

Technical Assistance to the
Renewable Energy
Association of Sierra Leone
(REASL)

FINAL REPORT



Mark Hankins

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Acronyms and abbreviations

ACE	Africa Clean Energy
AEEP	Africa-EU Energy Partnership
AfDB	African Development Bank

ARD	Africa Regional Department
ASD	African Solar Designs
ASU	Arizona State University
BOP	Base of the Pyramid
CIF	Climate Investment Funds
DFID	Department for International Development
DIV	Development Innovation Venture
DRE	Distributed Renewable Energy
EDSA	Electricity Distribution and Supply Authority
EFO	Energy for Opportunity
EGTC	Electricity Generation and Transmission Company
Endev	Energizing Development
EPC	Equipment and Procurement Company
ERC	Energy Regulatory Commission
EU	European Union
FAPA	Fund for African Private Sector Assistance
FCO	Foreign and Commonwealth Office
IP	Investment Prospectus
GDA	Global Development Alliance
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMG	Green Mini Grids
GOGLA	Global Off-Grid Lighting Association
GoSL	Government of Sierra Leone
HND	Higher National Diploma
IDCL	Infrastructure Development Company Limited
IEC	International Electrotechnical Commission
IECRE	International Electrotechnical Commission Renewable Energy
IFC	International Finance Corporation
ISO	International Organisation for Standardization
IRENA	The International Renewable Energy Agency
JICA	Japan International Co-operation Agency
LED	Lighting Emitting Diode
KCPE	Kenya Certificate for Primary Education
KCSE	Kenya Certificate for Secondary Education
KEBS	Kenya Bureau of Standards
KEREA	Kenya Renewable Energy Association
MCC	Millennium Challenge Corporation
MFI	Micro Finance Institution
MoT	Ministry of Trade
NEPAD	New Partnership for Africa's Development
NITA	National Industrial Training Authority
NCTVA	National Council for Technical, Vocational and other Academic Awards
NGO	Non-Governmental Organisation

ODI	Overseas Development Institute
OM	Operations and Maintenance
OND	Ordinary National Diploma
RE	Renewable Energy
PAYG	Pay-As-You-Go
PDP	Project Development Programme
QA	Quality Assurance
REACT	Renewable Energy and Adaptation to Climate Change Technologies Fund
RECP	Renewable Energy Cooperation Programme
REASL	Renewable Energy Association of Sierra Leone
SDG	Sustainable Development Goal
SEADS	Strategic Energy Advisory and Dialogue Services
SEFA	Sustainable Energy Fund for Africa
SE4All	Sustainable Energy for All
SL	Sierra Leone
SLSB	Sierra Leone Standards Bureau
SLAMFI	Sierra Leone Association of Micro Finance Institutions
SLEWRC	Sierra Leone Electricity & Water Regulatory Commission
SHS	Solar Home System
SOBA	Sierra Leone Opportunities for Business Action
SSS	Standard Specification Sheet
SREP	Scaling Up Renewable Energy Program
TA	Technical Assistance
ToT	Training of Trainers
TEREA	Tanzania Renewable Energy Association
TOR	Terms of Reference
UK	United Kingdom
UNDP	United Nation Development Program
UNOPS	The United Nations Office for Project Services
UK	United Kingdom
UKAID	United Kingdom Agency for International Development
USAID	United States Agency for International Development
VAT	Value Added Tax

Report t Summary

The Sierra Leone off-grid solar market is relatively small and undeveloped, but given the large off-grid population, the growing competitiveness of renewable solutions and limited reach of the grid, renewables have an extremely large potential for growth. Thus far, market penetration

for off-grid solar products is relatively low, and many customers select equipment that is short-lived and poor quality. The government prioritises the renewable energy sector and has mandated the private sector to drive renewable off-grid market growth. There are a number of barriers that slow the development of markets, in particular lack of finance and a lack of clarity in government regulation and incentive programmes.

Following the signing in 2016 of the Energy Africa Compact Agreement with the Government of Sierra Leone (GoSL), DFID agreed with government agencies to improve transactional processes to enable the development of renewable energy businesses in the country and to mobilise various stakeholders to build an efficient renewable product market.

A significant outcome of the Compact campaign was the formation of the Renewable Energy Association of Sierra Leone (REASL), a trade association for market actors. REASL has a corporate mission that is to *accelerate the adoption of renewable energy for achieving universal energy and economic empowerment in Sierra Leone.*

In order to help REASL to realise its mission, DIFD supported this assignment by African Solar Designs, Ltd. (ASD) to conduct five tasks:

- Identify the information and data requirements of REASL and key stakeholders and propose efficient management systems and processes to meet requirements.
- Identify and shortlist the most relevant international renewable energy industry partners, for REASL to support delivery of its objectives. This may include the Global Off-Grid Lighting Association (GOGLA), manufacturers, EPCs, investors and others;
- Identify and shortlist the most relevant international and national renewable energy, Climate Change and Sustainable Development institutions and interest groups that are well placed to support REASL and its objectives. This may include the Energy Revolution Taskforce, IFC Lighting Africa, World Bank and others.
- Develop an efficient regime for collaborating with Standards Bureau for establishing, monitoring and enforcing the minimum quality standards for renewable energy equipment that is imported into the country for resale.
- Develop training needs and curricula in renewable energy in partnership with recognised technical training institutions.

The assignment was carried out from April to July 2017. The scope of this document covers solar power, specifically, pico, solar home systems, professional systems / mini grids, and grid connected systems. The document also offers a “road map” approach for REASL members, with guidance to move forward in building the REASL organisation and in developing quality assurance, capacity building and outreach to international organisations.

This report has seven sections. Section 1 provides a background for the assignment. Section 2 gives details on the Sierra Leone renewable energy context. Section 3 provides an analysis of REASL management and administrative structures and suggests the next step in the organisational development. Section 4 details private sector renewable energy actors with potential to invest and develop the market. Section 5 provides a list of international and regional groups that can provide support and funding. Section 6 outlines a roadmap for the development of training and capacity building. Section 7 provides a quality assurance roadmap.

SECTION 1

Introduction

1.1 Background

The UK government signed the first Energy Africa Compact Agreement with the government of Sierra Leone (GoSL) at The Energy Revolution Event held in Freetown, Sierra Leone on May 10, 2016. The primary objective of the Compact is to put Sierra Leone on the path to universal energy access through market-led accelerated adoption of renewable energy.

Energy access in Sierra Leone today stands at less than 10% in urban areas and less than 1% in rural areas. The Compact is being implemented by the Sierra Leone Ministry of Energy (MoE) and the UK Department for International Development (DFID). The Compact has immediate goals of:

- a. Working with government agencies for improved transactional processes that will enable renewable energy businesses in Sierra Leone to import and install 50,000 units of small solar home systems for lighting and mobile charging by the end of 2016 and 250,000 units by the end of 2017; and
- b. Mobilising government, NGO and private sector stakeholders for the development of an efficient renewable market in Sierra Leone.

A significant outcome of the Compact campaign is the formation of the Renewable Energy Association of Sierra Leone (REASL), a trade association focused on the development of an efficient and thriving renewables market in Sierra Leone. REASL is in its formative stage and has set itself the following goals:

- a. Represent the renewable energy industry to government, consumers and other stakeholders through advocacy, lobbying and marketing;
- b. Educate consumers, GoSL, financial sector decision makers and other renewable energy stakeholders on the economic, social and environmental benefits and issues around renewable energy adoption into the national energy market; and
- c. Proactively work to hasten the uptake of affordable, safe and reliable renewable energy products that meet international standards in Sierra Leone.

REASL is a new organisation that has a membership consisting mostly of new small businesses. It needs financial and technical support to be able to perform to scale and accomplish the ambitious national goals it has set itself. As part of its ongoing commitment to the Energy Africa campaign, DFID has agreed to provide technical assistance in order to:

- a. Establish efficient operational structure and processes for REASL; and
- b. Establish connections and build awareness amongst supportive international investors and funding organisations.

1.2 Objectives of Assignment

This document outlines the roadmap to help structure renewable energy activities in the Sierra Leone market, taking into account current market limitations, gaps, and opportunities. The Sierra Leone renewable energy market is relatively new and thus has the potential for rapid exponential growth if the right systems are in place and key participants are attracted to the market.

Under this assignment, the consultant is required to complete the following activities:

- a. Identify and shortlist the most relevant international renewable energy industry partners, for REASL to support delivery of its objectives. This may include the Global Off-Grid Lighting Association (GOGLA), manufacturers, EPCs, investors and others;
- b. Identify and shortlist the most relevant international and national renewable energy, Climate Change and Sustainable Development institutions and interest groups that are well placed to support REASL and its objectives. This may include the Energy Revolution Taskforce, IFC Lighting Africa, World Bank and others;
- c. Identify the information and data requirements of REASL and key stakeholders and propose efficient management systems and processes to meet requirements;
- d. Develop an efficient regime for collaborating with Standards Bureau for establishing, monitoring and enforcing the minimum quality standards for renewable energy equipment that is imported into the country for resale; and
- e. Develop training needs and curricula in renewable energy in partnership with recognised technical training institutions.

The following sections of the report provides REASL guidance on how to address some of the market and policy challenges surrounding the Sierra Leone renewable energy market. Based on background document review and activities completed that are aligned with the Terms of Reference for this assignment (see **Annex 1**), this document lays out management systems, energy actors, support organisations, as well as training and quality assurance road maps. The assessment was carried out from April to July 2017. Apart from background document review, a number of stakeholder consultations (see **Annex 2** for list of stakeholders consulted) in Sierra Leone were undertaken during the assignment period.

The scope of this document covers solar power, specifically, pico, solar home systems, professional systems / mini grids, and grid connects. While REASL should address all renewable energy needs, its initial focus should be on solar due to the nascent nature of the Sierra Leone market, as well as the practical solution these technologies can provide in meeting the short and medium term goals of the government for energy access. To grow the market effectively, focusing on solar will eventually attract other renewable energy systems.

SECTION 2

The Sierra Leone Context

Over 60%¹ of the population in Sierra Leone lives below the poverty level of US\$1.90 a day. Income inequality is moderately high and this has a direct impact on the country's current human development status where the country is ranked 179 out of 188 countries. Following the Ebola outbreak and a decade of civil war, the government, private sector and development community are making strides towards an economic recovery. On the renewable energy front, Sierra Leone energy potential is directly related to its population structure. Since the majority of the population resides in rural areas where grid access is largely undeveloped, small scale solar systems and green mini-grids are opportunities to provide power to un-electrified communities across the country.

The Sierra Leone off-grid solar market is relatively small and undeveloped, but has a large potential for growth. The national grid electricity is limited to the capital city and a few commercial towns in the country. Currently, 5% of the population is serviced by the grid, 11% of which are in urban areas². What little electricity is available in rural areas is expensive, with tariffs twice as high as the continent's average³, currently at US\$0.28/kWh. About 35,000 diesel generators are in use to generate 180MW across the country, which is almost double the current grid capacity.

The lack of activity in the off-grid market, that could serve most of the population, makes it attractive for renewable energy suppliers looking to expand in Sierra Leone. To take advantage of this potential for growth, it is important to put standardised systems in place to maintain high quality standards and educate locals on renewable energy technologies.

2.1 Renewable Energy Sector in Sierra Leone

The Sierra Leone market is underserved with only a few businesses operating in the market (see Section 4 for a detailed list of market actors active in Sierra Leone). This presents an ample opportunity for renewable energy players to enter this “untapped” market. In off-grid rural populations using electric lanterns, the quality of available products is low. However, the use of these products is significantly high with 97% of rural population using lanterns with disposable batteries⁴. This makes demand for off-grid products high, with solar home systems (SHS) and pico products seen as immediate solution to improving energy access in the country.

There are currently some programs and projects in Sierra Leone which make it attractive for new businesses, both on the SHS/pico and mini-grid space (see Section 5 for energy access programs and projects). The government is currently prioritizing the renewable energy sector. As part of the larger West African region, there is also an incentive to enter the Sierra Leone market through the Mano River Union -- Sierra Leone can become a strong energy hub due to its free trade to Guinea and Liberia as well as its location within the Mano River Union.

¹ World Bank Development Indicators, <http://data.worldbank.org/country/sierra-leone>

² Sierra Leone Opportunities for Business Action, Solar Market Opportunities in Sierra Leone

³ Sierra Leone Opportunities for Business Action, Solar Market Opportunities in Sierra Leone

⁴ Sierra Leone Opportunities for Business Action, Solar Market Opportunities in Sierra Leone

2.1.1 Barriers to entry in Sierra Leone renewable energy market

As in many other African countries, the private sector plays an important role in driving the renewable off-grid market in Sierra Leone. Though there have been positive developments, there are a number of factors that hinder international solar companies and mini-grid developers from entering the Sierra Leone market. These barriers include:

Solar companies

- Limited penetration of mobile phones in the country to make Pay-As-You-Go (PAYG) a success;
- The GoSL enacted the Finance Act, 2016 which provides for elimination of GST for quality solar products. However, stability and enforcement of the Act is still unclear which has directly affected the costs of solar products and created uncertainties in the market;
- Limited funding for start-up capital;
- Limited consumer financing options available to finance upfront system costs; and
- Limited technical capacity available for operation and maintenance in the country.

Mini-grid developers

Mini-grids have grown to provide power for small industry uses in addition to households and small businesses, thereby stimulating economic development in rural areas. Challenges are:

- Lack of consistent incentive offered by government to encourage mini-grid businesses to enter the market;
- Lack of subsidy policies, such as capital subsidies, aimed at short-term performance;
- Limited technical capacity to design, install and maintain mini-grids;
- Lack of data on renewable energy resources for specific regions in the country
- Limited funding available in SL market; and
- Lack of understanding of the culture and capacities of rural and remote regions makes it difficult to estimate electricity demands, establish appropriate payment infrastructure, and select suitable technologies.

These challenges need to be addressed to make the market attractive to international renewable energy businesses. This document aims to address these issues and presents case studies of training and capacity building methods that may benefit the Sierra Leone market, with REASL playing an important role in the acceleration of investments and business development of the renewable energy market.

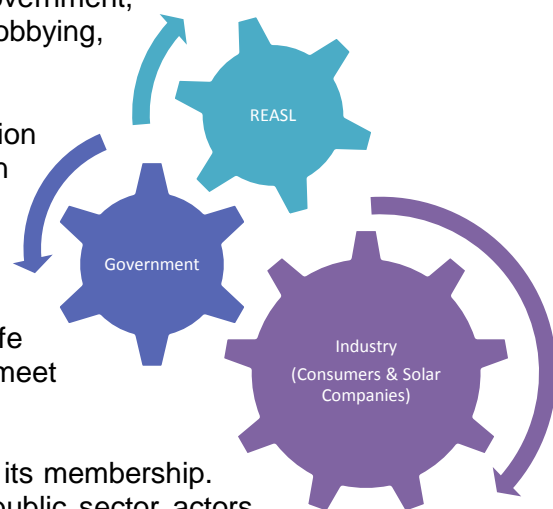
SECTION 3

REASL's Management and Administration Structure

3.1 General Information on REASL

The Renewable Energy Associate of Sierra Leone (REASL) is a newly formed organisation established on May 10, 2016 through the Energy Africa Compact between the UK government and the government of Sierra Leone (GoSL) at The Energy Revolution Event. REASL is a trade association focused on the development of an efficient and thriving renewables market in Sierra Leone. Its mission is to *accelerate the adoption of renewable energy for achieving universal energy and economic empowerment in Sierra Leone*. REASL has set the following goals to achieve this mission:

- Represent the renewable energy industry to government, consumers and other stakeholders through advocacy, lobbying, and marketing.
- Educate consumers, GoSL, financial sector decision makers and other renewable energy stakeholders on the economic, social and environmental benefits and issues around renewable energy adoption into the national energy market.
- Proactively work to hasten the uptake of affordable, safe and reliable renewable energy products that meet international standards in Sierra Leone.



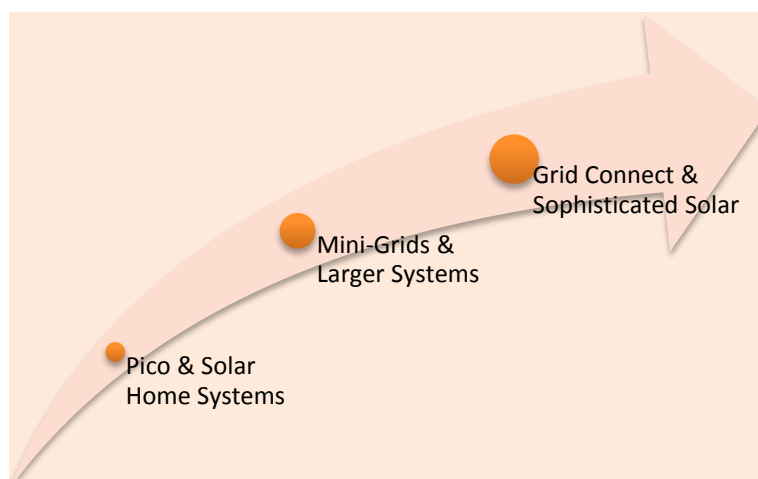
As a newly formed organisation, REASL is seeking to expand its membership. Currently, REASL has 14 members ranging from private to public sector actors (see **Annex 3** for list of REASL members). To be a successful force in the energy sector in Sierra Leone and accomplish the ambitious national goals it has set itself, REASL needs financial and technical support. In addition, REASL must find a strong organisational structure to run its activities and become a reliable industry association.

3.2 REASL Value Proposition

The Sierra Leone industry and market analysis illustrates that there is a huge potential for market growth. Regarding renewable energy, there are specific nodes within the value chain that can be leveraged to grow the market and ensure energy access is achieved. It is therefore important that REASL consider the following value proposition to effectively influence the off-grid market in Sierra Leone:

Figure 1: REASL Value Proposition

- **Building a quality market which supplies high quality products to all segments of society at competitive prices**
 - ✓ Increasing size of the market
 - ✓ Ensuring members have access
- Importance of **strong leadership & management**
- **Government buy-in is key.** Need to frame issues in a way that meets Government priorities. REASL is partner to GoSL programmes.



3.3 Questionnaire Insights

REASL aims to guide its members in the renewable energy market and provide them with sector specific knowledge and business opportunities. It is therefore important to note the opinions of members and potential members as to what REASL's focus areas should be and how they view the Sierra Leone market.

To gain these insights, a questionnaire was sent out to members and prospective members concerning REASL's operations and Sierra Leone's current renewable energy strengths and weaknesses (see **Annex 4** for the questionnaire and **Annex 5** for the list of respondents).

Regarding REASL's operations, **most respondents selected lobbying for policies and regulations as REASL's main role, as well as being instrumental in effecting change.** Sierra Leone lacks a strong and standardised regulatory structure and respondents agreed that strengthening regulations will in turn strengthen activity in the renewable energy sector. To achieve this, REASL must have a strong internal structure. **The respondents unanimously agreed that REASL needs a secretariat with operational staff.** This administration structure will allow for members to gain the most benefits from the organisation such as making connections to industry players, setting up events, shaping the market through policy and regulation, and knowledge sharing. Without a strong secretariat, the goals of REASL will be hard to maintain. Finally, to **increase effectiveness, respondents gave the following advice:**

- have a strong support staff (secretariat);
- work with all stakeholders to build a sector which is quality-focused, efficient, transparent and intolerant of unscrupulous practices;
- assist in the development of finance mechanisms for consumers and traders, especially for SHS and Pico systems targeted to base of the pyramid groups; and
- conduct regular knowledge sharing events / webinars which would establish linkages to stakeholders.

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. It is important to train and educate those in the sector who will then lead the change to

overcome said barriers. **The majority of respondents noted that the most important training needs in the sector are on development of finance schemes. Finance is reported as the main challenge in the renewable energy sector in Sierra Leone.** The next important training need, noted by respondents, is business development and supply chain development.

The pico, SHS, mini-grids and grid-connect markets are seen to address the immediate goal of improving energy access in Sierra Leone due to the current market realities and demands. This view is shared by most respondents who indicated that the **renewable energy sub-sector / technology that REASL should be involved in is: pico, SHS, mini-grids and grid connected renewable energy.** With this focus comes large potential for growth in the market. However, **among public and private sector decision makers there is a lack of awareness of the value proposition of mini-grids.** REASL should first seek to educate the public and private sector on the benefits of mini-grids, especially in the Sierra Leonean market. In this regard, it was noted by the **majority of respondents that the main opportunity in the Sierra Leone market is that it is “untapped”** and presents some incentives for expansion for renewable energy businesses.

