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Suggested Policy Priorities for the Advancement of Efficient Lighting in Sierra Leone

CLEAN ENERGY MINISTERIAL

SD STRATEGIES

BORGOC

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ABBREVIATIONS

BAU	Business as usual
CFL	Compact Fluorescent Lamp
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EDSA	Electricity Distribution and Supply Authority
EEP	Energy Efficiency Policy
EGTC	Electricity Generation and Transmission Company
EPREL	European Product Database for Energy Labelling
EU	European Union
EUEI PDF	EU Energy Initiative Partnership Dialogue Facility
GEF	Global Environment Facility
IEC	International Electro-Technical Commission
IFC	International Finance Corporation
INDC	Intended Nationally Determined Contribution
IOC	Organisation of Islamic Cooperation
LED	Light-emitting diode
MCC	Millennium Challenge Corporation
MCCU	Millennium Challenge Coordinating Unit
MDA	Ministry, Department, and Agency
MEPS	Minimum energy performance standards
MVE	Monitoring, verification and enforcement
NEEAP	National Energy Efficiency Action Plan
NREL	National Renewable Energy Laboratory
PEAK	Platform for Energy Access Knowledge
PV	Solar photovoltaic
RE	Renewable energy
RECP	Renewable Energy Cooperation Programme
RENAC	Renewables Academy
RISE	Regulatory Indicators for Sustainable Energy
SACREE	SADC Centre for Renewable Energy and Energy Efficiency
SADC	Southern African Development Community
SDG	Sustainable Development Goal
SEforALL	Sustainable Energy for All

SLWERC	Sierra Leone Electricity and Water Regulatory Commission
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNOPS	United Nations Office for Project Services
UK	United Kingdom
US	United States
USAID	US Agency for International Development
VAT	Value-added tax

INTRODUCTION

This analysis presents policies and measures to support Sierra Leone's ongoing lighting market transformation, in keeping with the country's national energy, energy efficiency, environmental, social and economic development plans. The suggested priorities reference existing national legislation, agreements, plans and other publicly available documents. They also refer to regional and international agreements, programmes and activities.

The goal of Sierra Leone's national and local lighting market transformation efforts is to extend access to clean, safe and efficient lighting for all. These efforts are part of the national commitment to provide universal access to electricity, where and when possible by means of renewable energy sources. Progress towards this goal should: increase the population's productivity, health and well-being; reduce reliance on diesel and other polluting fuel sources; and enable Sierra Leone to further develop its economy while participating in global climate change mitigation efforts (GoSL 2012; SLEPA 2015)[1].

We discuss **three policy priorities** that the government of Sierra Leone could consider pursuing over the course of three phases (2019-2020; 2021-2022; and 2023-2030):

1) Leapfrog to light-emitting diodes (LEDs);
2) Encourage a more competitive lighting marketplace; and
3) Target international support for energy efficiency policies and measures and for human resource capacity building.

In parallel, the government of Sierra Leone might aim to improve its national information systems to enable better coordination and monitoring of policy implementation. A fundamental challenge for energy-sector decision-making is the lack of publicly available up-to-date information on the electricity market as well as the implementation status of the measures initiated by recent administrations and international partners. The absence of reliable data constrains private investments and international support. It is a major barrier to accomplishing the country's national efficiency goals.

To accompany and implement existing policies as well as the priorities suggested here, this report discusses **three capacity-building mechanisms** with the potential of high and immediate impact:

1) Develop and utilise a monitoring framework for the implementation of efficiency and savings measures;
2) Create a central registry, authority or centre for data and information relevant to lighting energy efficiency; and
3) Enhance human resources through increased stakeholder input, training of energy sector staff and outreach to distributors, entrepreneurs and end-users (especially youth and women).

[1] According to the Second National Communication of Sierra Leone to the United Nations Framework Convention on Climate Change (UNFCCC), total emission of carbon dioxide (CO_2) for the year 2000 was 574.061 Gg. The CO_2 emissions from energy generation amounted to 529.287 Gg, as Sierra Leone's energy generation is based on diesel-powered generators (GoSL 2012). Furthermore, the country's Intended Nationally Determined Contribution (INDC) includes efficient lighting as a mitigation measure, stating: *"The domestic situation Sierra Leone faces, i.e, being solely dependent on fuel imports to meet its minimum energy needs, reducing emissions further than BAU [business as usual] can only be achieved through country wide [low emission development strategies] LEDs which the country has already adopted*" (SLEPA 2015).
Sierra Leone's Parliament in 2016 ratified the UNFCCC Paris Agreement, following up on its 2015 submission of its INDC. In 2018, the Global Environment Facility approved the concept for Sierra Leone's project grant application for USD 1.345 million for "*Building and Strengthening Sierra Leone's National Capacity to Implement the Transparency Elements of the Paris Agreement*", to be administered by Sierra Leone's Environmental Protection Agency.

To support the Government in evaluating the implementation of energy efficiency policies and measures as set forth in existing government documents, Annex A includes a table listing the range of lighting-related measures included in Sierra Leone's Energy Efficiency Policy (EEP) (MoE 2016a[2]) and the National Energy Efficiency Action Plan (NEEAP) (MoE 2015). It can serve as a starting point for monitoring efforts by Sierra Leone's authorities. Annex B provides data for selected indicators with relevance for Sierra Leone's electricity market, Annex C gives and overview of selected lighting product imports and Annex C details primary energy sources for lighting in households.

[2] The policy is variously dated as 2016 and 2017.

THE IMPORTANCE OF EFFICIENT LIGHTING FOR ACHIEVING SIERRA LEONE'S SUSTAINABLE ENERGY TARGETS

Worldwide, the provision of lighting is often based on polluting fuels and batteries which have detrimental impacts on public health, disproportionately affecting the poorest in each society. The carbon footprint of lighting systems and its associated negative impacts, however, can be mitigated effectively with the adoption of straightforward efficiency standards and measures.

Improving the efficiency of electric lighting is one of the most significant short-term initiatives that policy makers can take to combat climate change (UNEP 2012). Lighting accounts for as much as 15% of the world's total electricity consumption, resulting in 5% of global carbon dioxide (CO_2) emissions (UNEP 2015). Improving energy efficiency is also a key pillar of Sustainable Development Goal 7 (Ensure access to affordable, reliable, sustainable and modern energy for all) and an important foundation of the work of Sustainable Energy for All[3].

The use of efficient light bulbs (lamps), for example, can reduce lighting-related electricity consumption by 80% to 90% (UNEP and U4E 2017). A shift to efficient lighting options is a cost-effective way for countries to move forward with their decarbonisation pathways and to accomplish fundamental social and economic co-benefits.

In Sierra Leone, with its ambition to increase electrification throughout the country, the potential for improving energy efficiency is tremendous. Severe efficiency bottlenecks in the production, distribution and consumption of electricity continue to lead to high losses. The Electricity Distribution and Supply Authority (EDSA) estimates that distribution losses (technical and commercial) account for 35% of electricity purchases in the country (MCCU 2017); the NEEAP indicates that wastage in the end-use of electricity reached 45% in 2013 (MoE 2015).

Much of the production and use of energy in Sierra Leone is concentrated in the household sub-sector, where almost 65% of lighting is generated by inefficient, battery-powered torches or lanterns, resulting in environmentally hazardous solid waste (UNICEF 2017) (see Annex D.) Both on the supply- and the demand-side, a lack of energy efficiency negatively impacts the supply of power and hinders social and economic opportunities for all Sierra Leoneans.

[3] For further information see: https://unstats.un.org/sdgs/report/2016/goal-07/, https://www.seforall.org/energy-efficiency.

ADVANCING EFFICIENT LIGHTING IN SIERA LEONE: THE STATUS QUO

Over the past decade, Sierra Leone has initiated several efforts to improve the structure of the power sector and address efficiency deficits. The country has made progress by: the design of national energy, energy efficiency and renewable energy policies (MoE 2009, 2016a, 2016b) as well as a power-sector roadmap (MoE 2017); the unbundling of generation and distribution services through a National Electricity Act (GoSL 2011) that includes the founding of the Electricity Generation and Transmission Company (EGTC) and the Electricity Distribution and Supply Authority (EDSA); the creation of an electricity and water regulatory commission; the assignment of responsibilities to the Ministry of Energy including measuring market performance throughout the supply and delivery chain; and the encouragement of international and regional investment in the market.

