



SUSTAINABLE
ENERGY FOR ALL

**SIERRA LEONE
SUSTAINABLE ENERGY FOR ALL
(SE4ALL)
COUNTRY ACTION AGENDA**

July 30th, 2015

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ABBREVIATIONS AND ACRONYMS

AA	Action Agenda
AfP	Agenda for Prosperity
AfDB	African Development Bank
AU	African Union
BEFS	Bioenergy and food security project
BKPS	Bo-Kenema Power Services
BHP	Bumbuna Hydro Power
BSL	Bank of Sierra Leone
CESG	Cooking Energy Stakeholder Group
CFL	Compact Fluorescent Lamp
CRSOs	Collection & Recycling Service Organisations
CSP	Concentrated Solar Power
DoE	Directorate of Energy
Disco	Distribution Company
EA	Energy Access

ECREEE	ECOWAS Commission for Renewable Energy & Energy Efficiency
ECOWAS	Economic Community of West African States
ECOW-GEN	ECOWAS Programme on Gender Mainstreaming in Energy Access
EDEEB	ECOWAS Directive on Energy Efficiency in Building
EDSA	Electricity Distribution and Supply Authority
EE	Energy Efficiency
EEEP	ECOWAS Energy Efficiency Policy
EFA	Environmental Foundation for Africa
EFO	Energy for Opportunity
EGTC	Electricity Generation and Transmission Company
EIA	Energy Information Administration
EIB	European Investment Bank
EnMS	Energy Management System
EPA	Environmental Protection Agency
EREP	ECOWAS Renewable Energy Policy
ESHIA	Environmental, Social, and Health Impact Assessment
ESM	Environmentally Sound Management
EU	European Union
EUEI-PDF	European Union Energy Initiative-Partnership Development Facility
EWRC	Electricity and Water Regulatory Commission
FDI	Foreign Direct Investments
FAO	Food and Agriculture Organization
FIT	Feed-in -Tariff
GDP	Gross Domestic Product
GDR	Generation Disclosure Requirement
GEF	Global Environmental Facilities
Genco	Generation Company
GIZ	German Technical Cooperation

GOSL	Government of Sierra Leone
GTF	Global Trust Fund
GTI	Government Technical Institute
GWh	GigaWatt hour
IAEA	International Atomic Energy Agency
ICT	Information Communication Technology
ICS	Improved Cookstove
IEA	International Energy Agency
IIASA	International Institute for Applied Systems Analysis
IPP	Independent Power Producers
IRENA	International Renewable Energy Agency
IRP	Integrated Resource Plan
Kv	Kilovolt
FY	Fiscal Year
LDC	Least Developed Country
LED	Light Emitting Diodes
LPG	Liquefied Petroleum Gas
MAFFS	Ministry of Agriculture Forestry and Food Security
MEPS	Minimum Energy Performance Standard
MDAs	Ministries, Departments, Agencies
MDG	Millennium Development Goals
M&E	Monitoring and Evaluation
MoE	Ministry of Energy
MFP	Multifunctional Platforms
MoFED	Ministry of Finance and Economic Development
MoEST	Ministry of Education Science and Technology
MoJ	Ministry of Justice
MoLCPE	Ministry of Land Country Planning & Environment

MoLGRD	Ministry of Local Government and Rural Development
MoHS	Ministry of Health and Sanitation
MoU	Memorandum of Understanding
MRU	Mano River Union
MTA	Ministry of Transport and Aviation
MTI	Ministry of Trade and Industry
MV	Monitory & Verification
MVE	Monitory, Verification & Enforcement
MW	MegaWatt
MWR	Ministry of Water Resources
NGOs	Non-Government Organizations
NREP	National Renewable Energy Policy
NREAP	National Renewable Energy Action Plan
NPA	National Power Authority
O&M	Operation and Management
PBF	Public Benefit Fund
PFM	Public Financial Management
PRSP	Poverty Reduction Strategy Paper
PSFM	Participatory and Sustainable Forest Management
PPPs	Public-Private-Partnerships
PTC	Production Tax Credit
PV	Photo Voltaic
R&D	Research and Development
RE	Renewable Energy
RES	Renewable Energy Resources
RET's	Renewable Energy Technologies
SDG	Sustainable Development Goal
SE4ALL	Sustainable Energy for All

SEEA-WA	Supporting Energy Efficiency for Access in West Africa
SLCC	Sierra Leone Chamber of Commerce
SLE	Sierra Leone
SLIEPA	Sierra Leone Investment and Export Promotion Agency
SME	Small and Medium Enterprises
SMMEs	Small Medium & Micro Enterprises
SO	System Optimization
SPM	Supporting Policies & Mechanism
SPU	Strategy and Policy Unit
SREP	Scale-up Renewable Energy in Low Countries Programmes
SSL	Statistic Sierra Leone
STTP	Solar Thermal Technology Platform
T&D	Transmission and Distribution
TOE	Tonnes of Oil Equivalent
UN	United Nation
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nation Development ProgrammeProgrammes
UNFCCC	United Nations Framework Convention Climate Change
UNIDO	United Nations Industrial Development Organization
WACCA	West African Clean Cooking Alliances
WAPP	West Africa Power Pool
WB	World Bank
WHH	Welthungerhilfe

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Executive Summary

The Sustainable Energy for All (SE4All) initiative is a programme launched by the UN Secretary General in 2012, with its three interlinked objectives: **(1) ensuring universal access to modern energy services, (2) doubling the global rate of improvement in energy efficiency and (3) doubling the share of renewable energy in the global energy mix, to be achieved by 2030.**

In Sierra Leone, ensuring universal access to modern energy includes access to electricity, access to mechanical power, access to community productive use, as well as access to clean cooking. Access to clean cooking is either cooking with a modern fuel, or as a minimum use of a more efficient cooking device – which would also contribute to energy efficiency targets. Doubling the global rate of improvement in energy efficiency includes energy efficiency in buildings, energy efficient appliances and equipment, adopting efficient lighting, transport system efficiency, energy efficiency in industry, small and medium-sized enterprises and energy utilities end-user efficient schemes. Doubling the share of renewable energy in the energy mix includes increased production of bioenergy, hydro, wind and solar in the case of Sierra Leone (MoE, Tarawalli. P, 2014).

The methodologies and definitions used in the SE4ALL Global Tracking Framework (GTF)¹ are being used to the extent possible. The planning horizon is as follows: short term (2010-2015), medium term (2015-2020) and long term (2020-2030).

For Sierra Leone, the SE4All target trajectory would mean increasing access to electricity from 13% in 2013 to 92% by 2030, doubling energy efficiency of electricity supply from 55% in 2013 to 91% by 2030, and doubling renewable energy level from 43,464 GWh in 2013 to 111,780 GWh by 2030 (MoE, Tarawalli. P, 2014). Importantly, these stated objectives of the Government of Sierra Leone (GoSL) align completely with the goals of the Sustainable Energy for All (SE4ALL) Initiative. Sierra Leone requires huge investment support in the energy sector to meet the Sustainable Energy for All (SE4All) goals by 2030.

The relevant policy and strategic measures to implement the three (3) main objectives of the SE4All programmes in Sierra Leone have been highlighted, including their challenges and benefits to the communities.

Improving the country's energy sector is one of the Government's foremost objectives. This critical priority was articulated in the Government's Agenda for Prosperity (AfP), which was unveiled in 2013. Beyond political support, the Government intends to devote financial resources to improving the sector due to the clear positive impacts on social and economic development. As such, the government of Sierra Leone embraces the goals of the SE4All initiative and will strive to achieve critical targets by 2030. Naturally,, the Government's ability to meet these targets will depend on funding. It is estimated that Sierra Leone will require investment and/or financial support of approximately \$7.8 billion over 18 years, based on an energy profile report conducted by UNDP, in 2012.

The Government is committed to working with the private sector, international energy development programmes and the donor community to achieve these essential improvements.

¹ <http://www.worldbank.org/en/topic/energy/publication/Global-Tracking-Framework-Report>

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In support of the SE4All programme, the Government of Sierra Leone noted its investments in hydroelectricity, thermal, solar and bioenergy, and its engagement in regional collaborative projects on power transmission at the first annual Sustainable Energy for All (SE4All) forum, held in New York, from 4th to 6th of June 2014.

Currently, there are four ministries with an interest in implementing and supporting Government energy programmes, including the Ministry of Energy (primary stakeholder), Ministry of Agriculture Forestry and Food Security, Ministry of Lands and Environment and Ministry of Trade and Industry. To ensure optimal coordination, the Ministry of Energy (with oversight responsibility) will lead the effort to ensure that the SE4All initiatives are implemented in Sierra Leone.

In 2014, the Government of Sierra Leone, through the Ministry of Energy, officially requested the assistance of the African Development Bank, in its capacity as host of the SE4ALL Africa Hub, to support Sierra Leone with the development of the SE4ALL Action Agenda and Investment prospectus. Such assistance would complement the successful cooperation on the country's Agenda for Prosperity, as well as the support provided by the Bank to help Sierra Leone prepare its expression of interest to become part of the Scaling up Renewable Energy in Low Income Countries Programme (SREP).

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Preamble

In December 2010, the United Nations General Assembly, through resolution 65/151, declared 2012 as the “International Year of Sustainable Energy for All”. The resolution requested the United Nations Secretary-General to coordinate the activities of the “International Year.” As a response, United Nations Secretary-General Ban Ki-moon launched the Sustainable Energy for All (SE4All) initiative, with its three interlinked objectives to be achieved by 2030:

- 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.

1. Introduction

Sierra Leone is situated in West Africa, with a total land area of approximately 72,325 sq. km, located between latitudes 6° 55' and 10° 00' north and between longitudes 10° 14' and 13° 17' west. It is bordered in the northwest by the Republic of Guinea, in the south and southeast by the Republic of Liberia, and west of Greenwich Meridian by the Atlantic Ocean.

According to Statistics Sierra Leone (2013), the population was estimated at 6.19 million in 2013, with a growth rate of 3.3%. The capital city of Freetown is located in the western area of the country and is home to approximately 1.25 million people (about 21% of the total population). According to Statistics Sierra Leone (2004), the average population density is about 75 inhabitants per square kilometre. Life expectancy at birth is 41.1 years and the fertility rate (i.e. births per woman) is 6.5. The infant mortality rate is 165.4 out of 1,000 live births.

Since the 1980s, the population of Sierra Leone has undergone major changes and is now characterised by an accelerated rate of urbanization. With 40% of the population living in the urban areas, which covers relatively less land area, population density was very high in the Western Area. The gender split is 94 males to 100 females. The population is youthful (15-39 accounting for 40%) with high growth potential (see below). Only 4.4% are aged 65 years and over. The working age population (ages 15-64) constitutes 54% of the total. There are more males than females aged 10-14, but more females than males aged 15-39 years.

Sierra Leone is divided into four regions, namely i) the Northern Region, made up of five district towns, including Kambia, Port Loko, Bombali, Tonkolili and Koinadugu; ii) the Southern Region, made up of four district towns, including Bo, Moyamba, Pujehun and Bonthe; iii) the Eastern Region, made up of three district towns, including Kenema, Kono and Kailahun; and iv) the Western Area, made up of the urban capital city Freetown and peri-urban towns.

Sierra Leone has a tropical climate with hot and humid weather in the rainy season, which usually spans from June to November, and a dry season, which typically spans from December to May. The country has an ambient temperature

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range of 27°C - 35°C and relative humidity varying from an average of 80% in the rainy season to about 50% in the dry season.

According to the UN classification, Sierra Leone is considered to be a Least Developed Country (LDC), with significant inequality in income distribution among its people. While it has substantial mineral, agricultural, and fishery resources, its economic and social infrastructures are not well developed, which hamper its economic development. Furthermore, unsustainable practices in agriculture, forest exploitation and mining have led to the degradation of ecosystem, causing environmental damage and disasters, thereby also affecting the country's development.

Energy consumption in Sierra Leone is dominated by biomass, which accounts for over 80% of the energy used. The largest source of biomass energy is wood fuel, followed by charcoal. Imported petroleum products are the next largest source of power, at approximately 13%.

Currently, the electricity sub-sector in Sierra Leone faces challenges, with less than 13% of the population having access to grid based electricity in 2013. Efficiency and access are constrained by high technical losses on the transmission and distribution (T&D) network, which are further compounded by low voltage quality due to an overburdening of infrastructure by illicit users. The stock of energy-efficient appliances and equipment also remains low. Furthermore, the development and use of renewable energy from hydro, solar, biomass and other renewable sources has been slow. In addition, there has been only marginal improvement in electricity supply over the last few years and the demand for energy far exceeds supply. Therefore, the sector faces the following challenges:

- A dilapidated transmission and distribution system resulting in high technical losses, estimated at about 40% of units generated;
- Generation capacity is insufficient. Only about 13% of the population has access to electricity from the national power grid;
- High seasonal variability in hydroelectric power production;
- The recently unbundled National Power Authority is not financially and operationally sustainable;
- There is currently no energy regulatory body in place;
- The governance structure of the entire energy sector needs to be overhauled and reformed.

Nevertheless, Sierra Leone has plenty of energy resources and great opportunities for the productive use of energy and for the development of energy facilities. Some of the conditions that provide opportunities include: the presence of strong political will, a stable political and security situation, a tropical climate conducive to solar energy production, high levels of rainfall for hydropower, the support of the West Africa Power Pool (WAPP), a large landscape of green vegetation for biomass, good working relationships between Government and development partners, and a good environment for doing business.

The level of energy consumption in the country has grown substantially between 2006 and 2013, from 16,168 GWh to 47,112 GWh respectively (MoE, Tarawalli. P, 2014). Nevertheless, there remains a significant amount of suppressed

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demand for energy, especially in the electricity sub-sector. Economic expansion in mining, agriculture and other industries is also accelerating demand.

The economic outlook for 2014 is bright, with GDP growth rate projected at 11.3 percent and an average of 8.5 percent during 2015-2016. Inflation will remain in the single digit in the medium-term. Exports are projected to continue to grow, while import growth will moderate, resulting in narrowing of the current account deficit in the medium-term. Gross foreign reserves are expected to increase to 4 months of imports in 2016. The exchange rate is expected to remain stable, supported by strong export performance and FDI inflows.

Sierra Leone is one of the pilot countries of the SE4All initiative, with UNDP and UNIDO co-leading the support to the implementation of the SE4All initiative. As part of the process to select potential first-movers, a mission was received in early June 2012 from the EU and UNDP to assess Government readiness and commitment to the SE4ALL initiative.

The SE4All Action Agenda process is strategy-driven and holistic, in which the three targets are analyzed together. This is also important in view of a potential energy goal that might emerge from the post-2015/Sustainable Development Goal (SDG) processes. The Action Agenda (AA) is endorsed by the Government of Sierra Leone and national stakeholders. It naturally serves as a basis for donor co-ordination and assistance on energy and as a reference document for the private sector and civil society.

The process of developing the SE4ALL Action Agenda is itself of critical importance as it will define the ultimate quality and relevance of the product. It is clear that there is national ownership of the Action Agenda and the development process is an inclusive exercise of stakeholder engagement led by national authorities. The exercise brought together stakeholders from all the relevant sectors into one conversation, endorsed and coordinated at the highest political level, in order to optimize the cross-sectoral impact. An indicative outline of the Action Agenda development process is therefore included at the end of this report. The Action Agenda is concise, pragmatic and action oriented, building on existing plans and strategies.

Energy access is a high priority in the Government's Agenda for Prosperity and, thus, the SE4All initiative is timely for Sierra Leone. It is important to have a document reflecting the state of play in the energy sector.

The Government of Sierra Leone's Agenda for Prosperity (AfP), which is also the PRSP III, sets out eight (8) Pillars for how Sierra Leone will take the early steps towards achieving economic recovery and energy access sufficiency nationwide. The pillars consist of the following: Pillar 1 – Diversified economic growth, Pillar 2 – Managing natural resources, Pillar 3 – Accelerating human development, Pillar 4 – International competitiveness, Pillar 5 – Labour and employment, Pillar 6 – Social protection, Pillar 7 – Governance and public sector reform and Pillar 8 – Gender and women's empowerment (AfP, 2013).

2. Vision and targets until 2030

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2.1. The vision

Sierra Leone's vision for 2013 to 2035 is to become a middle-income country. It would be an inclusive, green country, with 80% of the population above the poverty line. It would have gender equality, a well-educated, healthy population, good governance and rule of law, well-developed infrastructure including the energy sector, macroeconomic stability with private-sector, export-led growth generating wide employment opportunities; there would be good environmental protection, and responsible natural resource exploitation.

The vision of SE4All in Sierra Leone, well aligned with the Agenda for Prosperity (AfP) (2013-2018) and the country's vision for 2013 – 2035, is to reduce poverty and become environmentally sustainable by the year 2030. .

By 2035, Sierra Leone aspires to be an inclusive, green, middle-income country, with the following features:

- Socially, economically and politically empowered women contributing to national development in various forms;
- Less than 5% of unemployment for those actively seeking work;
- Over 80% of the population above the poverty line;
- Free and compulsory education for every child;
- Over 90% literacy rate;
- Access to affordable housing for all;
- A health care and delivery system within a 10-kilometre radius of every village;
- An effective and efficient child and family welfare system;
- Life expectancy of 70 years, where every mother has access to a modern hospital in which she can successfully give birth;
- Less than 11% stunting among children under two years of age;
- An independent, accessible, and trustworthy judiciary system;
- A system of political governance where governments are voted in and out of power peacefully, and where governments are accountable for efficient and effective delivery of public services;
- A modern and well developed energy infrastructure with reliable supply;
- World standard ICT;
- A stable, export-led economy, based on sound macroeconomic fundamentals, with inflation close to 5% and government revenues significant increase to 35% of GDP;

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- Private sector-led growth, creating value-added products, and providing jobs for the population;
- An effective environmental management system in place that protects our biodiversity and is capable of pre-empting environmental disasters;
- Responsible and efficient natural resource utilization.

Energy sector

The overall objective of the sector is to:

- Increase installed electric capacity from the current 97 MW to 1000 MW by 2018. This target is based on the projected demand for energy by mining companies, estimated at 650 MW, while residential consumers, SMEs and commercial entities are projected to require 350 MW. The provision of 1000 MW installed capacity will require significant new investments in generation, transmission and efficient distribution;
- Rebuild the National transmission and distribution Network (National Grid Master Plan), involving reinforcing the Bumbuna line to evacuate more power to Freetown;
- Execute the West African power pool, negotiating a power purchase agreement with Côte D'Ivoire, and identifying power purchase opportunities from Mano River Union countries;
- Unbundle and restructure the energy sector, by:
 - Effectively implementing the National Electricity Act (2011), which calls for the establishment of an electricity generation and transmission company, an electricity distribution and supply authority and an energy asset unit;
 - Undertaking a cost-based national electricity tariff study, with a view to meeting both commercial and social objectives required for development. The tariff will reflect the costs of the existing sources of energy generation - thermal, hydro and solar;
 - Strengthening the capacity of the Ministry of Energy, including reviewing the service conditions for employees.
- Increase electricity generation by installing an additional 600 MW of thermal base load capacity, starting to integrate the mining companies into the energy sector through joint ventures or other business models. In addition, this will ensure that all district headquarter towns have electricity;
- The Barefoot College Solar Strategy will be rolled out to all districts, so that remote areas likely to be off the national grid will have access to affordable and sustainable energy. Small-scale biomass for rural electrification will also be explored;
- Explore new energy potential for the long-term. This will involve construction of Bumbuna II and several other hydro sites with the potential to be economically viable, and which can represent a total estimated capacity of 750 MW;

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- Investigate opportunities to use off-grid solar power services, and promote the creation of markets for solar technologies through the private sector (such as solar photovoltaic, solar water heating, solar lanterns, solar refrigerators, solar cooking and solar water pumps);
- Investigate the potential for modern, sustainable and efficient forms of bioenergy, including improved and sustainable wood energy production, improved charcoal processing, and improved cooking stoves;
- Explore the potential use of biofuels, such as biodiesel from palm oil or ethanol for domestic consumption.