While most respondents answered the questionnaire directly, one respondent noted specifically what he required from REASL. This response brings up a very valid and important issue that REASL should seek to resolve: (1) **“Implement some form of inspection system so systems over a certain size are confirmed compliant to a yet undetermined standard. Keeping poor installation work out is critical”.**

In summary, respondents would like REASL to become the epicentre of their renewable energy interactions by evoking policy change, establishing a knowledge sharing base, conducting training to sharpen local market players and overcome barriers, and providing linkages to finance and to key stakeholders. It should however be noted that individual REASL member companies will initiate contact with international renewable energy companies for possible partnerships. REASL is not set-up to make these connections on behalf of companies and it should be a facilitator rather than actor in transactions.

3.4 Governance Instruments in Place

An integrated approach was used in setting up the REASL governance structure. The aim was to position REASL to engage in a highly-coordinated manner to increase the likelihood of having a substantial and sustainable impact in the solar industry.

3.4.1 Constitution

The Constitution sets out how REASL should be governed in principle, and the office bearers who are responsible for carrying out activities. The approved constitution provides the following organisations of the association:

- The General Assembly
- The Board of Directors
- Secretariat

REASL will need to focus on supporting this existing structure. However, based on the strategic plan (discussed in section 3.4.2), it is proposed that additional structure is needed to effectively achieve the set goals. This will include setting up the following structures; a secretariat with its own director, a technical committee, and an action committee. REASL will need to develop specific guidelines for the structure, operation, responsibilities and reporting duties of these additional proposed structures. To achieve this, REASL should focus on appointing relevant individuals to prepare these guidelines and other additional rules,

regulations, by-laws and guidelines before they are finalised and approved by the Executive Committee.

Secretariat

As provided in Article 45 of REASL's constitution, a secretariat should be established immediately. The key roles of the proposed secretariat include:

- Be responsible in assisting the executive secretary in managing the affairs of the Association in conforming to the Constitution and By-Laws;
- Support the Association with a high level of strategic advisory and patronage role, and provide advice in resource mobilisation and fund raising; and
- Assist the Executive Secretary in hiring and remunerating employees as may be required for conducting the business of the Association.

Technical committee

This committee will be primarily involved in providing technical support to the executive committee and the secretariat on matters pertaining to the efficient operation of REASL. To perform this role effectively, it is proposed that the committee should convene monthly meetings. In general, the committee responsibilities will include:

- Advising the executive committee and secretariat on matters related to realizing REASL's mission, vision and objectives;
- Advising on the day to day administrative matters of REASL;
- Devising and implementing strategies on increasing and sustaining membership;
- Supporting networking and information dissemination activities of REASL; and
- The role of sensitizing REASL members and other stakeholders on the importance of enforcement of quality standards for renewable energy technologies and applications, detailed in the Constitution.

It is proposed that the committee be constituted in line with Article 40, 41 and 43 of REASL's constitution. This is to ensure there is consistency and clearly defined roles for the individuals who will constitute the committee.

Action committee

It is also proposed that an action committee is established to assist the executive committee and the secretariat in developing priorities, policies and programs focused on growing the Sierra Leone off-grid market. It is proposed that committee should convene monthly meetings. To achieve the objectives set out in the strategic plan of REASL, the action committee will work closely with the technical committee and other part of the association. The key roles of the committee will include:

- Networking at international and regional levels - establish a forum for collaboration to discuss renewables and identify synergies;
- Networking with the government agencies to influence policies;
- Engage with and encourage the Government to participate in renewable energy development;
- Awareness raising amongst leaders - create a forum for leaders / regulators to talk about renewable energy;
- Supporting project developers;
- Becoming involved in mechanisms for the public to raise concerns to quality standards on renewable energy products;
- Sensitizing REASL members and other stakeholders on the importance of enforcement of quality standards for renewable energy technologies and applications, detailed in the Constitution; and
- Developing promotional material.

It is also proposed that the action committee should be established in line with Article 40, 41 and 43 of REASL constitution.

3.4.2 Strategic plan

There was a consultative meeting held on 7th February 2017 that set out priorities for REASL. These REASL 5-year priorities include:

Government Relations

- ✓ Advocacy
- ✓ Policy
- ✓ Operationalization of policies

Market Growth

- ✓ Investors / funders
- ✓ Training
- ✓ Communication
- ✓ Product Standards & Development

REASL Internal Capacity

- ✓ Secretariat
- ✓ Benefits proposition
- ✓ Self-sustainability

Figure 2: Strategic Goals



3.5 Formation of Secretariat

Setting up of a secretariat will be critical for REASL to achieving its strategic goals. However, the main issue will be on how REASL finance its operations in the short term and even in the long term. This sub-section identifies key activities the REASL secretariat can work on in year 1 to 3 as well the possible sources for funding.

3.5.1 Operations of the Secretariat

A REASL secretariat will be lean, focused and dedicated to the needs of its members. It should not be diverted by non-core projects or initiatives and its work should not compete with the products and service offerings of its membership.

The section below provides a suggested set of activities for a secretariat in its initial 3 year phase. This set of activities is for prepared for guidance purposes only. Actual plans will depend on the priorities of membership and funds available. We note that engaging with different government departments, consumers, NGOs and other key stakeholders will be a core task of REASL.

For this to happen, REASL should take the following actions:

Year 1

- Engage the Ministry of Finance on quarterly basis to streamline and ensure stability of the VAT and import duties on solar products. The proposed secretariat should communicate regularly to REASL members on the changes in the regulatory environment.
- Work with the Ministry of Finance to improve the policy and regulatory framework that will make PAYGO a viable model in the distribution of solar products.
- Engage and support SL Bureau of standards on the development mandatory standards for solar products and equipment. Convene an annual meeting with the Bureau to keep track on the implementation of quality standards procedures and also to improve or increase the list of products that have meet the standards.
- Engage Ministry of Education (through National Council for Technical, Vocational and other Academic Awards), other technical institutions and the Universities to develop a curriculum that is properly aligned to the needs and gaps in the SL market.
- REASL should facilitate training on renewables that focuses on technology, project development and financing.
- Work with the Port Authority of SL to simplify the importation procedures for quality solar products.
- Together with the Ministry of Energy, host, facilitate and attend workshops, seminars & conferences (involve volunteers & members). This will be one avenue the association can raise money to finance its operations.
- Conduct an annual market assessment on the size of the market and the movement of quality and substandard solar products in the market. This can be done by outsourcing consultancy services funded by potential donors and development agencies.
- REASL should conduct a quarterly awareness campaign on renewable energy and availability of quality solar. The campaign should inform:
 - **Consumers** on product availability, quality, place of purchase, pricing, after-sale services and financing mechanism. This will boost credibility and confidence of consumers on the solar product sold and the distributor.
 - **Financial Institutions** on the opportunities available in the renewable energy sector.
- Develop systems and procedures (e.g., accounting packages and forms) in the 1st half of the year to facilitate operations of the proposed secretariat.
- Staff the Proposed Secretariat with capable personnel.
- Introduce/set affordable and meaningful memberships subscriptions.
- Develop membership database that can be accessible to members and other interested parties.
- Conduct training and capacity-building for members and their technical staff.

- Encourage REASL members to develop articles & publish under REASL - could include member success stories.

Year 2

- Liaise with Electricity Distribution and Supply Authority to set up a directory for all the licenced technicians. The database should be available to the public.
- Once the Secretariat is in place, REASL should consider conducting a half yearly market assessment.
- Within the first quarter of Year 2, REASL should establish a fully functional consultancy department that does not compete with the services and products offered by existing members.
- Lobby to have standards for solar PV gazetted if this didn't happen in Year 1
- Continue with monthly email update to inform members of relevant policies, investments, activities etc. that are taking place locally, regionally & internationally
- REASL should facilitate business match making events in Freetown and other areas
- Work with ministry of trade and industrialization to promote local manufacture of renewable energy products and enterprise development.
- By the end of Year 2, REASL should establish an online training portal working together with Ministry of Education.
- Engage Ministry of Finance on quarterly basis to ensure stability of the regulatory environment.

Year 3

- Publish books and guidelines on renewable energy. This activity can be done closely with Ministry of Energy and Education.
- Establish solar demonstration site that can promote renewable energy in general
- Work with Ministry of Finance to revise the fiscal procedures with regard to solar products.

3.5.2 Financing the secretariat

The secretariat can be financed using the following channels

- i. Grant financing
- ii. Service fees
- iii. Membership fees

Grant financing

This is the most viable and practical way through which REASL secretariat can be financed. As seen in other jurisdictions, such as Kenya and Tanzania, renewable energy associations are supported by donor organization and international development agencies that are promoting renewable energy market development in those countries. There is already a number of such groups in Sierra Leone, which REASL can approach to finance their secretariat. Groups like DFID, UNIDO, World Bank/IFC, AfDB, GIZ, DANIDA, JICA, SIDA, SNV are actively supporting establishment of renewable energy market in many African countries, something that REASL can leverage. REASL will need to approach this groups with their strategic plan and present a solid proposal on how they want to run and fund the secretariat. Other relevant grant facilities, such as grant challenges can also be explored.

We note that there is not an established method for REASL to fund its operations. Development partners are mission-focused and often averse to non-core activities. There are, however, some programmes which overlap with the priorities of REASL and its members. These include UNOPS' mini-grid programme, DFID's Energy Africa initiative, USAID's Power Africa and IFC's Lighting Africa. REASL can help these groups' objectives while simultaneously maintaining its own objectives and independence. Funds available within these programmes could support the REASL secretariat.

Service fees

REASL can offer services to various entities in the industry and use the fees raised to fund its secretariat. Some of the possible services include holding workshops and seminars, organising industry expos and exhibitions, conducting market research, training and capacity building, producing media material such a magazine, some forms of consultancy work, among others. However, such services should not in any way be in conflict with what REASL members offer and should not be allowed to preoccupy the activities of the association. It should also be noted that service fee can only cover as much, since REASL is an industry association and not a business.

Membership fees

Membership fees paid by new members who are joining the association plus membership renewal fee paid annually is a critical core source of finance that REASL can use in running the secretariat. In the initial 3 year phase of operations, membership fees are not likely to cover 100% of the secretariat's operation.

3.6 REASL and the Renewable Energy Sector

As earlier stated, REASL should cover all sectors in renewable energy. However, due to solar currently seen as one of the more practical solution in addressing short to medium-term energy access goals, primary focus should be made on solar energy specifically the following four areas: Pico Systems, Solar Home Systems, Professional / Mini Grid, and Grid Connect.

System	Details
Pico System	<ul style="list-style-type: none"> • <20W • Plug and play • Quality issues but few safety issues
Solar Home System	<ul style="list-style-type: none"> • 20W to 1000W • Relatively simple • Few safety issues
Professional / Mini-Grid	<ul style="list-style-type: none"> • 1kW to 200kW • Multiple power sources • Complex • Safety issues
Grid Connect	<ul style="list-style-type: none"> • 1kW to 50MW+ • Connected to the EDSA system • May be complex • Safety Issues

Table 1: Four Categories of PV Systems for Sierra Leone

REASL is well positioned to influence the Sierra Leone off-grid market by ensuring there is a productive relationship between the government, the private sector and the consumers of the solar products. The following outlines REASL's potential to influence the market:

- **REASL should be educators of the market** and actively conduct various renewable energy related training to instructors, installers, retailers, regulators, decision makers, project developers and end users with the support of local institutions. Furthermore, the association should form relationships with international technical institutions to offer courses that meet international standards. REASL should also be actively engaged in awareness campaigns across the country, educating the consumers, planners and other stakeholders on the quality of solar products as well as brand sensitization.
- **REASL should provide information on experiences in other countries.** Kenya, Tanzania and Ethiopia, for instance, have actively developed the off-grid solar market.

This can be attributed to coordinated efforts between the government, the private sector and development partners. REASL should work to collect and disseminate success stories from other markets. Other activities will include:

- ✓ Highlighting the business models used
 - ✓ The quality standards adopted
 - ✓ The distribution and marketing strategies by private sector players
 - ✓ Reporting on country-level product sales performance / market share of solar products
 - ✓ Country-level information on ease of doing business and market potential
- **REASL should provide opportunities in the market.** Sierra Leone is a young market with the right building blocks for growth. REASL has the opportunity of providing information to different solar companies and consumers and this will be through the following mechanism:
 - ✓ Providing access to publications regarding industry trends and market opportunities
 - ✓ Invitation of members to trade fairs, exhibitions, conferences and seminars
 - ✓ Notification of opportunities for grants, investment and loans
 - ✓ Introduction of members to quality verified products to bulk buyers
 - ✓ Business-to-business matchmaking with distributors, and other stakeholders along the supply chain
 - ✓ Providing strategic linkages to members on affordable credit lines
 - ✓ Passing information to consumers on financing options available in the market
 - **REASL should also work with other government departments such as the Ministry of Finance.** Apart from engaging with the departments in the energy sector, REASL has a critical role to play influencing some of the activities of the Ministry of Finance. It is vital for the REASL members to have a united voice with which to call for supportive policy, financing and regulation. It is proposed that REASL can liaise with Ministry of Finance in the following areas,
 - ✓ The GoSL has in place the Finance Act of 2016, which provides a clause on the elimination of GST sales taxes on sale of quality certified solar products. The interpretation of the Act has been left to the ministries which provides risk for ambiguity. REASL should work closely with the Finance departments to interpret the provisions of the Finance Act 2016 and communicate the information timely and with precision to its members. This will be crucial in ensuring the products being imported by the distributors and retailers falls under the criteria presented in the Finance Act 2016. Furthermore, stability is need in the implementation of the provisions of the Act.
 - ✓ No comprehensive policy framework or guidance has yet been established with regard to the PAYGO model—mainly on regulations on the mobile money. REASL should lobby the finance department to come up with regulations that can be beneficial to both the consumer of a solar product and the solar provider
 - ✓ Work closely with the Ministry of Finance to encourage compliance by facilitating the clearance of legitimate imports and exports at Ports
 - ✓ Enhanced credit availability through commercial banks, Micro finance institution and other credible institutions. To encourage growth of the off-grid sector, REASL should lobby for lowly capped interest financing with a longer repayment period.

3.7 Procedures, databases and forms that capture REASL's information requirements

This section sets out a list of information collection work and activities that REASL might do to serve its members. This includes an annual sector monitoring survey for SHS, pico, mini-grids and grid connect (as is done by national RE associations in the US and Europe). This also includes annual consumer surveys as well as databases of suppliers, importers, retailers, training providers and technicians.

3.7.1 Annual Market Survey

The growth of the solar off-grid market in Sierra Leone will, to some extent, depend on the availability of market data. For potential investors, data will be informative on the market gaps, opportunities and any challenges on financing and business models. For the government, market data will be useful in developing policies and off-grid oriented regulations. In general, data will ensure the industry is up-to-date on all renewable energy trends.

It is therefore proposed that REASL conduct an annual market survey covering the whole country. This survey should gather data from households, small scale businesses, solar product retailers, importers, distributors, manufacturers, government representatives from the relevant ministries, donors and other organizations working in the solar technology space. The annual report should contain the following information:

- Noteworthy trends on market growth, technology adoption, industrial trends, employment and financing for renewable energy technologies;
- Policy environment updates, ie: Government support of solar technology, proposed policies, policies under review, and quality standards adopted;
- Solar energy programs available in the country;
- Annual market demand of solar products;
- Annual data on solar equipment sold in the market covering: residential rooftop, industrial rooftop, ground mounted solar, off-grid PV, utility scale system, solar home and Pico systems;
- Financing for renewable technologies with specific interest in solar technology financing. Include data on: financiers, recipients, amount of finance provided, type of financing and target beneficiaries; and
- Supply chain market opportunities with highlights on innovative business models, marketing and distribution strategies, ease of business, access to finance, and business to business match making opportunities.

A skeleton data instrument that REASL can use for this survey is attached in **Annex 8**.

Consumer Market Survey

In addition to the annual market survey, it is proposed that, REASL conduct an annual consumer market survey. The aim of this annual assessment should be to understand:

- Consumer spending on off-grid solar products;
- Perception on quality, price, after-sale services, availability, durability, etc
- Capacity and willingness to pay;
- Level of awareness in regard to place of purchase, brand awareness and financing opportunities;
- Understanding consumer preferences with consideration of those in underserved regions and off-grid areas; and
- Cost benefit analysis of different lighting options.

A comprehensive coverage of the consumer market will inform the economics behind consumer behaviour with regard to pricing, business model receptiveness, quality, technology and financing options.

3.7.2 Organise a National Renewable Energy Week in Sierra Leone

It is proposed that REASL should organize a National Renewable Energy Week. This event should be organised annually and held alternatively across different commercial centres in Sierra Leone. The event will serve the following purposes:

- Increase awareness of end users on potentials of renewable energy technologies;
- Provide platform for renewable energy entrepreneurs to advertise their services and build partnerships;
- Give developers the opportunity to create partnerships with local project owners;
- Technology demonstrations, workshop, and site visits.

To make the event attractive to consumers, developers, and local solar entrepreneurs, REASL should integrate an annual theme that reflects the current market trends and opportunities in the Sierra Leonean market. Entrepreneurs who display their products and services should pay a fee that will go towards facilitating some of REASL activities. Entrance of consumers should be free of charge.

3.7.3 Develop and maintain an information Database

It is proposed that REASL should develop a database that has comprehensive information easily accessible to the public and other interested parties. The database should be updated on a regular basis. The information collected will help support REASL's advocacy efforts and also help to track the performance of its members in the market.

The proposed database should have:

- A list of companies categorised in terms of the solar products they import and distribute, their geographical coverage, and the type of quality verified product(s) sold, and their physical location
- Solar employment statistics
- Supplier of solar products
- Manufacturers
- International renewable energy conference that can appeal to REASL members
- Financiers
- List of licensed technicians
- Training institutions
- Atlas of renewable energy potential

3.7.4 Market Awareness Campaigns

Development of Sierra Leone's off-grid market will largely depend on the level of awareness of solar products by communities from different demographic profiles. Consumer awareness and education in other markets such as Kenya has positively affected demand for quality products. REASL should therefore conduct regular market campaigns to:

- Educate the consumers about availability of quality solar products
- Inform the consumers on financing options being provided by REASL members
- Provide consumers with the knowledge of where and who sells quality products
- Product discrimination and differentiation

These campaigns should be conducted throughout the counties using printed media, broadcasting media, social media, billboards and other available platforms. To reach the off-grid rural population, it is important to implement market campaigns in local languages and respect local cultural practices.

3.7.5 Renewable Energy Conference

This annual conference should be organised mainly to bring together the public and private sectors. It will involve discussions around the policy and regulatory environment. REASL and its members can use this platform to lobby the government to improve the regulatory environment by reducing the taxes, offer incentives and developing the solar specific policies and action plans.

3.7.6 Monitoring and evaluating the sector

A comprehensive monitoring of the sector is needed on regular basis. The set of procedures used for this M&E will assess progress, effectiveness and achievements of REASL-supported initiative designed to increase and improve access to sustainable energy services. It is proposed that a REASL Action Committee should procure services of a consultant to regularly conduct a market surveillance to ensure that its members:

- Adhere to the quality assurance provided by the Sierra Leone Standards Bureau
- Keep data of the demand and supply of solar products
- Have data on stream of revenue

3.7.7 Training

REASL should cooperate with solar demonstration sites which can be used for regular training of technicians. The technical training should be done on regular basis and should be geared to educating and providing local technicians with skills to be able to carry out design, feasibility study, installation, quality control, and operation and maintenance for solar PV systems. To effectively roll out this demonstration site, it is proposed that REASL work with the government and call for backing of international development agencies and donors.

SECTION 4

Renewable Energy Actors

This section presents an annotated list of local and international renewable private sector entities that can work with REASL on energy access initiatives and provide support on solar PV sub-sectors in Sierra Leone. It examines their on-going activities in the West Africa region and proposes potential roles for them in building off-grid lighting markets with support from REASL.

4.1 Analysis of findings and gaps

The Sierra Leone off-grid market has not received due attention due to long periods of political uncertainty and economic shocks brought about by the financial crisis of 2007 as well as the recent Ebola epidemic. Fortunately, improvements have been made in recent years with support from international donors to rehabilitate the economy and in particular the energy sector.