With the NEEAP and the EEP, two important energy efficiency policies were published. They are part of the effort to align Sierra Leone's policies with the energy efficiency framework of the Economic Community of West African States (ECOWAS 2015). The EEP and NEEAP jointly foresee approximately 40 policy measures aimed at efficient lighting. They are named in the documents as "measures," "objectives," or "policy statements" and cover nine areas:

- Financing
- Capacity building
- Awareness raising
- Legal and regulatory
- Institutional support and cooperation
- Research and development
- Residential
- Public
- Planning and policy implementation.

Annex A includes a complete list of the lighting measures put forward by the EEP and NEEAP (MoE 2016a; 2015). Although ambitious in many aspects, the instruments currently fall short of creating a fully effective framework for advancing energy efficiency in the country. First, both policies lay out a profusion of measures that may overlap or be redundant. A more clearly organised framework would further on-the-ground implementation and enable the prioritisation, funding and assignment of responsibilities for key actions.

Second, the measures require more clarity and specificity so that responsible parties can undertake and effectively complete tasks. Each measure would benefit from a corresponding SMART indicator[4]. Third, although the energy efficiency targets for lighting convey ambitious coverage (e.g, "*up to 100% efficient light bulbs [will be] sold by 2030*" (SEforAll 2015, p.9), they could be improved in terms of scope, scale and the suggested practices. They also need operational definitions. For example, the target for lamp efficiency can be brought up to date by prioritising the use of LED lamps, instead of inefficient and

[4] SMART indicators ensure that a measure is: Specific; Measurable; Achievable; Relevant; and, Time-bound. The International Energy Agency offers online training and templates for SMART energy efficiency indicators (see https://edx.iea.org/). Use of these or similar indicators would enable Sierra Leone to track and compare its progress towards policy goals and objectives and energy efficiency program milestones.

mercury-containing compact fluorescent lamps. Finally, sector-specific efficiency targets for industry, commercial, government and residential applications might be specified.

SUGGESTED EFFICIENT LIGHTING POLICY PRIORITIES

Considering the present state of Sierra Leone's lighting market (for an overview of lighting products, see Annex C) and an evaluation of existing policies and measures, the country would benefit from continuing the development and implementation of its electricity, energy efficiency and environmental goals. International best practices for lighting market transformation can be applied when designing and enforcing policies and measures.

We suggest giving priority to three policy areas for lighting: 1) leapfrogging to LEDs; 2) encouraging a more competitive lighting marketplace; and 3) targeting regional and international investment and support for energy efficiency policies and plans.

"Leapfrog" to Light Emitting Diodes in All Market Sectors and End-Use Applications

Our suggested leapfrog strategy has ambition to implement high-efficiency products while simultaneously phasing out less-efficient lighting sources and systems.[5] For Sierra Leone, the leapfrog (and phase-out) strategy must include both fuel-based lighting technology, inefficient consumer products that rely on single-use batteries, as well as inefficient grid-based technologies.

The EEP mentions, among other measures, subsidies to bring down the consumer price of efficient lighting products (MoE 2016a). However, consumer subsidies may not be an effective strategy for two reasons: first, the remarkably rapid market development for light emitting diodes has brought very affordable, good performance products to market; and, second, the transaction costs of market interventions (such as subsidies and rebates) relative to the cost of efficient lighting sources are not cost-effective. Sierra Leone may be better served by exploring other measures to support the development of a sustainable market, including encouragement and education for private sector suppliers and civil society organisations who could introduce the notion of payment schemes for lighting services, for businesses, groups or individual purchasers.

The market transformation objective should be a complete and rapid changeover and adoption of LEDs in all applications and sectors, justified as follows:

a) LED lighting has very low-input power demand and very high efficiency; it is adaptable to the many and diverse needs of Sierra Leone's end-users; and, it is electronic, direct current and digitally compatible with "smart" energy (including micro-grids), building and transport systems.

b) Increasing access to clean, safe lighting with LEDs would create the lowest-input power demand possible for any electrical system (main power grid; microgrid; building-based diesel generator or solar photovoltaic (PV) system; household-based PV system; and portable, battery-based lighting appliances). Lower input power demand from each lighting installation, in turn, allows more installations per fixed amount of electrical supply.

[5] Typically, national "phase-out" regulations ban the import and sale of non-conforming products; they also may ban the import, re-export and local manufacturing (for export) of non-conforming products. A plan for phase-out should include research, public consultations and resources for informing the marketplace of the forthcoming changes. The schedule for phase-out may be sequential and more stringent over a period of years, or it may have a single-date deadline. In any case, the phase-out process must be clearly publicised well in advance of implementation to allow users to become familiar with new products and for the private sector to prepare for compliance and to build up a supply of conforming products. Taking care to encourage new products well in advance of the phase-out promotes market stability and co-operation of the private sector.

c) Good-quality LED lighting products have minimal environmental impacts. Compared to conventional lighting sources and luminaires, they are very long-lived; they can be lower weight and smaller in design, which reduces shipping and distribution costs and space; they should contain no lead solder (if so specified) nor mercury; and they can be manufactured from aluminium, glass and/or recyclable plastics, so they can be safely collected and recycled.

LEDs are transforming the global use of lighting and energy. Much like mobile telephone technology has extended communications access worldwide[6], LED lighting extends lighting energy services, enabling people worldwide to: reduce expenses; conduct their study, work and businesses independent of daylight; be safe and healthy; and be productive, no matter where they work or live, on-grid or off-grid. Sierra Leone's future generations will recognise, adopt and adapt LED lighting for a better future for all. To be successful, any lighting policies and plans should therefore incorporate extensive stakeholder input and consideration of the country's demographics (see Annex D).

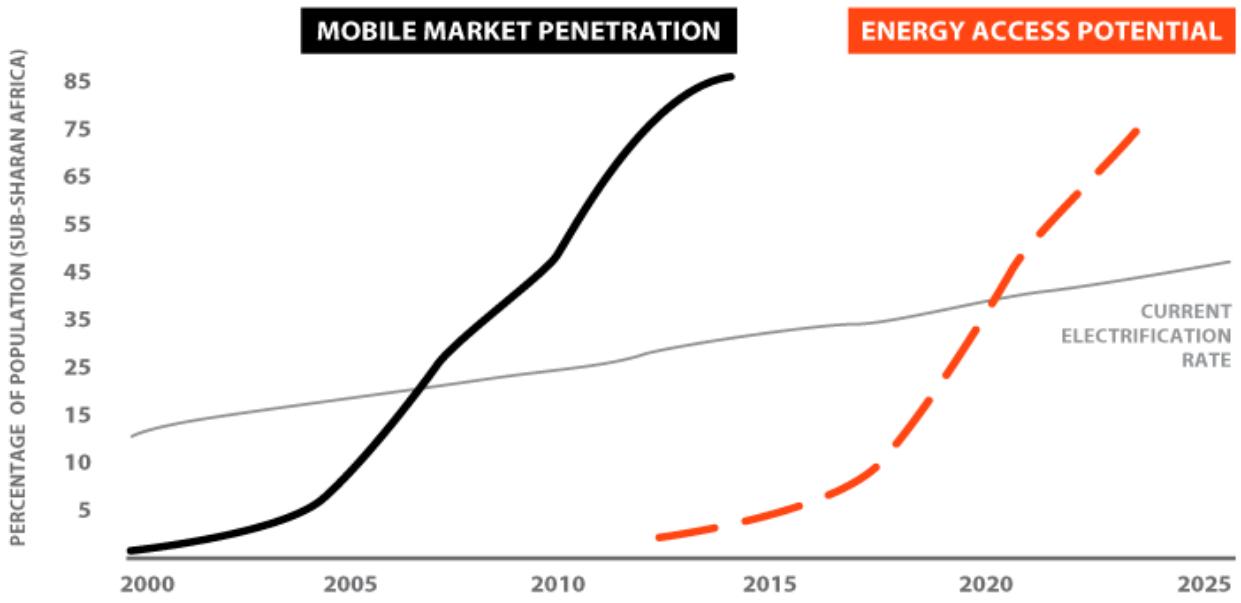

Figure 1. Power for All depiction of energy access potential as a parallel to mobile telephone market development (Source: Power for All)

[6] Many organisations have noted the potential for efficient lighting in off-grid applications to replicate the adoption curve of mobile telephones. For example, early market research efforts of the World Bank/IFC/GEF Lighting Africa projects explored this parallel potential. Recently, Power for All, a global advocacy campaign, declared, "*We believe that modern, clean technology can now leapfrog slow, inefficient and centralized systems—just as mobile phones leapfrogged landlines in the developing world*". See: https://www.powerforall.org/about/contact.