2.2. Energy sector trajectory

In declaring 2012 the “International Year of Sustainable Energy for All,” the UN General Assembly established three global objectives to be accomplished by 2030: ensure universal access to modern energy services, double the global rate of improvement in global energy efficiency, and double the share of renewable energy in the global energy mix.

The SE4ALL universal access goal will be achieved only if every person on the planet has access to modern energy services provided through electricity, clean cooking fuels, clean heating fuels, and energy for productive use and community services.

Projection of planned targets

Table 1 below show the SE4All goals planned for the short, medium and long-term. The activity plans for these periods are outlined below, including projection for the generating installed capacity.

Table 1: Summaries of planned targets based on available resources

SE4ALL PILLARS	2010	Short Term	Medium Term	Long Term
		2010 – 2015	2015 – 2020	2020 – 2030
Access to electricity (%)	8.6	19	44	92
Energy efficiency (%) (electricity system goals)	52	62	85	91
Renewable energy (biomass, hydro, solar) GWh (share in the electricity mix of Sierra Leone %)	15,048 (86%)	48,180 (87.8%)	59,880 (84.5%)	115,380 (86.8%)

Source: MoE, SSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF 2013, Tarawalli, P. Energy Consultant & Team (2014).

2.3. Energy access target by 2030

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On-going energy access programmes/projects in the Ministry of Energy:

- Implemented 6MW thermal plant in Lungi;
- On-going electricity transmission and distribution in Lungi
- Implemented 6MW thermal plant in Kono;
- On-going transmission and distribution in Kono;
- Implemented 2.3MW thermal plant in Makeni;
- Implemented 4.8MW thermal plant in Bo;
- Implemented 1MW thermal plant in Lunsar;
- On-going transmission and distribution in Lunsar;
- On-going construction of 2MW mini hydro in Charlotte;
- On-going construction of 2MW mini hydro in Bankasoka;
- On-going installation of 6,800 solar street lights;
- On-going development of renewable energy and energy efficiency policies and action plans;
- Implemented pico-hydro and solar installation at No. 2 River community;
- Implemented an energy task force;
- Implementation of the Electricity Act 2011 (the EGTC, EDSA, EWRC & Energy Asset Unit);
- Developed the energy strategy for the implementation of 1000 MW within the period 2014-2017;
- Completed Bumbuna town electrification project phase I;
- On-going rehabilitation of transmission and distribution of western area electrification of Freetown, IMATT and Mountain Villages;
- On-going pre-paid meter roll out in Lungi, Freetown, Bo, Kenema, Lunsar, Makeni/Kono and Bumbuna township;
- Implementation of Barefoot Women Solar Project and related training;
- Rehabilitation of BKPS thermal plants;
- On-going Addax connectivity of a 161 kV transmission line between Addax bioenergy site and Bumbuna-Freetown supply - 15MW;

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- Planned construction of a 120 kW mini hydro in Makali;
- On-going construction of two customer service centres in the western area;
- Implemented installation of 94 solar street lights, (19 Lakka, 50 Kerry Town and 25 Hastings) 315 kVA transformer and generator to Lakka and Kerry Town communities for ebola treatment centres.

Table 2 below shows the total energy (biomass, electricity and petroleum products) supply trajectory (2014 – 2030) in GWh.

Table 2: Total energy supply trajectory from 2014 to 2030 in GWh

Energy (GWh)/Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Biomass	46,116	47,628	49,824	52,116	54,084	54,588	56,436	61,140	65,868
Electricity	900	2,664	3,300	3,936	4,560	6,456	6,660	6,876	7272
Petroleum products	4,020	4,584	5,232	5,880	6,492	7,068	7,764	8,388	8,988
Total (GWh)	51,036	54,876	58,356	61,932	65,136	68,112	70,860	76,404	82,152

Source: MoE, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

Energy (GWh)/Year	2023	2024	2025	2026	2027	2028	2029	2030
Biomass	69,636	74,364	78,888	83,736	89,244	93,888	98,100	105,060
Electricity	7,500	7,920	8,340	8,556	9,000	9,576	9,780	10,236
Petroleum products	9,469	9,984	10,608	11,244	11,868	13,384	12,948	13,476
Total (GWh)	86,605	92,268	97,836	103,536	110,112	115,848	120,828	128,772

Source: MoE, SSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

Access to electricity

In 2013, 12.5% of the population had access to the electricity grid, and the access rate is projected to increase for grid-connected, mini-grid and stand-alone systems, as indicated in Table 3 below.

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Table 3: Overview of the energy access targets and trajectories (2010 – 2030) in %: grid-connected, mini-grids and stand-alone system.

	2010	2013*	2015	2016	2017	2018	2019	2020	2021
Population with access to electricity (%)	8.6	12.5	19	24	29	32	37	44	56
Grid-connected population (%)	8.2	10	15	18.5	22.25	24	27.5	30	33
Population connected to renewable energy powered mini-grids (%)	0.3	1.75	3	4	5	6	7	11	19
Population with access to stand-alone systems powered by renewable energy (%)	0.1	0.75	1	1.5	1.75	2	2.5	3	4

	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population with access to electricity (%)	61	66	69	72	75	79	82	87	92
Grid-connected population (%)	36	39	40.5	42.5	44.5	47	48	51.5	55
Population connected to renewable energy powered mini-grids (%)	20	21	22	22.5	23	24	25	26	27
Population with access to stand-alone systems powered by renewable energy (%)	5	6	6.5	7	7.5	8	9	9.5	10

Source: MoE, SSL, EDSA, EGTC, Tarawalli, P. Energy Consultant & Team (2014).

The proportions of urban and peri-urban households with access to electricity are expected to reach 100% in 2030, from 12.5% in 2013, whilst the proportion of rural communities and households with access to electricity are expected to reach 70% in 2030, from 0.5 % in 2013.

Access to modern cooking systems

The targets for expanding access to modern cooking systems, like the use of improved cook stoves and efficient production of charcoal for the 2010-2030 period, is shown in table 4.

Table 4: Targets for expanding access to modern cooking systems (2010 – 2030)

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	2010	2013*	2015	2016	2017	2018	2019	2020	2021
Population using improved cook stoves (number of inhabitants)	724,097	1,114,250	1,496,624	1,800,828	2,050,943	2,382,513	2,729,378	3,312,963	3,691,111
Population using improved cook stoves (% of total population)	12.6	18	23	27	30	34	38	45	50
Total charcoal production (toe)	85,000	133,500	166,305	179,195	192,170	216,256	232,507	247,242	261,987
Charcoal production with improved carbonisation techniques (yield superior to 25%) (tonnes of charcoal)	850	1,335	3,489	7,752	14,217	21,613	29,201	39,448	48,695
Share of charcoal produced by efficient charcoal production techniques (%)	1	1	2	4	7	10	12	16	18
Population using modern cooking fuel alternatives (LPG, biogas, solar cookers, kerosene) (number of inhabitants)	57,468	74,283	260,282	400,184	546,918	700,739	933,735	1,104,321	1,200,000
Population using modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers, kerosene) (%)	1	1.2	4	6	8	10	13	15	17

	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population using improved cook stoves (number of inhabitants)	4,099,469	4,519,085	4,875,854	5,330,934	5,720,343	6,213,402	6,548,138	6,803,784	7,068,121
Population using improved cook stoves (% of total population)	53	57	60	64	67	71	73	74	75
Total charcoal production (toe)	287,891	302,006	313,997	339,377	354,751	369,621	397,674	406,231	421,803
Charcoal production with improved carbonisation techniques (yield superior to 25%) (tonnes of charcoal)	59,473	70,562	87,679	104,176	121,900	137,437	151,953	167,428	185,902

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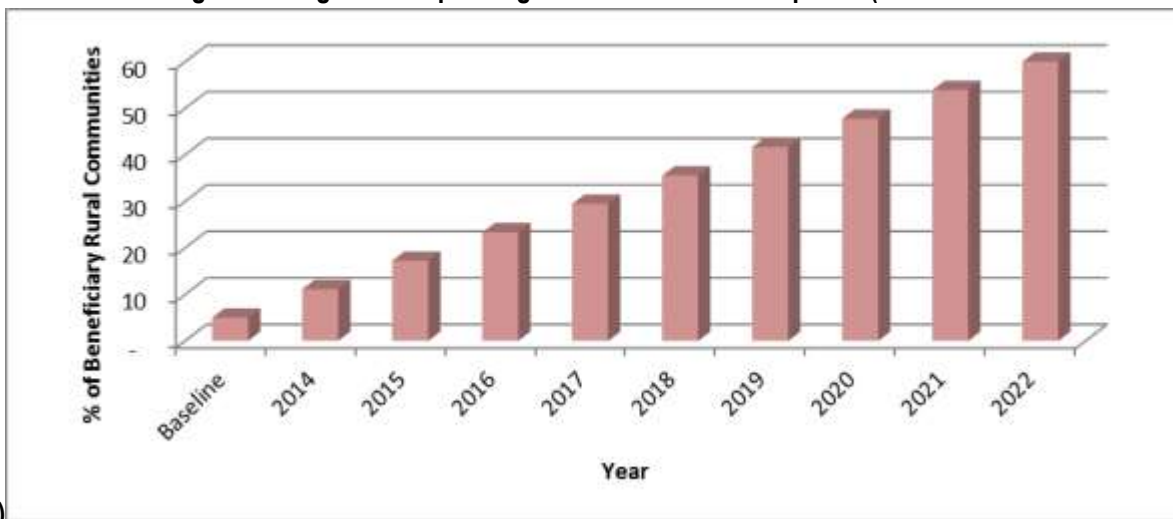
charcoal)										
Share of charcoal produced by efficient charcoal production techniques (%)	21	24	28	32	36	39	41	43	46	
Population using modern cooking fuel alternatives (LPG, biogas, solar cookers, kerosene) (number of inhabitants)	1,314,924	1,427,079	1,544,021	1,665,917	1,792,943	1,925,279	2,063,112	2,206,633	2,356,040	
Population using modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers, kerosene) (%)	17	18	19	20	21	22	23	24	25	

Source: MoE, SSL, MAFFS, PU, EUEI-PDF 2013, Tarawalli, P. Energy Consultant & Team (2014).

Access to mechanical power

The proportion of rural communities with access to mechanical power (using multi-functional platforms) is expected to reach 60% in 2022, as presented in Figure 1.

Figure 1: Targets for expanding access to mechanical power (2010 –



2022)

Source: MoE, SSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF 2013, Tarawalli, P. Energy Consultant & Team (2014).

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2.4. Renewable energy target until 2030

The total renewable energy (wood fuel, biofuel, hydro, solar and wind) supply trajectory (2010 – 2030) in GWh is presented in table 5.

Table 5: Total renewable energy supply trajectory (2010 - 2030)

	2010	2013*	2015	2020	2025	2030
Total wood fuel supply (GWh)	14,892	21,972	47,628	56,436	78,888	105,060
Wood fuel supply for firewood (GWh)	13,872	20,364	40,488	45,156	59,172	73,536
Wood fuel supply for charcoal production (GWh)	1,020	1,608	7,140	11,280	19,716	31,524
Bio-fuel (GWh)	0	0	72	168	294	372
Hydro power (GWh)	156	150	372	2,976	4,680	5,796
Solar (GWh)	0	18	108	384	480	528
Wind (GWh)	0	0	0	12	18	24
Total (GWh)	15,048	22,140	48,180	59,888	84,360	111,780

Source: MoE, SSL, EDSA, EGTC, MAFFS, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

The total grid-connection for renewable energy (hydropower) in MW & GW installed capacity for 2010, 2020 and 2030 is shown in table 6 below.

Table 6: Targets for grid-connected renewable energy

	2010	2020	2030
Renewable energy in MW installed capacity (excluding medium and large hydro)	6.0	149	293
Renewable energy share in the electricity mix (%) (excluding medium and large hydro)	5.8	11.8	13.3
Large- and medium-scale hydropower installed capacity in MW (more than 30 MW)	50	510	935

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Large and medium-scale hydropower (more than 30 MW) share in the electricity mix (%)	52	40.5	42.5
Total renewable energy installed capacity in MW (including large- and medium-scale hydro)	56.0	659	1,229
Total renewable energy penetration in the electricity mix (%) (including medium and large hydro)	57.8	52.3	65.3
Grid connected generation (GWh)	2010	2020	2030
Renewable energy electricity production in GWh (excluding medium and large hydro)	10.92	645.84	1,265.76
Renewable energy share of electricity consumption in % (excluding medium and large hydro)	5.6	9.1	10.2
Large- and medium-scale hydropower generation in GWh (more than 30 MW)	141.6	2,864	5,371
Large- and medium-scale hydropower generation (more than 30 MW) as share of electricity consumption (%)	72.8	40.5	43.5
Total renewable energy generation in GWh (including medium and large hydro)	152.52	3,505.64	6,686.76
Total renewable energy penetration in electricity consumption (%) - (including medium and large hydro)	78.4	52.3	65.3

Source: MoE, SSL, EDSA, EGTC, Tarawalli, P. Energy Consultant & Team (2014).

The share of the rural population served by off-grid (mini-grids and stand-alone) renewable energy electricity services (targets) in % for 2010, 2020 and 2030 is indicated in table 7 below.

Table 7: Targets for off-grid applications

	2010	2020	2030
Share of the rural population served from off-grid (mini-grids and stand-alone) renewable energy electricity services (%)	0.4	14	37

Source: MoE, SSL, EDSA, EGTC, Tarawalli, P. Energy Consultant & Team (2014).

The targets for domestic use of renewable energies (including biofuels, charcoal, LPG, biogas and solar) in ratios and percentages for 2010, 2020 and 2030 are indicated in table 8 below.

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Table 8: Targets for domestic use of renewable energies (Including biofuels)

	2010	2020	2030
Biofuels (1st generation)			
Consumption ratio of ethanol to gasoline	0.0:1	0.25:1	0.3:1
Consumption ratio of biodiesel to diesel and fuel-oil	0.000004:1	0.0001:1	0.0002:1
Share of population using improved cook stoves(%)cook stoves	12.6	45	75
Share of charcoal produced by efficient charcoal production techniques(%)	1	16	36
Share of Population using modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers,) (%)	1	15	25
Solar water heater technologies for sanitary hot water and preheating of industrial process water			
No. of residential houses (new detached house price higher than €75,000) with solar thermal systems	12	480	1880
District health centres, maternities, school kitchens and boarding schools with solar thermal systems (%)	0.1	55	100
Agro-food industries (preheating of process water) with solar thermal systems ((%)	0	25	60
Hotels with solar thermal systems (%)	0.8	35	80

Source: MoE, SSL, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

2.5. Energy efficiency target until 2030

Energy efficiency

There is great potential for energy efficiency improvements in Sierra Leone. Primary energy consumption per capita was 0.295 tons of oil equivalent (toe), in 2013. There is considerable room for improvement in the various energy sub-sectors. Energy constitutes a large proportion of the country's GDP costs and a considerable percentage of household energy expenditure. Pursuing energy efficiency (EE) measures will contribute significantly to savings. Alternative energy sources could also reduce the negative impact on the environment resultant from fossil fuel dependence, as well as reduce the cost of energy services.

On the energy demand side, the need for increasing access, promoting the use of more efficient and cleaner energy sources and equipment, as well as of widely-available renewable energy resources, cannot be over-emphasized. The Government has placed emphasis on the promotion of LPG as a cooking fuel in households, as well as wider dissemination of fuel-saving stoves, and the adoption of renewable technologies. For agriculture and fisheries, the

2015)

need for the provision of energy sources, including renewable energy sources to stimulate mechanization should be addressed. In the commercial sub-sector, focus is on more efficient energy devices for communal cooking and heating as well as for lighting.

A review of the energy sector in Sierra Leone reveals that poor efficiency plagues almost every energy sub-sector. For instance, over 45 percent of the electricity generated in the Western Area remains unaccounted for; while traditional methods of firewood and charcoal have efficiencies below 30 percent. Low efficiencies mean unnecessary waste, which cannot be afforded in a country in which energy supplies are well below the suppressed demand.

The energy efficiency policy and action plan formulated in 2014 addresses the policy and implement measures for efficient lighting, solar cookers, efficient buildings, energy labelling of products/buildings, transport and improved cook stoves. These are in line with the ECOWAS regional energy efficiency policy and energy efficiency initiatives.

The SE4All targets of energy efficiency for short, medium and long-term are shown in table 9 below.

Table 9: Energy efficiency target until 2030

SE4ALL - Energy Efficiency	2011	Short-Term	Medium-Term	Long-Term
		2012 – 2015	2015 – 2020	2020 – 2030
Energy efficiency % (electricity system gains)	52	62	85	91

Source: MoE, SSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

The macro-economic energy efficiency indicators of Sierra Leone are outlined in table 10 below.

Table 10: Macro-economic energy efficiency indicators

Indicator	Data from the past					Targets for the future			
	Year	Year	Year	Year	Year	Year	Year	Year	Year
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Final energy intensity (Final energy consumption kWh/GDP)	8.6	7.47	6.72	6.81	6.77	10.97	11.45	11.73	12.3
Final energy consumption/capita	3,108	3,024	3,072	2,988	3,035	4,872	6,480	8,976	11,148

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(kWh/ capita)									
Annual electricity consumption (kWh)/capita	7.822	7.21	28.043	26.281	34.336	162.132	911.284	995.128	1,078.29
Electricity consumption (kWh)/GDP constant (in billion US \$)	0.0237	0.021	0.078	0.073	0.093	0.289	0.888	1.052	1.378
Electrification rate (%)	8	8	8	8	8.6	19	41	62	82
Electricity consumption (kWh)/household	46.93	43.2	168.26	157.69	206.02	972.79	5,467.7	5970.77	6469.74

Source: MoE, MoFED, SSL, BSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

Initiative on efficient lighting

Table 11 below shows the national targets for efficient lighting for 2013, 2020 and 2030.

Table 11: National 2020 and 2030 targets for lighting

	2013	2020	2030
Percentage of high efficiency grid-powered, non-directional household lights sold (i.e. CFLs or LEDs, with a light output superior to 40 lumens/watt) *	0.6	60	100
Percentage of high efficiency off-grid, non-directional household lights sold, (i.e. CFLs or LEDs, with a light output superior to 40 lumens/watt) *	10.3	70	100
Percentage of high efficiency public street lights.	10.3	85	100
Number of high efficiency lighting devices (CFL or LED) sold or distributed during the year.	150,000	1,500,000	2,500,000
Estimate of kerosene savings (million litres)	6	14	30

Source: MoE, SSL, EDSA, EGTC, Tarawalli, P. Energy Consultant & Team (2014).

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High Performance Electricity Distribution

The national targets for the losses in the electricity sub-sector are indicated in table 12 below for 2013, 2020 and 2030.