At the same time, synergetic trends are making “sustainable energy for all” a reality across the globe. They include decline in cost of renewable technologies, revolution of mobile phones being used to pay for power, innovative business models, smart mini-grid systems and proliferation of innovative business and financing models. The Sierra Leone market is yet to significantly benefit from the improved energy access that these decentralised solutions offer.

Other factors critical for the Sierra Leone solar market include quality assurance standards, conducive customs and tax laws and a stable regulatory environment. The establishment of REASL is timely for the needs of both consumers and off-grid market actors (solar companies and mini-grid developers). REASL has an important role to play in influencing the policy environment, supporting the private sector and facilitating its growth. For the market to become attractive for international off-grid market actors, their specific interests should be addressed, as outlined below.

For **consumers**, major concerns include:

- Quality of products
- Affordability of products and electricity
- Availability of stock (pico, kits and solar home systems)
- Warranties
- After sale services and spare parts
- Delivery and installation
- Availability of consumer credit
- A wide choice of technologies, products and product features

For **solar companies** and **GMG developers**, major concerns include:

- Taxation and incentives
- Consumer awareness of products and services
- Frequency of product supply
- Availability of technicians to provide operation and maintenance services
- Ability and willingness of the consumer to pay
- Competition

- Ease in setting up companies and doing business

4.2 Renewable energy actors to work with REASL

The following table is a review of key global and African renewable energy actors that would be interested in working in the Sierra Leone market. Furthermore, the listed renewable energy actors can work with REASL to accelerate the country's household solar market and mini-grid developments.

The proposed solar companies have:

- Distributed and sold off-grid solar products approved by Lighting Africa
- Unique PAYG business models that can be tested for the Sierra Leone market for the expansion of current PAYG systems
- In-house financing options that can encourage off-grid communities to buy solar products
- Wealth of experience from other markets across the globe
- Have smarter procurement and distribution programmes to ensure quality products are distributed

On the other hand, the proposed mini-grid developers:

- Have innovative business models suitable for SL market
- Are offering technical training on operation and maintenance
- Some linkage to international financing
- Some are integrators offering a variety of solar products and services suitable for Sierra urban and rural communities

Some of the companies listed in the following table may have an interest in investing in Sierra Leone. Others may be willing to work closely with distributors, licensees or franchises in the country. In cases where companies may not be able or willing to invest in Sierra Leone, the experiences of business models and the lessons learned from introduction of new products may be useful for Sierra Leone participants.

Institution	Contacts	Description	Relevance to REASL	
PAY-AS-YOU-GO SOLAR COMPANIES				
1	Solar Kiosk	<p>Andreas Spiess, CEO</p> <p>E: spiess@solarkiosk.eu</p> <p>http://solarkiosk.eu</p>	<ul style="list-style-type: none"> • Enables and empowers sustainable economic development of those at the base-of-the-pyramid through clean energy services, quality products and sustainable solutions. • Their first project was successfully implemented in 2012. Since then, they have established 6 country subsidiaries across three continents namely Africa, Asia and Latin America. • Their success can be attributed to the establishment of the Solar Kiosk E-HUBB energy centre providing sustainable energy services and solar powered home systems in off-grid communities. E-HUBB is considered a gathering place for the community where people can socialise while charging the back-up batteries and phones while having a beverage. • They have over 200 E-HUBBs in six countries with over 200,000 products sold with over 215 women serving as operatives and agents. 	<ul style="list-style-type: none"> • Solar Kiosk is already operating in Ghana and has proven that there is a sustainable and profitable market in West Africa. The same approach can be introduced in Sierra Leone off-grid market. The technology and business model used by Solar Kiosk is unique and transferable. • REASL has an opportunity to work with Solar Kiosk since the company is expanding rapidly and adoption of its technology across Africa is growing. • Likelihood to enter Sierra Leone Market: Medium

	Institution	Contacts	Description	Relevance to REASL
2	Fenix International	<p>Lyndsay Handler CEO</p> <p>E: lhandler@fenixintl.com</p> <p>Corporate Headquarters 30 Cleveland Street San Francisco, CA 94103, USA</p> <p>Uganda Office Plot 11 Wampeywo Avenue Kampala, Uganda</p>	<ul style="list-style-type: none"> • Produces ultra-affordable solar mobile solutions based on PAYG systems to power off-grid communities. In Africa, the company has taken key interest in the EAC region but is looking to expand to Sub-Saharan Africa. Its flagship solar power system, ReadyPay Power, generates radical access to energy in Uganda. • The company reached over 100,000 clients in January 2017 in Africa and the success is mainly attributed to its business model where customers pay just US\$0.15 per day for the entry level product, with 36 months to complete payment for the entry level US\$160 solar home system. 	<ul style="list-style-type: none"> • Building on a robust financing model, a high-quality product, and utter commitment to exceptional customer experience, Fenix is now poised to take ReadyPay and additional product lines to new African markets in the coming year and West Africa is included in its target market. • REASL has an opportunity to work with Fenix International when it establishes its presence in West Africa with consideration for Sierra Leone off-grid market. • Fenix International is committed to providing sustainable energy solutions to off-grid market in Africa which is well aligned with REASL strategic goals and long-term objectives. • Likelihood to enter Sierra Leone Market: Medium

	Institution	Contacts	Description	Relevance to REASL
3	MKOPA Solar	Jesse Moore, Chief Executive Officer and Co-Founder Tel: +254 707 333 222 E: info@m-kopa.com; jesse.moore@m-kopa.com http://www.m-kopa.com	<ul style="list-style-type: none"> • MKOPA is considered the global leader of PAYG energy services for off-grid customers. It was established in 2011 and by April 2017 over 500,000 households owned an MKOPA solar product while 15,000 owned solar TV systems in Kenya, Tanzania and Uganda. • Innovation in both credit schemes and technology-based instalment payment mechanisms (both falling under the PAYG category) has contributed enormously to the success of the MKOPA business model • The total disclosed funding for the company as of 2016 was more than \$65.45m raised through equity, debt and grant financing • MKOPA has over 500 staff employed directly and also over 2,500 retail agents across the EAC region • MKOPA is beginning to license its technology to experienced and reputable third parties outside the East Africa Region 	<ul style="list-style-type: none"> • MKOPA has an established market in the EA region and is strategically looking to expand to other markets in Africa. The company is fully focused on distributing its technology to other off-grid markets in Africa. • REASL should consider working with MKOPA considering: <ol style="list-style-type: none"> i. The company is focused on off-grid communities who have interest on affordable, modern and reliable source of lighting and mobile charging. ii. It is a source of productive jobs both directly and indirectly iii. Has strong support for renewable energy technological transfer iv. The company is attracting investors, as well as support from development agencies and foundations who are keen to see similar results replicated in other regions across Africa. • Likelihood to enter Sierra Leone Market: Low (licensing is more likely)

	Institution	Contacts	Description	Relevance to REASL
4	Off-grid Electric	<p>F Xavier Helgesen CEO</p> <p>E: info@offgrid-electric.com</p> <p>www.offgrid-electric.com</p>	<ul style="list-style-type: none"> OGE is currently providing solar home systems to off-grid households and businesses in EAC region through innovative financing solutions. With its PAYG business models, the company is offering basic electricity services for as little as US\$0.19 per day. Under the PAYG model OGE has specialised on the Energy as a Service model. Over 100, 000 households are currently using OGE solar home systems and providing employment to over 1,000 people (youth and women included) In 2016, the company raised more than US\$70 million in form of debt and equity financing, part of which was directed to an expansion plan in West Africa. 	<ul style="list-style-type: none"> The success of the PAYG model (Energy as a Service) used by Off-grid Electric in Tanzania and Kenya can be replicated in Sierra Leone. OGE has a plan underway to initiate a project in Ivory Coast. REASL can leverage from the presence of Off-grid Electric in West Africa to promote sustainable solutions for energy access in the country. Furthermore, REASL has the opportunity work with Off-grid Electric in supporting technological transfer and innovation around the PAYG model of energy access. Likelihood to enter Sierra Leone Market: Medium
5	Mobisol	<p>Thomas Duveau Head of Business Development</p> <p>Tel : +49 30 2935 1931</p> <p>E: thomas.duveau@plugintheworld.com</p> <p>www.plugintheworld.com</p>	<ul style="list-style-type: none"> Berlin-based Pay-As-You-Go solar company operating in Kenya, Tanzania and Rwanda providing quality SHS. The company sells systems varying in size from 80 to 200 Wp to match the various energy needs of differing households The company has sold over 100,000 SHS across three countries. In late 2016, Mobisol got US\$15.4 million to support Kenya expansion. The main financiers of were IFC and Dutch Development Bank. The company is expanding in the African region. 	<ul style="list-style-type: none"> The activities implemented by Mobisol fit the objectives of REASL. The company has a record of success on off-grid projects where it is operational especially in energy access. Mobisol can help REASL develop a more robust business model around PAYG model in Sierra Leone. Likelihood to enter Sierra Leone Market: Low

	Institution	Contacts	Description	Relevance to REASL
6	Nova Lumos	<p>Ron Margalit Director of Engagement E:ron.margalit@nova-lumos.com</p>	<ul style="list-style-type: none"> Lumos is an off-grid solar company selling solar products in West Africa through PAYG. The company power model is unique in that the customer makes a one-time payment to acquire a solar panel, an indoor power unit and LED lights. However, for the customer to be able to access the electricity from the indoor power unit has to make a payment via the mobile airtime. In 2016, the company raised over US\$90 million mix of private equity and development banks to finance the expansion plans for the company in other West Africa countries 	<ul style="list-style-type: none"> Their unique PAYG model could be suitable for Sierra Leone. Additionally, the company is expanding its operations in West Africa REASL members can work with Lumos to sell lighting products to off-grid communities and create jobs through agents and on-ground operatives Likelihood to enter Sierra Leone Market: Medium
7	BrighterLite	<p>E: info@brighterlite.com</p>	<ul style="list-style-type: none"> Norwegian Company operating in Africa and Asia. The company is similar to other PAYG companies in Africa where the customer pays a small upfront cost and weekly instalments to access electricity. The Brighterlite product has three attributes: <ol style="list-style-type: none"> Equipped with leading battery technology for efficient charging and durability Cost-efficient technology for managing system and securing customer payment Pay-as-you-go concept undercutting costs of current alternative solar home systems Implementing off-grid projects in Kenya, Pakistan and Myanmar 	<ul style="list-style-type: none"> The company is already in three markets offering Lighting Africa verified quality products through the PAYG business model. The goals of the company are well aligned to the overall objectives of REASL—to increase energy access by selling solar products to off-grid communities at an affordable cost Likelihood to enter Sierra Leone Market: Low

	Institution	Contacts	Description	Relevance to REASL
8	Village Power	Thomas Huth, Co-Founder CEO Tel: (+256) 414 252 616 Tel: (+256) 777 455 266 Tel: (+256) 706 200 300 E: info@village-power.ch E: info@village-power.ug Village Power House Plot 31, Golf Course Road Off Wampewo Avenue, Kololo, Kampala	<ul style="list-style-type: none"> • A PAYG company offering off-grid power solutions to households in Uganda, Kenya, Zambia, Tanzania and Mozambique. The company Mobile Money payment plan allows our customers to pay off their system in instalments over the period of one year, often with less than they would have spent on traditional lighting sources such as kerosene. It has been a success especially in Kenya and Tanzania • Partners with local banks and microfinance institutions to offer their customers the option of a commercial loan to finance their system. 	<ul style="list-style-type: none"> • Actively looking for other off-grids market to power using its products. • It also has unique customer financing to allow them solar system purchase. • There is an opportunity for REASL to introduce this company to Sierra Leone in the long term because: <ol style="list-style-type: none"> i. Links consumers to options of financing ii. Champion of reducing energy poverty iii. Allows consumers to pay for solar products in instalments • Likelihood to enter Sierra Leone Market: Low
9	Jua Energy	Tel: +254 703 842245 E: info@juaenergy.com	<ul style="list-style-type: none"> • Jua Energy is a PAYG company present in South Africa, Kenya, Uganda, Ethiopia and Nigeria • Manufactures a wide range of power banks, solar lights, headphones, Bluetooth speakers and solar home systems for both rural and urban markets with affordable price and high quality • Generally, company focuses on: <ol style="list-style-type: none"> i. Solar residential solutions offered through solar home systems, Pico and solar water heaters ii. Solar commercial solution through mini-grid, solar pumping, street lighting, iii. Consumer electronic accessory iv. Technology transformation and transfer 	<ul style="list-style-type: none"> • The success of the company in EAC region has led to expansion to West Africa. • REASL has an opportunity to work with Jua Energy to provide products suited for SL off-grid market. • Likelihood to enter Sierra Leone Market: Medium

Institution		Contacts	Description	Relevance to REASL
10	SolarNow	E: info@solarnow.eu	<ul style="list-style-type: none"> SolarNow is a for profit social business with Dutch origins, focused on provision of high-quality solar home systems, electrical appliances and power solutions that are designed to fit the needs of both rural and urban households, entrepreneurs and institutions It uses PAYG model to sell and distribute its solar products It currently has 36 branches across Uganda with aspirations to grow in East Africa and west Africa 	<ul style="list-style-type: none"> The PAYG model, while existent, has a lot of room for growth. REASL can work with SolarNow to enhance the model in the market Expansion is underway and the company is targeting new markets Likelihood to enter Sierra Leone Market: Low
11	Omnivoltac Energy Solutions	Dr. Huashan Wang Founder & CEO https://omnivoltaic.com/	<ul style="list-style-type: none"> Omnivoltac is a specialist product provider for off-grid products used by customers worldwide, especially for those who live in under or un-electrified regions. It uses Omni-Pay as their PAYG model for their low-income population solutions 	<ul style="list-style-type: none"> As stated, the PAYG model needs more participants to make the market more active. REASL can work with Omnivoltac and their PAYG model “Omni-Pay” to provide more solutions for the population. They are present in EAC and West Africa and are looking to expand Likelihood to enter Sierra Leone Market: High
12	Fosera	Robert Haendel, Founder & CEO http://www.fosera.com/	<ul style="list-style-type: none"> Fosera sells high quality pico-solar-home-systems for light generation, phone charging, powering of radios and TVs. Special features of the products consist of Li-Battery technology, ultra-efficient LEDs and the modular system design, which allows the system to grown with the demand of the user. They have partnered with Lumeter Networks for a PAYG system. 	<ul style="list-style-type: none"> They are present in Eastern Africa – Kenya, Ethiopia and Mozambique. Likelihood to enter Sierra Leone Market: Medium

Table 2: Pay-As-You-Go Solar Companies

Institution	Contacts	Description	Relevance to REASL
SOLAR PRODUCT COMPANIES			
1	Solar Sisters Caroline Mailloux, Director of Engagement Tel: 401-835-7073 E: caroline.mailloux@solarsister.org Skype: CJMailloux www.solarsister.org	<ul style="list-style-type: none"> Solar Sisters has a unique business model of eradicating poverty by empowering women with economic opportunities through provision of clean energy technology with women providing direct sales services to the households and businesses in rural communities. It distributes improved cookstoves and solar products. The company is operational in Uganda, Nigeria and Tanzania with over 2,500 Solar Sisters entrepreneurs and has served more than 180,000 households. 	<ul style="list-style-type: none"> The Mission of Solar Sisters is a world where women are the key driver for green revolution and every household has access to clean and affordable energy. REASL can partner with Solar Sisters to push for a 'last mile' program for solar products with consideration for women involvement. Furthermore, REASL can leverage from Solar Sisters' unique model to provide direct and indirect employment to women at the local level. Likelihood to enter Sierra Leone Market: High
2	WakaWaka Jehmu Greene Tel: 202-904-1089 E: media@waka-waka.com https://waka-waka.com/	<ul style="list-style-type: none"> WakaWaka is a social enterprise that manufactures and sells portable solar products. They opened an office in Kigali, Rwanda in 2014 and launched the Virtual Grid, the world's first telecom-based pico solar pay-as-you-go system. In 2016 WakaWaka started selling through retail, in the UK, France, Germany, Switzerland and Scandinavia and expanding to other markets across the globe. WakaWaka has a unique business model called "share the Sun". When customers buy a WakaWaka they also give a solar light to a family living without access. 	<ul style="list-style-type: none"> WakaWaka has a unique business model that distributes portable solar products that are water proof. The company is expanding rapidly and the next market target is West Africa. WakaWaka can work with REASL to effectively sell the waterproof products to off-grid consumers in Sierra Leone. In the short-term the likelihood of entering SL market is low but in the long-term there is a possibility Likelihood to enter Sierra Leone Market: Medium

Institution		Contacts	Description	Relevance to REASL
3	Oolu Energy	<p>Nilmi Senaratna Co-founder</p> <p>Daniel Rosa Co-Founder E: info@oolusolar.com</p>	<ul style="list-style-type: none"> Oolu Energy is an off-grid company operating in West Africa. It has in a Pay-As-You-Go model and the company is using it for last mile distribution of solar products in a number of countries in West Africa. 	<ul style="list-style-type: none"> The company is present in West Africa and can work with REASL to reach communities where national grid is non-existent. Likelihood to enter Sierra Leone Market: Medium
4	PEGAfrica	<p>Hugh Whalan Co-Founder and CEO E: info@PEGafrica.com</p>	<ul style="list-style-type: none"> PEGAfrica provides solar home systems on credit to households in West Africa. PEG headquarter is in Accra Ghana employing over 250 local staff. The company also expanded to Côte d'Ivoire and is targeting more countries in the region. 	<ul style="list-style-type: none"> The company is already present in West Africa. REASL should leverage on this with a long-term strategy of influencing SL off-grid market by distributing solar products and other services. There is a good chance the company will be venturing into the SL market Likelihood to enter Sierra Leone Market: Medium
5	Little Sun	<p>Eva Brandt Project Manager - Humanitarian Projects E: eva@littlesun.com</p>	<ul style="list-style-type: none"> Little Sun is a social enterprise that produces solar powered LED lamps. It is a project of artist Olafur Eliasson and engineer Frederik Ottesenand with a mission to bring sustainable energy to all. Little Sun light is changing the fabric of off-grid communities in more than 10 African countries, including Zimbabwe, Ethiopia, Kenya, Senegal, and Ghana – with many more to come. So far (as of December 30 2016), they had distributed a total of 508,148 Little Suns worldwide 	<ul style="list-style-type: none"> REASL can work with Little Sun to provide services and products to SL off-grid consumers. The company is present in several countries in West Africa, and is currently expanding. Likelihood to enter Sierra Leone Market: Medium

Institution		Contacts	Description	Relevance to REASL
6	SunnyMoney	<p>Pippa Palmer MD, SolarAid</p> <p>E: pippa.palmer@solar-aid.org</p>	<ul style="list-style-type: none"> SunnyMoney is a UK-based social enterprise that distributes and sells portable solar products to off-grid communities in Africa. SolarAid owns and raises philanthropic funding for SunnyMoney's expansion The organisation selling products currently in Kenya, Uganda, Tanzania, Malawi and Zambia 	<ul style="list-style-type: none"> SunnyMoney's target is to distribute its solar products across Africa with an aim of reducing energy poverty. REASL's objectives and long-term goals are well aligned to SunnyMoney's mission. A partnership can be forged with an aim of distributing more solar products to households across Sierra Leone. Likelihood to enter Sierra Leone Market: Low
7	Prosoenergy	<p>Güngör Kara CEO</p> <p>E: g.kara@prosoenergy.com</p>	<ul style="list-style-type: none"> Prosoenergy is an international distributor of solar products targeting the Bottom of the Pyramid (BoP) with quality products and services at affordable prices in Africa and Asia The company is being supported by Lighting Africa and Energy4Impact in a last mile distribution program across Africa 	<ul style="list-style-type: none"> Prosoenergy is currently pursuing opportunities in other markets for its products. REASL has an opportunity to introduce them into SL market. Likelihood to enter Sierra Leone Market: Medium
8	Nokero Solar	<p>Jennifer Butte-Dahl Head of Alliances</p> <p>Tel: (+1) 202 415 5019</p> <p>E: Jen@Nokero.com</p>	<ul style="list-style-type: none"> Nokero is company based in Denver but has initiatives and programs in Africa and Asia. So far the company has distributed its products to close to 120 countries with the aim of reducing kerosene usage by off-grid communities Since 2009, Nokero has distributed more than 5million LED bulbs with an annual growth of 100% 	<ul style="list-style-type: none"> Nokero solar products are being used in a number of countries in West Africa and the company has the capacity to enter Sierra Leone market Likelihood to enter Sierra Leone Market: High