Expand and Reinforce Policies and Business Best Practices that Support and Encourage a Competitive Market for Renewable Energy and Energy-Efficient Lighting Products and Systems

The following best practice actions would support Sierra Leone's lighting market transformation:

a) Information campaigns and local demonstration projects tailored to the interests and needs of end-users, to increase demand for and use of LED lighting

b) Bulk procurements of LED lighting products and systems, with the aim of increasing the quality, performance and range of purchase options for each group of buyers. One example of a collaborative effort is the United States Department of Energy's Municipal Solid-State Street Lighting Consortium, which offers many resources that could be useful to Sierra Leone's many street lighting efforts[7].

c) Public-private partnerships that provide lighting consumers with factual and useful information about good-quality, durable LED lighting and good service expectations and purchasers' recourses for poor-performing products. Partnerships should include trade associations and consumer advocacy groups, similar to those being established for the renewables market[8].

d) Increased monitoring, verification and enforcement of regulations and standards throughout the supply and distribution chain for products, from port-of-entry to point-of-purchase, end-use installation and finally end-of-useful life and recycling or disposal of solid waste. These activities also must apply to any conventional and transitional light sources and lighting systems (such as existing incandescent and fluorescent lamp technologies and their respective electrical gear, including ballasts and batteries) that remain in the market until a complete transition to LEDs is achieved.

Survey and Accurately Describe Lighting User Groups, Their Needs and Their Desired Lighting Products and Services

Sierra Leone can accelerate its market activities by participating in regional and global efforts to strengthen neighbouring or similar emerging lighting markets. This can be accomplished through the following actions:

a) Establish policies and allocate resources for relevant parties to regularly measure and report the size, characteristics and performance of the national lighting market, using internationally recognised indicators. This will help establish a baseline and track progress, so that private partners, government and civil society organisations can best target their efforts and understand the lighting needs in each market sector (industrial, commercial, government and residential).

b) Promote the growth of Sierra Leone's illumination engineering and lighting design professions by recognising and encouraging academic, continuing and practical education for professionals and for skilled practitioners. Also, encourage and educate lighting market entrepreneurs and end-user

[7] US Department of Energy, DOE Municipal Solid-State Street Lighting Consortium.
For further information see: https://www.energy.gov/eere/ssl/doe-municipal-solid-state-street-lighting-consortium.

[8] A recent report on a survey of the renewable energy trade states: "*Concerning the Sierra Leone market, most respondents identified the following as major barriers: high price of equipment, undeveloped government policies, unavailability of finance to consumers and dealers. Some respondents also identified poor quality of equipment services and poor capacity of market players that contribute to the slow uptake of renewable energy in the country. This indicates an underserved, young market*" (Hankins 2017).

groups, especially those who can reach underserved areas of the market. Having local resources to install, maintain and repair lighting systems will help ensure the sustainability and performance of the lighting market throughout Sierra Leone.

c) Share reports describing the Sierra Leone market with regional and international investors, organisations and individuals that show an interest in supporting climate change mitigation programmes, economic and social development, and the health and well-being of Sierra Leone's population. Where interests are compatible, use lighting market descriptions and accomplishments to strengthen Sierra Leone's investor prospectuses and donor grant applications.

d) Contribute Sierra Leone's market development data to regional and international efforts to forecast future demand for energy efficient lighting and other essential energy-based services[9]. Sierra Leone would benefit from being able to benchmark its progress, consider harmonizing regulations, and, participate in regional advocacy and communication programmes.

[9] Two examples of benchmarking collaborations are World Bank / Sustainable Energy for All's Regulatory Indicators for Sustainable Energy (RISE: http://rise.worldbank.org/ / https://www.seforall.org/rise) and Power for All's Platform for Energy Access Knowledge (PEAK: https://www.powerforall.org/peak/).

THREE PHASES FOR SPECIFIC POLICY ACTIONS TO SUPPORT THE LIGHTING MARKET TRANSFORMATION

Phase I: 2019–2020

A. **Designate a person or team to coordinate and support all national lighting efficiency efforts**, drawing from the government, academia and the private sector. This is envisioned as a liaison role, with the capability to introduce key players to each other, convene collaborative meetings as needed, track progress and assist various efforts to deliver benefits within their planned time frame. The designee should already be involved in one or more energy efficiency activities and have a strong professional network within Sierra Leone and preferably in West Africa. The designee also should be aware of international commitments[10] made and responsibilities assigned to various government entities, especially the Environmental Protection Agency and the Ministry of Energy.

B. **Plan and initiate a promotional programme to increase the market share of clean, renewable and efficient off-grid lighting products.** This programme could immediately draw upon the published resources of the World Bank Group's Lighting Africa and Lighting Global programmes[11] and the resources and tools of Sustainable Energy for All, particularly its energy efficiency accelerators[12] and people-centred accelerator[13]. The objective should be to increase the quantity and diversity of imports of off-grid products that are tested and verified as high quality by Lighting Global[14]. For example, any bulk procurements or international donor-supported product distributions could agree to only use products that are tested by a certified laboratory and verified (prior to import) to have equal or better performance than specified by Lighting Global[15].

   Evidence for the urgency of this programme is documented in the report of results of a multi-indicator study published by Statistics Sierra Leone (Annex D). Briefly, the results document widespread reliance on single-use batteries for torches and lanterns as a primary means of lighting households. This end-user practice is expensive, inefficient and generates hazardous solid waste (spent batteries and lamps). Greater access to and use of rechargeable products would bring immediate economic, lighting and environmental benefits to nearly all Sierra Leone households.

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[10] For example, in October 2016 Sierra Leone's Parliament "*…ratified five United Nations conventions on the environment and the charter of the Organisation of Islamic Cooperation (OIC). The conventions include the Paris Treaty on Climate Change, Minamata Convention, Rotterdam Convention, Basel Convention, Nagoya Protocols and the Charter of the Organisation Islamic Cooperation*" (Bangura 2016).

[11] Lighting Africa is a regional programme of Lighting Global; see https://www.lightingafrica.org.

[12] For further information see: https://www.seforall.org/partnership/accelerators/energy-efficiency-accelerators.

[13] For further information see: https://www.seforall.org/connecting-partners/accelerators/people-centered-accelerator.

[14] Lighting Global operates the lighting Quality Assurance programme; see https://www.lightingglobal.org/quality-assurance-program/. "*The Lighting Global QA framework served as the foundation for – and is now based on – International Electrotechnical Commission (IEC) Technical Specification 62257-9-5. This IEC specification provides the global QA framework for off-grid lighting*". A list of off-grid lighting products is available at http://www.lightingglobal.org/products.

[15] "*Contact Lighting Global [qa@lightingglobal.org] to discuss using IEC/TS 62257-9-5 to set up requirements for a bid specification for bulk purchase orders or other program activities*" (see: https://www.lightingglobal.org/quality-assurance-program/).

C. **Undertake a field survey (using qualitative and quantitative instruments[16]) of all market sectors** to establish a baseline of available lighting products and to map how types of products are sold, by which market players, and through which channels they are imported and then supplied to the end-user. An important aspect of this field study is to identify and engage with private sector players that are instrumental for a successful market transformation. The report of the study should be publicly available so that all interested parties can benefit from the results. For examples, see the lighting market status reports published by UN Environment's United for Efficiency initiative[17].

D. **Continue the waiver of tariffs on imported goods[18]**. which has been extended from the original exemption of three years to indefinitely[19], adding clarification that high-efficiency lighting (on-grid and off-grid products) qualify for this waiver as "energy-efficient".

