- Communicating information widely to the public in nontechnical language, specifically, address perception of high risk of LPG use for cooking in households
- Facilitating operator training
- Monitoring to discourage commercial malpractice as well as raise public awareness
- Offer incentives to encourage private LPG retail/service companies to build up distribution network and retail outlets
- Developing financial schemes such that LPG marketers can offer micro-finance schemes, and can lower barriers to LPG selection by making it easier to finance cylinder deposit fees and stove purchases

The specific objectives of the safe and sustainable cooking initiatives include:

a) Creating a self-sustaining entrepreneurial network of rural micro-enterprises for delivery of improved biomass fuels. Measures to achieve this objective could be, among others:

- Conducting training courses for new entrepreneurs wherever required
- Conducting refresher courses for successful entrepreneurs

b) Promotion and marketing activities, e.g. village level awareness camps and programs organised to create marketing opportunities for the new enterprises

- Ensuring quality of the products through continuous monitoring and evaluation
- Encouraging local banks and financing institutes to support the new businesses

c) Establishing the use of improved biomass fuels as a common practice for rural households by:

- Strengthening and expanding PSFM in production forest areas: support the development of strategic partnerships and collaborative arrangements with national institutions and Non-Profit Associations, regional and international agencies.
- Ensuring community engagement in PSFM and village livelihood development
- Pilot forest landscape management: develop methodologies and frameworks for forest landscape management
- Enabling a legal and regulatory environment (especially forest law) For example:
- Assessment of national REDD+ potential

- Development of a REDD+ Strategy, including assessments such as: forest conservation and use, agriculture, energy, livelihoods, rural economy, biodiversity & ecosystem services, development issues etc.
- Development of criteria & guidelines for the development of REDD+ pilot projects
- Undertake assessment of environmental and social issues and risks: identify major potential synergies or inconsistencies of country sector strategies in the forest, agriculture, transport, or other sectors with the envisioned REDD+ strategy

d) Establish a monitoring system for the fuel wood value chain in order to prevent uncontrolled deforestation and guarantee sustainable forest management.

Examples:

- Involve women in the conceptualization, development and implementation of energy policies, projects and programs as much as possible
- Produce promotional messages to address the gender issue and attempt to form partnerships with women's groups (or NGOs in the area)
- Develop programs to train young women to produce, operate and maintain equipment on their own
- Develop and implement gender-responsive national policies and programs on clean and efficient cooking
- Economic empowerment of women through their increased involvement in the cooking energy value chains
- Capacity building of policy makers and practitioners to integrate gender in their cooking energy policies and programs
- Integration of gender indicators in all baseline studies
- Conduct gender analysis of business models to evaluate economic implications for women in the value chain as well as social benefits and barriers for women related to different production modes
- Development of practical guidelines for mapping gender in the cooking energy value chains
- Gender integration in marketing and awareness raising messages at regional level to ensure that women and men are targeted and to ensure the content is gender sensitive

12. THE WEST AFRICAN CLEAN COOKING ALLIANCE-WACCA

The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) initiated a regional Cooking Energy initiative called West African Clean Cooking Alliance (WACCA). It was officially launched during the ECOWAS High Level Energy Meeting in Accra, Ghana, on 30 October 2012. The overall objective of the initiative is to provide access to clean, safe, efficient and affordable cooking energy in the entire ECOWAS region. The principal goal of the initiative is to improve living conditions (economic, social and health) of the population of ECOWAS countries through an increased access to cleaner and more efficient cooking fuels and devices, sustainable biomass and modern fuels, while reducing local (deforestation) and global (greenhouse gases emissions) environmental impacts. The WACCA objectives are in line with the overall objective of ECREEE to promote energy access, renewable energy and energy efficiency within the ECOWAS region and thus by 2020, 60% of the population and by 2030, the entire ECOWAS population shall have access to clean, safe, efficient and affordable cooking energy.

At regional level, WACCA is set to build upon existing interventions on the various fuels and technologies, accumulate and share knowledge on the available existing technologies and technical approaches. WACCA will facilitate the adoption of standards for cooking technologies in accordance with international agreements as developed under the Global Alliance for Clean Cookstoves (GACC) and through that,

enhance and complement activities implemented in the framework of the ECOWAS Regional Program on Sustainable Energy for All (SE4ALL) through the use of Renewable Energy (promotion of alternatives of Fuel-wood) and Energy Efficiency (ECOWAS Initiative on Standards and Labelling). The capacities for research and policy development on guidelines for the value chain of cooking fuels (wood, charcoal, LPG, bio-ethanol, etc.) will be strengthened and a consistent system for monitoring and evaluation in accordance with other monitoring and evaluation systems will be developed at regional level.

At national level, WACCA will assist in mapping the existing initiatives on fuel and cooking equipment and updating national strategies for cooking energy. Through the evaluation of solutions and bottlenecks, the initiative will enable the development of approaches for the local production of equipment and fuels and market development for technologies and fuels. Key elements of the initiative will be development of clean cooking strategies, capacity development, and implementation of awareness campaigns and establishment of financing mechanisms.

Agencies and organizations working together with ECREEE include:

- ETC-Energia,
- Global Alliance for Clean Cookstoves (GACC)
- Austrian Energy Agency (AEA)
- GERES,
- GIZ and
- ICEED

SUB-ANNEX 1A: STANDARDS AND LABELING ACTIONS

Step	Description	Priority	Resource Needs
1	Implementation of core activities		
1.1	Conduct training and informational workshops to educate and build capacity among stakeholders. For instance: - Training workshops to build capacity on standards and labelling in the national standards bodies and energy authorities - Training workshops in certification procedures, compliance monitoring, and enforcement programs. - Training of importers, retailers and other relevant stakeholders such that they actively support the initiative.	H	H
1.2	Initiate the Institutional Development Plan.	H	H
1.3	Initiate the Monitoring, Verification, and Enforcement Plan.	H	M
1.4	Initiate the Monitoring & Evaluation Plan	H	M
1.5	Initiate the Communications Plan and launch awareness campaigns	H	H
2.0	Product Policy Implementation		
2.1	Assess international product definitions, test protocols, rating schemes, performance level definitions, certification procedures, technical analyses, and data sources for use as a baseline in development of S&L policy for the selected product category	H	L

2.2	Collect additional market data and baseline usage and performance data for the selected product category, as necessary to inform a decision on efficiency performance levels, for instance through field surveys (e.g. end-use metering studies) and laboratory testing	H	H
2.3	Development of minimum energy performance standards (MEPS) for selected products on the basis of market analysis and international benchmarking	H	M
2.4	Organize a series of in-person stakeholder meetings for the selected product category to discuss proposed efficiency requirements, collect feedback, and encourage institutional buy-in.	H	L
2.5	Adopt or develop a test method for evaluating energy performance of the selected product. Take steps to harmonize with international test methods, to the extent that such standards are available, applicable for use in the region, and can help to expedite the policy development process	H	L
2.6	Finalize requirements for certification and regional recognition of qualified products	H	L
3.0	Implementation of complementary activities		
3.1	Development of supporting government activities to increase the effectiveness of energy efficiency standards and labels, such as government promotion of the program, inclusion into government procurement policy and publication of lists of current models on the market	M	L
4.0	Financing of implementation of the S&L initiative		
4.1	Explore options for technical assistance and develop proposals for potential donors in order to secure funding for implementation of the S&L	H	L
Notes: H=High, M=Medium, L=Low			