Table 12: National 2020 and 2030 targets for losses in the electricity sector

	2013	2020	2030
Total 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).	45	15	9
Transmission losses.	6	3	2
Total distribution losses *	39	12	7
Distribution technical losses	13	8	5
Distribution non-technical losses	27	4	2

Source: MoE, EDSA, EGTC, Tarawalli, P. Energy Consultant & Team (2014).

Safe, sustainable and affordable cooking

The national targets for safe, sustainable and affordable domestic cooking energy are presented in table 13 below for 2013, 2020 and 2030.

Table 13: National 2020 and 2030 targets for domestic cooking energy

	2013	2020	2030
Forest areas under sustainable management schemes (% of national forest area)	12.2	35	70
Improved cook stoves (% of stoves sold that are considered to be ICS)	12.6	45	75
Efficient charcoal production (% share of total national production)	1	16	46
Use of modern fuel alternatives (LPG, biogas, solar cookers and others) (% of the total population)	1	15	25

Source: MoE, SSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

3. Priority action areas

3.1. Energy access

Access to electricity

Access to energy services is a major concern in Sierra Leone, where a majority of the population has no access to modern energy carriers. Population access to electricity in Sierra Leone increased from 3% in 1999 to 12.5% in 2013, as shown in Table 14. The advent of Bumbuna Hydro Power supply to Makeni and Freetown, in the last quarter of 2009, contributed to a slight increase in access to grid power.

Table 14: Population with access to grid connected electricity in Sierra Leone

(2006 – 2013)

POPULATION	2006	2007	2008	2009	2010	2011	2012	2013
Freetown	38,362	47,281	53,126	64,306	67,422	73,551	86,200	93,755
BO-Kenema	8,762	9,078	9,455	10,180	11,302	12,593	17,553	24,331
Makeni	305	430	521	596	602	1,040	3,490	9,104
Lungi	-	-	-	-	-	-	-	1,758
Kono	-	-	-	-	-	-	-	377
Total grid connected customers	47,429	56,789	63,102	75,082	79,326	87,184	107,243	129,325
Population with grid connection	284,574	340,734	378,612	450,492	475,956	523,104	643,458	775,950
Population without grid connection	4,937,426	5,009,266	5,106,388	5,173,508	5,294,644	5,478,896	5,394,202	5,414,330
Urban	1,982,418	2,030,416	2,079,941	2,131,013	2,183,784	2,238,230	2,294,311	2,414,209
Rural	3,234,472	3,312,784	3,393,589	3,476,917	3,563,016	3,651,850	3,743,349	3,776,071

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Access to electricity (% of the population)	5.5	6.4	7.4	8.7	8.2	8.7~9	10.7	12.5
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Source: MoE, SSL, EDSA, EGTC, Tarawalli, P. Energy Consultant & Team (2014).

Traditional uses of biomass, mainly in the form of wood charcoal and firewood, still dominate the energy mix, with substantial impacts on economic activities, livelihood, health and the environment. Moreover, lighting in rural areas is mainly based on kerosene lamps, as discussed above. Thus, there is an urgent need to improve access to energy, particularly for low-income segments of the population. Activities in the fields of energy efficiency and renewable energy should, whenever possible, be framed in the context of access to clean, modern and affordable energy carriers in rural and urban areas and as a contribution to poverty alleviation and income generation.

In Sierra Leone, programmes and projects concerning energy access fall under the responsibility of the Ministry of Energy programme. Based on the National Energy Policy Strategic Plan 2015, the Ministry of Energy is to implement 1000 MW of electricity installed capacity by 2017, which is part of the project that aims to provide nearly 100% access to electricity by 2030. The implementation of the Government's policy of universal access by 2030 is the most important action in this regard. To accomplish this, all regional and district capitals will need to be connected to the national grid. Additionally, an ongoing effort is being made to provide electricity to rural areas through a variety of sources and mechanisms.

The potential energy access programmes and projects in Sierra Leone are:

- Multi-functional platforms;
- Hydropower potential (pico, mini, mega);
- Improved cooking stoves;
- LPG use;
- Grid extensions ;
- Solar PV for off-grid electricity.

The need to integrate energy access into national and regional poverty reduction strategies was recognised during the development of the ECOWAS white paper on energy access. As stated in the Agenda for Prosperity (AfP) (2013 - 2018), the Poverty Reduction Strategy Paper (PRSP III) for Sierra Leone recognized the need to provide electricity as one of the key priorities. The need for additional generation capacity and modernization as well as the extension of transmission and distribution grids was discussed above in the section on electricity sector.

The Barefoot Solar Women are also contributing to increase energy access to rural communities, by installing solar PVs in several communities in the rural area. Besides the improvement of the national electricity system, there is a need to work on sustainable off-grid solutions in rural areas, integrating such things as provision of lighting for rural areas and access to mechanical or motive power.

Table 15 lists the measures to increase access to energy.

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Table 15: Measures for achieving targets regarding access to energy

No.	Measures for achieving access to energy	Timeframe
1	Increasing installed power generation capacity from the current 97.4 MW to 1000 MW by 2018. This target is based on the projected demand for energy by mining companies, estimated at 650 MW, while residential consumers, SMEs and commercial entities are projected to require 350 MW. (See targets in table 3). The provision of 1000 MW will require significant new investments in generation capacity, transmission and efficient distribution;	2015 - 2020
2	Rebuilding and expanding the national transmission and distribution network, involving reinforcing the Bumbuna line to evacuate more power to Freetown and develop the Sierra Leone electricity national grid;	2015 - 2030
3	Supporting the completion of the CLSG line and executing the West African Power Pool, negotiating a power purchase agreement with Côte D'Ivoire, and identifying power purchase opportunities from Mano River Union countries;	2015 - 2018
4	<p>Continuing the unbundling and restructuring of the energy sector:</p> <ul style="list-style-type: none"> • Effectively implementing the National Electricity Act (2011); this calls for the establishment of an electricity generation and transmission company, an electricity distribution and supply authority and an energy asset unit; • Undertaking a cost based national electricity tariff study, with a view to meeting both commercial and social objectives required for development. The tariff will reflect the costs of the existing sources of energy generation - thermal, hydro and solar; • Strengthening the capacity of the Ministry of Energy, including reviewing the service conditions for employees. 	2015 - 2018
5	Increasing generation of electricity by installing an additional 600MW of thermal base load capacity, starting to integrate the mining companies into the power sector through joint ventures or other business models. In addition, this will ensure that all District Headquarter towns have electricity;	2015 - 2018
6	The Barefoot College Solar Strategy will be rolled out to all districts, so that remote areas likely to be off the national grid will have access to affordable and sustainable energy. Small-scale biomass for rural electrification and establish programmes for women in renewable energy (WIRE) will also be explored;	2015 - 2022
7	Exploring new energy potential for the long-term. This will involve construction of Bumbuna II, and several other hydro sites with the potential of being economically viable, and which can represent a total estimated capacity of 750 MW. A UNIDO field assessment study conducted in 2012 shows an estimated hydro power potential of over 4,500MW;	2015 - 2025
8	Investigating the opportunities to use off-grid solar power services, and promoting the creation of markets for solar technologies through the private sector (such as solar photovoltaic, solar water	2015 - 2018

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	heating, solar lanterns, solar refrigerators, solar cooking and solar water pumps);	
9	The potential for modern, sustainable and efficient forms of bioenergy will be researched, including improved and sustainable wood energy production, improved charcoal processing, and improved cooking stoves;	2015 - 2020
10	The potential use of biofuels, such as biodiesel from palm oil or ethanol for domestic consumption, will be explored;	2015 - 2020
11	Community and productive uses of energy. There are some Multi-functional Platforms (MFP) (e.g. a diesel engine powering various end-use equipment, such as grinding mills, huskers, small electricity generators, battery chargers, pumps, welding and carpentry machines) available in Sierra Leone, which are mainly used for electricity generation and agro-processing. There is a need to conduct additional pilot programmes supporting the introduction of MFPs in rural areas and serving, for example, cooperatives and women organisations;	2015 - 2022
12	Expanding the use of LPG countrywide.	2015 – 2020

Source: MoE, MoFED, SSL, BSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

The existing definitions and measurements of access to electricity fail to capture several important aspects of the problem.

Multiple access solutions. Off-grid options (for example, solar lanterns or stand-alone home systems) and isolated mini-grids are required in many countries as transitional alternatives to grid-based electricity. In geographically remote areas, these options could potentially serve as long-term solutions as well. Therefore, expansion of access, through off-grid and mini-grid solutions, needs to be tracked in addition to main grid connections, although it is important to recognize that such solutions may vary in the quantity and quality of electricity they can provide and the measurement of electricity access should reflect those differences. Using current data and measures, access to electricity cannot be differentiated based on the supply characteristics of the electricity source.

Supply problems. In many developing countries, grid electricity, typically provided by utility companies, suffers from irregular supply, frequent breakdowns, and quality-related problems (such as low or fluctuating voltage). Power is often supplied only at odd hours (such as midnight or midday), when the need for electricity is minimal. Low wattage also significantly reduces the usefulness of access. Connection costs and electricity tariffs constrain energy use among households that cannot afford them. Illegal and secondary connections serve a significant proportion of the population in many countries, representing lost revenues for the utility and posing a safety hazard. None of these attributes of the availability, quality, affordability, and legality of supply are reflected in existing data on access.

Electricity supply and electricity services. Electricity is useful only if it allows desired energy services to be run adequately. Access to electricity supply is therefore different from the use of electricity services, which implies the ownership of the appropriate electrical appliance and the actual use of electricity. It is nonetheless important to measure both of these in order to inform policies and project design. Meanwhile, measuring access to electricity services through consumption of kilowatt-hours (kWh) fails to capture several important factors. Firstly, such a measure does not reflect which energy services are actually operated within the household. Secondly, it tends to

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emphasize higher consumption, clashing with energy-efficiency goals. Poor households often have no choice other than to operate old and inefficient applications to meet their needs, despite high unit costs. Finally, electricity consumption depends on several external factors, such as household income, size, spending priorities, and so on. Therefore, ownership of appliances, rather than electricity consumption, provides a preferable measure of access to electricity services.

Community and productive uses of energy

A household-based definition of access to energy excludes access to energy for community services and productive uses. Energy is crucial for enterprises, driving economic and social development by increasing productivity, income, and employment, reducing workloads and freeing up time for other activities, as well as facilitating the availability of higher-quality or lower-priced products through local production.

In addition, providing energy to businesses ensures higher economic sustainability of electrification projects, as productive activities often translate into higher energy demand density and an increase in customers with more capacity to pay (EUEI 2011).

Energy for community services (e.g. health and education) is fundamental for socioeconomic development, because it can lead to the substantial improvement of human capital.

A stakeholder multi-platform was launched in 2012 by the Ministry of Energy, with support from the UNDP, to create several communities and productive uses of energy countrywide.

Access to cooking solutions

Current measures of access to modern cooking solutions are confined to fuels and therefore omit the role of the cookstove. Understanding the cooking solutions of households entails knowing not only the fuels but also the type of cook stoves used. It is the combination of the two that will determine levels of efficiency, pollution, and safety outcomes.

Meanwhile, individual behaviors, cooking practices, and housing characteristics also affect the actual performance of a household's cooking solutions.

Technical standards and certification systems related to cook stoves. Ongoing development of improved or advanced cook stoves shows that high performance in terms of efficiency, pollution, and safety can be achieved even with solid fuels. This is important, since a large part of the developing world is expected to continue to rely on solid fuels (biomass and coal) for cooking, despite increasing use of non-solid fuels (IEA 2012). Therefore, advanced biomass cook stoves that offer significant improvements over traditional self-made cook stoves may serve as a transitional alternative to the most modern cooking solutions.

Nonetheless, it is not possible to evaluate the technical performance of a cookstove through simple observation. A certification system is therefore needed, whereby cook stoves carry a stamp that indicates their performance level.

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This presents an additional challenge, which is to reach universal consensus on the technical standards used for certification.

Convenience of cooking solutions. For the poorest households in Sierra Leone, cooking often involves lengthy and exhausting fuel collection, particularly for women. Several studies analyze the impacts of this burden on women's health, their income-generating opportunities, and the lack of time for other tasks, not to mention on leisure and repose (Clancy, Skutsch, and Batchelor 2003). Time and effort invested in cookstove preparation and cleaning, as well as in cooking itself, are also important dimensions to consider. It is therefore important to measure the "convenience factor" along with the technical performance of a cooking solution to obtain a comprehensive measure of access.

The variability of performance outcomes. The performance of cooking solutions, as evaluated under standard testing conditions, may not be achieved in practice, owing to individual behavior, cooking practices, and site conditions.

Maintenance requirements may have been disregarded and accessories such as chimneys, hoods, or pot skirts not used, deteriorating the performance of the cookstove.

Fuel stacking. Any measure of access solely based on the primary cooking solution will fail to capture the complex phenomenon of fuel stacking, which refers to the parallel use of multiple fuels and cook stoves. The transition to more modern energy solutions in the home is a dynamic process, and many factors contribute to the choice of fuels and cook stoves. Even households that have adopted a modern fuel or an advanced cookstove may continue to use—at the same time—secondary and tertiary fuels and cook stoves on a regular basis. The underlying causes of this practice need to be identified to inform policy and project design.

In Sierra Leone, the West Africa Clean Cooking Alliance (WACCA), which is one of the programmesCentre for Renewable Energy and Energy Efficiency (ECREEE) programmes that contributes to the SE4ALL goals of the ECOWAS region, 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 and action plans, capacity development, implementation of awareness campaigns and establishment of financing mechanisms.

The challenges of traditional biomass use for cooking and inefficient cook stoves are outlined below:

- Night time hours are unavailable for activities, including school homework, craft production and general income generation;
- Female household members spend as much as two days a week sourcing fuel wood;
- Deforested hillsides lead to land degradation, erosion and landslides;
- Increased cases of respiratory illnesses and general ill health, as a result of smoke exposure;
- The high and variable cost and availability of kerosene and purchased wood for low-income families is particularly damaging for income and food security;
- Access to communications and information is reduced;

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- Increased use of low efficient cook stoves and the traditional three fire-stone.

The efforts undertaken by the Government of Sierra Leone to minimize the above challenges are listed below:

- Strengthen the capacity building of the Energy Directorate in the Ministry of Energy;
- Introduction and implementation of the proposed WACCA programmes and other clean cooking associated projects;
- Proper coordination and collaboration amongst partners in the promotion of clean cooking activities;
- Financial support in the form of incentives;
- Introduction of clean cooking fuel and improved cook stoves (ICS).

Access to mechanical power

There are some Multi Functional Platforms (MFPs) available in Sierra Leone, which are mainly used for electricity generation and agro-processing. There is a need to conduct additional pilot programmes supporting the introduction of MFPs in rural areas targeting services such as cooperatives and women organisations. Programmes should include training and support provided to artisan networks and women's organisations on installation and maintenance of MFPs. They will also require support and implementation of credit strategies. Lessons learned in these pilot programmes should flow into the design of more extensive programmes for rural communities.

The implementation of MFP enterprises could provide opportunities for income generation and workload reduction for women, benefiting them and their children. MFP programmes could be combined with functional literacy courses and vocational training. Given the impact of potential diesel price hikes/shortages on the running of the MFPs, it is necessary to evaluate the feasibility of running MFP on biofuels.

Challenges

Several barriers must be overcome if universal access to energy is to be achieved. As highlighted by SE4ALL (2012), a set of common elements will have to be put in place to overcome those barriers:

- High-level commitments on the part of political leadership towards achieving universal energy access;
- A realistic energy-access strategy and clear implementation plans linked to overall national development and budget processes;
- Strong communication campaigns to inform stakeholders of planned changes and related benefits;

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- Sufficient funding to support the delivery of energy services from appropriate sources and at affordable rates. An increase in financing from all sources and in various forms is required, from large projects down to the micro level;
- A robust financial sector, willing to lend to the energy sector and to provide end-user financing;
- A legal and regulatory framework that encourages investment;
- Active promotion of project and business opportunities and a consistent flow of deals or transactions to attract a critical mass of private sector players (e.g. banks);
- Processes to match actors around specific projects and proposals, particularly in public-private partnerships;
- Energy access for community institutions (e.g., rural multifunctional platforms, typically driven by diesel that powers pumps, grain mills, generators, etc.);
- The means to support successful small-scale projects and solutions to reach larger scale;
- Robust and effective public utilities;
- Strong internal capacity, potentially supported by external technical assistance;
- A deliberate effort to improve the availability of accurate and timely information;
- Reconciliation of regional and national interests in energy projects.

3.2. Renewable energy

Sierra Leone's energy demand is characterized by a low per capita consumption of petroleum and electricity and a high dependence on renewable energy including biomass fuels in the form of firewood, charcoal and bio-waste. Biomass will remain the main energy source for the foreseeable future. However, apart from biomass, there are other potential renewable energy sources available for exploitation. These include small-scale hydropower, solar, and wind.

However, there are several challenges in the way of harnessing these resources in a productive and meaningful way.

Hydropower

In Sierra Leone, hydropower is a major energy source, holding great promise for the country, which possesses several rivers that could be utilized for electricity. According to the Power Sector Master Plan (1996), 27 potential hydropower sites with a total capacity of 1,513 MW have been identified, and a recent study conducted by UNIDO estimated hydropower potential to be about 5,000 MW, covering 300 sites nationwide. However, except for two sites (Bekongor and Bumbuna), most of the others suffer from water flow rate variations between the wet and dry seasons. Yiben II, Bekongor III, Kambatibo, Betmai III, Yiben I and Bumbuna Falls are the most attractive in terms of generation cost.

2015)

Currently, these sources remain virtually untapped.

Sierra Leone has built three hydroelectric plants to date: the 2.4 MW Guma plant installed in 1967 in the Western Area, (decommissioned in 1982) and a 6 MW run-of-the river hydro power plant, Dodo, located in the Eastern Province, some 380 km from Freetown and 69 km from the headquarter town of Kenema. The latter is functional and is operated by the BKPS, and it is a part of a regional grid connecting thermal power plants in Bo and Kenema. The 50 MW capacity Bumbuna hydropower plant was commissioned in 2009, although it is presently operating at half capacity, transmitting electric power to Freetown on a 205 km 161 kV line.

Although many of the researched rivers fall under the small to medium hydropower system (i.e. 1 – 100 MW), there is a potential for pico to mini hydropower systems (5 kW to 1MW). Resources under 2 MW potential capacity are expected to attract public-private partnerships and wider investment by the private sector.

Construction of a small hydro power plant (1 MW), funded by the Chinese Government, UNIDO and GOSL, is underway in Port Loko (Bankasoka). The design has been completed and the project implementation is expected to initiate soon. The Government of Sierra Leone and of China are also developing the Charlotte (2.2 MW) and Makalie (0.5 MW) hydro power plant projects.

In Sierra Leone, hydropower generation has accounted for a substantial part of the total electricity generation mix. Currently, hydroelectricity represents approximately 85% of the installed grid-connected electricity generation capacity.

Bioenergy

Biomass is the main source of energy in use in households in Sierra Leone, mainly in the form of fuelwood and charcoal, while the use of agricultural crop residues and bagasse in the sugar industry remain limited. In addition, there is considerable potential (without impacting food production) for the production of biofuels from energy crops such as maize and cassava and from processing of charcoal into biochar. The Addax sugarcane ethanol project in Makeni has been completed, making available 15 MW of capacity to the national grid.