Table 3: Solar Product Companies

Institution	Contacts	Description	Relevance to REASL
MINI-GRID BUSINESSES			
1	Asantys Systems Nicolas Rohrer Managing Director E: nicolas.rohrer@asantys.com	<ul style="list-style-type: none"> Germany based system integrator offering services in solar technology installation and maintenance. The portfolio of the company consists of micro-grids, solar diesel hybrid systems, solar telecom supply systems, solar water pumping systems, solar streetlight systems, solar home and pico systems as well as grid connected power plants Asantys Systems works through agents in Africa and has developed a number of mini-grid projects in Cameroon, Mali, Senegal, Madagascar. 	<ul style="list-style-type: none"> Asantys Systems is expanding in West Africa and REASL has an opportunity of forging a strong partnership with Asantys Systems to advance the RE technology narrative in the country in line with the objectives of REASL. Likelihood to enter Sierra Leone Market: High
2	PowerHive Christopher Horner Founder & CEO E: chris@powerhive.com	<ul style="list-style-type: none"> Technology venture company that partners with utilities and independent power producers to provide clean, modern and affordable micro-grid electricity to off-grid communities in rural areas. The innovative idea behind PowerHive's success is combining solar, energy storage and mobile connectivity The company has successfully implemented micro-grid projects in Ethiopia, Ghana, Kenya, Liberia, Nigeria and Tanzania – with plans to expand to other countries in Africa. 	<ul style="list-style-type: none"> Their access solution is suitable for Sierra Leone off-grid market They are active in West Africa with plans to expand further PowerHive's experience gained in East and West African markets could be contextualised to improve presence of the mini-grid space in Sierra Leone Likelihood to enter Sierra Leone Market: Medium

	Institution	Contacts	Description	Relevance to REASL
3	Trama TechnoAmbiental (TTA)	Alberto Rodriguez Lead Africa Projects Tel (+254) 701 863 042 E: alberto.romez@gmail.com	<ul style="list-style-type: none"> • Global consulting and engineering company with commitment to delivering sustainable energy solutions to off-grid communities. The company has been one of the pioneers of renewable energy-based micro-grids in East Africa region • TTA has designed, supplied and installed a number of mini-grids in West Africa (Ghana, Morocco and Cape Verde) and are pushing to expand to other off-grid markets in Africa 	<ul style="list-style-type: none"> • Expansion of TTA in West Africa presents an opportunity for partnership with REASL with an objective of providing power to the under electrified communities. • TTA offers technical training and capacity building for technicians. REASL members could learn from TTA on best practices in the mini-grid sector. • Likelihood to enter Sierra Leone Market: Medium
4	E.ON Off Grid Solutions	Daniel Becker Managing Director E: info@eon-offgrid.com	<ul style="list-style-type: none"> • E.ON Off Grid Solutions operates under the name Rafiki Power (meaning friendly power in Swahili). • Rafiki Power is a mini-grid company specializing in electricity from clean and reliable sources of electricity. Customer segments are villages and businesses without access to the main electricity grid. Technology focuses are Solar Hybrid Systems (currently PV / Battery / Diesel). EOGS developed a containerised hybrid system including a 7.5kWp Solar PV array (~30kWh/day) and a 50kWh battery storage system. • The company has 8 mini-grid projects in Tanzania operating in rural areas serving more than 500 households. 	<ul style="list-style-type: none"> • Hybrid technology could be utilised in Sierra Leone market to reach more rural areas. • Likelihood to enter Sierra Leone Market: Low

	Institution	Contacts	Description	Relevance to REASL
5	GERES	Tel: (+33) 442 185 588 E: contact@geres.eu	<ul style="list-style-type: none"> • Development NGO specializing in sustainable energy and environment protection. They develop technologies and services to build sustainable economic value chains, bringing in the human, social and cultural dimensions of its areas of operation. • Projects in West Africa; Benin, Mali, Senegal and Niger. 	<ul style="list-style-type: none"> • GERES can help in the following areas: support with clean energy production, supporting local initiatives for economic development, work with government agencies to support clean energy. • Likelihood to enter Sierra Leone Market: High
6	Nayo Tropical Technology (NTT)	Tel: (+234) 8033 135 657 E: nayotroptech@yahoo.com	<ul style="list-style-type: none"> • High tech company specializing in R&D, manufacturing and marketing of power solutions products and systems. • Operates in Nigeria with contacts in the US, Asia and Europe. 	<ul style="list-style-type: none"> • With West African market understanding and international contacts, NTT could be a valuable partner for Sierra Leone's renewable energy growth. They do installation services as well as consultancy services on carbon reduction. • Likelihood to enter Sierra Leone Market: Low (consultancy services Medium)
7	INENSUS	<p>Nico Peterschmidt Managing Director</p> <p>Tel: (+49) 532 138 271-0 E: np@inensus.com</p> <p>Jakob Schmidt-Reindahl Rural Electrification Project Implementation</p> <p>Tel: (+49) 532 138 271-71 E: js@inensus.com</p>	<ul style="list-style-type: none"> • German consultancy firm for private sector driven mini-grid electrification and leading engineering company for hybrid-power systems with medium to high renewable penetration in developing countries. • They have been working on mini-grid & hybrid power system related projects in Senegal, Tanzania, Nigeria, Mozambique, Madagascar, Cameroon, Mali, Kenya, Uganda, South Sudan, Somalia, Namibia, Benin, Ghana and Tunisia. 	<ul style="list-style-type: none"> • With ample experience in West Africa and a focus on mini-grids this could be a good connection to expand the Sierra Leone renewable energy market to international businesses. • Likelihood to enter Sierra Leone Market: High

	Institution	Contacts	Description	Relevance to REASL
8	Power Gen Renewable Energy	Sam Slaughter Owner & CEO Tel: (+253) 713 051 239 E: sslaughter@powergen-re.com	<ul style="list-style-type: none"> • PowerGen is an EPC in East Africa; Somalia, Kenya, Uganda, Rwanda, Tanzania, Zambia, and Mozambique. • Experts in integrating solar, wind, battery storage and diesel generators along with smart metering and control systems to create sustainable, cost-effective energy solutions for all scenarios. 	<ul style="list-style-type: none"> • Their insights on creating a successful smart metering and control system to ensure sustainability and cost efficiency could be adapted to Sierra Leone market. • Likelihood to enter Sierra Leone Market: Medium
9	RVE.SOL	Vivian Vendeirinho Founder & Chairman of the Board Tel: (+254) 701 019 437 E: vivian@rvesol.com	<ul style="list-style-type: none"> • Social Entrepreneurship for profit – as a GMG developer they deploy and operate rural energy solutions. Over the past 5 years they have developed a unique customizable GMG-based energy access solution to rural development, integrating affordable water and energy access, mobile prepayment and metering and empowering entrepreneurial businesses for the eradication of rural poverty in Africa. • They have projects in: Portugal, Kenya, Tanzania and Mozambique. 	<ul style="list-style-type: none"> • With the integration of a prepayment system to empower entrepreneurial sectors – This business model could encourage Sierra Leone business owners to join the renewable energy market. • Likelihood to enter Sierra Leone Market: Low
10	SteamaCo	George Potts Director E: george@steama.co	<ul style="list-style-type: none"> • SteamaCo enables convenient buying and selling of off-grid utilities. Their universal smart meter connects any utility asset to the cloud wirelessly. They compile the data, process payments and physically switch utilities on or off within seconds. • Projects in: Kenya, Tanzania, Benin, Nepal 	<ul style="list-style-type: none"> • The wireless cloud technology to process payments and switch utilities on/off could be very useful in remote areas and when there are multiple projects around a vast area. • Likelihood to enter Sierra Leone Market: Medium

Institution		Contacts	Description	Relevance to REASL
11	Virunga Power	Brian Kelly Founder and MD E: info@virungapower.com	<ul style="list-style-type: none"> Virunga Power is a developer, investor and operator of renewable power projects and rural distribution grids. They have projects in Kenya and Tanzania. 	<ul style="list-style-type: none"> Virunga Power are actively pursuing opportunities for rural utility projects in new markets. REASL could introduce them to the Sierra Leone market thereby opening the door to West Africa. Likelihood to enter Sierra Leone Market: Medium

Table 4: Mini-Grid Companies

The table below provides a list of companies that already have Sierra Leone-based agents or franchises. This is a limited section of the growing market for off-grid products in the country.

Institution		Contact	Description	Relevance to REASL
PRIVATE COMPANIES ALREADY OPERATING IN SIERRA LEONE MARKET				
1	Azuri technology Azuri is active in Sierra Leone off-grid market, working with Sierra Leone Teleficient Communication.	Emily Ord Marketing Manager E: emily.ord@azuri-technologies.com	<ul style="list-style-type: none"> Azuri is a commercial provider of PAYG solar systems to rural off-grid communities. The company has used mobile technology to turn a development challenge into a business challenge through its Azuri solar home systems, which allow users to pay for solar power on a pay-as-you-go basis. Like other PAYG companies, Azuri leverages from a community based distribution model to sell its products to off-grid communities. The company is also selling solar TV systems in key markets such as Kenya and Tanzania. 	

	Institution	Contact	Description	Relevance to REASL
2	BBOXX	<p>Mansoor Hamayun Chief Executive Officer</p> <p>E: m.hamayun@bbox.co.uk</p> <p>Natasha Cooper Assistant to CEO</p> <p>E: n.cooper@bbox.co.uk</p>	<ul style="list-style-type: none"> • BBOXX is leading The Solar Revolution by offering an on-grid experience in an off-grid world, powered through a unique financing model to sell solar home systems to the mass market on a monthly payment plan. Since inception in 2010, it has sold over 70,000 units across 35 countries, providing power to over 350,000 people. • The company is currently working with a number of partners in Sierra Leone. 	
3	Barefoot Power	<p>Rick Hooper CEO</p> <p>E: rckh@barefootpower.com</p>	<ul style="list-style-type: none"> • Barefoot Power is an off-grid energy company, leading in solar home system and accessory design & distribution. Specialised in large scale electrification projects based on pico PV, providing end-to-end solutions including financing, installation, and maintenance and lifecycle management. • The company is operating in Sierra Leone and has an assembly plant in new Barefoot College in Konta Line village, Port Loko district. 	
4	Western Africa Off-grid	<p>Sam Zoker Managing Director</p> <p>Tel: (+232) 79 519617 E: sam.zoker@wao-grid.com</p> <p>7A Cantonment Road, Off King Harman Road, Freetown, Sierra Leone</p>	<ul style="list-style-type: none"> • Western Africa Off-grid is based in Freetown and provides solar home system and solar hybrid solutions for residential, commercial and rural customers. It has recently partnered with Nations EnerGen a US based solar company to form a joint venture, EnerGen WAO which specializes in pico-solar home systems. 	

Institution		Contact	Description	Relevance to REASL
5	Solar Era	<p>Sophie Johnson Director of Solar Era</p> <p>Tel: (+232) 99 301 000 E: sophie@solarera.eu</p> <p>Sierra Leone Office Unit 5, 7 Lumley Beach Highway Aberdeen Freetown, Sierra Leone</p>	<ul style="list-style-type: none"> Solar Era sells and distributes high quality pico-solar-home-systems for lighting, phone charging, powering of radios and TVs. The company distributes Fosera products across Sierra Leone. 	
7	Ignite Power	<p>Peter Mathey Support@ignite.solar</p> <p>8B Lightfoot Boston Road Off Wilkinson Road Freetown Phone: 0785-8908</p>	<ul style="list-style-type: none"> Ignite Power is a developer of clean energy solutions for households in off-grid areas. Ignite solutions are targeted to be as affordable as possible and environmentally friendly, providing nation-scale interventions in a sustainable way in line with the global goals on rural electrification. 	
8	Easy Solar	<p>Alexandre Touew</p> <p>Email; alex@easysolar.sl</p>	<ul style="list-style-type: none"> Distributor of Azuri and Greenlight Planet's SunKing solar pico products Easy Solar was one of the first companies to introduce PAYG in partnership in with Teleficient. They have been operating PAYG for more than one year now. 	
9	Teleficient		<ul style="list-style-type: none"> They have been distributing Azuri pico products through a PAYG partnership with Easy Solar 	
10	Energy Efficient Solutions, EES	<p>Jonathan Jonah</p> <p>CEO at Energy Efficient Solutions Sierra Leone Ltd</p>	<ul style="list-style-type: none"> They are the distributors of distributor of d.light solar lighting products 	

Table 5: Private Companies Already Operating in Sierra Leone

SECTION 5

Support Organisations and Institutions

REASL is focused on developing an efficient and thriving renewables market in Sierra Leone. To do this, it seeks support from a variety of groups active in renewable energy, climate change, sustainable development, rural developments and other relevant areas of development.

This section presents a list of institutions and organisations that REASL members can collaborate with or seek assistance from to grow the Sierra Leone renewable energy market. These groups can provide assistance to REASL in various ways including financial support, technical support, partnership in carrying out its key activities, training and capacity building and transfer of best practices.

Sierra Leone receives support from a number of international organisations to develop its energy access programmes, as identified in the list below. The government of the United Kingdom, through DFID, is one of the most pro-active agencies supporting the country's energy sector through the Energy Africa Campaign. There is also a high amount of donor funding coming in as part of the post-Ebola recovery assistance — some of it being directed into energy access programmes.

The list provided in this section identifies various groups and organisations that can work with REASL and its members to help the association meet its objectives and goals. The list also identifies institutions that can promote private players to enter the Sierra Leone market. This section is divided into:

- **Energy programs**

These are programs being run regionally or internationally for the development of sustainable energy and energy access. They can work with REASL in promoting renewable energy through awareness creation, training, marketing and capacity building; support it in industry representation and lobbying work, help in the development of quality standards and in some cases, offer financial assistance to REASL and its members.

The Energy Africa Initiative is one of the key programmes actively supporting the growth of the country's nascent off-grid solar market. The programme involves a number of initiatives, including the development of an Energy Compact for Sierra Leone and establishment of an Energy Revolution Task Force. Another instrumental initiative is the launch of the Power for All programme in May 2016, which played a key role in the formation of REASL and continues to support its work.

- **Multilateral Development Banks and Development Agencies**

Multilateral development agencies include the World Bank, AfDB and UNDP. Some of the programmes of these agencies are regional and do not cover Sierra Leone alone but have been identified as opportunities that REASL and its members can leverage to access technical and financial support. Areas of intervention can be in technical and financial assistance for REASL and its members, alongside supporting REASL activities such as stakeholder's education, training and capacity building and standards control development.

- **Private sector groups**

These are private sector trade associations and groups that are working towards creating an enabling market and policy environment for the industry either locally, regionally or internationally. Groups like GOGLA are well positioned to work with REASL towards its first goal of representing the renewable energy industry to government, consumers and other stakeholders through advocacy, lobbying and marketing. Some of them can also offer assistance capacity building and raising finances. REASL can as well learn from their international experiences.

- **Non-governmental organisation and foundations**

These are groups that are active in the renewable energy and energy access sector either in Sierra Leone or the region and have activities that align with the goals and objectives of REASL. A group like Energy for Opportunity (EFO) is implementing a number of solar projects and providing solar technical training to people in the rural areas alongside creating awareness for solar products. The same goes with Practical Action, which is active in sustainable energy access across the region. Such groups have experience in working with the communities and accessing finance, which can be of help to REASL. Partnerships can be in areas of training and capacity building, lobbying, market expansion, awareness creation and so on.

- **Specialised project funding windows and financial groups**

These are fund facilities and other financial institutions and programmes that REASL and its members can use to access financing. Some of the identified institutions are specific to the Sierra Leone market (e.g. the Sierra Leone Association of Micro Finance Institutions which is already offering financial products to the solar companies) or have programmes that include Sierra Leone as a priority country (e.g. Renewable Energy and Adaptation to Climate Change Technologies Fund and Africa Clean Energy Business). The list also includes grants, challenge funds, foundations, regional facilities and impact investment groups that renewable energy companies in Sierra Leone can leverage for the financing of their projects. (Note that some of the identified programmes and organisation in other sections of the list also contain a financial component)

- **Training institutions**

One of the objectives of REASL is to develop renewable energy training needs and curricula in partnership with recognised technical training institutions. To develop the young renewable energy industry in Sierra Leone, training and capacity building is a key requirement. The list contains some of the regional and international training institutions that REASL and other entities in the renewable energy industry can use or partner with in training.

- **Groups already working with REASL**

The list also includes groups that are already working with REASL or have some form of partnership. These have been identified as important to maintain and build on the relationship. They include the Power for All programme, the Energy Revolutionary Task Force and groups like Oxfam IBIS.

The following tables contain the identified support groups and organisation per section.

Institution	Contacts	Description	Relevance to REASL
MULTILATERAL DEVELOPMENT BANKS/DEVELOPMENT AGENCIES			
1	World Bank (WB) Zhihong Zhang Senior Program Coordinator, Climate Investment Funds CTF/SREP representative E: zzhang2@worldbank.org	<ul style="list-style-type: none"> • The World Bank finances different energy infrastructure and energy access projects across Africa. In Sierra Leone, they have financed projects such as: <ol style="list-style-type: none"> i. Sierra Leone Energy Sector Utility Reform Project, and ii. Sierra Leone: Western Area Power Generation Project • World Bank projects in Sierra Leone are mostly with the government and focused on supporting utility scale and infrastructure projects. 	<ul style="list-style-type: none"> • Active in supporting renewable energy and energy access projects across Africa. They are implementing SREP programme in a number of countries in Africa. Its investment wing, International Finance Corporation (IFC) offers financing to private companies in different sectors. WB is also involved in many renewable energy sector studies for policy and market development. • Developing a young renewable energy market like Sierra Leone will require support from groups like WB. REASL should work closely with the government to attract such support.

	Institution	Contacts	Description	Relevance to REASL
2	African Development Bank (AfDB)	<p>Mrs. Komal HASSAMAL African Development Bank Energy, Environment and Climate Change Department</p> <p>SREP representative</p> <p>Tel : (+225) 20 26 36 76</p> <p>E: k.hassamal@afdb.org</p>	<ul style="list-style-type: none"> • Sierra Leone is a beneficiary of a \$300,000 grant from the Climate Investment Funds (CIF), implemented through AfDB with support from the World Bank. The grant (received in 2016) is for developing an Investment Prospectus (IP) under the Scaling Up Renewable Energy in Low Income Countries (SREP) Program. • Through the IP, the country will create a series of projects to help reduce barriers for renewable energy development and market transformation. Potential areas of SREP intervention are renewable energy technologies in on-grid and off-grid areas such as solar photovoltaic, hybrid generation systems, mini-hydro, and wind resource mappings, and dissemination of sustainable energy systems with a strong focus on increasing access to energy with private and public sector participation. The IP will also be supporting local investment in renewable energy technologies by engaging local commercial banks to facilitate financing for renewables at more competitive terms for local small and medium enterprises and individual households. • AfDB is running a number of Renewable Energy support programmes, some of them being part of the SE4All initiatives: <ul style="list-style-type: none"> i. AfDB Sustainable Energy Fund for Africa (SEFA) ii. AfDB African Renewable Energy Fund (AREF) iii. Fund for African Private Sector Assistance (FAPA) 	<ul style="list-style-type: none"> • In line with its goal of representing the industry to governments and other policy makers, REASL should actively participate in the SREP programme. • The Investment Prospectus created for SL under the SREP is in line with some of the goals and objectives of REASL. It targets removing barriers in the industry such a financing and growing the off-grid market. • REASL should actively participate in such programmes and position itself as the go-to organisation and a strong stakeholder in the industry.