E. **The Sierra Leone Electricity and Water Regulatory Commission has recently developed the SLEWRC Mini-Grid Regulations 2018 (draft). The draft regulations are expected to be presented to Parliament for approval in early 2019. The regulations aim** to enable more rapid increase in access to renewably generated electricity for lighting and other consumer and commercial uses. Schedule 1 in the draft regulation, Application form for basic mini-grid licence, requests information on plans for distribution, specifically, to the number of end-use consumers (including street lighting). This information could be provided by applicants more rapidly as Phase I, Item C (above) is implemented. Lighting loads should be anticipated and quantified as a primary end-use demand for any planned mini-grid.

Phase II: 2021–2022

A. **Launch aspirational information and communication programmes to introduce and reinforce the "leapfrog to LED" strategy** (Phase I, Item B above). Coordinate the timing and release of messages with the private sector to ensure that new products are available in the local market when end-users hear about and see the campaign. Consider key audiences, including electrical hardware distributors, market vendors, entrepreneurs, women and youth.

B. **Start planning a bulk procurement programme to identify and fulfil the needs for efficient lighting** in government, healthcare and education facilities throughout Sierra Leone. Use best practices for forming buyers' groups, which will learn about and strive to conform to national standards for procurements. In 2019, convene government and institutional buyers with an interest in creating and participating in a bulk procurement programme for high-efficiency lighting products and systems. The group, initially starting in the capital, Freetown, should aim to conduct its first procurement in 2020.

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[16] Initially the field surveys could utilise surveys already applied in the field by Statistics Sierra Leone, Lighting Africa's market research programmes, and the survey tools of other organisations. The data and results could then be compared with baseline and trend information resulting from these organisations' prior studies. The International Energy Agency also has many tools available for countries to use for energy data collection.

[17] Available from: https://united4efficiency.org/resources/publications/?fwp_products=lighting.

[18] Under the framework of the Energy Compact signed between the Government of Sierra Leone and the Government of UK in 2016, a duty waiver was granted to all importers of solar products. It was subsequently put into law the amendment to the Goods and Services Act of 2009 outlined in the Finance Act of 2017. The documents set out a clear priority for solar RE technology. To level the playing field for private developers, duty exemptions should be technology neutral.

[19] As reported in Johnson (n.d.): "*VAT and Tariff Waiver now have a streamlined importation process to customs 'green channel', that is linked to qualified certified solar products (pico-PV and home solar market has tripled in size)*".

C. **The procurement group may expand (or welcome additional groups to focus on other sectors, for example, on infrastructure and transport facilities)** to conduct procurements for several years (tentatively to 2025–26) or for as long as needed to support lighting market transformation. The group should seek international assistance to learn about best practices and it should identify templates for technical specifications appropriate to each lighting application and for types of lighting products and systems that it plans to purchase.

D. **Create a detailed market forecast for future lighting needs and service demands** by type of building and location, starting with existing buildings and forecasting construction to 2030. Correlate this forecast with electricity access projections from current national energy plans and the (updated) Electricity Sector Reform Roadmap. Incorporate as baselines or trend points any data collected during Phases I and II.

Phase III: 2023–2030

All the actions listed in Phases I and II should continue as required and be reinforced and regularly refined up until 2030 – or, until the efficient lighting market is self-sustaining and all people in Sierra Leone have access to clean, efficient lighting. Additional suggested long-term policy actions include:

A. **Participate, with neighbouring states (such as members of the Mano River Union and ECOWAS), in regional and international programmes** to build up an efficient lighting market and distribution network in the sub-Saharan West Africa region. Initiatives such as the ECOWAS Regional Off-Grid Electrification Project; the World Bank Group's Lighting Africa and Lighting Global; UN Environment's United for Efficiency and Sustainable Energy for All's Building Efficiency Accelerator are international platforms to exchange experiences and to develop a peer network of competent professionals within the Government, the private sector and civil society. ECREEE has already been working in Sierra Leone, with the aim of establishing a national centre of competence for renewable energy standards and certification. It is important to ensure that lessons learned from the project (currently on hold) are considered[20].

B. **In 2023, initiate a new market research and consultation process to update periodically any regulatory documents pertaining to lighting**. This should ensure that all lighting products and systems (including LEDs and off-grid products) will be regulated in a timely manner (every three to four years) for performance and efficiency. To facilitate trade and rapid regional market development, it is suggested that Sierra Leone considers harmonising its minimum energy performance standards (MEPS) with contemporary standards from one (or more) of its major trading partner countries or regions.

   For example, Sierra Leone could require or encourage that any lighting products imported from the United States bear the ENERGY STAR label[21], which indicates high efficiency and verified performance. For products imported from the European Union, Sierra Leone could require conformance with the relevant European Commission directives, for example lamps that meet a specific level in the energy labelling directive[22]. Sierra Leone also could consider utilising the performance levels published by the International Energy Agency's 4E Solid-State Lighting Annex[23]. All three of the above harmonisation

[20] Source: interview with a local expert.
[21] See: ENERGY STAR – Lighting: https://www.energystar.gov/products/lighting_fans.
[22] European Commission – Lighting: https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficient-products/lighting.
[23] International Energy Agency 4E Solid-State Lighting: https://ssl.iea-4e.org/product-performance.

options are dynamic, incorporate extensive public consultations, publish excellent and detailed information, and are associated with ongoing product testing, measurement and verification programmes.

C. **The relevant government ministries and agencies[24] should co-operate to create a detailed plan of action for monitoring, verifying and enforcing lighting MEPS.** This plan of action would build on the market baseline begun in Phase I, Action C (above) and continue to periodically survey the market. Activities should be planned to adapt to new applications as they are introduced with the extension of the electrical grid and the establishment of mini-grids.

D. **For existing requirements, the government authority with enforcement jurisdiction should specifically investigate and prepare the legal means to enforce the Minamata Convention on Mercury.** Sierra Leone is a signatory to this Convention. By 2020 the Convention's requirements will: 1) phase out mercury in batteries; and 2) minimise to specific limits the amount of mercury allowed in discharge lamps. Of particular interest to Sierra Leone should be the limits for linear fluorescent lamps and Compact Fluorescent Lamps (CFLs), which may presently be prevalent in the lighting market. Plans should also be made for an environmentally sustainable programme to collect and dispose of all existing lamps that contain mercury.

E. **For existing requirements, the government authority with enforcement jurisdiction should specifically investigate and prepare the legal means to promulgate and enforce any MEPS, electrical safety standards and associated testing standards** for all lighting products, to ensure completion of the market transformation initiated under the "Leapfrogging to LEDs" strategy, and to permanently deliver the associated benefits to Sierra Leone.

[24] Such as Ministry of Energy, Ministry of Environment, Sierra Leone Statistics, Ministry of Commerce, Ministry of Justice.

KEY CAPACITY BUILDING MECHANISMS

To implement existing policies and the priorities suggested above, we suggest three key capacity-building mechanisms with the potential for high and immediate impact:

Develop and Use a Monitoring Framework for the Implementation of Efficiency and Savings Measures

A monitoring framework for tracking progress of a national efficient lighting strategy is an essential step for its success. Monitoring, verification and enforcement (MVE) should be integrated into all components of Sierra Leone's energy efficiency policies. MVE activities should focus on the implementation of policy measures and standards as well as on the lighting market and products being sold.

As outlined by UNEP's Energy Efficiency Lighting Toolkit (UNEP 2012), a monitoring, verification and enforcement strategy is important for:

- Increasing market compliance and supporting minimum energy performance standards (MEPS)
- Enabling impact evaluation (benefits of policies X costs of policies)
- Providing relevant data to inform the government about the future direction of lighting policy and better allocation of resources
- Ensuring that consumer satisfaction aligns with expectations
- Protecting suppliers by ensuring equal entry conditions
- Facilitating the accomplishment of policy goals.

Both the EEP and the NEEAP lay out plans for monitoring activities. The EEP mentions the goal of assuring long-term monitoring and reporting of policy accomplishments through a "Monitoring and Evaluation Group from a consortium of stakeholders" (EEP, 7.4, iii). Additionally, an "Energy Efficiency Monitoring and Implementation Program" is envisioned (EEP, 6.7.1, iii). The NEEAP announces the creation of a framework for "Monitoring, Verification and Enforcement (MV&E) of Minimum Energy Performance Standards (MEPS) for Lighting Systems" (MoE 2016a, 9.1.3).