Dried plant biomass can be used as fuel in thermal power plants or converted to produce solid briquettes, which can then be utilized as fuel for small-scale industries. Biogas digesters of various designs are capable of sustaining household, industrial and institutional energy needs.

Over 86% of Sierra Leone's population depends on fuelwood for cooking and other domestic uses. The consumption of fuelwood is worsened by the widespread use of inefficient cooking methods, the most common of which is still an open fire. The rate of consumption of fuelwood far exceeds the replenishing rate, to such an extent that desert encroachment, soil erosion and loss of soil fertility are now serious problems in the country.

The largest sources of fuel-wood at present are open forests, communal woodlots and private farmlands. Supply from natural forest regeneration is continuously being diminished due to additional activities, such as the clearing of forests for development projects, agricultural production and industrial activities. Since forests are essential for a healthy environment, to mitigate wind and water erosion and desertification as well as for providing energy resources, it is essential that they are cropped on a rational basis.

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Wood fuel is the dominant and cheapest fuel available on the Sierra Leonean market and its production, transportation and sale are all undertaken by the private sector. There is no official Government pricing regulatory body responsible for setting the prices of wood fuels in Sierra Leone. Rather, the pricing is dependent on the supply and demand conditions.

Possibilities exist for projects looking to generate methane gas from livestock manure and litter through anaerobic fermentation in biogas plants.

Heat and electricity generation in the form of co-generation of electricity in the industrial sector from biomass, using the bagasse energy, should be re-introduced in the country.

In the country, charcoal is used extensively as a domestic fuel. It is also used in the recreation, catering and metallurgical industry, leaving scope for its further exploitation.

Biofuels: Various crops can be fermented to produce ethanol (ethanol gel fuel) and sunflower seeds and Jatropha tree nuts can be crushed and processed to yield bio-diesel. Sierra Leone could look to mitigate its high dependence on importing petroleum products for its liquid fuel requirements by supplementing petroleum with biofuels, which would result in co-benefits such as creation of local jobs..

The major environmental problems related to renewable energy production from biomass, if not properly managed, is mainly deforestation. From available statistics from the agriculture sector, roughly 392,000 hectares of forest were lost between 1990 and 2010, representing 12.6% of the country's forest cover. The nation's 2.726 million hectares of forest and woodland reserves could be depleted within the next 136 years, if not properly managed. This would result in negative impacts on the environment, such as soil erosion, desertification, loss of biodiversity, micro-climatic change and flooding. Most of these impacts are already evident in different ecological zones in the country, amounting to huge economic losses.

Sierra Leone disposes of almost all of its refuse in landfill sites and in 2012 the total domestic and industrial refuse disposed of amounted to 594,000 tons. The most feasible area for incineration of refuse from large municipalities would be the Kingtom and Freetown/Waterloo Highway dump sites, where it was estimated, in 2012, that approximately 268,000 tons of usable waste could be produced annually. The net realizable energy available from sewage-derived methane in Sierra Leone would be assessed for electricity generation and for heating purposes. Options for projects pertaining to energy production from municipal waste landfills should be examined, including production of biogas and methane gas.

Solar energy

Sierra Leone experiences sunshine for most of the year and hence solar energy is in abundance. A more recent study estimated the average solar irradiation at 1,460 to 1,800 kWh/(m²/y)², which indicates the great potential for solar power in the country, using solar PV or/and solar thermal systems.. Solar street lighting has been installed in all the 14 districts in the country and some development partners have installed solar PV in schools, hospitals, district councils and growth centres.

² These data need revision since computations were made from temperature and humidity measurements carried out at only 8 different sites across the country in 1996.

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The use of solar PV is increasing in Sierra Leone.. Prior to the civil conflict in the country, solar PV was used extensively in the telecommunication industry at repeater stations which are now powered by diesel generators. Few solar systems are used for household lighting and entertainment, and some institutions use it for water pumping.

In 2014, solar PV installed capacity in the country was about 2.5 MWp.

The potential uses and applications of solar energy in Sierra Leone include:

- Solar passive building design practice for residential, commercial and industrial buildings, to minimise energy consumption. This includes energy consumed by occupants, as well as that of the construction of the building;
- Solar water heating for domestic, recreational, institutional and industrial use;
- Solar space heating - closely related to solar passive and active building design practice and can also include solar water heating technologies;
- Solar cookers as an alternative to cooking with fuelwood in rural areas;
- In agriculture (e.g. crop drying, greenhouses), especially for small-scale farming and irrigation (water pumping) purposes;
- For electricity production (photovoltaic and solar thermal) generation, ranging from small- to medium-scale and from stand-alone applications to large-scale grid-connected applications;
- Heat pumps for water heating, space heating and cooling.

Wind energy

Despite scant wind speed data, it is estimated that Sierra Leone's average wind velocities range between 3 m/s and 5 m/s, reaching an average of approximately 8 m/s in some mountainous areas. There are indications that wind speeds of 12 m/s are possible in parts of the country, implying that wind energy could be a viable option for energy production in selected locations. Wind farms are, for instance, possible in some areas such as along the coastline or off-shore, among other locations within the country.

With the low wind speed turbines now available in the market, there is a strong potential for the use of these systems in the rural areas, particularly in the north of the country. There is a known wind energy system in Sierra Leone that is located in the Bonthe district along the south coastline area.

See chapter 1.3 for targets in page 9.

Challenges for renewable energy Programmes

The challenges for renewable energy deployment in Sierra Leone are listed below:

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- Low level of awareness;
- High cost of initial capital investment;
- Lack of financing and private investment;
- Absence of adequate research and development ;
- Lack of economic incentives;
- Lack of human capacity;
- Lack of legal framework and enforcement mechanisms;
- Lack of accurate data.

Renewable energy measures

Measures contained in the National Renewable Energy Policy (chapters on legal instruments and planning framework) include:

- (i) Appropriate regulations for grid-connection and wheeling of electricity generated from renewable energy;
- (ii) Establishing Feed-in-Tariffs (FIT) which typically incentivize electricity producers by offering more favourable pricing for electricity produced through renewable energy;
- (iii) Introducing Power Production Tax Credit (PTC) to electricity generation companies which is aimed at incentivizing the adoption of renewable energy;
- (iv) Adopting a Public Benefits Fund (PBF) which requires that a certain percentage of the tariff be dedicated to supporting renewable energy generation projects on and off the grid;
- (v) Phasing in of regulations requiring power producer tariffs to be based on full cost accounting and the incorporation of environmental externalities;
- (vi) New legislation for the energy sector incorporating renewable energy that provides equitable opportunities for their development;
- (vii) Regulations for the petroleum industry to accommodate locally produced bio-diesel and ethanol;
- (viii) Appropriate legal and regulatory instruments to stimulate the uptake of renewable energy power generation into the electricity system;
- (ix) Mechanisms to increase the access of renewable energy to the national electricity grid;
- (x) Strengthening co-operation between the Ministry of Energy and the other bodies active in the renewable energy and planning sectors;

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- (xi) Encouraging formal discussion and collaboration between institutions in the renewable energy and planning sectors whose activities are inter-related;
- (xii) Establishing energy planning and implementation units at the Ministry of Energy and assigning responsibilities for energy related matters at local Government levels;
- (xiii) Ensuring that the strategic plans and programmes of the renewable energy sub-sectors are appropriately appraised, with a view to ensuring consistency with the overall national energy policy and plans and resolving conflicts arising from sub-sectoral plans and programmes;
- (xiv) Establishing a national energy information system which will involve consistent data gathering and processing of energy resource inventory, consumption patterns, energy technologies, and other relevant socio-economic parameters;
- (xv) Instituting an accelerated and effective manpower renewable energy development programme;

Measures for achieving renewable energy targets

Table 16 below shows the measures and activities intended to achieve the targets set in the previous sections by the Ministry of Energy. The implementation of the activities will be monitored by ECREEE at regional levels.

Table 16: Measures for achieving renewable energy targets

	Name and reference of the measure	Type of measure*	Expected results**	Targeted group and or activity***	Existing or planned	Start and end dates of the measure
1	Developing an Energy Act.	Regulation	Laws for energy administration & management	MoE, MoFED, investors, planners, Public and private administration, rural and urban population etc.	Planned	2015 - 2016
2	Reviewing the National Energy Policy, 2009	Policy	Clear policy direction on energy matters	MoE, MoFED, investors, planners, Public and private administration, rural and urban population etc.	Planned	2015 - 2016
3	Implementing the National Electricity Act 2011	Regulation	Established EDSA and EGTC	MoE, MoFED, investors, utility management, customers (end-users), public and private sector, rural and urban population	Existing	2011 - date

2015)

4	Implementing the Electricity and Water Regulatory Commission Act 2011	Regulation	Authorisation, certification and licensing, including tariff, customer complaint etc.	MoE, MoFED, investors, utility management, customers (end-users), public and private sector, rural and urban population	Existing	2011 - date
5	Reviewing the Power Generation Act 2006	Regulation	Public Private Partnerships' participation in the power generation trade	MoE, MoFED, EWRC, EGTC, investors, rural and urban population, Public administration etc.	Planned	2015 - 2017
6	Promoting the Financing Act 2013 on duty free concession on RE equipment and materials	Financial	Access to funds, awareness raising	MoE, MoFED, Investors, end users, Public administration, installers, urban or rural population,	Planned	2015 to 2017
7	Holding workshops and media programmes to remove barriers hampering the effective development, implementation and dissemination of RETs	Soft	Behavioural change	MoE, MoFED, Public administration, urban or rural population	Planned	2015 to 2018
8	Providing incentives for the importation and application of renewable equipment/ devices.	Financial	Access to RE technologies	MoE, MoFED, Investors	Planned	2015 to 2018
9	Introducing an appropriate Legal Framework to support the development of a Renewable Energy Act.	Regulation	Access to legal directions	MoE, MoFED, MoJ, Public administration, urban or rural population	Planned	2015 to 2018
10	Introducing Power Production Tax Credit (PTC) to electricity generation companies aimed at incentivizing the implementation of renewable energy.	Financial	Funds to accelerate RE	Investors, MoE, MoFED,	Planned	2015 to 2020
11	Providing affordable feed-in-tariffs (FIT) to incentivize electricity producers.	Financial	Access to funds	Investors, electricity producers, MoE, MoFED, EWRC	Planned	2015 to 2018

2015)

12	Adopting a Public Benefits Fund (PBF) which requires that a certain percentage of the tariff be dedicated to supporting renewable energy generation projects on and off the grid.	Financial	Access to energy and funds	MoFED, MoE, EWRC, end-users, rural and urban population, investors	Planned	2015 to 2025
13	Prioritising the installation of RETs in remote and underdeveloped communities	Regulation	Increase access to RETs	MoE, MoFED, investors, installers, rural population	Planned	2015 to 2030
14	Setting up institutions to produce and assemble RE devices	Regulation	New technologies on RE	MoE, MoFED, installers, investors, planners, R&D engineers,	Planned	2015 to 2030
15	Setting targets and tracking systems to monitor the contribution of RE in the national energy mix.	Regulation	Increase access to energy	Planners, MoE, MoFED, Public administration	Planned	2015 to 2020
16	Raising public and stakeholder awareness of the benefits and opportunities of renewable energy.	Soft	Increase awareness on RE, behavioural change	MoE, MoFED, rural and urban population, end-users, investors	Planned	2015 to 2030
17	Introducing research and development work in renewable energy matters, as well as promoting dialogue with countries active in RET research and development.	Regulation	New innovations	MoE, MoFED, R & D engineers, investors, trainers,	Planned	2015 to 2030
18	Conducting training in RETs in tertiary and other learning institutions.	soft	Capacity building	MoE, MoFED, USL, RE institution	Planned	2015 to 2030
19	Developing hydropower projects in the country, including development of pico hydro schemes.	Regulation	Access to energy	MoE, MoFED, Investors,	Planned	2015 to 2030

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20	Introducing Public private partnerships and promoting indigenous participation in hydropower development.	Regulation	Public Partnership ownership	Private sector	MoE, MoFED Public Private Partnership sector, investors	Planned	2015 to 2020
21	Implementing measures to reduce the rate of deforestation and land degradation and minimize threats of environmental problems resultant from the use of biomass resources.	Regulation	Sustainable forest management		MoE, MoFED Public administration, rural and urban population, MoAFFS,	Planned	2015 to 2030
22	Formalizing the commercialisation of firewood and charcoal.	Regulation	Well-coordinated and proper commercialisation of wood fuel		Rural and urban population, MoE, MoTI, MoAFFS, MoFED	Planned	2015 to 2020
23	Monitoring the contribution of agro-based industries to electricity production from wastes.	Regulation	Access to energy		MoE, MoFED investors, municipal councils	Planned	2015 to 2025
24	Promoting improved production and efficient use of fuelwood and charcoal.	Soft	Reduce health risk and wastages of wood fuel		MoE, MoFED, MoAFFS, rural and urban population	Planned	2015 to 2020
25	Introducing efficient production and use of ethanol, biogas, bagasse, biodiesel and bio-char from palm kernel, sugar cane, manure, sewage, municipal waste, briquettes, pellets, elephant grass, cassava, straw and husk.	Regulation	Increase bio-energy access		MoE, MoFED, MoAFFS, investors, end-users, planners, installers, Public administration	Planned	2015 to 2025
26	Providing financial incentives to increase the percentage of solar energy in the energy mix.	Regulation	Increase solar power access		MoE, MoFED, Investors, end-users, planners, installers, Public administration	Planned	2015 to 2025
27	Complementing renewable energy development with energy	Soft	Behavioural Change		MoE, MoFED, investors, end-users, Public administration	Planned	2015 to 2018

2015)

	efficiency programmes.					
28	Introducing measures to ensure that wind energy is harnessed at sustainable costs to both suppliers and consumers in the rural and coastal areas.	Financial	Wind power installed along the coastal and rural areas	MoE, MoFED, investors, end-users, urban and rural population, Public administration	Planned	2015 to 2025
29	Ensuring environmental considerations are included in all renewable energy planning and implementation.	Regulation	Green RE equipment	MoE, MoFED, MoAFFS, EPA, end-users, investors, Public administration	Planned	2015 to 2020
30	Exploiting Clean Development Mechanism (CDM) with other stakeholders to assess and package renewable energy projects.	Financial	Reduce GHG emission	MoE, MoFED, MoAFFS, EPA, investors, public administration	Planned	2015 to 2018
31	Developing solar battery disposal mechanisms and ensuring strict adherence to disposal protocols..	Regulatory	Installed solar batteries Disposal Sites	MoE, MoFED, MoAFFS EPA,	Planned	2015 to 2020
32	Supporting public private partnerships' participation in the promotion and development of renewable energy fuels, devices and technologies at competitive prices.	Regulatory	Behavioural change	MoE, MoFED, MoAFFS, EPA, investors, public administration	Planned	2015 to 2018

Source: MoE, MoFED, SSL, BSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

On-going hydropower projects and Programmes in the country:

The main renewable energies available in the country are hydro, solar and biomass, and there is also a tremendous potential for bioenergy production.

The following are the on-going renewable energy projects and their status:

1. Bumbuna Hydro Project – Phase I: The project has an installed capacity of 50 MW and a firm capacity of 18 MW. It was commissioned in November 2009 and is currently supplying power to Freetown and Makeni.

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- Plans are underway to serve the Magburaka, Lunsar and Bumbuna communities along the transmission line. The ongoing works at the site include landslide mitigation activities, minor road works and the construction of a weir downstream from the power house. The system requires the construction of a second 161 kV transmission line to Freetown;
2. Bumbuna Hydro Project – Phase II: The project will increase the installed capacity of the Bumbuna hydro scheme by 350 MW. It requires about Euro 520 million, as estimated in 2009, to create a regulatory dam (35 km upstream of phase I), expand the power house at phase I plant (increase from 50 MW to 100 MW), and construct a second power house at Yiben and a third power house downstream from the phase I dam;
 3. Makalie and Charlotte mini hydro projects: These are 120 kW and 2.2 MW hydro power plants, respectively. Funding has been secured for these projects and works are being undertaken by a Chinese engineering team;
 4. Bankasoka Mini Hydro Project: This is a 2.2 MW plant under construction along the Bankasoka River, Port Loko Town. The project was implemented under a bilateral agreement between the GoSL and the Government of China;
 5. Yele Mini Hydro Project: The 250 kW project was completed and operational prior to the war, but partially destroyed during the civil conflict. It currently requires major rehabilitation for which an EOI has been submitted for review and follow up by the GoSL;
 6. Bekongor Hydro Project: An 85 MW project located between Kenema and Kono Districts, which currently requires detailed feasibility studies, as well as environmental and social impact assessments;
 7. Dodo Hydro Project: A 6 MW project currently serving the Bo-Kenema Power Services. Plans are underway to increase its installed capacity to 12 MW;
 8. Moyamba Mini Hydro Project: A 10 MW project to be constructed in the Moyamba District to serve Moyamba Town, Shenge, Rotifunk, Njala, Mano and Tiama. Funding pledges for initial works have been received from GEF and UNIDO;
 9. Solar Street Lighting Project: This project aims at installing 8,880 solar street lights in Freetown and Provincial and District Headquarter cities and towns. The estimated cost of the project is USD 28 million to be jointly provided by GoSL, ECOWAS Bank for Investment and Development and the Government of India;
 10. Rural Solar Electrification (Barefoot Initiative);
 11. ADDAX Bio-energy Project: The GoSL has signed an agreement with ADDAX to build a biomass plant with a maximum capacity of 30 MW to produce ethanol. Excess ethanol produced is to be sold to NPA;
 12. Solar Park Project: The project, approved by the parliament for implementation, installation and connection to the national grid, will have an installed capacity of 6 MW and produce approximately 9,9m kWh per year, which equates 8.5% of Sierra Leone's total consumption (based on 2009 data). The project will be located next to Freetown, the capital of Sierra Leone, at latitude 9°N close to the equator. With high global irradiations, up to 2,200 kWh/m², Sierra Leone is dedicated for use of solar energy, but the average humidity of more than 50% during the year limits the technology mainly to photovoltaic..

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All major components, like solar modules and inverters, will be manufactured in Germany, the leader in renewable energy solutions.

3.3. Energy efficiency

According to studies conducted by the Ministry of Energy and the UNDP in 2012, the growth in the demand for fuelwood and charcoal is estimated at 3% per annum. Electricity demand, on the other hand, is growing between 6-7% annually, while consumption of petroleum products is estimated to increase at about 5% per annum. The losses in the production, transportation and use of energy are also as high as 22% annually. System losses in electricity distribution amount to roughly 25% of electricity produced, while wastage in the end-use of electricity is estimated at about 45%. Besides lessening the immediate associated costs, reducing technical losses within the energy sector and ensuring more efficient use of energy would also decrease demand and avoid unnecessary investments in energy capacity. Previous efforts by the Ministry of Energy and other agencies to promote energy efficiency and conservation in homes and industries have not resulted in sustained implementation of effective measures within the country due to a number of financial and institutional obstacles.