	Institution	Contacts	Description	Relevance to REASL
3	UNDP	<p>UNDP Sierra Leone</p> <p>Tel: (+232) 22 231 311 Tel: (+232) 22 233 190 Tel: (+232) 22 233 628 Tel: (+232) 22 233 648</p> <p>E: registry.sl@undp.org; communication.sl@undp.org</p> <p>55 Wilkinson Road Freetown, Sierra Leone</p>	<ul style="list-style-type: none"> UNDP has had presence in Sierra Leone since 1977. Its work has been in partnership with the Government of Sierra Leone, UN agencies, development partners, civil society groups, and local communities. The UN agency's work in Sierra Leone is largely focused on achievements of SDGs and the country's development agenda. 	<ul style="list-style-type: none"> Leading implementation of Sustainable Development Goals (SDGs) initiatives in Sierra Leone. Of interest to REASL will be initiatives on SDG 7 - affordable and clean energy. UNDP has been carrying out activities in this area, including distribution of solar lanterns in collaboration with Panasonic Corporation. Being an energy poor country, access to affordable, clean and reliable energy is an urgent need for the country. SDG 7 sits well the objectives and goals of REASL in both short term and long-term. REASL should work closely with UNDP in its SDG 7 activities and position itself as a strong UNDP partner in the implementation of SDG 7 goals.
4	SNV Netherlands Development Organisation	<p>Lindsey Hasanaj-Goossens E: bdhub@snv.org</p> <p>Tel: +31 302776198 Tel: +31302775240 Tel: +31307012440 Fax: +31302772332</p>	<ul style="list-style-type: none"> SNV is a non-profit organisation with interest on inclusive economic growth and human development. It concentrates its capacity development services in programs with demand driven change processes in renewable energy with objective of improving livelihood of those at the bottom-of-the-pyramid No physical offices in Sierra Leone but it is implementing renewable energy projects through its West African office in Ghana. 	<ul style="list-style-type: none"> Present in many African countries where it is undertaking different renewable energy programmes. It is especially active in the promotion modern cook stoves and bio energy, alongside off-grid solar PV development. Well positioned to offer technical support to REASL. It can also work with REASL in identifying business opportunities for REASL members and raising awareness on renewable energy technologies.

	Institution	Contacts	Description	Relevance to REASL
5	Swedish Development Cooperation (SIDA)	No Direct Contact E: sida@sida.se Tel: (+46) 8 698 50 00 Fax: (+46) 820 88 64	<ul style="list-style-type: none"> • Swedish development agency that works in cooperation with the Swedish government and other international bodies, such as the UN, EU and the World Bank. Carries out different challenge funds targeting specific regions. They include: <ol style="list-style-type: none"> i. Demo Environment Challenge Funds <ol style="list-style-type: none"> a. Planning Grant Fund (up to SEK 284,000) b. Demonstrating Grant Funds (up to SEK 1.8 mil). 2017 grant targets Kenya, Mozambique, Tanzania and Zambia. ii. Fnnovation Against Poverty Challenge funds iii. The Africa Enterprise Challenge Fund • Carrying an initiative on clean energy financing called Capital Access to Renewable Energy Programme. The facility is supporting the growth of a sustained market for renewable energy, targeting energy focussed micro, small and medium sized enterprises in East Africa. 	<ul style="list-style-type: none"> • Carrying out a number of programmes in Africa that are targeted at renewable energy technologies. Sierra Leone is not included in many of these, but as the market grows it could become part of the target countries. REASL can also seek partnership with Sida to have some of these programmes available to Sierra Leone.
6	GIZ	Malte Kirchner Country Director Tel: (+49) 421-98504375-10 E: giz-sierra-leone@giz.de malte.kirchner@giz.de GIZ Regional Office Sierra Leone – Liberia 32d Wilkinson Rd. Freetown, Sierra Leone	<ul style="list-style-type: none"> • GIZ has had presence in Sierra Leone since 1963. Its office is based in Freetown. Currently, its activities are geared towards post war and post Ebola outbreak initiatives to help economic development. 	<ul style="list-style-type: none"> • GIZ's Project Development Programme (PDP) the agency has been promoting German renewable energy companies to explore new markets in Africa. For example, GIZ has been promoting solar-hybrid mini-grids in Kenya. In Ghana they are promoting investment in large scale and distributed renewable energy. • REASL can seek support from GIZ in implementing its strategy and in turn aid GIZ in promoting German renewable energy technologies.

Table 6: Multilateral Development Banks / Development Agencies

Institution	Contacts	Description	Relevance to REASL	
ENERGY PROGRAMMES				
1	IFC Lighting Africa E: anjagi@ifc.org	Arthur Itotia Program Manager - Nairobi Office E: anjagi@ifc.org	<ul style="list-style-type: none"> • Currently operational in 11 African countries, including Bukina Faso, Nigeria, Liberia, Mali. • Its focus has been market catalyzation for off-grid solar lighting and mobile charging products. It works in: market intelligence, quality assurance, assess to finance, consumer education, and business development support. • Helps countries develop solar product standards & quality assurance mechanisms. It has conducted a number of solar off-grid lighting product market studies. 	<ul style="list-style-type: none"> • Lighting Africa compliments the objectives of REASL. It's a market catalysing programme that has recorded success, especially in the development of quality standards for off-lighting products. • Lighting Africa can offer support in development of quality standards, conducting market studies, helping REASL members access financing and off-grid lighting product awareness.

	Institution	Contacts	Description	Relevance to REASL
2	USAID Power Africa	Rockfeler Herisse, Ph.D. Senior Partnerships Advisor USAID/Guinea & Sierra Leone E: rherisse@usaid.gov	<ul style="list-style-type: none"> • Power Africa is a US government initiative to increase access to power in Sub-Saharan Africa implemented by USAID through partnerships between governments, private sector and finance institutions. • Besides electricity grid connection, the programme supports Beyond the Grid initiatives, providing small-scale and off-grid renewable energy solutions through off-grid market support, mobilising finance, creating enabling environments, technical assistance and supporting women-led electricity access initiatives. • Supports Sierra Leone through a: <ol style="list-style-type: none"> i. \$44 million partnership agreement between the Millennium Challenge Corporation (MCC) and the Republic of Sierra Leone. ii. USAID Global Development Alliance (GDA) focused on post-Ebola economic recovery by supporting energy access initiatives to improve livelihoods. • Working with private and public sectors to expand energy access and build post-Ebola disaster resilience. 	<ul style="list-style-type: none"> • REASL and its members can leverage the Power Africa programme to grow the off-grid market. With a rural electrification rate of less than 1%, the Power Africa beyond the grid initiatives is an opportunity for REASL, as an industry representative, to work with power Africa in facilitating access to off-grid solar products. • Power Africa is already actively participating the many post-Ebola disaster initiatives being supported by donor and agencies such as GDA. A lot of money is moving in this direction, including energy access programmes to support livelihoods.
3	Energy 4 Impact — Green Mini- Grids Market Development Programme	Peter Weston Director, Investment and Advisory Services Tel: (+44) 207 242 8602 E: info@energy4impact.org peter.weston@energy4impact.org	<ul style="list-style-type: none"> • An AfDB programme that aims to spur sustainable economic development, social progress and poverty reduction in Africa through mini-grid development. The programme supports developers on issues like business planning, market development, grid design, project finance, grid operation and maintenance. • Currently managed by Energy4Impact. 	<ul style="list-style-type: none"> • A facility that green-mini grid developers in Sierra Leone can make use of to accelerate access to electricity in rural area. The support areas by the facility fits well with the needs that mini-grid developers in Sierra Leone will need assistance on.

	Institution	Contacts	Description	Relevance to REASL
4	SE4All Programme	<p>Eng. Benjamin Kamara Director of Energy Ministry of Energy Republic of Sierra Leone</p> <p>T: (+232) 76 362654; (+232) 76 369538</p> <p>E: info@energy.gov.sl</p>	<ul style="list-style-type: none"> A global initiative to achieve universal energy access in line with SDG number 7. It is a multi-agency programme that includes AfDB, UNDP, NEPAD, and AUC among others. SE4All Africa Hub Secretariat, hosted by AfDB, coordinate and facilitate the implementation of the SE4ALL initiative on the African continent. Sierra Leone is among one of the African countries that have developed a SE4ALL Action Agenda and Investment Prospectus. 	<ul style="list-style-type: none"> To create a national policy and a financial environment as outlined in Sierra Leone Action Agenda and Investment Prospectus will require involvement of all renewable energy stakeholders. Working towards its goal of representing the renewable energy industry to policy makers, REASL should position itself as a strong stakeholder in the SE4All programme and push for development of policies that will incentivise RE market expansion.
5	SE4ALL Energy Access Practitioners Network	<p>No Direct Contact</p> <p>Tel: +1 202 887 9040</p> <p>E: info@energyaccess.org</p>	<ul style="list-style-type: none"> The Energy Access Practitioner Network is a global platform that brings together energy service providers and stakeholders from 170 countries to support the delivery of clean, reliable, and affordable decentralised energy as a contribution to the Sustainable Development Goal of universal energy access by 2030. It provides services ranging from webinar, workshops, conferences, databases and finances. It is a platform for sharing knowledge, building partnerships and catalysing actions in the energy access sector. Its membership is made of NGOs, businesses, programmes and other entities from across the globe involved in energy access programmes. Its membership in Sierra Leone includes Energy for Opportunity NGO and Child Care Sierra Leone. 	<ul style="list-style-type: none"> The Energy Access Practitioner Network is a good platform for REASL and its members to network, build capacity, match making, and seek financing and other activities that will grow the off-grid market in Sierra Leone. Sierra Leone is among the countries with the lowest electricity access in the world and such a network can be utilised to address some of these challenges.

	Institution	Contacts	Description	Relevance to REASL
6	United Nations Office for Project Services (UNOPS)	Nick Gardner Global Practice Lead, Infrastructure E: nickg@unops.org	<ul style="list-style-type: none"> • UNOPS is an operational arm of the United Nations, supporting the successful implementation of its partners' peacebuilding, humanitarian and development projects around the world. UNOPS provides project management, procurement and infrastructure services to governments, donors and UN organisations, the United Nations Children's Fund (UNICEF) and the UK Department for International Development (DFID). • UNOPS is implementing a Rural Renewable Energy Project in cooperation with the Republic of Sierra Leone's Ministry of Energy and with funding from UK Aid. The overall goal of the project is to improve rural renewable energy access through private sector involvement. • The program is a 4-year initiative that will see installations of over 50 mini-grids across Sierra Leone. 	<ul style="list-style-type: none"> • UNOPS is a well-funded organisation with a network of international development agencies. REASL and mini-grid developers in SL should use the opportunity of working UNOPS in developing more the mini-grid projects. • Additionally, UNOPS can help REASL and its members access international funding for mini-grid developments.
7	GIZ Energizing Development (EnDev)	Malte Kirchner Country Director Tel: (+49) 421-98504375-10 E: giz-sierra-leone@giz.de malte.kirchner@giz.de GIZ Regional Office Sierra Leone – Liberia 32d Wilkinson Rd. Freetown, Sierra Leone	<ul style="list-style-type: none"> • Supporting the efforts of Power for All in SL through technical support in critical areas of the RE sector, performance reporting and awareness raising. It is working to grow a distributed renewable energy market in Sierra Leone through: <ol style="list-style-type: none"> i. Awareness raising ii. Performance tracking iii. Technical support and training iv. Assisting project planning, system installation & operation, maintenance. v. Matchmaking for businesses vi. Helping RE companies identify business and financing opportunities. 	<ul style="list-style-type: none"> • REASL and GIZ EnDev can work together in areas such as training, awareness creation, quality control and standards. The programme can as well offer in technical and financial assistance in different areas its working on.

Table 7: Energy Programs

Institution	Contacts	Description	Relevance to REASL
PRIVATE SECTOR GROUPS			
1	Sierra Leone Opportunity for Business Action (SOBA) Kim Beevers Portfolio Director and Technical Lead Email : info@sobasl.org	<ul style="list-style-type: none"> • SOBA is a DFID-funded market systems development initiative implemented by Adam Smith International (ASI). It has been providing on-going technical support and targeted financial investment towards a market systems change in Sierra Leone since 2013. They have been collaborating with private sector players in areas of agriculture, sustainable energy, and financial service. • Conducted a market study on SHS as it seeks to stimulate the solar market. 	<ul style="list-style-type: none"> • SOBA can support the full establishment of REASL and its work in stimulating the renewable energy market. It is a business organisation with a wide range of stakeholders and donor support that REASL can leverage. • REASL is already partnering with SOBA, and this partnership should be strengthened.
2	Global Off-Grid Lighting Association (GOGLA) Tel: (+31) 304 100 914 Email: info@gogla.org	<ul style="list-style-type: none"> • A global industry association formed in 2012 through the IFC Lighting Africa Programme. Created to accelerate access to modern energy services through private sector players in the off-grid lighting market. It has sector support programmes working in the following areas: <ol style="list-style-type: none"> a) Mobilising investments b) Creating an enabling environment c) Quality assurance and consumer protection • Membership includes most of the international off-grid electricity companies working in Africa. It also has membership from renewable energy associations such as KEREA of Kenya, REIAMA of Malawi and TAREA of Tanzania. 	<ul style="list-style-type: none"> • REASL should become a member of GOGLA and partner with them in the development of the off-grid lighting product market in Sierra Leone. GOGLA is in a position to provide technical support to REASL in carrying policy and regulations lobbying activities and developing quality standards. It can also assist REASL mobilise funds and collect market information for its members.

Table 8: Private Sector Groups

Institution	Contacts	Description	Relevance to REASL
NON-GOVERNMENTAL ORGANISATIONS AND FOUNDATIONS			
1	Energy for Opportunity (EFO) Simon Willans and Co-Founder Paulo Munro Co-Founder Tel: (+232) 76 692 155 E: mail@energyforopportunity.org	<ul style="list-style-type: none"> • An energy NGO working in West Africa. Its focus is on energy access through solar PV technology. EFO has been working in Sierra Leone, Liberia and Ghana in four programme areas: Skills training, livelihoods support, health and education. • Sierra Leone is the main focus of EFO in West Africa and acts as the regional centre. They have installed solar PV systems in schools, health facilities and communities, including micro-grids of up to 5.5kW. Community Charging Points forms the core activity of EFO. With support from donors such as AusAid, EFO has been working with post-secondary school institutions to provide technical training at local level and offer practical training to engineers entering the workplace. Trained individuals work at community charging stations and providing maintenance for community households with home solar systems. They have been working with agencies such as DFID to promote solar energy in the community and demonstrate the technology. They are also active in renewable energy research work. 	<ul style="list-style-type: none"> • This is an active NGO in the Sierra Leone renewable energy sector. They have an extensive network of donors supporting their activities. • Their involvement in technical training fits well with REASL capacity building objectives. They have also been active in promotions of solar PV technology through awareness creation and technology demonstration. • EFO can support REASL members develop technical skills and promote solar PV technology. REASL should seek partnership with EFO and its donor networks.

Institution	Contacts	Description	Relevance to REASL
2 UN Foundation (UNF)	Jem Porcaco Lead Coordinator — UNF Energy for Women’s and Children’s Health Programme E: jporcaro@unfoundation.org	<ul style="list-style-type: none"> • A foundation doing charitable and humanitarian work in the areas of child health, climate change & energy, sustainable development, technology, women, girls, and population, and supporting the United Nations. • One of its programmes is Energy for Women’s and Children’s Health Programme, in Ghana, Uganda, Malawi and Tanzania. It was initially planned to include Sierra Leone but was excluded because of the Ebola outbreak. 	<ul style="list-style-type: none"> • The UNF’s Women and Children’s Health programme carried out need assessment on health centres and solar PV system designs to meet those needs. In some places, depending on suitability, mini-grid systems were designed. • This programme is supporting development of off-grid solar system for health facilities, which can have a huge impact if rolled out in Sierra Leone.
3 Practical Action	Tel : (+221) 77 881 27 81 E: west.africa@practicalaction.org.uk practicalaction.org/acceuil	<ul style="list-style-type: none"> • An NGO that is focused on the use of technology to bring socioeconomic development. It works with communities to build skill and knowledge that will help them tackle poverty. • Programmes are organised in 4 themes: <ul style="list-style-type: none"> i. Sustainable energy access ii. Food and agriculture iii. Urban water and waste iv. Disaster risk reduction • It also has a consultancy wing that offers advisory services in these four areas. In Africa, it has offices in East Africa, South Africa and West Africa. The West African office is based in Senegal from where it operates in Sierra Leone and other regional countries. 	<ul style="list-style-type: none"> • Practical Action is one of the most active groups in Africa, promoting renewable energy and energy access. In West Africa, it is working in various modern energy access programme, through bio-energy and solar PV technologies. • In Sierra Leone, it is working closely with the Power for All initiative in the energy access programme. It will make a strategic partner for REASL in promoting the uptake of off-grid products as well as in areas of training and capacity building.

Table 9: Non-Governmental Organisations and Foundations

Institution	Contacts	Description	Relevance to REASL
SPECIALISED PROJECT FUNDING WINDOWS AND FINANCIAL GROUPS			

	Institution	Contacts	Description	Relevance to REASL
1	AECF Renewable Energy and Adaptation to Climate Change Technologies Fund (REACT)	Paul Greener Tel: +254(20)269 9137/8/9 E: info@aecfafrica.org ; pgreener@aecfafrica.org E: react_solar@aecfafrica.org	<ul style="list-style-type: none"> Part of the African Enterprise Challenge Funds (AECF) geared to support business development in Africa in the fight against poverty. REACF is supporting businesses providing innovative renewable energy, climate resilience or adaptation related solutions that benefit rural communities in Sub-Saharan Africa. So far, REACT has helped more 71 businesses reach over 500,000 households and create 3,000 jobs in East Africa alone in its four rounds of funding. The 5th round of financing is focused on the SHS markets in Malawi, Zambia, Zimbabwe, and Sierra Leone. Applicants get between US\$ 250,000 - US\$ 1.5 million. 	<ul style="list-style-type: none"> Sierra Leone is among the four countries that the challenge fund will focus on this year. This is an opportunity for Sierra Leone Solar Home Systems market players to get financial and technical support that will enable them develop their innovative ideas.

2	Institution	Contacts	Description	Relevance to REASL
	<p>Africa Clean Energy (ACE) Business</p>	<p>Anna Stephenson</p> <p>Address</p> <p>Department for International Development (DFID)</p> <p>+44 (0) 1355 84 3132</p> <p>E: a-stephenson@dfid.gov.uk</p> <p>https://devtracker.dfid.gov.uk/projects/GB-1-204637</p>	<ul style="list-style-type: none"> • Programme focuses on a market based approach for private sector delivery of SHS products and services. This will lead to improved energy access for people in sub-Saharan Africa who are currently without modern energy. The programme will work in 14 priority countries: Mozambique, Malawi, Zambia, Zimbabwe, Tanzania, Rwanda, Uganda, Kenya, Ethiopia, Somalia, Nigeria, Ghana, Sierra Leone and Senegal. • The programme will support: <ul style="list-style-type: none"> i. Technical assistance to improve the enabling environment for a market based approach for private sector delivery of solar home system (SHS) products and services (Policy and Regulatory Reform, investment readiness, learning and Coordination). ii. Finance for businesses wanting to enter new and emerging SHS markets in sub-Saharan Africa for their start up and early commercialisation of ideas. iii. Test innovative approaches to stimulating private sector investment and a market development. • This programme will run until 2022. It has a budget of £43,320,000. 	<ul style="list-style-type: none"> • Sierra Leone is a priority country for this programme that will benefit companies in the energy access spectrum. It is an opportunity for solar market players and members of REASL to receive technical assistance and financing to enable them develop innovative product for the off-grid market.

	Institution	Contacts	Description	Relevance to REASL
3	Africa-EU Renewable Energy Cooperation Programme (RECP)	Michael Franz E: michael.franz@euei-pdf.org E: recp@euei-pdf.org	<ul style="list-style-type: none"> • An African-European platform for promoting renewable energy market development and investment in Africa that was initiated in the framework of the Africa-EU Energy Partnership (AEEP). It is being implemented across several African countries, including Sierra Leone where between 2013 and 2014 it funded the development of Sierra Leone Household Cooking Energy Plan. It's structured in four main sub-components: <ol style="list-style-type: none"> i. Supporting policy advisory; ii. Private sector cooperation; iii. Access to finance; iv. Innovation and skills development. • Activities in West Africa include; holding matchmaking and off-grid investment forums, training and certification of solar PV installers, solar PV market studies, and supporting development of renewable energy policies. • Part of the EU Energy Initiative Partnership Dialogue Facility (EUEI PDF) that also hosts Africa-EU Energy Partnership (AEEP) and Strategic Energy Advisory and Dialogue Services (SEADS) 	<ul style="list-style-type: none"> • REASL and its members should utilise this facility for financial support and sector networking. Sierra Leone is an AEEP signatory country and RECP is already active in the country. REASL can use it to finance activities such as workshops and technical training in line with the facilities support sub-components.