Sierra Leone's MVE plans reveal a firm commitment to an integrated policy approach for advancing energy efficiency in the country. However, implementation is lagging behind and hindering the accomplishment of the country's efficiency targets and broader energy-sector reform plans.

Sierra Leone would benefit enormously from a capacity-building initiative for policy makers on MVE systems. Support for such a training and knowledge-sharing program can be sought internationally.[25]

Further steps need to be undertaken in order to enable a fully operational MVE system. The UNEP-GEF en.lighten initiative recommends the adoption of six measures to ensure adequate monitoring of lighting efficiency policies (UNEP 2014). Table 1 depicts these measures and can serve as a set of indicators to guide and assess MVE efforts in the country.

[25] Organisations like the Greenhouse Gas Management Institute (GHGMI) or the Renewables Academy (RENAC) offer relevant courses. International donors have supported trainings financially in the past.

Table 1. Summary of Monitoring, Verification and Enforcement Measures

Entry Requirements	Registration System	Product Performance Database	Market Surveillance	Enforcement Framework	National Lighting Test Laboratories
Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Adapted from UNEP, 2014, Status report on lighting Monitoring, Verification and Enforcement activities programmes in Cambodia, Indonesia, Lao PDR, Philippines, Thailand and Vietnam.

Creation of a Central Institution Collecting Energy-Sector Data Including Lighting Efficiency Information

One fundamental enabling factor for successfully implementing a national lighting strategy is the establishment of a central registry for relevant data, including information on lighting products traded in the market. According to UNEP, a survey indicated that more than 80% of a sample of selected countries rely on some type of compulsory entry condition for lighting products (UNEP 2012). Suppliers and importers are required to provide information to the system on the energy performance of their products. A centralised list or a national online registry can compile product information and help verify failure in compliance of standards.

In countries like Australia, Canada, Chile and the United States, products must pass a certification test before their suppliers can sell them in the market. In other countries, such as the Republic of Korea, inspection and testing is conducted within manufacturers' factories to attest to quality standards (UNEP 2014). In the European Union, a registry for products with a mandatory energy label has recently been introduced: As of 1 January 2019, suppliers (manufacturers, importers or authorised representatives) need to register their products and acquire an energy label in the European Product Database for Energy Labelling (EPREL), before selling them on the European market. Lamps and many other lighting products are covered (EC 2019).

In a lighting market dominated by large traders such as Sierra Leone, the adoption of compulsory entry conditions for suppliers entering the national market is the preferred option.

In addition to compulsory entry conditions, verification activities should be carried out to determine product compliance with safety and performance standards and to ensure market surveillance and enforcement actions. Verification can be undertaken primarily through testing processes, and thus it is important to develop the country's testing capacity. A first step should be the establishment of reliable laboratory facilities. Laboratories, however, demand high investments in maintenance, equipment and training. UNEP's toolkit on efficient lighting recommends the following considerations when developing testing capacities:

Frequency of testing	If testing is only required for occasional product development, then having a fully accredited laboratory will not be cost effective.
Volume of testing	This depends on both the size and composition of the market, as well as on programme implementation. A large market with many suppliers and products will require testing for many products, while a voluntary labelling programme in a smaller or homogenous market with a limited number of suppliers will not require the testing laboratory to handle as much volume.

Certification of products	If testing is required to provide the certification of products to international standards, then unaccredited laboratories will not be able to fulfil the requirement. Usually products are already submitted for safety certification.
Independent compliance testing support	If independent compliance tests are required, manufacturers may prefer to have access to product testing that can accommodate design, production and testing. In some cases, this may mean an on-site or local laboratory; in other cases, it may mean a manufacturer's own laboratory or a contracted test laboratory familiar with their products.
Product range or testing scope	Developing testing capacity for one type of lighting product only, such as CFLs, may not be adaptable if there be a shift in market demand for another product such as LED lamps.
Local production support	If new manufacturers enter the market, they may need access to local testing capacity (not necessarily independent third-party or accredited), which may be enough to guide product development and quality control of mass production.
Availability and accessibility of capacity elsewhere	It is more common for product testing to be performed at an international location by an experienced, accredited laboratory with sufficient capacity and the ability to turn around results quickly.
Development of complementary capacities	The option to share capacity with neighbouring states and/or trade partners is often overlooked. An example would be reciprocating the test capacity for one type of lighting product, such as LED lamps, in return for use of test facilities for a different type of product, such as CFLs.

Adapted from UNEP, 2012. Achieving the Global Transition to Energy Efficient Lighting Toolkit.

Creation of Additional Human Resources Through Extension and Training of Energy Sector Staff

Both the EEP and the NEEAP emphasise the need for investment in capacity building. The NEEAP mentions capacity-building plans for technical training and strengthening and enhancement of institutions (MoE 2015, 9.2.2). The EEP foresees capacity building for "*authorities, public and financial institutions on technical and economic evaluation of energy efficiency projects*" (MoE 2016a, 5.7.3, i, ii, iii).

Human capacity will be essential for developing and maintaining the long-term initiatives within the efficient lighting framework, such as MVE schemes, awareness campaigns, financial incentives, and other As previously suggested, human resources in Sierra Leone can be reinforced by partnering with neighbouring states, participating in regional and international programmes and engaging in peer networks of competent professionals within government, the private sector and civil society. The following priority action areas could be considered:

- In addition to the work being undertaken within ECREEE, cooperation with other African regional energy efficiency and renewables' centres should be considered, with a particular focus on SACREEE. SACREEE is currently (starting autumn 2018) building a programme for energy efficiency appliances and lighting. While the SADC market covers a different regional area and different trade agreements, the products are typically globally traded with similar characteristics. There should be many opportunities for mutual exchange of information and experiences. In addition

to this, the testing programme to be established under the SACREEE/EACREEE programmes may have important results to be shared. There may also be training opportunities.

- The Government could also consider whether existing international aid agreements that provide opportunity for training allow opportunities for public officials to join particular European capacity building programmes focusing on market surveillance and requirements' setting.
- Sierra Leone's human resources are developing but have limited capacity to undertake extensive lighting market transformation efforts. This shortage, however, opens opportunities for other stakeholders to become engaged and educated about energy efficiency, lighting, and the many benefits that lighting will offer to all people in Sierra Leone. Many civil society organisations in other regions with low rates of electrification have succeeded in grass-roots efforts to bring energy efficient off-grid lighting services to rural and peri-urban end-users. In addition to the programmes of aforementioned international organisations, a global industry has evolved to reach populations worldwide. The Global Off-grid Lighting Association[26], for example, has private sector and civil society members who innovate and respond to end-user needs for high efficiency, high quality lighting.

[26] GOGLA (see: https://www.gogla.org/) recently introduced GOGLA Bridge [with support from the Africa-EU Renewable Energy Cooperation Programme (RECP)]. It is, "*a database for GOGLA members and the broader stand-alone solar product sector providing an overview of support services for incubating and accelerating the growth of off-grid solar companies. Users can easily access information about grants, awards and competitions as well as details on relevant financing institutions and crowdfunding opportunities*".

CONCLUSIONS AND OUTLOOK

This report presents suggestions for advancing Sierra Leone's efficient lighting market. It considers policies measures and strategic plans already in place and explores opportunities for the future, often drawing on international best practices.

Three broader efficient lighting priorities are being discussed: To "leapfrog" to light emitting diodes in all market sectors and end-use applications; to expand and reinforce policies and business best practices that support and encourage a competitive market for renewable energy and energy-efficient lighting products and systems; and, to survey and accurately describe lighting user groups, their needs and their desired lighting products and services.

More specific policy actions are then explored to support a transformation of the lighting market to more efficient products as well as better service for more Sierra Leoneans. Altogether 14 individual steps are categorised in three Phases, from 2019 through to 2030. Institutional improvements which can support the design and implementation of policies and measures are detailed and supported with available market data.

Substantial financial and technical resources are available internationally to support the Government of Sierra Leone's efforts to provide efficient lighting solutions for its citizens. Where possible, we have tried to link them to specific potential implementation measures. The suggested actions should enable Sierra Leone to successfully access these resources and to continue to seek regional and international funding and technical aid.