According to various internal reports from the energy, agriculture, transport, environment and infrastructure sectors, energy utilization in Sierra Leone is highly unsustainable due to the following reasons:

- i. Forest and woodland reserves are being depleted for heating and cooking purposes, using stoves of less than 30% efficiency;
- ii. Soil erosion, desertification and micro-climate change resulting from forest clearing;
- iii. Emissions from inefficient transport vehicles are sources held hazard in cities;
- iv. Use of inefficient electrical appliances (lighting, refrigeration, air conditioning, motors, fans, etc.), especially in the residential, commercial and industrial sectors, in the face of insufficient electricity supply, have aggravated the demand-supply imbalance;
- v. Serious pollution due to inefficient use of fossil fuels is affecting major cities, leading to negative consequences on agriculture, water supply, forest resources, sea level rise, health, etc;
- vi. Energy efficiency regulations are currently absent;
- vii. Construction of energy inefficient buildings;
- viii. Non-payment of electricity bills by customers.

The challenges faced by Sierra Leoneans regarding energy efficiency are listed below:

- (i) Low level of awareness regarding the efficient use of energy;
- (ii) High cost of initial investment;

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- (iii) Absence of Research & Development;
- (iv) Lack of economic incentive;
- (v) Unreliable electricity supply;
- (vi) Lack of willingness to pay for energy consumption;
- (vii) Lack of quality control and standards;
- (viii) Lack of human capacity;
- (ix) Lack of legal framework and enforcement mechanisms;
- (x) Lack of accurate data on consumers;
- (xi) Unavailability of energy efficient products;
- (xii) Lack of finance for energy efficiency and conservation programmes.

Objective One: To address the energy needs of women

The ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW-GEN) is being implemented by ECREEE. Its overall objective is to contribute towards increased access to modern, affordable and reliable energy services, energy security and environmental sustainability by tailoring national and regional policies, projects and programmes to the energy needs of men and women.

The strategy for achieving the programme's objectives will include:

- Building and strengthening capacities for gender mainstreaming in energy policies and projects;
- Steering and supporting the development of gender-sensitive policies within the region;
- Promoting knowledge management, awareness creation and advocacy on gender and energy issues;
- Implementing gender-responsive investment and business promotion in sustainable energy development in the ECOWAS region.

The Mano River Union (MRU) recognizes that women's access to sustainable energy is critical to the development of the region's economy as well as to the success and sustainability of the SE4ALL initiative and the MDGs. The MRU is therefore committed to promoting the full participation of women as key stakeholders at all levels of decision-making for the proper integration of gender perspectives in the planning, implementation and monitoring of all energy-related dialogues, initiatives and policies, in order to promote sustainable energy for all. To this end, the Mano River Union convened a regional Conference on "Women's Economic Empowerment through Energy Access in the MRU Sub-region," from 7-9 May 2013, in Freetown, Sierra Leone. The event was hosted by the Government of Sierra Leone and

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organized with the support of the ECOWAS ECREEE, the United Nations Industrial Development Organization (UNIDO) and the African Development Bank (AfDB). The conference reviewed the status of women's economic empowerment in sustainable energy and showcased best practices from the MRU and other countries in the ECOWAS region. In order to overcome the existing barriers and explore possible solutions to build on opportunities for women's entrepreneurship, a draft framework action plan was developed and agreed upon.

Sierra Leone is an important participant to both the ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW-GEN) and the framework action plan on women's economic empowerment through energy access in the Mano River Union (MRU).

Objective Two: To improve energy efficiency in buildings

The ECOWAS, through ECREEE, in cooperation with the Member States, has developed the ECOWAS Directive on Energy Efficiency in Buildings (EDEEB). The main purpose of the ECOWAS Directive for Energy Efficiency in Buildings (EDEEB) is to promote the improvement of energy efficiency of buildings among ECOWAS Member States.

Energy efficiency requirements in the building codes and thermal regulations of ECOWAS Member States shall ensure that energy efficiency is taken into account in the design and building phase and can help to implement the building energy efficiency potential. The respective building code shall define norms and standards for the energy performance of buildings based on the climate zone in which they are located.

The EDEEB defines the ECOWAS framework on energy efficiency for buildings, highlighting the following:

- (i) A common general framework to measure and calculate energy performance of buildings;
- (ii) Minimum requirements for new buildings' energy performance;
- (iii) Minimum requirements for existing buildings' energy performance, subject to major renovation and requiring project approval;
- (iv) Minimum requirements for renewable energy sources used in new and existing buildings, subject to major renovation and requiring project approval;
- (v) Buildings' energy certification.

Strategies in the buildings sector include, among others:

- National building code tailored to local conditions and construction practices, which requires or encourages minimum energy efficiency standards in buildings, criteria for tropical architecture and a link to urban planning, in line with the requirements of the ECOWAS EDEEB;
- Measures aiming at reducing energy consumption in public buildings by addressing the building as such and the building operation (including user behaviour);

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- Develop and implement a system to award energy performance certificates for public buildings;
- Promotion of the use of local materials in construction;
- Qualification, accreditation and certification schemes for installers of energy-related building elements;
- Develop and disseminate a compilation of model designs for sustainable construction of small buildings.

Objective Three: To improve energy efficiency in the lighting sector

ECOWAS, through ECREEE, has developed the ECOWAS regional strategy on energy efficient lighting. The strategy covers both on grid and off-grid lighting. The actions outlined in the ECOWAS strategy cover the four parts of the integrated policy approach:

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

The SE4ALL country action agenda for Sierra Leone will align its actions on energy efficient lighting with the ECOWAS regional strategy, such that national actions complement those taken at the ECOWAS level.

Strategies:

- Adopting Minimum Energy Performance Standards (MEPS) for on-grid and off-grid lighting devices;
- Supporting energy efficient lighting policies and measures through awareness raising campaigns targeting final consumers;
- Establishing a system for Monitoring, Verification and Enforcement (MV&E) of Minimum Energy Performance Standards (MEPS) for lighting systems;
- Environmentally sound management, through the implementation of a collection and disposal system for energy efficient light bulbs.

Objective Four: To improve energy efficiency in the cooking sector

ECREEE initiated a regional Cooking energy initiative called West African Clean Cooking Alliance (WACCA). The specific objectives of WACCA are:

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- Promote the implementation of policies and regulatory framework on clean cooking initiatives in the ECOWAS region;
- Enhance capacity building in clean cooking initiatives in the region;
- Support and harmonise standards and labelling practices in the region.

At national level, WACCA is assisting 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 the establishment of financing mechanisms and the implementation of awareness campaigns. Sierra Leone is one of the pilot countries of the WACCA initiative.

Strategies:

- Improvement of national cooking policies, strategies and targets, including legal and regulatory mechanisms, in line with the existing ECOWAS regional policies and the WACCA initiative;
- Develop gender-responsive actions and economic empowerment of women, and integrate gender aspects in national planning and strategy and decision-making processes;
- Support cross-sectoral coordination through the inclusion of clean cooking across sectors, e.g. through inter-ministerial task teams;
- Improve the efficiency and sustainability of the energy value chain, through participatory and sustainable forest management (PSFM);
- Monitoring system for the fuel wood value chain;
- Establish SMEs to distribute efficient fuels at local level, and establish public bodies to support and stimulate private sector involvement;
- Capacity building programmes for public and private actors, and in collaboration with local communities;
- Standards and labelling for improved cook stoves and fuels;
- Information dissemination and knowledge sharing (e.g. catalogue of best practices and strategies, information materials on clean cooking fuels and stoves, awareness raising campaigns and capacity building workshops);
- Programmes to enhance access to finance, increase the use of carbon financing and improve the regulatory framework.

The measure for achieving energy efficiency targets is indicated in table 17 below for the 2015 to 2030 period.

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Table 17: Measures for achieving energy efficiency targets

No.	Measure	Type of measure	Description of the measure	Target group	Implementing body/parties	Time frame
1	Adoption of Minimum Energy Performance Standards (MEPS) for on-grid and off-grid lighting devices	Energy efficiency policy/tool, awareness raising/information	<p>To adopt and enforce the Minimum Energy Performance Standards (MEPS) in Sierra Leone implemented by a regional work group</p> <p>Conduct national consultations with policy makers and other stakeholders</p> <p>Pursue ECOWAS Process of Standardisation (Ecosham)</p> <p>Adopt ECOWAS harmonised MEPS on efficient lighting and publish in national official journal</p> <p>Set up a national standards and labelling technical committee</p> <p>Phase out of inefficient lighting products</p>	Equipment manufacturer s, retailers, end users	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI)	2015 to 2017
2	Supporting energy efficient lighting policies and measures, through awareness raising campaigns targeting final consumers	Awareness raising	<p>Conduct public awareness campaigns and demonstration programmes on energy efficient lighting:</p> <ul style="list-style-type: none"> • Inform consumers and other stakeholders of the social, economic and health advantages of efficient lighting; • Distribute free (or subsidised) on-grid and off-grid lighting products to selected communities (with disposal of old lamps); • Develop social housing projects with efficient lighting. 	End users, planners, retailers, energy suppliers	Ministry of Energy, Ministry of Trade & Industry, Ministry of Works, House & Infrastructure	2015 to 2020
3	Establishing a system for Monitoring, Verification and	Capacity	Establish national registries for on-grid and off-grid lighting	End users, public	Ministry of Energy (MoE), Ministry of	2015-2017

2015)

	<p>Enforcement (MV&E) of Minimum Energy Performance Standards (MEPS) for lighting systems</p>	<p>building</p>	<p>products:</p> <ul style="list-style-type: none"> +Create and make functional national registries for lighting products; +Create and make functional a regional registry for lighting products; Collate data on lighting products – country of origin, importers, quantity, quality, technical data sheets. <p>Monitor import/export of efficient lighting products into Sierra Leone (with periodic checks) & set penalties for non-compliance of standards and labelling requirements</p> <p>Conduct regular census of importers, wholesalers and distributors of efficient lighting products</p> <p>Conduct periodic checks on importers, wholesalers and distributors of efficient lamps</p>	<p>administration , equipment manufacturer s, retailers</p>	<p>Trade & Industry (MoTI) and Ministry of Works, House & Infrastructure (MoWHI)</p>	
<p>4</p>	<p>Environmentally sound management through the implementation of a collection and disposal system for energy efficient light bulbs</p>	<p>Capacity building, awareness raising/information</p>	<p>Create public awareness of the environmentally sound collection and disposal of on-grid and off-grid efficient lamps and batteries.</p> <p>Organize public education and awareness campaigns on the rationale behind and methods for environmentally sound collection and disposal of used lamps and batteries in national and local languages through radio, television, posters/leaflets, newspapers, SMS messages, at social events, markets and through celebrities.</p> <p>Organize special education programmes for the youth in</p>	<p>End users, Public administration , equipment manufacturer s, retailers</p>	<p>Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Ministry of Works, House & Infrastructure (MoWHI), Environmental Protection Agency (EPA), Ministry of Agriculture, Forestry & Food Security (MoAFFS), Ministry of Lands, Country Planning & Environment</p>	<p>2015 to 2030</p>

2015)

			<p>schools.</p> <p>Conduct national consultations with policy makers and other stakeholders:</p> <ul style="list-style-type: none"> • Development of national regulation for environmentally sound disposal of spent efficient lamps and batteries; • Application of extended producer responsibility principle; • Setting up Collection & Recycling Service Organisations (CRSOs). <p>Develop and adopt national regulations for environmentally sound disposal of spent on-grid and off grid efficient lamps and batteries:</p> <p>Conduct national consultations with utilities, selected shops, schools and other stakeholders on:</p> <ul style="list-style-type: none"> • Development of national collection systems for spent efficient lamps and batteries; • Involvement of informal sector in spent lamps collection; • Incentives for consumers and spent lamp collectors. <p>Design a national collection system for spent efficient lamps and batteries with:</p> <ul style="list-style-type: none"> • Involvement of the informal sector in spent lamps collection; 		(MoLCPE)	
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2015)

			<ul style="list-style-type: none"> • Incentives for consumers and spent lamp collectors. <p>Adopt and implement national collection system for spent efficient lamps and batteries.</p> <p>Establish Collection and Recycling Service Organisations.</p> <p>Develop and implement national collection systems established for spent on grid and off grid efficient lamps and batteries:</p> <ul style="list-style-type: none"> • Invite bids and select a 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; • Invite bids and select a contractor to build and operate a regional recycling and disposal facility for spent on-grid and off-grid efficient lamps and batteries. <p>Commission a regional recycling and disposal facility(ies) for spent on-grid and off-grid efficient lamps and batteries.</p>			
5	Market assessment of key-energy using appliances	Capacity building, awareness raising/information	<p>Market assessment:</p> <p>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.</p> <p>Collection of additional market data and baseline usage, as well as performance data for selected product categories, as necessary,</p>	Public administration, equipment manufacturers, retailers	Ministry of Energy (MoE) and Ministry of Trade & Industry (MoTI),	2015 - 2020

2015)

			to inform a decision on efficiency performance levels, for instance through field surveys (e.g. end-use metering studies) and laboratory testing.			
6	Implementation of standards and labels	Energy efficiency policy	<p>Develop standards and labels together with ECOWAS:</p> <p>Conduct national consultations with policy makers and other stakeholders;</p> <p>Pursue ECOWAS Process of Standardisation (Ecosham);</p> <p>Adopt ECOWAS Harmonised MEPS on efficient appliances and publish in national official journal;</p> <p>Set up a national standards and labelling technical committee.</p> <p>Impact assessment:</p> <p>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.</p> <p>Diffusion of EE appliances:</p> <p>Develop and introduce programmes to encourage or require public-sector and large-scale private-sector procurement of energy efficient products.</p>	Public administration, equipment manufacturers, retailers, energy suppliers	Ministry of Energy (MoE) and Ministry of Trade & Industry (MoTI),	2015 - 2017
7	Building capacity among national standards bodies and other stakeholders	Capacity building	<p>Capacity building:</p> <p>Training and informational workshops to educate and build capacity among stakeholders:</p> <ul style="list-style-type: none"> • Training workshops to build capacity on standards and labelling in the national 	Public administration, equipment manufacturers, retailers	Ministry of Energy (MoE) and Ministry of Trade & Industry (MoTI),	2015 - 2017

2015)

			<p>standards bodies and energy authorities;</p> <ul style="list-style-type: none"> • Training workshops in certification procedures, compliance monitoring, and enforcement programmes; • Training of importers, retailers and other relevant stakeholders such that they actively support the initiative. <p>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 programmes. In this context, the cooperation between energy authorities and authorities in charge of standards shall be strengthened.</p> <p>Develop capacity-building materials for S&L programme managers and stakeholders.</p>			
8	Raising awareness on energy-efficient appliances for national authorities, the commercial sector and the general public	Awareness raising/information	<p>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.</p> <p>Design and conduct awareness raising campaigns for national authorities, manufacturers, distributors, specialized professionals such as engineers and technicians and the general public.</p>	Public administration, equipment manufacturers, retailers, end-users	Ministry of Energy (MoE) and Ministry of Trade & Industry (MoTI),	2015 - 2016

2015)

9	Financing for the diffusion of energy-efficient appliances	Financial	<p>Consult with political bodies and utilities on drafting incentives schemes to promote the purchase of energy-efficient appliances.</p> <p>Develop and introduce 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.</p>	Public administration, equipment manufacturers, retailers, end-users	Ministry of Energy (MoE) and Ministry of Trade & Industry (MoTI),	2015- 2018
10	Introduction of energy efficiency criteria into the national building code and establishing a link to the ECOWAS Directive for Energy Efficiency in Buildings (EDEEB)	Energy efficiency building policy/tool	<p>Develop and implement a national building code tailored to local conditions and construction practices which requires or encourages a high level of energy performance for new buildings; this should include minimum energy efficiency standards in buildings under the building permit procedure; criteria for tropical architecture and the link to urban planning.</p> <p>The national building code should be developed in accordance with the ECOWAS Directive on Energy Efficiency in Buildings (EDEEB). Specifically, compatibility with the EDEEB should be ensured in at least the following aspects:</p> <ul style="list-style-type: none"> • A common general framework to measure and calculate the energy performance of buildings; • Minimum requirements for new buildings' energy performance; • Minimum requirements for existing buildings' energy performance, subject to 	End users, Public administration, planners, architects, installers,	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Ministry of Works, House & Infrastructure (MoWHI) and Ministry of Lands, Country Planning & Environment (MoLCPE)	2015 to 2016

2015)

			<p>major renovation and requiring project approval;</p> <ul style="list-style-type: none"> • Minimum requirements for renewable energy sources used in new and existing buildings, subject to major renovation and requiring project approval; • Buildings energy certification. 			
11	Capacity building, institutional strengthening and training measures on energy efficiency for the buildings value chain	Capacity building	<p>Capacity building for building and construction authorities, for implementation and enforcement (inspection, certification) of energy efficiency criteria in building codes.</p> <p>Training for building professionals to comply with the energy efficiency standards in the building code, through use of bio-climatic technologies.</p> <p>Development of local industries to produce building materials and equipment for high efficiency buildings.</p> <p>Showcase bio-climatic architecture adapted to local climate conditions, through demonstration projects</p>	End users, Public administration, planners, architects, engineers, installers, manufacturers of construction materials	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Ministry of Works, House & Infrastructure (MoWHI) and Ministry of Lands, Country Planning & Environment (MoLCPE)	2015 to 2020
12	Promotion of the use of local materials in construction	Capacity building	<p>Development of a catalogue of local building materials, construction, monitoring and evaluation of demonstration buildings.</p> <p>Establishment of testing facilities to ensure that products comply with technical requirements</p>	Manufacturers of construction materials, architects, engineers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), (MoWHI) and (MoLCPE)	2015 to 2020
13	Developing and implementing a system to award energy performance certificates for public buildings in Sierra Leone	Policy/tool	Development of an accreditation process to accredit bodies that will issue the energy performance certificate.	Manufacturers of construction materials,	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Ministry	2015 to 2020

2015)

			<p>Development of a standard for energy performance certificates establishing reference values such as minimum energy performance requirements for relevant building categories.</p> <p>Development of a national building energy performance register: Where an energy performance certificate is issued, such information contained in the energy performance certificate will be required to be submitted to a national building energy performance register to be established and maintained by the pertinent authority.</p>	architects, engineers	of Works, House & Infrastructure (MoWHI) and Ministry of Lands, Country Planning & Environment (MoLCPE)	
14	Introduction of improved management practices and technical measures to diminish losses in the electricity distribution system	Energy efficiency policy/tool	<p>Management practices related to billing and maintenance, such as optimised billing and regular inspection of lines.</p> <p>Shortened billing cycle, including thorough tools that produce a bill immediately upon meter reading.</p> <p>Regular inspection of lines to identify and remove illegal, unsafe connections, and to encourage all users to become paying customers.</p> <p>Regular preventive maintenance of all components of the distribution system in order to assure reliable power supply. This includes, notably, upgrading of lines and transformers that are operating near capacity that show signs of weakness or that are outdated and inefficient.</p> <p>Installation of pre-paid meters to improve bill collection and relations with clients.</p> <p>Installation of high voltage</p>	End users, Public administration, planners, installers, energy suppliers	Ministry of Energy (MoE), Electricity & Water Regulatory Commission (EWRC), Electricity Distribution & Supply Authority (EDSA) and Electricity Generation & Transmission Company (EGTC)	2015 to 2025

2015)