	Institution	Contacts	Description	Relevance to REASL
4	Scaling off-grid energy	<p>Molly Doyle USAID, Senior advisor for Scaling Off-Grid Energy</p> <p>E: info@scalingoffgrid.org</p>	<ul style="list-style-type: none"> • A grant funding for off-grid renewable energy solutions that power local economic activities for African-owned and operated enterprises, associations, or organisations. It creates a platform for donors and investors in the energy access space to work with businesses to facilitate their product reach to households. Its activities revolve around expanding the market, driving demand and strengthening the marketplace. • Founding partners are USAID, DFID, and Shell Foundation. It's part of the US Power Africa and UK's Energy Africa energy access initiatives. 	<ul style="list-style-type: none"> • The facility is providing financial and technical assistance to off-grid solar business in Africa. It awarded more than US\$4 million to promising off-grid businesses in Africa in 2016. • Off-grid solar companies looking at venturing into the Sierra Leone market can utilise this facility for both financial and technical assistance.

Institution	Contacts	Description	Relevance to REASL
<p>5 Sustainable Energy Fund for Africa (SEFA)</p>	<p>João Duarte Cunha SEFA Coordinator, Energy, Environment and Climate Change Dept</p> <p>E: j.cunha@afdb.org</p>	<ul style="list-style-type: none"> • A multi-donor trust fund that is administered by the African Development Fund. Supports small and medium scale renewable energy and energy efficiency projects in Africa through: technical assistance during project preparation, equity investment, and creating an enabling market environment. • The facility has approved 33 projects across 19 countries in Eastern, Southern and Western Africa. In Cameroon, it has provided equity investment in a 21MW hydro power project and given a project preparation grant to a 72MW solar PV. Some of the enabling environment grants that have been provided in West Africa for renewable energy promotion and GMG support programme in Mali and Niger respectively. • SEFA has a Renewable Energy Fund (AREF) as well that is supporting small to medium scale independent power producers (IPPs). 	<ul style="list-style-type: none"> • One of REASL's goals is expanding the Sierra Leone renewable energy market and creating consumer and stakeholder's awareness. SEFA is supporting market development and creation of an enabling environment for through renewable energy promotions, energy sector support programmes, GMG market development support etc. in countries like Mali, Tanzania, Niger and Rwanda. REASL, working with the government, can apply to SEFA to have such programmes in Sierra Leone. • SEFA is also an opportunity for financial support to RE companies entering the Sierra Leone market, though project preparation grants and equity investment.

	Institution	Contacts	Description	Relevance to REASL
6	Fund for African Private Sector Assistance (FAPA)	<p>Peter Ide Chief Technical Cooperation Administrator</p> <p>Tel: (+225) 2026 2743</p> <p>E: k.kojima@afdb.org</p>	<ul style="list-style-type: none"> • A multi-donor fund run by AfDB in support of the banks Private Sector Development strategy. Provides untied grants for technical assistance and capacity building to different groups working for the development of the African private sector. They include governments, regional communities, market associations, regulators, private companies and enterprises. • It's a multi-sector facility targeting enterprise development, access to social and economic infrastructure, investment and business climate. As of Feb 2017, 66 projects have been approved for a total of US \$55.78 million - 26% going to West Africa. Average per project is around US \$850,000. • Projects in West Africa include: providing integrated support for development of women-owned enterprises in Cameroon, assisting MFI operations, creating a greenfield MFI in Cote d'Ivoire, facilitating financial inclusion, improving the efficiency of SME financing in Senegal and Gambia, and supporting a youth employment and entrepreneurship program in Sierra Leone. 	<ul style="list-style-type: none"> • FAPA is working with different groups to build the private sector in Africa. One such group is market and trade associations, such as REASL. • This facility is an opportunity for technical assistance in expanding the Sierra Leone renewable energy market, building the financing capacity through MFIs and capacity building in the sector, including supporting special groups in the sector, such as women and youth. • This facility is flexible and can be used to support different REASL goals.

Institution	Contacts	Description	Relevance to REASL
7 Acumen Funds	Tel: (+233) 030 298 4098 A&C Square No. 14 Jungle Road East-Legon P.O. Box CT8740 Accra, Ghana	<ul style="list-style-type: none"> • An impact investment fund. It has been funding, solar energy projects with high impact potential. It has been supporting projects in both West and East Africa. • Projects include: a Uganda-based company selling and financing solar home systems (US\$1.4M), Burn clean cook stove (US\$750K), D Light Solar (US\$2.9M), financing M-Kopa mini solar home systems in Kenya (US\$1.1M). • Invests in companies leading innovations in hand-held solar power, cook stoves, off-grid generation, home systems, and bio-gasification systems. 	<ul style="list-style-type: none"> • Acumen has been supporting the expansion of off-grid solar companies in Africa. The fund is has supported the success of solar pico and PAYG companies working in East Africa, such as M-Kopa and D-Light. • Solar companies entering the SL market can leverage this in their expansion as well as to bring innovative products to the market. REASL members can use this to develop high impact projects for the people of SL, not just in solar PV but clean cook stove and bio-energy.
8 Energy Access Venture	Emmanue Beau Co-founder Michael H Gara Co-founder E: info@eavafrica.com	<ul style="list-style-type: none"> • Group that helps energy access companies raise funds. They also offer assistance to early stage development companies in the form of business development advice, technical assistance, capacity building and training. • They have invested in companies like PAYG, solar water pumping, solar cooling and heating, solar pico, solar home systems and mini-grid companies. They include off-grid electric, sun-culture, off-grid electric and PEG in Ghana. 	<ul style="list-style-type: none"> • Off-grid solar companies entering Sierra Leone market can use this platform to find appropriate financing. It can as well be used by members of REASL who are at early stage of development to access technical assistance and gain business development support. • In a young off-grid market like Sierra Leone, most companies will be able to meet the ventures impact objectives.

	Institution	Contacts	Description	Relevance to REASL
9	UN Powering the Future We Want Grant	E: poweringthefuture@un.org	<ul style="list-style-type: none"> This facility offers a grant in the amount of \$1 million US dollars to fund future capacity development activities in energy for sustainable development. The Grant is awarded to an individual, institution or partnership based on past and current achievements, with the objective of promoting leadership and innovative practices in meeting the global energy challenge. Its 2017 thematic focus is on "Sustainable Energy for Eradicating Poverty and Promoting Prosperity in a Changing World". 	<ul style="list-style-type: none"> The 2017 theme of using sustainable energy to eradicate poverty and promote prosperity fits well with the situation in Sierra Leone. As one of the poorest countries in the world, renewable energy players in the country should tap this opportunity to advance their projects that are geared towards eradicating energy poverty and bringing social economic development.
10	Rockefeller Foundation	Tel: (+254) 20-498-7000 272 2610 Fax: 254-20-272-2613	<ul style="list-style-type: none"> The foundation gives grants to NGOs, private companies and other groups in Asia and Africa. Has made pioneering efforts in venture philanthropy, supporting market-based ideas with the potential to solve global challenges. This includes clean energy access and development of off-grid technologies. Lately, it has been channelling funds to mini-grid projects in these regions. It has a Smart Power for Rural Development program that it is rolling out in partnership with different agencies and donors. 	<ul style="list-style-type: none"> In a country like Sierra Leone where electricity access is very low and they are still recovering from the devastation of the Ebola outbreak, Rockefeller Foundation could be interested to offer grants to organisations working to alleviate the situation. REASL and its members can get financing from the foundation to advance energy access. The foundation has been having a focus on mini-grid development and mini-grid developers in Sierra Leone can take advantage of this.

Institution	Contacts	Description	Relevance to REASL
11 Shell Foundation Accelerating Access to Energy Programme	Shell Foundation 40 Bank Street London E14 5NR United Kingdom	<ul style="list-style-type: none"> The Shell Foundation has been working since 2002 to increase the provision of energy to the poor through the innovation and scale-up of decentralised energy solutions, such as solar lighting, biogas, biomass gasification, and the sale of low-cost energy products. The foundation has been using enterprise-based model to support high impact initiatives from idea conceptualization, piloting and scaling-up. 	<ul style="list-style-type: none"> Shell foundation enterprise-based model grant is a good opportunity for a country like Sierra Leone where small businesses face the challenge of financing their innovations. To address the challenge of energy access in a country like Sierra Leone, the market need to utilise facilities like Shell Foundation that are supporting businesses across the development stages.
12 USAID Development Innovation Venture (DIV)	E: div@usaid.gov	<ul style="list-style-type: none"> A grant challenge targeting innovative solutions to world challenges. Its cross sectoral, impact oriented and evidence based grant open thorough the year to applications from any country. The Grant is given for 3 stages of development: <ul style="list-style-type: none"> i. Stage 1: Proof of Concept / Initial Testing (\$25k-150k, up to 3 years) ii. Stage 2: Testing and Positioning for Scale (\$150k-1.5m, up to 3 years) iii. Stage 3: Transitioning Proven Solutions to Scale (\$1.5m-15m, up to 5 years) 	<ul style="list-style-type: none"> Sierra Leone, having low energy access and poor infrastructure, is a strong candidate for this grant challenge. A facility like DIV gives opportunities to project developers to initiate high impact innovate projects that can help increase energy access which will in turn have a socioeconomic impact on the society.

	Institution	Contacts	Description	Relevance to REASL
13	Sun Funder	<p>Shelmith Theuri Investment Officer</p> <p>E: connect@sunfunder.com; shelmith@sunfunder.com</p>	<ul style="list-style-type: none"> • A solar finance business offering support to solar companies to unlock capital for solar energy in emerging markets. Based in San Fransisco and Tanzania. It provides short-term inventory and project finance loans to leading solar energy companies to help them scale deployments of solar energy systems and catalyze growth in the sector. • The facility has financed a range of solar companies from pico and SHS business, PAYG to mini-grid developers. They include: Sunny Money, BBoxx, PEG, Angaza and off-grid electric. 	<ul style="list-style-type: none"> • Facilities like Sun Funder are ideal leverage the growth of off-grid solar market in Sierra Leone. As witnessed with companies it has financed in other countries, it is a much-needed source of financing for a young markets like Sierra Leone. • It is mostly being used by some of the most successful solar pico PAYG and solar home systems companies in Africa, some of which have a high potential of for entry into SL market.
14	InfraCo Africa	<p>Tel: +44 (0) 20 35975400</p> <p>E: info@infracoafrica.com</p>	<ul style="list-style-type: none"> • A facility providing funding and expertise needed to develop early-stage projects into viable investment opportunities. It invests directly into high impact projects, from inception to execution. They are working across sub-Saharan Africa. • They have invested a lot in renewable energy projects and companies, from utility-scale projects, mini-grid projects, and standalone solar companies. Some of the projects include: Redavia solar rental business in Tanzania; Abiba 50MW solar project in Nigeria; a 60MW solar farm in Chad. 	<ul style="list-style-type: none"> • InfraCO Africa investment will match with mini-grid companies that are interested in entering the Sierra Leone market. The facility has funded some projects in West Africa, and Sierra Leone being an eligible country renewable energy companies can use it to access financing for their projects.

	Institution	Contacts	Description	Relevance to REASL
15	Blue Haven Initiative	Liesel Pritzker Simmons Co-Founder & Principal	<ul style="list-style-type: none"> • An impact investment that is helping mission-driven projects and companies achieve scale, supporting entrepreneurs whose innovations spur change, and partnering with other investors to accelerate economic progress. • The facility has a keen interest in Africa where it is investing in energy access projects. Some of the portfolios it has invested in include: Mkopa Solar, and Karibu homes PEG solar home system in West Africa. 	<ul style="list-style-type: none"> • This facility can be used by solar and mini-grid companies entering the Sierra Leone market to expand their business. It is also beneficial to those that are introducing relatively new products in the market, such as PAYG and other innovations.
16	FSD Africa	<p>Mark Napier Director at FSD Africa</p> <p>+254 20 402 4000 +254 729 729 111 info@fsdafrica.org</p>	<ul style="list-style-type: none"> • Created in 2012, FSD Africa is a \$35 Million program funded by DfID, targeting the financial sector development programme. It aims to reduce poverty across sub-Saharan Africa by building financial markets that are efficient, robust and inclusive. The initiative targets to open microfinance institutions, banks, stock exchanges brokers, Telecommunications companies and insurance companies and private equity firm to open up the financial markets with a long term goal of achieving sustainable human development. • FSD has a network that is currently active in Southern Africa, East Africa and West Africa. • FSD Africa has in place a strategic plan 2013-2018 that aims to achieve the following objectives. 	<ul style="list-style-type: none"> • The facility is well positioned to provide financing to consumers through its network in REASL. The financing can be provided to reduce the upfront costs incurred by households to acquire solar products. REASL members can leverage from the facility so as to have an source of supply financing.

Table 10: Specialised Project Funding Windows and Financial Groups

Institution	Contacts	Description	Relevance to REASL
PROGRAMMES AND ORGANISATIONS ALREADY HAVING A FORM OF WORKING RELATIONSHIP WITH REASL			
1	<p>Power for All</p> <p>Ami Dumbya Sierra Leone Campaign Lead</p> <p>Tel: (+232) 76 242 328</p> <p>E: ami@powerforall.org</p> <p>Skype: amidumbuya1</p> <p>http://www.powerforall.org/campaign/</p>	<ul style="list-style-type: none"> • A campaign that advances renewable and decentralised electrification solutions as the fastest, most cost effective and sustainable approach to universal energy access The Sierra Leone chapter was launched in May 2016. It has been working with the government, private sector and civil society stakeholders to address energy poverty in the country. Its priority areas are: <ol style="list-style-type: none"> i. Support to government energy programmes; ii. Strengthening the renewable energy sector; and iii. Design an Energy Revolution Initiative that raise awareness on decentralised solar technologies • They were instrumental in the formation of REASL and are working with solar sector players such as Angaza, Azimuth, Azuril, BBOX, Ignite Power, JUA Energy, Nations Solar, One Degree Solar, RCD Solar Co, and Smiling Through Light. 	<ul style="list-style-type: none"> • Power for All already works with REASL. The campaign was instrumental in its formation and one of its priority is to strengthen the renewable energy sector by supporting REASL build its capacity as the voice of the industry. • Power for All is well funded campaign with a network of donor support and working in different regions. In Sierra Leone it has the attention of the government, private sector and the civil society groups. REASL should use this campaign to bring the sector together and build itself to be able to actively represent the sector long after the campaign is gone.

	Institution	Contacts	Description	Relevance to REASL
2	Energy Revolution Task Force	Zainab Buya-Kamara Permanent Secretary Ministry of Energy Tel: (+232) 76242328 E: info@slenergyrevolution.com	<ul style="list-style-type: none"> • Launched in May 2016 by the president of Sierra Leone. It is being supported by the UK government as part of the official Compact between the Sierra Leone government and UKAID's Energy Africa campaign. A Task Force Committee has been formed to spearhead its work. The taskforce pledge to provide at least 250,000 homes with solar systems in all Chiefdoms. It will be supported by the Power for All campaign to create a comprehensive program to deliver on ambitious targets for the growth of the solar home system market. • Its roles will be: <ol style="list-style-type: none"> i. Build demand for solar technologies amongst households and enterprises ii. Strengthen the supply of high quality solar technologies into the country iii. Drive policy reform to accelerate access to solar solutions iv. Enable access to finance to help the sector to scale at speed 	<ul style="list-style-type: none"> • The task force has offered key support in the formation of REASL. As part of the Energy Africa Campaign compact for Sierra Leone, building a strong renewable energy trade association is one of its priority areas. • REASL should leverage this relationship with the task force to fully establish itself and grow into a self-reliant and vibrant renewable energy association.

3	Institution	Contacts	Description	Relevance to REASL
	Oxfam IBIS	Tel: (+232) 78 950 050 E: ibissl@ibiswestafrica.com	<ul style="list-style-type: none"> A global non-profit organisation that has been working in SL under the EU co-financed Promoting Renewable Energy Services for Social Development (PRESSD). They are piloting renewable energy projects in six districts across SL. They also actively participated in the formation of REASL. Active in; capacity building efforts through training of trainers and government workers, solar PV project development, solar energy awareness creation and promotion of pico solar lighting products. 	<ul style="list-style-type: none"> Part of the Power for All campaign and has committed to the following: <ol style="list-style-type: none"> Continue offering support to REASL Actively participate in capacity building through collaboration with the government, training institutes and other sector actors. Push for development of pro-poor energy access policies and initiatives through collaboration with civil society organisations. Push of industries open data sharing platform Most of these commitments also fall under REASL objectives.
4	Rocky Mountain Institute		<ul style="list-style-type: none"> A research, publication, consulting, and lecturing non-profit organisation that focuses on innovation in energy and resource efficiency. The institute has been engaging businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions in these areas. It works through research, analysis, and having whole-systems expertise. 	<ul style="list-style-type: none"> Rocky Mountain Institute is working with the GoSL to develop an integrated energy plan that takes full advantage of DRE to achieve universal energy access in the country. It is also a key stakeholder in the Power for All Program in the country. It makes an important partner for REASL in the areas of training, policy lobbying, research and market research.
5	Sierra Leone Association of Micro Finance Institutions (SLAMFI)	Email: info@slamfi.sl Tel: +232-76-640-096	<ul style="list-style-type: none"> A Sierra Leone micro-finance industry group that promotes the development of professionally sound and financially sustainable Microfinance Institutions (MFIs). It offers group and individual loan product to businesses in areas in different sectors, including the energy sector. 	<ul style="list-style-type: none"> SLAMFI has a renewable energy (power sector) loan product given to SMES in renewable energy. Participates as a stakeholder in the Power for All programme and is working with REASL to unlock consumer financing for SHS. REASL should work with SLAMFI on supply and demand side financing as well as work together to develop special tailor made financial products for its membership.

Table 11: Programs & Organisations with Existing Working Relationships with REASL

SECTION 6

Training Roadmap

6.1 Training Roadmap Components

This training roadmap addresses technical capacity in four main components of the Sierra Leone solar PV market: (1) grid connect, (2) professional/mini-grid, (3) solar home system, and (4) pico system market. These four categories require distinct yet related levels of technical training and capacity building. Currently, the Sierra Leone market is still at nascent stages of development, largely served through off-grid mini-grids, solar home systems and solar pico. With supportive government policies and backing from international development agencies and donors, the market is expected to grow and expand to grid connect systems.

This roadmap looks at the building capacity and training necessary for the following six groups:

1. Installers / technicians
2. System designers / engineers
3. Suppliers
4. Consumers
5. Regulator
6. Training institutions

Every group is different but interlinked in the process of transforming a market. It is therefore important to understand each group and build specific capacity and training tools.

6.1.1 Installers/technicians

Other than the pico market category where products are designed as plug and play, solar home systems, mini-grids and grid connect systems require technical capacity to ensure the systems are properly designed and the quality is sufficient. Building local technical capacity is key in making the market vibrant. By increasing the level of awareness, building professionalism, and reducing the costs of installation, operation and maintenance, the market will take an upward growth trajectory that will be self-sustaining.

Technician training should be geared to educate and provide local technicians with skills to be able to carry out design, feasibility study, installation, quality control, and operation and maintenance for solar PV systems. These technicians are mostly solar practitioners with limited academic background. Training should also focus on building the understanding of standards and regulations among solar technicians. This is important in promoting quality standards and professionalism in the market. In this respect, training should teach technicians how to distinguish and determine the quality of systems, provide customers with system quotations, and design solar systems in accordance with the prevailing laws and regulations. Once it is understood how to maintain quality standards so as not to dilute the market, technical training on operation and maintenance, especially for solar home systems, institutional systems and mini-grids is very important. Operation and maintenance technical skills will keep systems running for longer and will increase trust in local technician experts, thus increasing local market activity.

To build capacity at the community level, straight forward lessons must be developed in local languages. Groups providing these trainings should come prepared with manuals that provide a step by step guide on solar electricity systems.

6.1.2 System designers/engineer

Building local technical design and engineering capacity will be crucial for the development of more advanced systems such as solar and hybrid mini-grid and grid-connect systems. Engineers should be trained to properly design and size solar systems so that they have proper functionality and so they meet energy needs. It is also important to have system designers who are well trained on all the available technologies such as solar hybrid, inverter technologies, storage technologies and system grid connection and islanding.