Existing and new policies only have value if they are fully implemented, monitored, reviewed and regularly updated. Currently, one of the most important challenges that Sierra Leone faces, is the unavailability of data and information from any source, let alone a central registry that can be publicly accessed, and that shares clear, comprehensive, regularly updated energy-sector data, following international standards and metrics.

Sierra Leone has a young, entrepreneurial population eager to participate in regional and international growth opportunities. Efficient lighting is a well-understood and documented service that improves productivity, health and well-being. Coordinating end-user needs, professional and stakeholder capabilities and international support is key for Sierra Leone's leadership to guide the country forward.

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Noted: Phase 2 (to be completed by mid-2020) *"Energy Efficiency Incentives: The MoE will promote specific energy efficiency policy instruments in order to deliver on the policy objectives which bear mostly on; i. the phasing out of incandescent lighting bulbs, ii. the promotion of energy efficient street lighting,"... (2.4, p 22).* This document also mentions prior policy documents, specifically:

- National Energy Policy (2009)
- Policy Letter (2016)
- National Renewable Energy Policy (2015)
- Energy Efficiency Policy (2015)

Sierra Leone Ministry of Energy (2016a). Energy Efficiency Policy of Sierra Leone. Available from: http://www.energy.gov.sl/policies/.

Noted: This policy document points to evidence that inefficient lighting is a barrier to development in Sierra Leone (2.1.iv). It calls for financial incentives to promote adoption of efficient lighting (5.3.i); and provides several relevant policy statements, *"GOSL will introduce Compact Fluorescent Lamps (CFLs) and Light Emitting Diode (LED) at subsidized prices,"* and *"GOSL will monitor the direct procurement of energy efficiency: goods and services" (5.4.2).* It also introduces relevant measures, including *"Introduction of compulsory minimum energy performance standards for lighting according to the ECOWAS energy efficient lighting strategy,"* and *"Establishing and enforcing codes and standards for energy efficiency technologies" (5.5.3.ii and 5.5.3.iv).*

Furthermore, it advocates training to increase lighting resources, specifically, *"Capacity building measures for authorities to conduct technical and economic evaluation of public street lighting projects, awareness raising about innovative technologies and business models"* (5.7.3.i). Section 6.1.2.xi requires *"Mandating the deployment of energy saving light fixtures in government offices and facilities."* For the residential sector, lighting policy statements include: *"GOSL will ensure that standards and labels are mandatory for appliances and buildings, "*and *"GOSL will introduce use of Compact Fluorescent Lamp (CFL) and Light Emitting Diode (LED) as efficient lighting technologies"* (6.5.1) followed by measures, "*Distribution of CFLs and LED lighting systems at subsidized prices" "Mandatory standards and labels for appliances..." "Establish National Registries for on-grid and off-grid lighting products"* and, *"Conduct regular census of importers, wholesalers and distributors of efficient lighting products"* (6.5.2.i, ii, v and vi). Likewise, for public lighting, "*GOSL will encourage*

the use of energy saving public lighting" and, *"GOSL will encourage Energy Efficiency measures with special focus on the development of energy efficient lighting" (6.7.1).*

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ANNEX A. LIGHTING-RELATED MEASURES IN TWO POLICIES OF SIERRA LEONE: ENERGY EFFICIENCY POLICY (MOE 2016A) AND NATIONAL ENERGY EFFICIENCY ACTION PLAN (MOE 2015)

Policy Document	Area of the Measure	Type of Measure	Measure
EEP (5.3, i)	Financing	Objective	Incentives for producers and importers to offer energy efficient appliances and lighting.
EEP (5.3, i)	Financing	Objective	Tax credits to companies that produce such appliances and fixtures.
EEP (5.3, i)	Financing	Objective	Incentives for homeowners (such as tax credits) to install energy-efficient appliances and lighting.
EEP (5.4.3, i)	Financing	Measure	Energy Efficiency Fund to provide rebates to on-grid customers who implement substantive changes in their equipment to gain efficiency.
EEP (5.4.3, iii)	Financing	Measure	Maintaining a list of qualified energy-efficient equipment for which buyers will receive a refund.
EEP (5.4.3, vii)	Financing	Measure	Providing a duty-free incentive to importers of energy-saving equipment.
EEP (5.4.3, viii)	Financing	Measure	Providing a budget line for each Ministry, Department, and Agency (MDA) to facilitate the purchase and installation of energy-efficient appliances or mandating each MDA to devote a minimum percentage of its budget to upgrading its equipment and fixtures.
EEP (5.5.3, ii)	Legal and Regulatory	Measure	Introduction of compulsory minimum energy performance standards (MEPS) for lighting according to the ECOWAS energy-efficient lighting strategy.
EEP (5.6.2)	Awareness Raising	Policy Statement	Replacing inefficient devices with energy-efficient ones in public offices and promoting the same at the state and local levels.
EEP (5.6.2)	Awareness Raising	Policy Statement	Sustained and comprehensive public education and awareness-creation campaign on the methods and benefits of energy conservation.
EEP (5.6.3, i)	Awareness Raising	Measure	Inclusion of information / training / energy efficiency subjects / informational activities in school curricula and in the local area.
EEP (5.6.3, ii)	Awareness Raising	Measure	Awareness-raising measures targeting specific groups (for example, installers, architects, engineers).
EEP (5.6.3, v)	Awareness Raising	Measure	Distribution of brochures / leaflets and posters or advertisements in public areas.
EEP (5.7.3, i, ii, iii)	Capacity Building	Measure	Capacity building for authorities in public and financial institutions on technical and economic evaluation of energy efficiency projects.

EEP (5.8.2)	Institutional Support and Coordination	Policy Statement	Energy efficiency governance structure at the national, regional and local levels and enhancement of cross-sectoral coordination.
EEP (5.8.3, iii)	Institutional Support and Coordination	Measure	Enhancement of effective co-operation between ministries and parastatal institutions such as the Ministry of Water Resources; Ministry of Agriculture, Forestry and Food Security; Ministry of Lands, Country Planning & Environment; Ministry of Education, Science and Technology, etc.
EEP (5.8.3, iv)	Institutional Support and Co-ordination	Measure	Establishment of energy efficiency units at the state and local government levels for the development and implementation of policies, strategies and programmes.
EEP	Research and Development	Objectives	Energy efficiency research and outreach programmes and provision of seed funds for their activities.
EEP (5.9.3, i)	Research and Development	Measure	Developing and promoting local capability in the nation's design and fabrication of energy-efficient devices and technologies for the utilisation of energy resources.
EEP (5.9.3, iv)	Research and Development	Measure	Initiating and promoting energy efficiency educational programmes and research activities in tertiary institutions and research institutes.
EEP (5.9.3, v)	Research and Development	Measure	Encouraging results-oriented research and development, including information systems and software solutions, in the energy efficiency sector by making expenditure on such efforts tax deductible.
EEP (5.9.3, vi)	Research and Development	Measure	Encouraging data collection and statistical analysis of energy consumption patterns and penetration of different energy conversion and use technologies in different sectors.
EEP (6.5.2, i)	Residential	Measure	Distribution of CFLs and LED lighting systems at subsidised prices.
EEP (6.5.2, ii)	Residential	Measure	Mandatory standards and labels for appliances, vehicles and buildings.
EEP (6.5.2, v)	Residential	Measure	Establishing National Registries for on-grid and off-grid lighting products.
EEP (6.5.2, vi)	Residential	Measure	Conducting regular census of importers, wholesalers and distributors of efficient lighting products.
EEP (6.5.2, vii)	Residential	Measure	Measures aimed at reducing energy consumption in public buildings by addressing the building as such and