			<p>distribution systems that improve power quality and reduce theft.</p> <p>Power factor correction to reduce losses, through the installation of capacitor banks on client premises where they are needed.</p>			
15	Promotion and widespread dissemination of efficient cook-stoves in Sierra Leone	Capacity building	<p>Develop capacity building manuals on various aspects of clean cooking fuels and devices.</p> <p>Support the identification of pioneer producers willing to manufacture improved cook stoves and assist them in producing the new models. Pioneer producers can later on be used as trainers of other producers and could benefit from innovations and promotional support. Arrangements with pioneer producers should, however, leave enough room for other production units to undertake large-scale dissemination in the future.</p> <p>Develop and implement programmes for training of trainers.</p> <p>Develop and implement programmes for male and female stove producers on business development.</p> <p>Develop and implement programmes for training for improved stoves in productive use (building on the model of UNIDO for cluster development, bio-char and other innovative stoves).</p> <p>Develop and implement programmes to train entrepreneurs on how to improve the quality of products, better understand consumer</p>	Investors, end users, Public administration, planners, installers, equipment manufacturer s and retailers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI) Ministry of Agriculture, Forestry & Food Security (MoAFFS), United Nations Development Programme (UNDP), and European Union (EU)	2015 to 2020

2015)

			<p>preferences and incorporate feedback, attract investment, market their products, and keep financial records.</p> <p>Develop and implement programmes for training and capacity reinforcement of private operators, research institutions, NGOs, village associations, women groups and female entrepreneurs, and consumer associations.</p> <p>Develop and implement programmes to support the training and education of women entrepreneurs that can become engaged and employed throughout the value chain, leading to increased success of cook stove businesses.</p> <p>Capacity building for local enterprise development along the value chain, through individual organizations and women's networks or via regional knowledge and training centres.</p> <p>Develop and implement strategies to expand distribution channels for improved cook stoves, for instance by adding improved cook stoves and fuels to large non-cooking product distribution/wholesale networks, and improve existing cook stove and fuel-specific distribution networks to ensure consumer access.</p> <p>Support the development of the technical, research, and training capacity within the humanitarian community to develop efficient cook stove intervention in humanitarian settings.</p>			
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16	Formation of a National Cooking Energy Stakeholder Group (CESG)	Capacity building	<p>Formation of a National Cooking Energy Stakeholder Group (CESG) – headed up by the Ministry of Energy, with participation from all key Government, development partners, NGO/CBO and private sector groups.</p> <p>The CESG will ensure that sector players are working toward a cohesive coordinated strategy and are learning from each other, leveraging each other's work, not duplicating efforts, and able to advocate for the sector as one unified voice. The CESG will support cross-sectoral coordination, through the inclusion of clean cooking across sectors (health, energy, environment, gender, economic development, education and training, forestry, rural development etc.).</p> <p>The CESG will serve several objectives, including:</p> <ul style="list-style-type: none"> • Coordination of the sector/regular meetings; • Sharing of best practice/knowledge hub; • Harmonize donor funding and resource mobilization. 	Investors, Public administration, planners, equipment manufacturer s and retailers	Ministry of Energy (MoE), development partners, NGO and private sector groups	2015 to 2020
17	Promotion of efficient charcoal production	Capacity building	<p>To establish coherent and transparent policy and regulatory framework to stimulate efficient charcoal production and by leveraging public and private sector resources.</p> <p>To carryout public education and awareness campaigns on charcoal production, through gender-based knowledge</p>	End users, Public administration, planners, installers, energy suppliers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Ministry of Agriculture, Forestry & Food Security (MoAFFS), UNDP, and EU	2015-2020

2015)

		<p>products.</p> <p>To improve the efficiency and sustainability of the charcoal production value chain, through participatory and sustainable forest management.</p> <p>To ensure accurate and reliable baseline data for conducting a detailed cost-benefit analysis on the opportunity cost of efficient charcoal production.</p> <p>To provide incentive to manage woodlands better, ensuring that appropriate tree species for fuel wood and charcoal are planted, that management to increase yields is applied, and that techniques to improve harvesting to stimulate re-growth or easier replanting are applied.</p> <p>To minimize kiln's technical inefficiencies that characterizes the entire charcoal production value chain. Charcoal is produced at half or two-thirds of the efficiency it could be were improved techniques and training applied. This results in the harvesting of nearly twice as much wood as necessary to produce the same amount of charcoal as with a well-managed efficient charcoal kiln.</p> <p>To ensure viable business and financial models with cost efficient incentives to scale up efficient charcoal business.</p> <p>To increase know-how, technical skills on kiln producing charcoal to avoid considerable wastes of wood, resulting in harvesting more forest than would be necessary if wood-to-charcoal</p>			
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2015)

			<p>transformation were more efficient.</p> <p>To establish standards, certification and labels on charcoal production and product information for end users to make informed decision on purchases (durability, user friendliness, emissions factors).</p> <p>To increase level of awareness and capacity on sustainable charcoal production technologies (type of kilns).</p>			
18	Create a self-sustaining entrepreneurial network of rural micro-enterprises for delivery of improved biomass fuels	Capacity building	<p>Conducting training courses for new entrepreneurs wherever required.</p> <p>Conducting refresher courses for successful entrepreneurs.</p> <p>Promotion and marketing activities, e.g. village level awareness campaigns and programmes organised to create marketing opportunities for the new enterprises.</p> <p>Ensuring quality of the products, through continuous monitoring and evaluation.</p> <p>Encouraging local banks and financing institutes to support the new businesses.</p> <p>Establishing use of improved biomass fuels as a common practice in rural households.</p>	End users, Public administration, planners, installers, energy suppliers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI) and Ministry of Agriculture, Forestry & Food Security (MoAFFS)	2015-2020
19	Promotion of the use of energy efficient fish smoking kilns for artisanal fish smoking	Capacity building	<p>Demonstration of energy efficient fish smoking kilns in local communities; adapt the improved kilns to local conditions and materials.</p> <p>Provide training for the construction, use and</p>	Fish smokers and wood fuel traders	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), and Ministry of Agriculture, Forestry & Food Security	2015-2020

2015)

			<p>maintenance of the improved fish smoking kilns.</p> <p>Introduce local production of improved fish smoking kilns.</p> <p>Produce training and information material, in order to promote the introduction of improved kilns/ovens.</p> <p>Ensure the widespread dissemination of energy efficient fish smoking kilns in fish smoking communities.</p> <p>Promote the creation of social enterprises in order to promote the dissemination of efficient kilns.</p> <p>Mobilize community members to restore degraded mangroves through enrichment planting.</p> <p>Transfer of skills on building energy efficient fish smoking ovens to the unemployed youth in the target communities, along with facilitation of the adoption and utilization of these energy-saving technologies by women.</p> <p>Explore the use of solar fish driers</p> <p>*Communication activities to raise awareness of wetland values and functions.</p> <p>Build capacity on wetland conservation, and disseminate good practices from existing community-based management programmes in other West African countries.</p>		(MoAFFS).MoE, MoTI, MoAFFS	
20	Improving the efficiency and sustainability of the cooking energy value chain, through participatory and sustainable	Capacity building	Strengthen and expand Participatory and Sustainable Forest Management (PSFM) in production forest areas: support	End users, Public administration , planners,	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI) and	2015-2020

2015)

	forest management (PSFM)		<p>the development of strategic partnerships and collaborative arrangements with national institutions and Non-Profit Associations, regional and international agencies.</p> <p>Ensure community engagement in PSFM and village livelihood development.</p> <p>Pilot forest landscape management: develop methodologies and frameworks for forest landscape management</p> <p>Enable a legal and regulatory environment for local governance of forests.</p> <p>Clearly define the differing jurisdictions of the Forestry Division, chiefdoms, local villages and other actors involved in forestry.</p> <p>Clearly define rights and activities of forest users at the local level.</p>	installers, energy suppliers	Ministry of Agriculture, Forestry & Food Security (MoAFFS) (Forestry Division)	
21	Promoting the selection and dissemination of adequate tree species for biomass fuels	Capacity building	<p>Produce, publish and disseminate a compilation of Sierra Leonean tree species and their uses.</p> <p>Support research on the harvesting of mangroves for firewood, fish smoking and their removal in the context of artisanal salt mining activities.</p> <p>Support research on plantation (human-made) forests, with a focus on tree species that are most relevant for the Sierra Leonean context.</p> <p>Conduct research and demonstration programmes planting and experimenting with native species, especially those that have high economic value in</p>	End users, Public administration, planners, installers, energy suppliers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI) and Ministry of Agriculture, Forestry & Food Security (MoAFFS) (Forestry Division)	2015-2020

2015)

			communities.			
22	Promotion of Liquefied Petroleum Gas (LPG)	Energy efficiency policy/tool	<p>Regulate LPG prices, in order to avoid price spikes.</p> <p>Modernize regulatory frameworks.</p> <p>Adopt and implement international quality and safety standards.</p> <p>Improving roads and port infrastructure and reducing congestion.</p> <p>Communicate information widely to the public in nontechnical language, specifically, address perception of high risk of LPG use for cooking in households.</p> <p>Facilitate operator training.</p> <p>Monitoring to discourage commercial malpractice, as well as raise public awareness.</p> <p>Offer incentives to encourage private LPG retail/service companies to build up distribution network and retail outlets.</p> <p>Develop 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.</p>	Investors, end users, public administration, equipment manufacturers, retailers, energy suppliers	Ministry of Energy (MoE) and Ministry of Trade & Industry (MoTI),	2015-2020
23	Integration of gender aspects into national energy planning, development and implementation of gender responsive actions and measures for the economic empowerment of women	Capacity building	<p>Involve women in the conceptualization, development and implementation of energy policies, projects and programmes.</p> <p>Produce promotional messages to address the gender issue.</p> <p>Develop and implement</p>	Policy makers, women	Ministry of Energy (MoE) Ministry of Social Welfare, Gender and Children Affairs (MoSWGCA) and Ministry of Agriculture, Forestry & Food Security	2015-2020

2015)

			<p>programmes to train young women to produce and sell clean cook stoves, produce more efficient charcoal and sustainably manage forests, as well as involve them in other parts of the cooking energy value chains.</p> <p>Capacity building of policy makers and practitioners to integrate gender into their cooking energy policies and programmes.</p> <p>Integration of gender indicators in studies.</p> <p>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.</p> <p>Development of practical guidelines for mapping gender in the cooking energy value chains.</p>		(MoAFFS)	
24	Developing National programmes to implement an ISO-compatible Energy Management Standard (EnMS) for Industry (ISO 50001)	Energy efficiency policy/tool	<p>Develop and implement a national Energy Management Standard compatible with ISO-50001 in Sierra Leone.</p> <p>Conduct national stakeholder consultations for the development of an EnMS for industry in Sierra Leone.</p> <p>Implement pilot Energy Management Systems and System Optimization in industrial facilities.</p> <p>Develop energy management benchmarking and award programmes.</p> <p>Develop and implement measurement and verification of compliance with Energy</p>	Industrial users, public administration, energy suppliers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Electricity & Water Regulatory Commission (EWRC), Electricity Distribution & Supply Authority (EDSA), Electricity Generation & Transmission Company (EGTC) and UNIDO	2015 to 2025

2015)

			<p>Management Systems (EnMS):</p> <ul style="list-style-type: none"> • Create capacity within relevant organizations to develop and implement an M&V programme of compliance with EnMS; • +Establish a recognition scheme for EnMS experts and organization and companies compliant with ISO 50001; • +Launch an accreditation programme for Energy Management Systems (EnMS), in accordance with the ISO5001 standard; • +Establish (voluntary) reporting programmes on energy use in industry. <p>Introduce best-practice information, dissemination and recognition programmes for industrial energy efficiency.</p>			
25	Capacity building on industrial energy efficiency	Energy efficiency policy/tool	<p>Energy Management Systems (EnMS) Expert Training.</p> <p>System Optimization (SO) Expert Training (steam, pumps, compressed air, etc.).</p> <p>Development and provision of tools to assist industry in developing and implementing EnMS and system optimization projects.</p> <p>Training of industry energy managers and engineers.</p>	Industrial users, public administration, energy suppliers	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Electricity & Water Regulatory Commission (EWRC), EDSA, EGTC and UNIDO	2015 to 2020
26	Implementing energy efficient motors programmeme	Energy efficiency policy/tool	<p>Implement a programme for replacement of inefficient motors such as:</p> <ul style="list-style-type: none"> • Old motors that have poor or 	Industrial users, public administration, energy	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), Electricity &	2015 to 2020

2015)

		<p>no rewind records. Typically, efficiency is lost when motors are rewound without taking enough care of the magnetic core;</p> <ul style="list-style-type: none"> • Excessively oversized motors that run at 50% and below their rated load. Oversized electric motors are a result of plant designers' and users' requirement of safety factors to ensure plant availability; • Replacing standard motors with energy efficient ones, giving users a better variable load handling ability. <p>Motor users are required to return their old motor being replaced (with rotor and stator intact) to the motor suppliers.</p> <p>Introduce subsidies for replacing old inefficient electric motors with new efficient ones. Electric motor users in industry would receive an instant once-off rebate on the purchase price of a new Eff1 motor when purchasing it to replace an old inefficient motor.</p> <p>These old motors are scrapped according to environmental regulations, after which a disposal certificate is submitted to the programme management. This step ensures that these energy guzzling motors do not re-enter the market.</p> <p>The programme will be offered to customers via the accredited suppliers on the programme. Local motor suppliers will be encouraged to register to participate in the energy efficient</p>	suppliers	Water Regulatory Commission (EWRC), Electricity Distribution & Supply Authority (EDSA), Electricity Generation & Transmission Company (EGTC) and UNIDO
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2015)

			<p>motors programme. The registration process verifies the supplier's product accreditation, technical specifications and financial position.</p> <p>Capacity building to industry personnel on energy efficient motors, adequate sizing and maintenance.</p> <p>Conduct random process compliance audits.</p> <p>Install a system for Monitoring and Verification (M&V) of the savings achieved through the energy efficient motor programme in Sierra Leone</p>			
27	Implementing mandatory vehicle fuel-efficiency standards and regulations on the import of used vehicles	Policy	<p>Standards:</p> <p>Conduct national consultations with policy makers and other stakeholders.</p> <p>Pursue ECOWAS Process of Standardisation (Ecosham).</p> <p>Adopt ECOWAS harmonised standards on fuel-efficient vehicles and publish them in the national official journal.</p> <p>Set up a national standard and labelling technical committee.</p> <p>Import regulations:</p> <p>Develop and implement regulations on the import of vehicles, prohibiting the import of discarded cars, busses and trucks.</p> <p>Impose extra levies on inefficient vehicles used to cross-subsidize more efficient vehicles.</p>	Public administration	Ministry of Energy (MoE), Ministry of Transport & Aviation (MoTA), and Ministry of Trade & Industry (MoTI)	2015 to 2030
28	Modernization of the public	Financial	Assessment of the state of the	Investors,	Ministry of Energy	2015 to

2015)

	vehicle fleet		<p>public vehicle fleet (age, vehicle condition, energy consumption), as well as the need for new, more efficient and less polluting vehicles.</p> <p>Develop/adopt and enforce public procurement guidelines for the acquisition of low-consumption vehicles in the public sector.</p> <p>Develop a financing plan for the purchase of new public vehicles.</p> <p>Prioritize vehicles to be replaced and continuously replace inefficient vehicles with new ones.</p>	Public administration	(MoE), Ministry of Trade & Industry (MoTI), and Ministry of Transport & Aviation (MoTA)	2030
29	Reduce energy consumption in individual transport, through expansion of public transport systems and services	Financial, information	<p>Expand bus lines to areas that have not yet been served by public transport and whose inhabitants have high mobility needs.</p> <p>Improve public transport services: provide air-conditioned buses, real time information at stops, online information on travel schedules.</p> <p>Mark separate bus lanes in cities to speed up bus travels.</p> <p>Reduce intervals of waiting times for public transport by expanding the number of buses or trains.</p>	Public administration , transport companies	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), and Ministry of Transport & Aviation (MoTA)	2015 to 2030
30	Enhancing sustainable mobility modes, through infrastructure improvement	Financial, information, awareness raising	<p>Improve public transport infrastructure such as construction of designated waiting booths with electric lighting, park and ride and bike and ride schemes.</p> <p>Improve safety of pedestrians and cyclists, by marking cycling paths in cities and constructing/maintaining</p>	Investors, Public administration , transport companies	Ministry of Energy (MoE), Ministry of Trade & Industry (MoTI), and Ministry of Transport & Aviation (MoTA)	2015 to 2030

2015)

			<p>sidewalks.</p> <p>Mark separate bus lanes in cities to speed up bus travels.</p> <p>Combine infrastructural measures with awareness raising measures, e.g. to promote cycling or walking for short distances instead of car use.</p>			
31	Introducing Private investment in energy efficiency	Energy efficiency policy/tool, capacity building, awareness raising/information or financial/fiscal.	Establish a level playing field for private sector investment in energy efficiency.	Investors, end users, public administration, planners, architects, installers, equipment manufacturers, retailers, energy suppliers	(MoE), (MoTI), MoFED, (MoWHI), (EPA), (MoAFFS), (MoLCPE), MoIC, MoEST, MoFAIC Non-Government Organisations, (MoHS), (MoWR) and Sierra Leone Chamber of Commerce (SLCC)	2015 -2016
32	Monitoring, Enforcement and Evaluation of energy efficiency activities	Energy efficiency policy/tool, capacity building, awareness raising/information	<p>Develop a performance tracking scheme to monitor and evaluate energy efficiency works.</p> <p>Penalize defaulters of energy efficiency actions.</p>	Investors, end users, public administration, planners, architects, installers, equipment manufacturers, retailers, energy suppliers	(MoE), (MoTI), MoFED, (MoWHI), (EPA), (MoAFFS), (MoLCPE), MoIC, MoEST, MoFAIC Non-Government Organisations, (MoHS), (MoWR) and Ministry of Justice (MoJ)	2015-2016
33	Competitive energy markets with appropriate regulation	Energy efficiency policy/tool, capacity building, awareness raising/information or financial/fiscal. Financial	<p>Develop an energy regulatory commission in the Ministry of Energy.</p> <p>Develop high efficiency standard in GoSL procurement to achieve value for money.</p>	Investors, end users, public administration, planners, equipment manufacturers, retailers, energy suppliers,	MoE), (MoTI), MoFED, (MoWHI), (EPA), (MoAFFS), (MoLCPE), MoIC, MoEST, MoFAIC Non-Government Organisations, (MoHS), (MoWR) and NPPA	2015 - 2018

2015)

34	Ensuring Data Collection and Indicators	Capacity building, awareness raising/information	Establish a strong database unit in the Ministry of Energy. Carry out yearly data validation exercise nationwide. Develop an inter-departmental link with Sierra Leone Statistic.	Investors, end users, public administration, planners, retailers, energy suppliers	MoE), (MoTI), MoFED, (MoWHI), (EPA), (MoAFFS), (MoLCPE), MoIC, MoEST, MoFAIC Non-Government Organisations, (MoHS), (MoWR) MoSWGCA and SSL	2015 - 2017	-
35	Establishing Research and Development (R&D)	Capacity building, awareness raising/information	Develop R & D institutions for energy efficiency advancement. Establish new energy efficiency programmes for the future researchers.	Investors, public administration, planners, installers, equipment manufacturers,	Ministry of Energy (MoE), Tertiary Institutions and the University of Sierra Leone (USL)	2015 - 2017	-
36	Tax Incentives	Energy efficiency policy/tool, Financial and fiscal measures	Establish duty free tax exemption and other financial incentives.	Investors, end users, public administration, equipment manufacturers, retailers	(MoE), (MoTI) and (MoFED)	2015-2016	

Source: MoE, MoFED, SSL, BSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

3.4. Additional link targets

The currently high deforestation rate, for the harvesting of traditional fuels, can lead to environmental, health and social impacts on the 65% of the population living in rural areas.