This is a more skills-based group with individuals holding university degrees or higher diploma trainings that makes them well positioned to advance solar PV technology in the country. Alongside engineering training offered through universities and polytechnics, technology companies can play a key role in training this group to provide them with practical skills about their products and technologies. Solar engineers can also be involved in research and development for the advancement of solar technology and providing tailor-made solutions to Sierra Leone energy challenges.

6.1.3 Suppliers

Educating and building the capacity of solar product supplier will lead to the supply of quality products, suppliers who are able to access finance, improved business operations, a deeper understanding of various business models, improved customer service, and business expansion.

Capacity building for suppliers includes solar integrators; solar product importers, distributors and wholesalers; solar product retailers; international solar companies and social enterprises that do manufacturing, distribution or retailing; and NGOs that supply solar products.

For the Sierra Leone market, capacity building and training should focus on solar distributors and retailers serving the off-grid market. The focus should be on practical issues and recommended skills that a small retailer and distributor should have to successfully operate their business and reach rural populations. Areas to focus on are education and awareness creation on product quality, marketing, client management, business development, invoicing, administration, and taxation.

6.1.4 Consumer

Development of the Sierra Leone market will, to a large extent, depend on the level of awareness of solar products. Consumer awareness and education has proven to build demand for quality products. Consumers will understand what solar products can and cannot do, thereby diversifying the market with new specialised consumer tastes.

Five key areas to focus on in consumer capacity building are:

1. The importance of quality solar products and how to identify them
2. Consumer financing and other available product access support
3. Product pricing and differentiation
4. Product use and solar technology application
5. Creating awareness on the role that solar energy can play in socioeconomic development

Capacity building should be conducted for consumers from all parts of the country. To reach the off-grid rural population, it is important to implement capacity building lessons in local languages and respect local cultural practices. Capacity building should also target groups such as women and rural farmers and should be channelled through NGOs and CBOs who already have existing relationships with those communities.

6.1.5 Regulators, energy ministry and other relevant government agencies

As seen in other markets in Sub-Saharan Africa, the importance of government agencies in developing off-grid markets cannot be overstated. These agencies are the policy makers, regulators and enforcers of change. Training staff working at the Ministry of Energy and Sierra Leone Electricity & Water Regulatory Commission (SLEWRC) on market regulation, policy development and building the agencies' capacity will not only ensure quality standards but will also lead to the development of market policies and regulations that will facilitate market growth. Other areas of focus are quality standard development, inspection and enforcement, awareness creation and consumer education, adopting best practices and development of a supportive regulatory framework.

6.1.6 Training Institutions

Building the capacity of training institutions to offer solar technical training is imperative in building the sector's technical capacity as a whole. Training institutions should be institutionalised and should be provided with a standardised technical training curriculum for both public and private institutions. Institutions to target include vocational and training institutes, polytechnics, universities, established centres of excellence, NGOs offering technical training, government agencies and the private sector.

Training and capacity building for training institutions is expected to be done through some of the following ways:

1. **Training of Trainers (ToT)** in both public and private institutions offering solar technical training.
2. **Involvement of technical training instructors** in training and capacity building programs run by the government and private sector.
3. **Building the technical capacity of training institutions** by providing them with the necessary equipment, training kits and materials. Some of them can also be developed into solar Center of Excellence.
4. **Collaboration with international training institutions** that have experience in best practices. Examples include international universities such as Arizona State University (ASU) and international solar training groups such as Solar Energy International and the Renewables Academy (RENAC).
5. **Partnerships with the private sector and technology suppliers** who will provide practical skills and industrial attachment to trainers.

6.2 Capacity Related Gaps and Issues with System Types

Through visits to Sierra Leone and literature reviews, various issues and gaps have been identified across the four segments of the Sierra Leone market. The table below shows how building capacity and training across the groups discussed can be used to address some of these gaps and issues.

System Type	Gaps & Issues	Training Remedies
Pico System	<ul style="list-style-type: none"> • Consumer understanding • Low quality equipment • Retailer understanding 	<ul style="list-style-type: none"> • Consumer education and awareness creation • Supplier training and education • Regulator capacity building

Solar Home System	<ul style="list-style-type: none"> • Retailer understanding • Sizing • Consumer use • Poor Installations • Improper equipment • System operation and maintenance 	<ul style="list-style-type: none"> • Technician training • System designers/engineers training • Consumer education and awareness creation • Supplier training and education • Regulator capacity building
Professional / Mini Grid	<ul style="list-style-type: none"> • Complex designs • Multiple power sources • Safety issues • Consumer monitoring and evaluation • System operation and maintenance 	<ul style="list-style-type: none"> • Technician training • System designers/engineers training • Regulator capacity building • Training institutions capacity building
Grid Connect	<ul style="list-style-type: none"> • Requires EDSA license • Grid connect skills • Islanding issues • Safety 	<ul style="list-style-type: none"> • Technician training • System designers/engineers training • Regulator capacity building

Table 12: Capacity Related Gaps and Training Remedies

6.3 Organisations Involved

While technical and vocational training in Sierra Leone is still at a development stage, the country has a 6-3-3-4 education system that favors technical and vocational education. There has also been a concerted effort from the government, non-governmental organisations and the private sector to support technical and vocational training for both young school-leavers and adults. Focus is also being put on training girls and women who make up a large proportion of the overall 50% illiteracy rate in Sierra Leone⁴.

Energy technical training is being offered at both public and private technical institutions and some non-governmental organisations. The most common energy technical training course is “Electrical Technician”. However, it is being offered with no specification on renewable energy technologies. To mediate this gap, institutions are starting to offer technology specific technical training depending on demand and availability of technical equipment for training. Barefoot Solar Training Center and IBIS/Oxfam Solar Training Program are some of the private and public sector led technology specific technical training being offered.

General curriculum technical training policy, curriculum development and accreditation is led by the Ministry of Education and the National Council for Technical, Vocational and other Academic Awards (NCTVA). Although not involved in technical training, the Sierra Leone Standards Bureau (SLSB) is involved in training of stakeholders on standard and quality management principles.

The following table shows some of the organisations involved in technical training and their respective roles and responsibilities.

Organisation	Roles and responsibilities
Ministry of Energy	<ul style="list-style-type: none"> • Government agency in charge of policy, vision, strategy, governance structure and monitoring.
Ministry of Education	<ul style="list-style-type: none"> • Government agency with an overarching role of monitoring education.

⁴ Unicef Sierra Leone Statistics, 2017

Organisation	Roles and responsibilities
National Council for Technical, Vocational and other Academic Awards (NCTVA)	<ul style="list-style-type: none"> • It is responsible for policy and curricula development among other roles. • Currently revising technical training curricula at all levels. • It's responsible for accreditation of technical trainees. • Provides accreditation, validation, examination and certification services for all technical and vocational programs in SL. • Monitoring and evaluation of vocational and technical training. • Technical training curriculum development in partnership with the ministry of education.
Barefoot Solar Training Centre	<ul style="list-style-type: none"> • Has been offering solar training with a focus on women. • Its training is accredited by UNIDO and the Ministry of Education. • Barefoot has had a long reputation of rolling out PV in SL. • Has been focusing on women training. Formed Barefoot Women Solar Engineer Association of Sierra Leone (BWSEASL)
Public Vocational Training Institutes	<ul style="list-style-type: none"> • Managed under the Ministry of Education • Created to grapple with the shortage of skilled manpower • Encouraging women and girls training • Certification in in three categories: technical/vocational certificate (T/V certificate); Ordinary National Diploma (OND) and Higher National Diploma (HND).
Private Vocational Training Institutes	<ul style="list-style-type: none"> • Expected to follow the national curriculum just like the public vocational training • Academic awarding is by the National Council for Technical, Vocational and other Academic Awards. • Renewable energy technology is trained alongside other technical trainings. Most institutions will give training depending on technology available to them.
Electricity & Water Regulatory Commission Electricity Generation and Transmission Company (EGTC) & Electricity Distribution and Supply Authority (EDSA)	<ul style="list-style-type: none"> • Recently formed agency to regulate the water and electricity sector. • Carried out licensing, permitting, sector regulation. • Has the power to inspect and penalize. • The two utilities are recently formed from the unbundled National Power Authority (NPA). • EDSA issues licenses for trained electric technicians.
IBIS/Oxfam	<ul style="list-style-type: none"> • Has constructed three solar PV labs for training - Freetown, Magburaka and Kenema. • Actively participating in development of curriculum for solar technicians. • Has trained 26 lecturers with Arizona State University as part of training of trainers program. • Partnering with ECREEE renewable energy and energy efficiency capacity building project. They have been using ECREE curriculum template in their training as there is no standard curriculum developed for the country. • Has been working closely with NCTVA in technician accreditation and certification.

Organisation	Roles and responsibilities
Energy for Opportunity (EFO)	<ul style="list-style-type: none"> • EFO has been conducting solar technical training in rural areas since 2011. • Has an objective of establishing solar electricity courses into the curriculum of higher education institutes by working with higher education institutions and relevant government agencies. • Previous trainings include Kamaso Solar Training Workshop on basic installation, maintenance and operation of the solar system and Gbendembu Solar Training in collaboration with Deng Solar Training Company of Ghana.
ECOWAS ECREEE	<ul style="list-style-type: none"> • Regional center that was established to promote renewable energy and energy efficiency in the West African ECOWAS region. • It engages the industry in capacity building, knowledge management, awareness rising and investment promotion • Regional job specific profile based on 58 tasks across 7 domains
Association of Certified Electrical Technician- Sierra Leone Renewable Energy Association of Sierra Leone (REASL)	<ul style="list-style-type: none"> • Newly formed group by certified electrical technicians. • Has not been active as it is still in the early stages of development. <ul style="list-style-type: none"> • Has been involved in curriculum development. • REASL has an interest in developing full technical training curriculum for solar and other technologies.

Table 13: Roles and Responsibilities of Technical Training Organisations

6.4 Licensing and Qualifications

To develop an effective solar technical training program for Sierra Leone, there is need for a strong licensing and qualification program. This will require strong regulations to govern the training, certification and accreditation process, in order to improve the delivery of products and services in the solar sector and introduce local expertise and professionalism.

Currently, licensing and qualification for solar PV is not centralised and lacks a proper structure. Technical training accreditation is being carried out by the Ministry of Education through the National Council for Technical, Vocational and other Academic Awards (NCTVA) while licensing is done by the relevant agencies, such as the Electricity Distribution and Supply Authority (EDSA) for electrical technicians.

Developing a proper licensing and qualification structure will ensure licensed solar technicians are allowed to design, install, operate and maintain solar PV systems. It will also meet the necessary qualifications in terms of training, skill development and experience. This is best carried out when all stakeholders are involved, from the government, vocational training institutes, the private sector, and academia.

To make effective, relevant stakeholders should ensure the following:

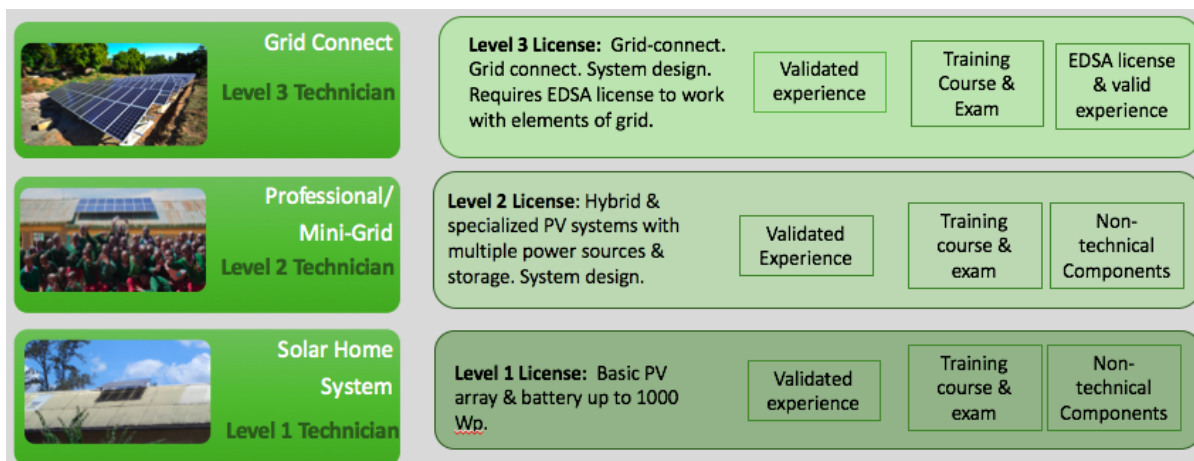
1. A standardised curriculum and a clearly stipulated licencing and accreditation structure for each training level;
2. Accreditation mechanisms for institutions offering solar training courses;
3. Curriculum and courses that are offered in each level should be tailored to meet local demand and cover industry issues and capacity gaps;
4. Carry out a comprehensive training of trainers for each level to ensure there are enough instructors;
5. Provide necessary training equipment and materials to training institutes for each level of technician training;
6. In addition to full term accredited courses, support targeted short courses for private companies, NGOs and stakeholders;
7. Coordinate government and development agencies' solar sector development projects with training support. When projects are being rolled out ensure the capacity building components work is done within the existing training framework; and
8. Target special groups such a women and marginalised communities.

6.4.1 Three level technician training

Licensing and qualification of solar PV technicians is usually carried out in a hierarchical structure according to the solar PV system sizes. This system size and functionality have been used to divide the market into different segments, and this is what can be used to license and accredit different levels of technician qualifications.

1. Level 1 Technician — solar home systems
2. Level 2 Technician — professional/mini-grid systems
3. Level 3 Technician — Grid connect technician

Figure 3: Technician Levels



• **Level 1 Technician**

A level 1 technician is the starting level of solar technician qualification. A licensed technician at this level is entitled to carry out solar PV installation work for small solar systems and/or single battery system of not more than 100W. These are mostly off-grid solar home systems with batteries. For the Sierra Leone solar sector, this technical training level is of high importance for rural electrification. The government, with support from government agencies and donors, is planning installations of more than 300,000 solar home system in the short term. Thus, Level 1 technical capacity technicians will be necessary for the success of such a program as well as electricity access through solar PV in general.

Table 14 shows the necessary qualifications and experience required for a Level 1 technician and some key areas of training.

Technician license class	Qualification and experience	Training components
Level 1 Technician	<ul style="list-style-type: none"> • Mid-level academic qualifications – secondary education, technical or vocational training. • Verifiable experience in solar PV installation over a set period of time. 	<ul style="list-style-type: none"> • Basics of solar electricity • Solar PV components and battery storage technical training • Small solar system installation • System operation and maintenance • Non-technical component: basic business and entrepreneurship training

Table 14: Qualifications and Experience for Level 1 Technician

• **Level 2 Technician**

This is a mid-level solar technician qualification in which qualified technicians can carry out solar PV system installation work for medium systems or multiple battery systems which may include an inverter. The systems can be hybrid or specialised PV systems with multiple power sources and storage. It also includes components of system design for the engineers.

These are technicians for both off-grid and on-grid institutional solar systems and large solar home systems in the excess of 100W. It will also include solar PV and solar hybrid macro-grids

and micro-grids. This level of technical capacity will play an important role in energy access through installation of large off-grid solar PV systems and mini-grid development. Already, Sierra Leone is seeing a growth in mini-grid developments led by the private sector and NGOs. The government and international development agencies have been working to stimulate private-sector led growth in this sub-sector.

The below Table 15 highlights key areas of qualification, training, and experience requirements for a Level 2 technician:

Technician license class	Qualification and experience	Training components
Level 2 technician	<ul style="list-style-type: none"> • Mid to high-level academic or training qualifications — secondary education with technician level 1 training or diploma/relevant college training. • Verifiable solar PV installation experience. Required experience depends on the level of academic qualification 	<ul style="list-style-type: none"> • Feasibility study and system design • Advanced Solar PV components and battery storage technical training • Solar PV hybridization • Non-technical component — basic business and entrepreneurship training

Table 15: Qualifications of Level 2 Technician

• **Level 3 Technician**

This is the highest level of technician qualification that allows for advanced solar PV system installations, including grid connected and hybrid systems. At this advanced level, a technician can carry out installation work for complex grid connected solar system that include other technologies and power sources, such as grid electricity, diesel generator back-up and large battery storage system. They can work with utility scale projects, although this will require additional training.

The on-grid solar market is currently very small in Sierra Leone. However, as observed in other developing markets, as the market grows and the national grid reach increases, the on-grid solar market will start to emerge and level 3 technicians will be highly valued.

Table below shows key areas of training, qualification, and experience requirements for a Level 3 technician:

Technician license class	Qualification and experience	Training components
Level 3 technician	<ul style="list-style-type: none"> • Higher level academic or training qualifications — diploma training with level 2 qualification or electric engineering training. • Verifiable solar installation experience depending on the academic level qualification • EDSA electrical technician licence 	<ul style="list-style-type: none"> • Designing and optimizing grid-tied solar PV systems • Operating and maintaining grid-tied solar PV system • Remote monitoring of solar PV systems <p>Advanced grid-tied solar hybrid systems</p>

Table 16: Qualifications of Level 3 Technician

6.5 Capacity Building Approach

Capacity building and training across the industry is vital for growth in the solar sector in Sierra Leone. It should be done in a way that ensures a comprehensive coverage of the country (both urban and rural areas), a wide availability to reach to all groups (women, marginalised, etc.) and brings technical competence in the industry. Capacity building can be approached either in two ways: a public track approach or a private track approach.

6.5.1 Public track approach

A public track approach is implemented through a standard solar training and curriculum with standardised accreditation and certification structure. It should have the following:

- **Centrally developed curriculum** through collaborative efforts by the Ministry of Education; Ministry of Energy; electricity regulator; National Council for Technical, Vocational and other Academic Awards; training and vocational institutions; Renewable Energy Association of Sierra Leone; and other relevant stakeholders.
- It should be **based on the existing technical and vocational institutes** and continue building the capacity of these institutions enable them to offer solar technical training across the three technician levels.
- **Training of trainers** for public institutions that will be offering technical training. Trainers should be trained across all levels of solar technician training and provided with equipment and tools required for training.
- **Identify training partners** in the country, regionally and internationally. These can be NGOs active in technical training, international development agencies, local and international universities, regional bodies, international solar training institutions, etc.
- **Set training targets** that are aimed at producing minimum number of technicians per technician level to meet the demand and develop technical capacity as the market grows.

6.5.2 Private track approach

The private track approach is implemented through private companies and the solar businesses. It is done through building internal company technical capacity, growing sector technical capacity for market reach and growing the market to expand sales. It can be carried out through:

- **Training of trainers** where technology providers such solar equipment manufacturers give training to trainers on their technology and products.
- **Organizing training workshops** to develop technical capacity internally or for the sector in general.
- **Business mentoring services** offered by international solar companies to small businesses distributing and retailing their products. This also helps linkage-building especially by new companies entering the market.
- **Partnership and collaboration** with the public and private technical and vocational institutions offering solar technical training.

6.6 Tackling key technical issues and capacity building

Training and capacity building should not be limited to classroom discussions. It should be a way of building the solar market in Sierra Leone through real scenarios.

The training programs should be designed to build the market by tackling key technical issues and gaps that inhibit the growth of the industry. Stakeholders should look at the bigger picture when investing in capacity building — building skills, finding clients, building companies and professionalizing the industry. This, in the long run, will lead to market expansion and create jobs for the communities.

6.7 Training Road Map Case Study

This section presents a case study to show how other jurisdictions have developed solar training and capacity building for their industries. Sierra Leone can use some of these experiences when developing its technical training programs.

6.7.1 The Kenyan experience

Case Studies 1 Training Roadmap Case Study from Kenyan Experience

The Kenyan solar market is said to be among the largest and most dynamic among developing countries with the highest per capita rate and a constant growth of over 10% per year over the past decade⁵. Most activities in the market relate to sale of household solar PV systems, mostly pico solar systems and solar home system, accounting for about 75% of total sale. Kenya was the pioneer market for pay-as-you-go (PAYG) solar mainly because of high penetration of mobile money. PAYG solar companies such as M-Kopa, Azuri Technologies and Mobisol have contributed immensely in rural electricity access through the innovation.