			by addressing the building operation (including user behaviour).
EEP (6.7.1)	Public	Policy Statement	Encouraging the use of energy-saving public lighting.
EEP (6.7.1, iii)	Public	Measure	Energy Efficiency Monitoring and Implementation Program.
EEP (6.7.1, iv)	Public	Measure	Establishment of an Energy Efficiency Centre.
EEP (7.1.2, v)	Planning & Policy Implementation	Measure	Establishing a national energy information system, which will involve consistent data gathering and processing of energy resource inventory, consumption patterns, energy technologies, energy efficiency measures and other relevant socio-economic parameters.
EEP (7.4, iii)	Planning & Policy Implementation	Measure	Monitoring and Evaluation Group from a consortium of stakeholders to ensure that the NEEAP passes a benefit/cost test and assure long-term monitoring and reporting of accomplishments in energy efficiency.
NEEAP (9.1.1)	Efficient Lighting Initiative	Measure	Minimum energy performance standards (MEPS) for on-grid and off-grid lighting devices.
NEEAP (9.1.2)	Efficient Lighting Initiative	Measure	Supporting energy-efficient lighting policies and measures through awareness raising campaigns targeting final consumers.
NEEAP (9.1.3)	Efficient Lighting Initiative	Measure	Establishing a system for monitoring, verification and enforcement (MVE) of minimum energy performance standards (MEPS) for lighting systems.
NEEAP (9.1.4)	Efficient Lighting Initiative	Measure	Environmentally sound management through the implementation of a collection and disposal system for energy-efficient light bulbs.
NEEAP (9.2.1)	Standards and Labelling Initiative	Measure	Market assessment of key energy-using appliances.
NEEAP (9.2.2)	Standards and Labelling Initiative	Measure	Capacity building (technical training, strengthening and enhancing institutions).
NEEAP (9.2.3)	Standards and Labelling Initiative (Awareness Rising)	Measure	Awareness raising: developing 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; designing and conducting awareness-raising campaigns for national authorities, manufacturers, distributors, specialised professionals such as engineers and technicians and the general public.

NEEAP (9.2.4)	Standards and Labelling Initiative	Measure	Fiscal/financial measures (customer credit schemes, demand-side management by utilities, changes to the tax systems).

ANNEX B. SIERRA LEONE: KEY INDICATORS

Sierra Leone: Key indicators, population and people, 1990–2017

SIERRA LEONE	1990	2000	2010	2017
Population, total (millions)	4.31	4.56	6.46	7.56
Population growth (annual %)	1.5	2.8	2.3	2.2
Surface area (sq. km) (thousands)	72.3	72.3	72.3	72.3
Population density (people per sq. km of land area)	59.7	63.2	89.5	104.7
Poverty headcount ratio at national poverty lines (% of population)	..	*66.4*	*52.9*	..
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	*67.1*	*61.3*	*52.2*	..
GNI, Atlas method (current US$) (billions)	0.80	0.66	2.69	3.83
GNI per capita, Atlas method (current US$)	190	140	420	510
GNI, PPP (current international $) (billions)	3.11	3.20	7.68	11.20
GNI per capita, PPP (current international $)	720	700	1,190	1,480
People				
Life expectancy at birth, total (years)	37	39	48	*52*
Fertility rate, total (births per woman)	6.7	6.3	5.2	*4.5*
Mortality rate, under-5 (per 1,000 live births)	*262*	*233*	*163*	*111*
Primary completion rate, total (% of relevant age group)	..	..	*66*	*66*
School enrollment, primary (% gross)	46.4	60.3	*110.7*	*114.8*
School enrollment, secondary (% gross)	15	*24*	*39*	*40*
School enrollment, primary and secondary (gross), gender parity	1	*1*	*1*	*1*

Source: World Bank Databank, from *Sierra Leone Country Profile,* as of December 2018.

Cost and delivery of electricity

- According to the Overseas Development Institute, for Sierra Leone, "*The electricity tariff is 28 US cents/kWh, twice as much as the continental average*" (2015).
- Reliability and quality of delivery of grid-connected services needs improvement.

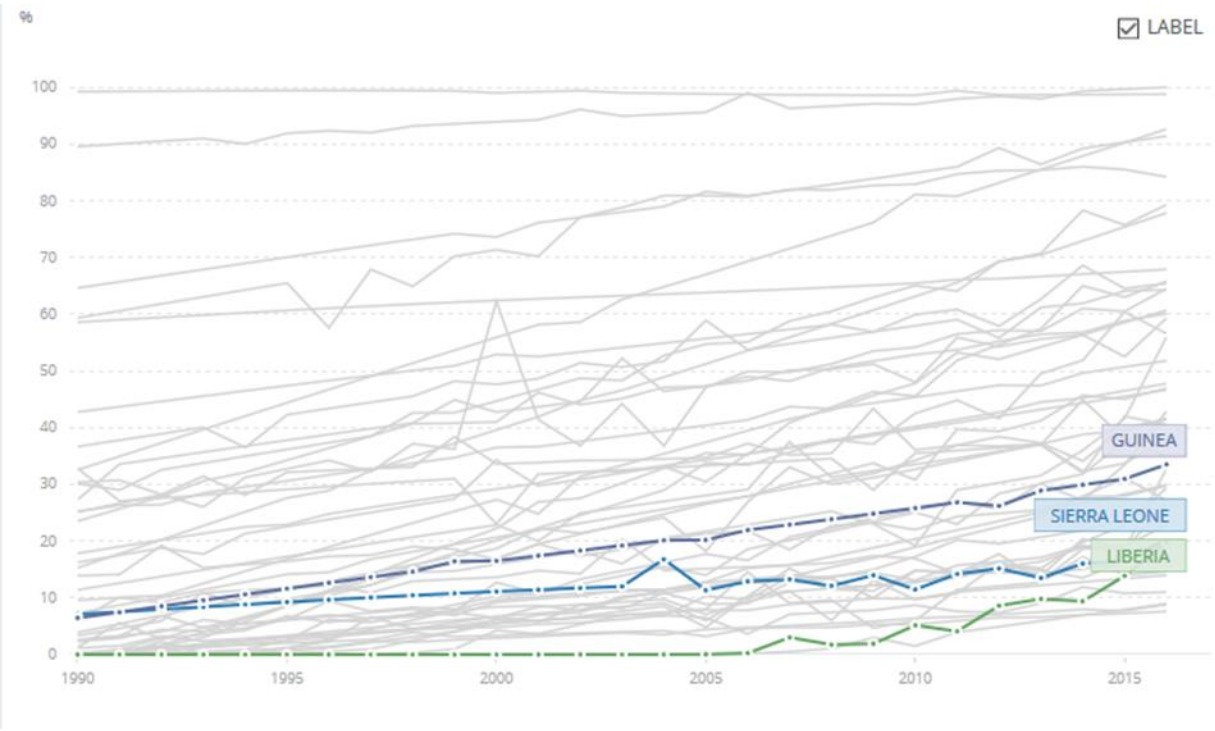
"Doing Business" indicators

- World Bank "Doing Business" ranking (2017): Sierra Leone is 169th out of 188 countries.
- Transparency International's Sierra Leone Country Profile, Corruption Perceptions Index: Sierra Leone is 130th of 180 countries; score is 30 out of 100. (Accessed 24/01/2019: https://www.transparency.org/country/SLE).
- Number of documents required for an import (2017): 7.
- Number of days to import (2017): 13.
- Cost to import a container (2017): USD 1,169.

Access to electricity

- 13% of the population has access to electricity, but only 1% of the rural population.
- Sierra Leone has approximately 100 megawatts of installed generation capacity. Much of this relies on diesel fuel, although renewable sources increasingly are coming online.
- Renewable energy mini-grids are being installed nationwide. (Power Africa, 2016).

Access to electricity as a percent of population in Sierra Leone, Liberia and Guinea, compared to the Africa region, 1990 to 2016



ANNEX C. SELECTED LIGHTING PRODUCT IMPORTS AND KEY TRADE PARTNERS, SIERRA LEONE, 2017

Source: UN COMTRADE.