The existent link between the energy sector and other sectors describe how the use of RE, implementation of EE and access to sustainable and reliable energy impact other areas, such as:

- Health and environment;
- Water and food security;
- Economic and productive sector;
- Society and education.

2015)

Table 18 below shows the energy sector's nexus to the other energy intensive sectors.

Table 18: Energy sector nexus to other sectors/areas

Sector	Potential Energy Need
Macroeconomic Policy	Stable prices/Low inflation
Agricultural Policy	Water pumping, storage and processing
Tourism Policy	Hotels & related services, heating & lighting
Trade/Industry/Investment/Employment Policies	Machinery, storage, lighting
Health Policy	Cold storage, facility lighting, equipment, water pumping, etc.
Education Policy	ICT/science labs, technical workshops, lighting, cooking, etc.
Water Resource Policy	Water treatment & pumping
Sanitation Policy	Water/sewerage treatment & pumping
Fisheries & Marine Resources Policy	Drying, storage & processing

Source: MoE, MoFED, MDAs, SSL, BSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014)..

Additional measures addressing the water-energy nexus are as follows:

- Research of energy potential in waste disposal sites (municipal waste, waste water treatment);
- Introduction of efficient technologies (e.g. efficient water pumping) in agriculture and households;
- Energy audits in water utilities;
- Capacity building to increase energy efficiency within municipal water supply systems;
- Educational programmes regarding water savings in schools/public institutions;
- Promote the use of photovoltaic water pumps, including irrigation systems;
- Promote the use of animal waste and manure for biogas production;
- Promote rainwater harvesting, micro-irrigation and groundwater re-charge schemes, in order to make irrigation of crops more energy and water efficient;

2015)

- Support the development of energy recovery from wastewater, which can reduce the energy demand in water treatment plants or even allow an injection of excess energy into the power grid;
- Reduce the use of non-renewable energy in agro-food systems, by using agricultural wastes and solar energy to produce the energy required for food processing.

In addition, renewable energy and energy efficiency can support the adequate functioning of health care facilities, among others, through the following measures:

- Vaccine refrigeration and ice pack freezing using solar and wind energy generated on site (temperature control is more accurate than with kerosene-fuelled absorption refrigeration);
- Lighting from renewable energy sources (substitute for kerosene lighting, which contributes to poor indoor air quality);
- Solar-based radio and radiotelephone communications (facilitate emergency medical treatment and provide reliable communications to other health clinics and facilities in the region);
- Enable medical appliances to operate with RES (incorporate inverters that are powered by RES into the system);
- Sterilization (with thermal energy rather than electricity, due to lower costs);
- Water treatment (endorse alternatives to chemical disinfection like UV or ozone treatment using RES sources);
- Water supply (RES-powered manual and large motor generator driven pumps);
- Solar thermal technologies (e.g. solar water heating, distillation and pasteurization);
- Energy storage technologies, in combination with RES electricity generation, for medical facilities. Equip hospitals with solar energy technologies (e.g. solar photovoltaic power plant, solar water heating installations, solar-powered vaccine refrigerator) and efficient light bulbs (replacement of regular light bulbs with compact fluorescent lights (CFLs)) and solar powered ceiling fans;
- Incorporate the hospital or health clinic as the centrepiece of a village mini-grid;
- Energy and women's health (<http://www.se4all.org/hio/energy-and-womens-health/>);
- Universal adoption of clean cooking solutions (<http://www.se4all.org/hio/universal-adoption-of-clean-cooking-solutions/>);
- Innovative finance (<http://www.se4all.org/hio/innovative-finance/>).

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Below are measures for achieving nexus targets as indicated in Table 19.

Table 19: Measures for achieving nexus targets

No.	Measure	Type of measure	Description of the measure	Target group	Implementing body/parties	Time frame
1	Promoting efficient use of tractors, out-board machines, marine and farming equipment.	Energy efficiency policy/tool, capacity building and awareness raising	<p>Establish energy efficiency codes, standards and tests for machines and equipment.</p> <p>Establish energy efficiency fuel quality.</p> <p>Develop training of operators on safety.</p>	Investors, end users, Public administration, planners, equipment manufacturers, retailers	Ministry of Energy (MoE), Ministry of Agriculture, Forestry & Food Security (MoAFFS), Ministry of Transport and Aviation (MoTA) Ministry of Fishery & Marine Resources and (MoWR)	2015 to 2020
2	Improving the efficiency and sustainability of the energy value chain, through participatory and sustainable forest management (PSFM)	Capacity building and awareness raising	<p>Establish a monitoring system for the fuel wood value chain, in order to prevent uncontrolled deforestation and guarantee sustainable forest management.</p> <p>Strengthen and expand PSFM in production forest areas:</p> <ul style="list-style-type: none"> • Support the development of strategic partnerships and collaborative arrangements with national institutions and non-profit associations, regional and international agencies; • Ensure community engagement in PSFM and village livelihood development; • Pilot forest landscape management: develop 	Investors, end users, public administration, planners, installers, retailers, energy suppliers	Ministry of Energy (MoE), Ministry of Agriculture, Forestry & Food Security (MoAFFS), Ministry of Lands, Country Planning & Environment (MoLCPE), Ministry of Justice (MoJ) and Environmental Protection Agency (EPA)	2015 to 2020

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			<p>methodologies and frameworks for forest landscape management;</p> <ul style="list-style-type: none"> • Enable a legal and regulatory environment (especially forest law). 			
3	<p>Set up Information Raising & Capacity Building programmes in the nexus between renewable energy/energy efficiency and the health care sector</p>	<p>Capacity building and awareness raising</p>	<p>Disseminate information about the successful implementation and the economic and environmental benefits of retro-fitting hospitals with energy-efficient or RE-based technologies; this will help increase the confidence of local Governments and lead to further replication in nearby villages.</p> <p>RE sources could provide alternate sources of energy for emergency services during power shortages.</p> <p>Plan regular training and information sessions to provide system designers and field technicians with the latest know-how and skills.</p>	<p>Investors, end users, Public administration, planners, architects, installers, equipment manufacturers, retailers, energy suppliers</p>	<p>Ministry of Health and Sanitation and Ministry of Energy (MoE)</p>	<p>2015 to 2020</p>
4	<p>Promote the use of RES technologies in the health care sector</p>	<p>Energy efficiency policy/tool, capacity building and awareness raising</p>	<p>Support the use of RES technologies in the health sector, for instance:</p> <ul style="list-style-type: none"> • Vaccine refrigeration and ice pack freezing using solar and wind energy generated on site (temperature control is more accurate than with kerosene-fuelled absorption refrigeration); • Lighting from renewable energy sources 	<p>Investors, end users, Public administration, planners, architects, installers, equipment manufacturers, retailers, energy suppliers</p>	<p>Ministry of Health and Sanitation and Ministry of Energy (MoE),</p>	<p>2015 to 2020</p>

2015)

(substitute for kerosene lighting, which contributes to poor indoor air quality);

- Solar-based radio and radiotelephone communications (facilitate emergency medical treatment and provide reliable communications to other health clinics and facilities in the region);
- Enable medical appliances to operate with RES (incorporate inverters that are powered by RE into the system);
- Sterilization (sterilize with thermal energy rather than electricity, due to lower costs);
- Water treatment (endorse alternatives to chemical disinfection like UV or ozone treatment using RE sources);
- Water supply (RE-powered manual and large-motor generator driven pumps);
- Solar thermal technologies (e.g. solar water heating, distillation and pasteurization);
- Energy storage technologies, in combination with RES electricity generation for medical facilities;

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			<ul style="list-style-type: none"> • Equip hospitals with solar energy technologies (e.g. solar photovoltaic power plant, solar water heating installations, a solar-powered vaccine refrigerator) and efficient light bulbs (replacement of regular light bulbs with compact fluorescent lights (CFLs)) and ceiling fans; • Make the hospital or health clinic the centrepiece of a village mini-grid. 			
5	Pursue an active cross-sector and international coordination of the multiple uses of water resources	Energy efficiency policy/tool, capacity building and awareness raising	<p>Set up a permanent dialogue process among stakeholders responsible for long term strategies and planning of different water uses.</p> <p>Actively participate in river basin scale policy dialogues on water and water-centred regional dialogues with neighbouring countries with which the country shares river basins.</p> <p>Improve the understanding and systematic analysis of dynamic cross-sectoral interdependencies and the growing demand for water, energy, land resources and agriculture.</p>	Investors, end users, Public administration, planners, architects, installers, equipment manufacturers, retailers, energy suppliers	Ministry of Energy (MoE), Ministry of Agriculture, Forestry & Food Security (MoAFFS), Ministry of Lands, Country Planning & Environment (MoLCPE) and Ministry of Water Resources (MoWR)	2015 to 2020
6	Promote the use of RES technologies in the water supply infrastructure and in the agro-food sector	Energy efficiency policy/tool, capacity building and awareness	<p>Promote the use of photovoltaic water pumps, including irrigation systems:</p> <ul style="list-style-type: none"> • Promote the use of animal waste and manure for biogas 	Investors, end users, public administration, planners, architects, installers, equipment	Ministry of Energy (MoE), Ministry of Agriculture, Forestry & Food Security (MoAFFS), Ministry of Lands, Country Planning &	2015 to 2020

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	raising	<p>production;</p> <ul style="list-style-type: none"> • Promote rainwater harvesting, micro-irrigation and groundwater re-charge schemes in order to make irrigation of crops more energy and water efficient; • Support the development of energy recovery from wastewater, which can reduce the energy demand in the water treatment plant or even allow the export of excess energy to the power grid. • Reduce the use of non-renewable energy in agro-food systems by using agricultural wastes and solar energy to produce the energy needed for food processing. 	manufacturers, retailers, energy suppliers	Environment (MoLCPE), and Ministry of Water Resources (MoWR)
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Source: MoE, MoFED, SSL, BSL, EDSA, EGTC, MAFFS, PU, EUEI-PDF, Tarawalli, P. Energy Consultant & Team (2014).

3.5. Enabling action areas

Energy planning and policies:

National Energy Policy;
National Strategic Action Plan;
Electricity and Water Regulatory Commission;
Renewable Energy Policy and Action Plan;
Energy Efficiency Policy and Action Plan;
SE4All Action Agenda.

Business model and technology innovation:

Commercialization and corporatization of utilities;
Demand side management;

2015)

SMART metering and billing systems;
Off-grid extension and electrification;
Loss reduction mechanism programmes.

Finance and risk management

The Ministry of Finance and Economic Development, in collaboration with the Ministry of Energy and the Public Private Partnership division, will ensure a proper financial and risk management regime in SE4All activities.

Capacity building and knowledge sharing

The transfer of knowledge and development of the human resource base for SE4All functions, including technical assistance to Government, will be managed by the MoE and building training institutions.

4. Coordination and follow-up

National SE4ALL coordination structure

The Director of Energy is the focal point responsible for all SE4All activities in Sierra Leone, under the Ministry of Energy.

Follow-up analysis

The Ministry will mobilize resources for the efficient management and operations of the SE4All activities in the country.

Monitoring, evaluation and reporting

A flexible but robust monitoring and evaluation framework will be established for the national SE4ALL Action Agenda, to monitor implementation, support lesson learning, and make necessary periodical adjustments (including provisions for regular review/update of the Action Agenda, which should be seen as a working document). In a bid to continually build support for the SE4ALL Action Agenda and foster ownership and accountability, a mechanism is being put in place to track progress that link to Government monitoring and evaluation instruments and, where relevant, build on existing monitoring exercises implemented by different partners, facilitating the collaborative participation of stakeholders and providing information access to the public. This work should also link to the Global Tracking Framework, ensuring accurate data. Reports on the Action Agenda implementation process will be regularly submitted to the GFT and Regional Hub.

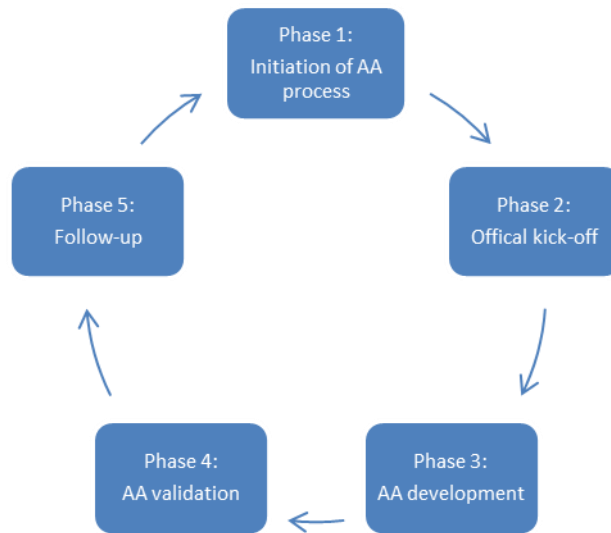
Link to Investment Prospectus(es)

The Action Agenda should be followed by the development of SE4ALL Investment Prospectus(es), with a view to mobilize the required investments for its successful implementation.

5. Process for development of the Action Agenda

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Figure 2: Outline of the Agenda development process consisting of 5 phases.



Phase 1: Initiation of AA process (week 2)

- Identification of lead development partner(s) providing technical assistance for the AA-development;
- Identification of the AA coordination group, National Expert Group and Validation Group, including assignment of roles;
- Recruitment of a consultant to support development of the AA.

Phase 2: Official kick-off (week 3)

- The Action Agenda development process is kicked-off at a high-level workshop led by the Permanent Secretary of Energy, to give the Action Agenda process the necessary political impetus and achieve the inter-ministerial dimensions of SE4ALL;
- Identification of sectoral working groups and champions for the SE4ALL target areas (access, renewables, energy efficiency) and other priority sub-groups.

Phase 3: AA development (weeks 5-21)

- Expert groups convene with consultant support to identify priority actions in the different areas of the Action Agenda;
- Consultation with key domestic stakeholder groups;

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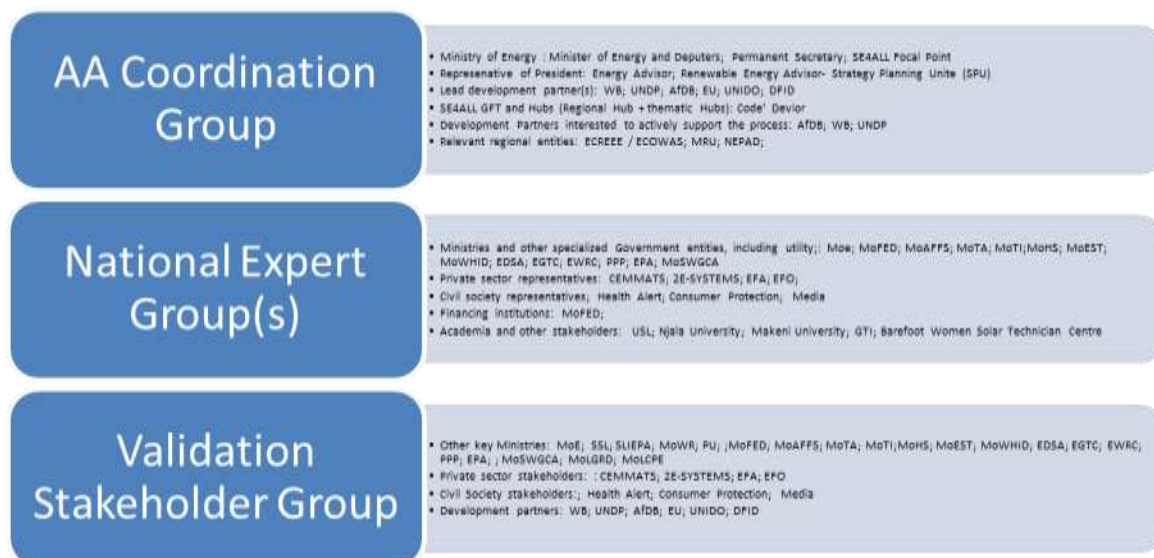
- Prepare draft AA led by AA Coordination Group consolidating inputs from sectoral working groups.

Phase 4: AA validation (weeks 22-30)

- The results of the specialized working groups is to be reported back to a high-level consolidation workshop that would ensure that the inputs provided by the sectoral areas are aligned with the vision and overall targets;
- Convene a validation workshop with the Validation Stakeholder Group – ensuring quality control of the draft Action Agenda;
- Following consensus regarding the Action Agenda, it preferably should be nationally (Government and possibly Parliamentary approval) and the goals and targets should support national development and sectoral planning, budgets and implementation.

Phase 5: Follow-up, including monitoring, evaluation and periodic adjustments

Figure 3: Overview of Action Agenda stakeholders:



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The roles and functions of the Sierra Leone SE4ALL Action Agenda Coordination Group include: (i) coordinate and manage the SE4ALL Action Agenda development and endorsement process, and inform on progress and emerging key issues; (ii) act as a focal point to manage broad cross-sectoral and multi-stakeholder consultation and inputs; (iii) commission studies and information gathering to support and inform the SE4ALL Action Agenda, and support working groups and committees, as needed; (iv) act as a focal point for communication, dissemination of information, and outreach; (v) act as liaison to the Regional Hub and GFT. The Sierra Leone Expert Group is set-up for the respective priority areas and consists of relevant representatives from Ministries and Government entities, private sector and civil society with the role of: (i) formulating the priority actions in the respective priority areas; (ii) defining additional information needs; (iii) communicating results to the AA Coordination Group. The Validation Stakeholder Group is made up of a wider range of stakeholders with the role of validating the AA draft and providing outside expertise and input to the process.

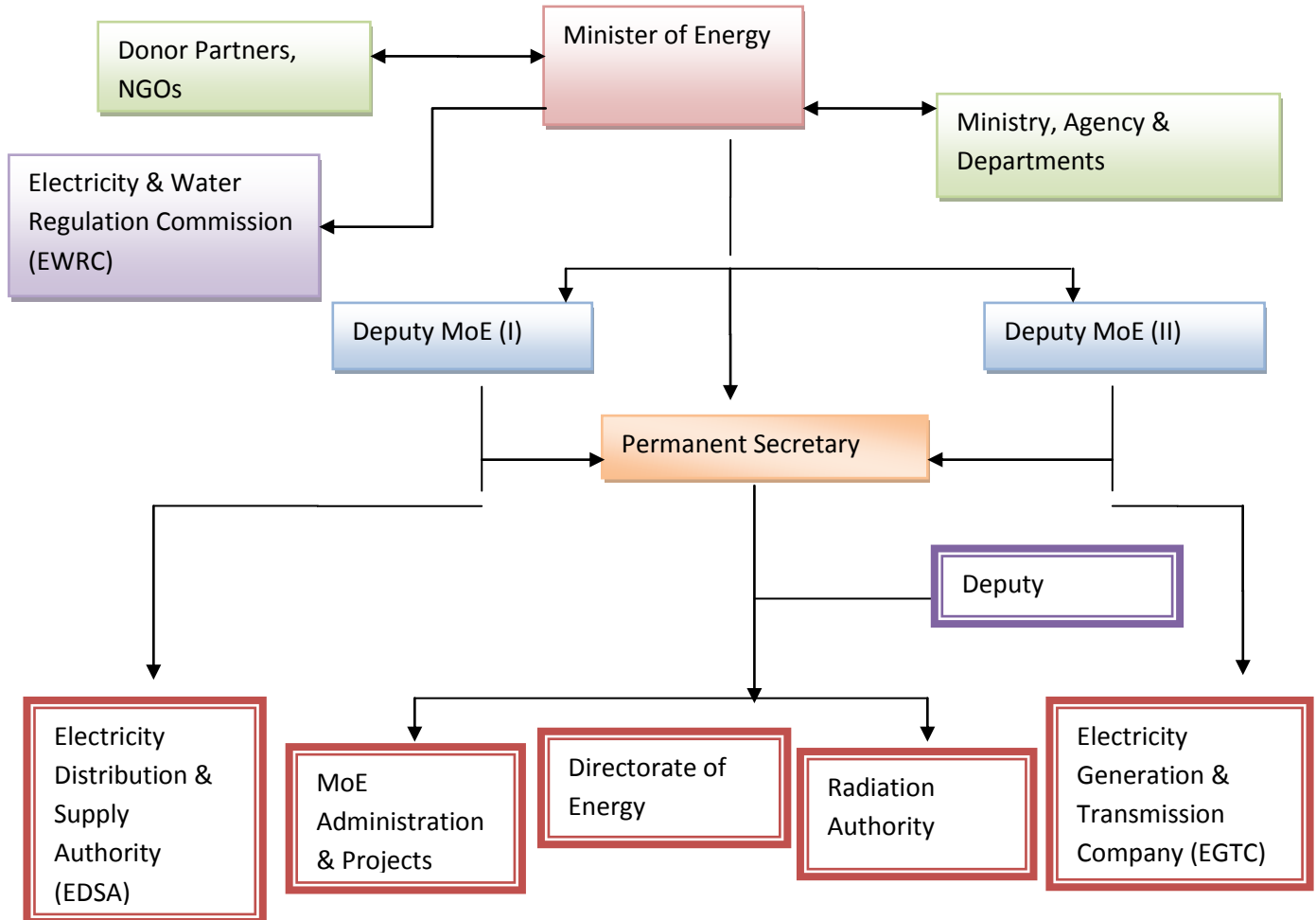
Activities and Timelines

Item	Activities	Timelines
1	Preparation of the inception report for the assignment (including time schedule and milestones for the national Action Plan process), based on the process agreed upon during the validation workshop held in Abidjan, 17-19 March 2014;	11 th June, 2014
2	Organise the national high level kick-off meeting;	20 th June, 2014
3	Establishment of a country expert group or build up on an existing group (e.g. inter-ministerial group), which will also serve as the national steering committee (SC) for the development and review of the Action Plans, in close partnership with the Ministry of Energy and other national key stakeholders;	3 th July, 2014
4	Develop the national renewable energy and energy efficiency baseline reports and the renewable energy scenario report. Collect and validate the baseline data collected through a workshop;	10 th September, 2014
5	Draft the Action Plans and discuss targets, measures, scenarios and actions in meetings with key stakeholders;	2 nd December, 2014
6	Presentation and discussion of the draft action plans in a workshop. (National Validation Workshop by MoE and stakeholders on the measures, targets and scenarios for RE&EE 2020/2030)	18 th December, 2014
7	The document is submitted for review and approval to ECREEE;	30 th December, 2014
8	Finalize the Action Plan documents;	5 th January, 2015
9	Prepare a report, brochure and power point presentation on the national NREAP/ NEEAP /	15 th January, 2015

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SE4ALL Action Agenda process and results.

Figure 4: Ministry of Energy organizational chart 2014



Ministry of Energy - Traditionally, the MoE dealt mainly with issues related to electricity, extending its focus recently to cover and address other energy issues. The Directorate of Energy (DoE), under the Ministry of Energy, was established by an act in 2010. The DoE was set up to conduct strategic planning on energy security and access issues and was mandated to introduce new energy sources and ensure efficient utilization of energy resources. To further implement its objective, the DoE formed the Renewable Energy and Energy Efficiency and Rural Electrification units in 2012 to address the issues of renewable energy and energy efficiency as well as rural electrification. The units are charged with the responsibilities of organizing and conducting research and development in energy and energy efficiency and on rural electrification.

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The Petroleum Exploration and Production Act 2011 and **The Bumbuna Watershed Authority and the Bumbuna Conservation Area Act No. 6 of 2008** are also particularly relevant to the topic of energy. The Bumbuna Conservation Area Act established the Bumbuna Watershed Management Authority to coordinate the sustainable land use and agricultural programme in an environmentally compatible manner in the Bumbuna Watershed, in order to promote environmental management and biodiversity conservation in the Bumbuna Conservation Area, thereby addressing the environmental and social needs associated with the Bumbuna Hydroelectric Dam, including the physical protection and sustainability of the Bumbuna reservoir. The Act establishes a Board of Authority with designated responsibilities³, including the development of a watershed management and conservation strategy and action plan to address water, land use and agricultural issues and to mitigate negative impacts on wildlife, vegetation and aquatic ecology. The Authority also prepares regulation to enhance the implementation of the Act, including issuance of licenses for the use of the conservation area.⁴ Bumbuna has been regarded as the project that will settle the acute energy shortage in the country and has received remarkable support from Sierra Leone's development partners, including the World Bank.

The **Petroleum Act** is essentially a mechanism, involving the participation of Sierra Leone representatives, for the regulation of petroleum operations. Although the Act requires that its administration be headed by a Government Ministry, Sierra Leone has not yet appointed the adequate representative. It is likely that the referred position will be appointed to the Director of Petroleum.⁵ The Petroleum Directorate is responsible for monitoring the petroleum operations under the Act.⁶ The National Petroleum Company is established under section 11 of the Act to participate in the process and manage the commercial aspect of exploration, on behalf of the state. Participation in all the petroleum exploration and production processes requires the appropriate permits and licenses. For example, a reconnaissance license is required under section 20(1), a petroleum license is required under section 30(1) (acquired by tender), a petroleum development plan is required under section 54(1) and a decommissioning plan is required under section 77(1). In all of these processes, special procedures apply.

Exploration for oil and gas came to a head following the discovery of Anadarko's Venus, a thin 50ft net hydrocarbon pay situated 1800m underwater, that was announced in August 2009. It was followed by Mercury approximately 135 net feet oil pay in two Cretaceous-age fan systems, where a well was drilled at a depth of approximately 15,950 feet in about 5,250 feet of water. The discovery has opened the door to a multi-million barrel oil frontier. These areas have now been divided into blocks, each of which have been subjected to a bidding process.

Ministry of Finance and Economic Development – Responsible for the provision of financial support needed to manage the Ministry of Energy's administration and programmes. MoFED is involved in the pricing of petroleum products, particularly for the transport sector, which represent a significant revenue stream for the national budget. MoFED also plays a supportive role in fiscal matters.

³ Sections 3 and 12 respectively.

⁴ See section 23.

⁵ See section 3 of Act No. 7 of 2011.

⁶ Ibid. Section 5.

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The Office of the President has appointed an energy advisor, who's role is to coordinate and track implementation of cabinet decisions by the ministries.

Electricity and Water Regulatory Commission – Responsible for regulating the management and operations of the Electricity Generation and Transmission Company and the Electricity Distribution and Supply Authority.

The Sierra Leone Electricity and Water Regulatory Commission Act of 2011¹ establishes a Commission that regulates the provision of electricity and water services and provides for matters incidental thereto, with the power to regulate rates and charges, licensing and related matters. The Commission, a corporate body with financial and operational autonomy, issues licenses for electricity and water investments and operations. .

The Commission includes a combination of private and public parties from the Institution of Engineers, the Labour Congress, the Sierra Leone Protection Agency, and four other persons appointed by the President, of which one is appointed as Chairman. The Chairman and remaining members must have recognized expertise¹ with no direct or indirect personal interests.¹

The Commission is responsible for issuing, renewing, amending and revoking licenses; registering and monitoring compliance of licensees; monitoring standards and ensuring (i) consumer protection; and (ii) fair competition.¹ It shall set and review rates, considering the criteria set forth in section 11 (2) and maintain a public register.¹ Part IV on the financial provisions includes sources of funding: (i) Government subventions; (b) payments due to the Commission and (c) monies accruing to the Commission; (d) grants, donations and other contributions; (e) annual level not exceeding 1% of the gross operating revenue and (f) a Government levy on electricity and water determined by the Parliament.

Licenses are regulated in Part V. Sect. 29, which stipulates that “*No person shall: (i) sell, provide, arrange or otherwise supply access to electricity and water services; (ii) construct, install or operate any facility for the sale, provision or supply of electricity and water services; (...) unless that person holds a license granted by the Commission*”. Sections 30 to 37 regulate the decision making process to grant, suspend or cancel a license.

Part VI regulates inspections and inspectors appointed and coordinated by the Commission.

The scope of the licenses refer to the “*selling, provision, arrangement or supply*” of electricity. Crop production for bioenergy purposes could be considered outside of the scope of this Act. However, the Act provides a good example of a collective decision making commission and license scheme that could serve as basis for bioenergy investments. The inclusion of private parties, some directly appointed by the President, may provide opportunities for vested interests.

Electricity Generation and Transmission Company – Responsible for managing the power generating stations and transmission lines in the country.

The National Electricity Act established the Electricity Generation and Transmission Company, the Electricity Distribution and Supply Authority, and provides for other related matters. The company's main function is generation, transmission and subsequent sale of electricity to the Authority, subject to a power purchase agreement to be approved

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by the Commission.⁷ In particular, it has the responsibility of is to (a) constructing electricity generation stations, including hydro-electric schemes, (b) execute business and projects generally associated with electricity generation and transmission, including the West Africa Power Pool, (c) remain informed regarding the developments relating to the generation of electricity, (d) advise the Minister on all matters relating to construction of infrastructure, generation and transmission of electricity and such other relevant duties. In addition, the company may be directed by the Minister on matters of policy.⁸ The Company has a board of directors comprised of a Chairman, the Permanent Secretary of the Ministry, the Financial Secretary, representatives of the Ministry of Marine Resources, Sierra Leone Institute of Engineers, Sierra Leone Chamber of Commerce, Industry and Agriculture, as well as the Director-General of the Company.

Electricity Distribution and Supply Authority – Responsible for managing the distribution networks and sale of electricity in the country. The National Electricity Act established the Electricity Generation and Transmission Company, the Electricity Distribution and Supply Authority, and provides for other related matters. Its board of directors, established to oversee the activities of the Company, is comprised of representatives and members similar to that of the Commission, but with the addition of representatives of the associations of consumers and manufacturers.⁹¹⁰The Authority distributes, supplies, sells, purchases, imports and controls electricity, establishes uniform standard voltage throughout its area of supply, secures the supply of electricity at a reasonable price, promotes and encourages the economic and efficient use of electricity, as well as related activities.¹¹ The Authority shall purchase the electricity through PPAs approved by the Commission and shall supply to users, subject to contract on terms set by the Authority.

The Minister may give general directions to the Authority on matters of policy (s. 38).

Part VIII provides for the duties of independent power producers, who shall sell power to the Authority, subject to the PPAs as approved by the Commission. Independent producers have the responsibility of constructing generating stations, including hydroelectric schemes; maintaining informed of developments relating to generation of electricity from natural resources available within the state, particularly those with high implications for the state and conducting other activities relevant to their scope of business.

According to section 55(1)(a), the Minister may, by order published in the gazette, compulsorily acquire private land or rights over and under private land for use by the Authority or the Company, subject to the payment of adequate compensation to the land owner. Such compensation is payable in the first instance by the Government of Sierra Leone, who shall be reimbursed by the Authority or the Company, as the case may be (b). The Company or Authority has the right to lop or cut trees, shrub or hedges which obstruct or interfere with its operations, and shall give not less than fourteen days' notice to the occupiers of the land.¹²The Company or Authority may enter any land over which it had acquired rights.¹³

⁷ Section 11.

⁸ Section 12.

⁹ Section 26(1).

¹⁰ Section 28(1).

¹¹ Section 34.

¹² Section 58 (1).

¹³ Section 59.

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Environmental Protection Agency (EPA) - EPA is responsible to ensure that environmental impact assessment measures are conducted, and resulting measures are implemented, for energy related programmes. The EPA works closely with MoE in the designing of GEF funded projects and work to enhance their capacity in the coordination and networking of clean technology, as well as to develop a baseline data inventory monitoring system.

Bilateral/ Multilateral Partners (UNDP, EU, DFID, JICA, AfDB, WB, GIZ, USAID, UNIDO, ECREEE) – Responsible for assisting the Government of Sierra Leone with its energy programmes, through institutional strengthening, project developments, funding and public private partnerships.

Ministry of Trade and Industry - oversees upstream and downstream activities on petroleum resources, including their exploration and marketing, and is responsible for ensuring the quality of service and safety standards within the petroleum sector. Petroleum marketing and sales are handled through the Petroleum Unit (PU) which has the responsibility of supporting energy infrastructure and production, as well as exploring the feasibility to green up the value chain of the cottage industry that utilize large amount of firewood, (e.g. fish smoking, cassava gari production, bakery and brick/ceramic production).

Ministry of Agriculture, Forestry and Food Security, Forestry Division (FD) – Plays a leading role in the fuelwood sector, both in terms of policy formulation and regulation. Holds a key role in matters related to bioenergy and crop-related energy issues. Responsible for promoting micro-nursery and community forestry, through tree replanting and farmer managed agroforestry to ensure that there is sustainable supply of renewable biomass to alleviate the pressure on natural forests.

Ministry of Social Welfare, Gender and Children Affaires – Responsible for coordinating gender and children issues relating to energy use.

Ministry of Local Government and Rural Development - The ministry responsible for supporting rural electrification programmes and coordinating, implementing and evaluating energy projects. The present decentralisation of the Government's functions creates opportunities for the governance of energy services in decentralised entities. programmes

Ministry of Education, Science and Technology – Responsible for supervising the institutions handling energy related programmes, such as training and research and development.

2015)

Ministry of Health and Sanitation – Support cross-cutting issues relating to clean energy practices and avoid pollution in communities to guarantee healthy living.

Ministry of Transport and Aviation – Responsible for coordinating energy use in the transport sector.

Ministry of Works, Housing and Infrastructure – Responsible for the development of codes, regulations and coordination of buildings.

Universities of Sierra Leone – Fourah Bay College, Njala University – Responsible for carrying out research and development on new energy technologies, as well as relevant training.

UNDP’s Business Development Service (BDS) and Agribusiness Services Programme:

Sierra Leone Agri-business Service Initiatives (SABI): The Sierra Leone Agri-Business Initiative (SABI) Project is a joint initiative between the GoSL, UNDP, FAO and UNIDO, modelled after the SONGHAI Centre in Benin that seeks to transform the agricultural value chain, boost the attractiveness of the agricultural sector to youth entrepreneurs in urban and rural communities, and create greater employment opportunities nationwide.

Government Technical Institute, Renewable Energy Centre (REC) Freetown - The centre accrued experience in both implementing solar, hydro and biogas technology as well as in training personnel. The institute is partnering with MoE and ECREEE on RE and EE projects, in an initiative to strengthen the technical and financial capacity of the REC as well as to explore the potential of transform REC into a Centre of Excellence in RE. Also, REC could be a potential candidate institution within which a Cookstove and Charcoal Development Centre (CCDC), for testing and certification, could be implemented.

ECOWAS Renewable Energy and Energy Efficiency Centre, Cape Verde (ECREEE) - As ECOWAS’ Centre of Excellence, ECREEE is working towards enhancing the regulatory, financial and technical capacity of the Ministry of Energy in formulating RE and EE policy, action plans and SE4ALL action agenda. WACCA, through ECREEE, is also supporting the MoE in the development and harmonization of standards and labels for cook stoves and their testing.

Environmental Foundation of Africa (EFA): EFA is an NGO that works closely with the MoE on renewable energy and rural electrification programmes. EFA is currently conducting a household energy usage survey as part of the EU funded project titled ‘Renewable Energy Empowerment in Rural Sierra Leone: A Vision to Electrify Rural Sierra Leone’. A new energy training centre is being built in Freetown.

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International Centre for Research in Agroforestry (ICRAF): The World Agroforestry Centre (ICRAF) in Sierra Leone supports the 'Building Biocarbon and Rural Development in West Africa Project (BIODEV).' BIODEV will operate in Guinea, Mali and Sierra Leone to demonstrate development and environmental benefits from undertaking a "high value biocarbon approach" across large landscapes. The four-year project, implemented in partnership with the Centre for International Forestry Research (CIFOR) and regional and international universities, is funded by the Government of Finland. The expected outcomes include more diversified livelihoods (many households will have planted or regenerated new trees and developed new value adding enterprises), higher incomes from farms and forests, and rangelands.

EU Energy Initiative Partnership Dialogue Facility (EUEI-PDF): EUEI PDF, in collaboration with the Ministry of Energy, is currently formulating a Household Cooking Energy Plan, which will form an essential first preparatory step in the development of a comprehensive Household Cooking Energy Plan for Sierra Leone and will build on the scoping study conducted by EUEI-PDF in 2011 with the Ministry of Energy. The results are expected have a significant impact on the Sustainable Energy for All initiative (SE4All) within Sierra Leone.

Welthungerhilfe (WHH): WHH is responsible for the installation of 20kW hybrid system (solar pv and pico hydro) at beach river no. 2, in Freetown Peninsular Area.

Food and Agriculture Organization (FAO): FAO has developed the Bioenergy and Food Security (BEFS) Approach for Sierra Leone, which seeks to assist policy-makers in assessing the interplay between natural resource availability, bioenergy production potential, rural development and food security, and in strengthening their capacity to manage the trade-offs associated with bioenergy development.

Energy for Opportunity (EFO): EFO is a national NGO established in 2005, that is currently working on energy, sanitation, clean water, health promotion and agriculture in six of the country's districts.. EFO has extensive experience in community mobilization, battery charging, clean water projects, and community energy projects, including carrying out fuel wood trade, energy assessments and surveys, solar capacity design, installation and training.

Civil Society Group - Consumer Protection Society: Consumers, particularly women, will be important beneficiaries of the bioenergy programme, as they will be able to reduce the share that energy represents in household budgets.

University of Njala, Freetown: is the major higher education institution in the country. The Department of Community Development leads local researchers and supervises the data collection and analysis regarding community development in the country.

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Sustainable and Thriving Environments for West African Regional Development (STEWARD) - is funded by USAID and the US Department for Agriculture (USDA), as a regional programme to support improved forestry policy and management and livelihoods. It works with communities, through NGOs, to improve regional cooperation in forestry conservation and regeneration in Sierra Leone, Guinea, Cote d'Ivoire and Liberia.

Barefoot Solar Women – Responsible for training of women in installing and maintaining solar PVs in rural communities.

Note: International institutions such as the World Bank, Food and Agricultural Organisation, Africa Development Bank, Islamic Development Bank; International and Local Non-Governmental Organisations, the aforementioned partner or fund energy projects. Private energy enterprises sell energy products of different types. There are both local and private companies engaged in the installations of renewable outfits, e.g. the barefoot women solar engineers association of Sierra Leone, managing a solar technician training centre for the installations of solar home systems in inaccessible areas of our rural community; this is a showcase of the Government initiative to electrify the rural communities, so as to raise their living standards for a brighter future. The Government Technical Institute has a renewable or alternative energy studies department conducting training and replicating some of the technologies in the renewable energy field.

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