Sierra Leone: 2017 Imports of Lighting Commodities, by World and by Trading Partners (UN COMTRADE)						
Code	**Commodity**	**Qty Unit**	**Alt Qty Unit**	**Net weight (kg)**	**Trade Value (US$)**	**Partner**
All below	**Lighting products**				**$ 2,604,506**	**World**
3406	**Candles, tapers**	**Weight in kilograms**	**7439**		**$ 8,693**	**World**
3406	Candles, tapers and the like	Weight in kilograms	1749	1749	$ 4,783	China
			2069	2069	$ 2,421	United Kingdom
			919	919	$ 1,127	United Arab Emirates
			1197	1197	$ 245	France
			523	523	$ 74	Netherlands
			286	286	$ 19	Spain
			518	518	$ 16	Greece
			176	176	$ 4	Germany
8513	**Portable electric lamps**	**No Quantity**	**0**		**$ 280,110**	**World**
8513	Portable electric lamps designed to function by their own source of energy (for example, dry batteries, accumulators, magnetos), other than lighting equipment of heading 85.12.	No Quantity	0	287433	$ 216,785	China
				383	$ 20,631	Japan
				16156	$ 15,141	United Arab Emirates
				6717	$ 6,880	South Africa
				2256	$ 5,572	France
				2782	$ 5,126	USA
				7194	$ 3,848	China, Hong Kong SAR
				258	$ 3,395	Netherlands
				473	$ 1,213	Italy
				1823	$ 874	United Kingdom
				1238	$ 277	Lebanon
				1100	$ 276	Germany
				384	$ 34	Nigeria
				42	$ 25	Oman
				47	$ 18	Spain
					$ 4	India
					$ 1	Singapore
9405	**Lamps and lighting fittings**	**Weight in kilograms**	**796595**		**$ 2,291,958**	**World**
9405	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like, having a permanently fixed light source, and parts thereof not elsewhere spe	Weight in kilograms	69350	69350	$ 462,531	Turkey
			415998	415998	$ 410,534	China
			24450	24450	$ 395,064	USA
			38420	38420	$ 381,140	France
			141129	141129	$ 226,820	United Arab Emirates
			20502	20502	$ 84,655	United Kingdom
			19014	19014	$ 73,730	Mauritania
			5214	5214	$ 73,301	Belgium
			12821	12821	$ 47,228	South Africa
			15051	15051	$ 29,472	China, Hong Kong SAR
			5795	5795	$ 28,205	Cyprus
			1104	1104	$ 20,065	Germany
			2657	2657	$ 14,357	Netherlands
			9685	9685	$ 13,415	Lebanon
			478	478	$ 6,802	Morocco
			725	725	$ 6,266	India
			1630	1630	$ 5,099	Iran
			2040	2040	$ 3,923	Ghana
			2105	2105	$ 3,427	Sweden
			214	214	$ 2,142	Italy
			5	5	$ 985	Mauritius
			384	384	$ 837	Nigeria
			5000	5000	$ 606	Seychelles
			410	410	$ 539	Albania
			1190	1190	$ 268	Australia
			482	482	$ 191	Romania
			153	153	$ 162	Canada
			55	55	$ 151	Oman
			518	518	$ 20	Greece
			3		$ 8	Congo
853931	**Electric discharge lamps**	**Number of items**	**20769**		**$ 23,745**	**World**
853931	Electric discharge lamps (excl. ultra-violet lamps), fluorescent, hot cathode	Number of items	9214	13851	$ 10,535	United Arab Emirates
			3671	7675	$ 4,197	China
			3211	4416	$ 3,672	United Kingdom
			1590	569	$ 1,818	South Africa
			1315		$ 1,504	Turkey
			900	4732	$ 1,030	Nigeria
			764	488	$ 874	Lebanon
			98	179	$ 113	USA

ANNEX D. PRIMARY SOURCES OF LIGHTING IN HOUSEHOLDS IN SIERRA LEONE, 2017

Source: Excerpted and adapted from Table TC 4.6 of *Sierra Leone Multiple Indicator Cluster Survey 2017, Survey Findings Report,* published in 2018 by Statistics Sierra Leone.

Sierra Leone (2017): Distribution of Household Members (Percent), by Type of Fuel and Technology (Clean or Polluting) Primarily Used for Lighting by the Household

	Percentage of household members in households with primary reliance for lighting on:					Summary				
	Clean fuels*				Polluting fuels**					
	Electricity ***	Solar lantern	Recharge-able flashlight, torch or lantern	Battery powered flashlight, torch or lantern	(Includes: Gasoline lamp; Kerosene or paraffin lamp; Charcoal; Wood; Oil lamp; Candle; Other fuel for lighting)	No lighting in household (%)	Total	Primary reliance on polluting fuels (%)	Primary reliance on clean fuels & technologies [1] (%)	Household members (#)
Total	**13.7**	**6.8**	**11.9**	**64.9**	**2.7**	**0.1**	**100.0**	**2.7**	**97.3**	**74,602**
Sex										
Male	13.9	6.8	11.9	64.7	2.5	0.1	100.0	2.5	97.3	35,862
Female	13.5	6.8	11.8	65.1	2.6	0.1	100.0	2.6	97.3	38,740
Area										
Urban	28.9	6.5	10.2	52.6	1.6	0.0	100.0	1.6	98.2	33,269
Rural	1.5	7.0	13.2	74.8	3.4	0.1	100.0	3.4	96.6	41,333
Region										
East	7.6	11.1	14.7	64.9	1.5	0.0	100.0	1.5	98.3	17,067
North	10.5	6.9	10.3	68.3	3.6	0.1	100.0	3.6	96.2	25,178
South	8.7	4.7	11.5	73.2	1.9	0.1	100.0	1.9	98.1	14,720
West	28.4	4.2	11.6	53.1	2.7	0.1	100.0	2.7	97.3	17,635
District										
Kailahun	0.2	11.8	25.4	60.4	2.1	0.1	100.0	2.1	97.8	4,742
Kenema	15.7	10.7	10.1	61.5	2.0	0.0	100.0	2.0	98.0	7,323
Kono	2.8	11.1	11.3	74.1	0.7	0.0	100.0	0.7	99.3	5,003
Bombali	29.0	6.4	3.5	58.2	2.7	0.1	100.0	2.7	97.2	6,214
Kambia	0.0	16.1	23.4	58.7	1.8	0.0	100.0	1.8	98.1	3,418
Koinadugu	0.3	5.7	20.6	69.5	3.4	0.0	100.0	3.4	96.1	4,000
Port Loko	11.2	5.1	6.8	72.1	4.2	0.1	100.0	4.2	95.6	6,614
Tonkolili	1.7	4.7	6.3	81.6	5.4	0.3	100.0	5.4	94.3	4,931
Bo	18.8	4.4	0.8	73.9	2.2	0.0	100.0	2.2	97.8	6,385
Bonthe	0.1	10.6	34.6	54.2	0.5	0.0	100.0	0.5	99.5	1,962
Moyamba	1.9	2.8	21.0	71.3	2.9	0.2	100.0	2.9	97.0	3,441
Pujehun	0.2	3.7	8.3	86.7	1.1	0.0	100.0	1.1	98.9	2,932
Western Area Rural	6.9	10.0	14.1	66.0	3.0	0.0	100.0	3.0	97.0	5,517
Western Area	38.1	1.5	10.5	47.2	2.6	0.1	100.0	2.6	97.4	12,119
Education of household head**										
Pre-primary or	6.8	6.7	12.9	70.3	3.4	0.1	100.0	3.4	96.6	43,608
Primary	11.5	8.9	11.8	66.0	1.5	0.2	100.0	1.5	98.3	7,418
Junior Secondary	19.6	5.7	12.1	60.6	1.9	0.1	100.0	1.9	98.1	7,744
Senior Secondary	30.9	6.8	9.0	51.5	1.7	0.0	100.0	1.7	98.2	15,727
Wealth index quintile										
Poorest	0.0	3.7	9.6	81.0	5.5	0.2	100.0	5.5	94.3	14,854
Second	0.0	7.9	14.3	75.0	2.8	0.0	100.0	2.8	97.2	14,804
Middle	0.1	9.6	17.4	70.9	1.7	0.0	100.0	1.7	98.1	14,723
Fourth	7.2	8.5	12.6	69.6	1.9	0.0	100.0	1.9	97.8	14,083
Richest	57.0	4.7	6.1	31.2	1.0	0.0	100.0	1.0	98.9	16,138

Survey note: 1) MICS indicator TC.17 - Primary reliance on clean fuels and technologies for lighting. See report: http://mics.unicef.org/news_entries/106/SIERRA-LEONE-2017-MICS-RELEASED or http://microdata.worldbank.org/index.php/catalog/3210

Author's notes: * "Biogas" was queried during the survey; all results were null. ** "Crop residue/Grass/Straw" and "Animal dung/waste" were queried in the survey; all results were null. ***The generation source of "Electricity" is unspecified in the survey. It could include electricity from on-site diesel generators. **** Results for the 105 heads of household reported as "Missing/DK" not included.