With all its accomplishments, the initial development of this market has had its challenges. One challenge has been complaints of underperformance or complete failure of solar systems. This, according to actors in the Kenyan market, was giving solar a bad name and curtailing its growth. The market was facing an influx of sub-standard products, poor workmanship in solar installations, lack of trained and qualified technicians and a lack of a properly laid out quality assurance mechanisms.

Acting upon feedback from stakeholders, and lobbying from the Kenya Renewable Energy Association (KEREAA) and other private sector groups, the Energy Regulatory Commission (ERC) in 2012 prepared and gazetted solar PV and solar water heating regulations. The solar PV regulations are applicable to solar PV system manufacturer, importer, vendor, technician, contractor, system owner, a solar PV system installation and consumer devices. Overcoming this challenge has made the market stronger. The general aim of the regulation was to:

1. Protect end-users from sub-standard solar PV and auxiliary products (i.e. solar inverters and batteries) in the Kenyan market;
2. Promote fair business practices in the solar PV industry;
3. Facilitate collection and maintenance of solar PV industry data; and

⁵ Kenya Energy Regulatory Commission Data, 2015

4. Support enforcement of the Solar PV Kenya Standard

These regulations provided the legal requirement for licensing and qualification of solar PV installers and designers. This requires any person who is involved in the design or installation of the solar PV system to be licensed by the ERC. In addition to that, they provided provisions for licensing of Solar PV manufacturers, importers, vendors or contractors by making it a requirement for any person who import, distribute, promote, sell or install any solar PV system to be licensed by the ERC as a vendor. Furthermore, it was made a requirement for any person who applies to be licensed as a vendor or contractor to have in his employment a licensed Solar PV system technician.

The regulations provide for three classes of solar technician licenses:

1. **Class T1 licence:** entitle the holder to carry out solar PV system installation work for small systems or single battery DC system of up to 100 Wp.
2. **Class T2 licence:** entitle the holder to carry out solar PV system installation work for medium systems or multiple batteries which may include an inverter.
3. **Class T3 licence:** entitle the holder to carry out solar PV system installation work for advanced, including grid connected and hybrid systems.

To be licensed, technicians need to have undertaken a solar training course from accredited training institutions. Qualification and experience for each category is shown on the following table:

Category	Education (Academic)	Professional(Job) Experience
Class T1 licence (Basic)	KCPE, Electrical Govt. trade test 2 and Basic Solar Training	Verifiable two years of solar installation experience
Class T2 licence (Intermediate)	KCSE, Certificate in Electrical and/ or Electronic and Intermediate Solar Training	Verifiable four years of solar installation experience
	KCSE, Diploma in Electrical and/ or Electronic and Intermediate Solar Training	Verifiable two years of solar installation experience
	Bsc Electrical Engineering or relevant degree Or Higher National diploma	One year of solar installation experience
Class T3 licence (Advanced)	KCSE, Diploma in Electrical and/ or Electronic and Advanced Solar Training	Verifiable four years of solar installation experience
	Bsc Electrical Engineering or relevant degree Or Higher National diploma	Two years of solar installation experience

Table 17: Qualification and Experience for the Three Categories of Solar PV Technician Licensing Level

These regulations assisted in the development of a standardised solar technical training curriculum to be used by training institutions. The Kenya National Industrial Training Authority (NITA), an agency within the Ministry of Education, along with ERC collaborated in developing accreditation and certification structures. The curriculum development and harmonization process ended up being a long process that involved stakeholders such as KERIA, training institutes and international development organisations that were supporting the process. It was carried out with an aim of institutionalization of solar PV training in public technical training institutions and standardization of private sector based solar training programs.

Introduction of these regulations has improved the delivery of products and services within the Kenyan solar PV sector. As of 29-05-2017, the ERC register had 342 registered solar PV technicians, majority of whom are in the T3 and T2 category. This is progress, given the earlier estimations of 800-1,000 solar PV technicians working in the Kenyan market with no formal training or certification. These technicians are distributed across the country, which makes it good for serving people living in rural areas.

The initiative has also seen a rise in the number of institutions offering technical training as demand for solar technician license rises. Currently there are about 16 institutions across the country have been accredited by NITA and ERC to offer solar technician training. They include leading universities and technical training institutes. The private sector and international development agencies such as JICA, DfID, DANIDA, World Bank and GIZ have been actively supporting training programs through training of trainers, training sponsorships, workshops and other forms of assistance. A 2012 study by JICA, however, found there is still many training institutions that are not offering solar courses and few instructors who have been trained on solar PV.

SECTION 7

Quality Assurance Roadmap

This section provides a roadmap for Quality Assurance (QA) frameworks that can be adopted and integrated into the Sierra Leone off-grid market. The primary goals of having a QA framework is to help market actors make informed purchasing, investment, and regulatory decisions and to ensure that the systems delivered to end-users operate effectively and as advertised.

The long-term objectives for the Quality Assurance Roadmap are:

- Continued use of fast track process for the approval of pre-qualified solar off-grid products
- Continued assurance that VAT and customs duties exemptions are available for qualified
- Solar product and appliance availability
- Facilitated development of a light-handed environment which incentivizes quality off-grid solar products and that includes
- Best practice quality assurance experiences and partners that can help to implement roadmap.

7.1 Quality Related Gaps and Issues with System Types

7.1.1 Pico Systems

Solar Pico systems are simple systems usually consisting of a single panel, LED light and sometimes a USB port for mobile phone charging. Typically, pico systems are suitable for Tier 1 and Tier 2 of the SE4ALL Multi-Tier Framework on Energy Access⁶. They are available through retailers such as electronic shops, solar providers, hardware and sometimes in kiosks. In a young market like Sierra Leone, some traders also sell systems in an open-air market. Pico systems are affordable especially for bottom of the pyramid customer segment. However, some quality related issues limit market growth and constrain interest from international pico providers. They include:

- **Consumer understanding.** The depth of knowledge on quality pico systems in the market is relatively shallow. In most cases, consumers cannot distinguish a good and bad product. Furthermore, cost-conscious consumers pay little attention to product quality. Most customers do go to retail shops but with no particular brand in mind
- **Low quality equipment.** A handful of certified solar Pico systems are available in Sierra Leone. There is little brand knowledge and reputation.
- **Retailer understanding.** Like other off-grid markets with similar characteristics to those of the Sierra Leone market, retailers are opportunistic and are focused mainly on fast moving pico products with short lives— knowing that customers will be obliged to replace the failed equipment and make a new purchase. It is a self-perpetuating cycle.

⁶ Tiers 1 and 2 provides a basic service level, such as lighting and cell phone charging. Households under these tiers mainly use kerosene or dry cell batteries for lighting.

There is little development in branding and product reputation especially among retailers focused on the Base-of-the-Pyramid (BOP) customer segment.

7.1.2 Solar Home System (SHS)

SHS are similar to pico systems but slightly larger and comprising of more LED lights and more USB ports. The features available with SHS make them suitable for Tier 1 and Tier 2 of the SE4ALL Multi-Tier Framework on Energy Access. Like pico systems, SHS are readily available across different retail shops that stock electronics, hardware equipment and solar products. A majority of these systems are part of the Lighting Africa program and also most PAYG companies are particularly interested in selling SHS products using their business model. The Sierra Leone off-grid market has unique gaps and issues in regard to SHS:

- **Quality of components.** There is non-certified equipment in the market that are often cheaper but of sub-standard quality. No standard is available that preclude specific components of the solar home systems in the market
- **Consumer understanding.** Cost-conscious consumers, especially those at the bottom of the pyramid, pay little attention to product quality. Little awareness in the market on which product is good or bad.
- **Installation & design quality.** Currently, the installation and design quality procedure does not require any particular licensing or quality certification.

7.1.3 Professional / Mini Grid

Mini-grids are considered the most effective approach of providing power to the off-grid communities especially in rural areas where the grid is non-existence. They are cost effective and flexible in integrating different technologies to ensure there is reliable power supply in remote regions. In Sierra Leone, there has been development of several mini-grids—owned and operated by the private sector. The development of community based mini-grids projects is not growing as fast as in other regions. This can be attributed to a number of gaps and issues related to but not limited to quality standards:

- **Quality of components.** No standard is available that preclude specific components of the mini-grid structure in the market
- **Installation standards.** Currently, the installation and design quality procedure does not require any particular licensing or quality certification
- **Safety.** No specific safety regulation has been drafted with regard to operating and maintaining a mini-grid system
- **O&M, spare parts.** As deployment scales up, a key challenge is the post-installation management of the mini-grids to ensure efficient payment collection and reduce operational costs. There is no particular licensing for operations and maintenance procedures. Also, no guideline has been provided on the quality of spare parts to be used in replacing worn-out components.

7.1.4 Grid Connect

Grid electricity in Sierra Leone is very limited to the capital city and a number of commercial towns. Access to the national grid in rural areas is almost non-existent with only 1% of the population having power. Commercial on-grid solar power installations have the potential to contribute largely to the nation's energy ecosystems. Demand for power is growing especially with the economy recovering and large industries establishing themselves in the country. Installations of such large grid connected systems at some point maybe relevant for SL in the Sierra Leone foreseeable future. Currently there as number of gaps and issues that have had an impact on take-off of such kind of systems. They include:

- **Integration with EDSA system.** There is no regulatory framework available in Sierra Leone that comprehensively outline the procedures on the power generated from the commercial on-grid systems can be integrated into the national grid. The issuance of permits and licenses has not been emphasised in government policies and energy strategies.
- **Quality of PV, inverters and BOS.** No specific Quality standards have been implemented with regard to quality of PV modules and other components. Furthermore, no regulations are available to ensure Balance of the system is achieved
- **Safety.** No specific safety regulation has been drafted with regard to operating and maintaining a grid connected system

7.2 Groups to be involved in the Quality Assurance Framework

To succeed in the implementation of the quality assurance standards, combination of efforts from different actors in the public and private space is needed. Integration of efforts must align with appropriate context, such as the level of involvement in the solar off-grid sector, resources and expertise. It is proposed that the following institutions and organisation should be actively involved in the quality assurance framework for off-grid solar products in Sierra Leone.

Organisation	Role & Experience
Ministry of Energy	Policy, vision, strategy, governance structure, monitoring. Rely on approved REASL members for quality.
Ministry of Trade	SLSB reports to MoT. Does not deal with taxes.
Ministry of Finance & Economic Development (MOFED)	Finance Act 2016 gives authority of MOFED to issue duty waivers; Finance Act of 2017 has been approved by Parliament
National Revenue Authority Customs, GST/Domestic Tax Dept	Under MOFED. Deals with taxes. Implementing body for waivers.
Energy & Water Regulatory Commission	Tariffs and licenses for grid and GMG.
SL Standards Bureau	Verify the standards, testing.
SL Import Export Promotion Agency	Collect data, match making.
ECREEE ECOWAS	Assembling standards of member states. Harmonizing.
REASL	REASL membership “entitles” companies to duty waivers.

Table 18: Organisations Proposed to be involved in the Quality Assurance Framework

7.3 Standards & Quality Assurance Ecosystem

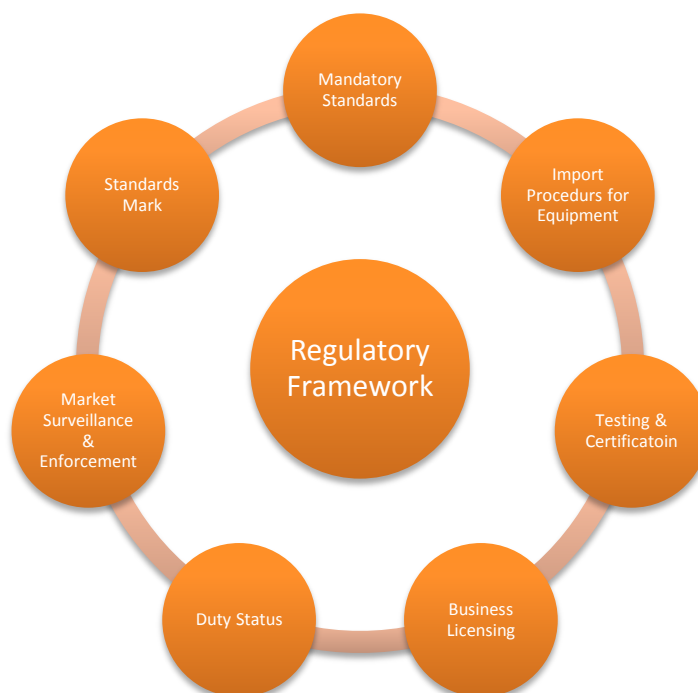
Low quality products and installations undermines consumer and professional confidence in solar technology in Sierra Leone. Potential consumers opt to buy other lighting off-grid products while professionals, especially technicians, lack the technical capacity to install, maintain and

operate a solar system. Therefore, there is a strong need to bridge this gap by ensuring consumers have quality products and improved capacity of solar technicians in the country.

Ideally, consumers should trust both the product and the installer. Consumers should also be able to determine what product best suits them in terms of system reliability and performance. Solar professionals need to have the right skills and technical know-how on the procedures for installing, operating and maintaining the solar system. Furthermore, they must be able to trust the information provided to them by their suppliers. This information must be clear, correct, and address the main requirement demands from a product and withstand comparison. To assist in this quality assurance step, it is essential for the authority and the quality standard implementing agencies to only allow the entry of products that fulfil minimum requirements related to performance, durability, reliability and safety. Only those products should be considered suitable with regard to legal instruments such as e.g. Energy Act of Sierra Leone or incentive schemes.

To address the needs and aspirations of different segments of the population in the Sierra Leone off-grid market, a comprehensive standard and quality assurance regulatory framework ecosystem must be adopted. This is briefly summarised in Figure 4.

Figure 4: Standard and Quality Assurance Regulatory Framework Ecosystem⁷



7.3.1 Mandatory Standards (Sierra Leone Standards Bureau and Ministry of Energy)

The Sierra Leone Standards Bureau working closely with members of REASL should adopt International Electrotechnical Commission (IEC)⁸ specification T/S 62257-9-5 Edition 2.0 and

⁷ Adopted from Ethiopian Standard Agency Off-Grid Solar Photovoltaic Lighting Requirements.

⁸ The IEC technical specification details how products should be tested

Lighting Global⁹ quality standards. The implementation of these standards should be mandatory to sufficiently ensure quality solar products are available to consumers in Sierra Leone off-grid market. The Lighting Global Quality Standards detail the minimum performance requirements and warranty terms and are regularly updated in consultation with the industry as the technology develops. The approach was taken in Kenya which is the most developed market in Africa for off-grid solar products. The ECOWAS community is also in the process of harmonizing their standards with the framework of Lighting Global.

The introduction of the mandatory standards will serve the following purpose:

- **Ensuring the imported solar products are suitable** in quality for Sierra market.
- **Provide a clear regulatory basis** for market surveillance activities targeting illegally imported solar products.
- **Protect consumers** with from buying low quality products.

It should be noted that IEC specification currently covers PV modules, and standards for SHS is currently under development. The specifications for SHS should be incorporated in the Sierra Leone standards when available. The Lighting Global Quality standard framework only covers Pico and SHS and do not cover the Solar PV modules.

7.3.2 Import Procedures for Equipment (Ministry of Trade)

It is proposed that the key technical requirement for imported solar products should provide evidence of compliance with the Lighting Global Quality Standards based on type testing in accordance with IEC T/S 62257-9-5. Using this approach means that the importers of solar products will be allowed to distribute their products after authentication of their certification has been confirmed.

In addition to compliance with the Lighting Global Quality Standards, it is further proposed that additional information should be requested from importers. This information could include serial numbers of products and evidence of purchase from the original equipment manufacturer in order to combat the problem of counterfeit products. Finally, once the import procedures are agreed upon, these should be clearly communicated to other relevant government agencies e.g. National Authority of Revenue, Sierra Leone Standards Bureau and the private sector (solar products importers).

7.3.3 Testing & Certification (Ministry of Trade, National Revenue Authority and SL Bureau of Standards)

It is proposed that in addition to providing evidence of compliance with the Lighting Global Quality standards and based on the testing in accordance with IEC T/S 62257-9-5, a laboratory testing should be conducted by a public or private institution with suitable ISO 17025 accreditation. Lighting Global has a network of Laboratories in Kenya, China, India, USA and Germany that can work closely with public and private sector SL to provide procedures of testing the solar off-grid products. Ethiopia is also setting up Ethiopian Conformity Assessment Enterprise that will conduct the Initial Screening Method, Market Check Method of the solar products. Lighting Global monitors the performance of the laboratories in the network to ensure that tests are being conducted rigorously and consistently. It also proposed that test laboratories outside of the Lighting Global network may also conduct testing to verify whether a product

⁹ The IFC & World Bank Lighting Global Quality Standards detail the required minimum performance requirements and warranty terms.

meets the Lighting Global Quality Standards. However, the lab must carry appropriate accreditations, demonstrate relevant capabilities, and be approved by Lighting Global prior to testing.

7.3.4 Business Licensing

Importation of electronic goods into Sierra Leone is regulated by National Revenue Authority through a mechanism of competency and business certification. The certification issued should be linked to the compliance of the mandatory standards procedures developed by the Sierra Leone Standards Bureau. Once the new certification requirements have been developed, they should be clearly communicated to the private sector by the relevant government agencies to allow solar companies to adopt the new requirements with a timeline that is acceptable.

7.3.5 Duty Status

The government of Sierra Leone Finance Act of 2016 made a law to specify that permanent elimination of import duties for qualifying solar equipment and provides requirement that products should meet IEC global quality standards in order to qualify for tax-free status (harmonised with Lighting Global Quality standards). The GoSL intends to amend the law to include: elimination of Goods and Services sales taxes on sale of quality certified solar products, mandate the Ministry of Energy to establish and maintain the list of qualifying products, implement tax-free status with customs and port officials to enable expedited “green lane” importation for qualifying products.

It is proposed that the duty exemption for qualifying solar products should be implemented. If the mandatory standard status is not implemented or is delayed in implementation, then the duty exemption should be linked to compliance with the Lighting Global Quality Standards. However, once the mandatory standard status is in place such a measure should be redundant as only compliant products should be legally imported.

7.3.6 Market Surveillance & Enforcement

No market surveillance is being done in Sierra Leone and this has allowed sub-standard products into the market. The introduction of a mandatory standard for solar product quality would give a clear mandate to the Ministry of Trade through the Sierra Leone Bureau of Standards to undertake a regular and objective market surveillance. Given the level of relevance and expertise, the Sierra Leone Bureau of Standards should work closely with National Revenue Authority and Ministry of Energy to develop a systematic mechanism for market surveillance. The purpose of the proposed market surveillance will be to:

- **Limit supply of low quality products into the market** by penalising institutions and organisations who fail to adhere to the set mandatory standards; and
- **Regularly verifying that the quality assured products** available in the SL market **perform in compliance with the relevant quality certification.**

These two objectives can be achieved using different approaches. The staff undertaking the market surveillance should have an updated list of all the products with valid Lighting Global Quality Certification. Bureau of Standards should also put in place penalties for importers, distributors, retailers, local assemblers who import, stock or distribute low quality solar products. Before implementing the penalties, clear communication should be made to the private sector as well as to the staff conducting the market surveillance. It is also necessary to conduct testing

for solar products randomly procured in the market. These tests should be conducted in accordance with IEC T/S 62257-9-5.

7.3.7 Standards Mark

The Sierra Leone Standard Mark (SLS Mark) could be used as a powerful tool in assisting the consumers in identifying the quality assured solar products. The Sierra Leone Bureau of Standards should have a department that will be in charge of ensuring the products that have met the mandatory Quality standards bare the SLS mark that is easily visible to the consumers and the surveillance team. In order to raise the profile of the SLS mark and its use in relation to off-grid solar products, it is proposed that consumer education activities should be undertaken. The activities could take two forms:

1. MoE, Sierra Leone Bureau of Standards and REASL work with relevant partners to develop a consumer education and awareness campaign to help sensitize the public about the products bearing the SLS mark.
2. Awareness should be conducted through REASL network of private sector actors.

7.4 Conformity Assessment for Components

This sub-section outlines the suitable quality standards framework for different components of energy access ranging from pico systems to grid-connect commercial systems. The conformity assessments are designed in a way that support development of the Sierra Leone market and energy systems circulating in the market.

7.4.1 Lighting Global Quality Framework

It is proposed that for SHS and pico systems, the Lighting Global quality framework assessment would be ideal. This would test methods and standards, test verification, and communicate quality to the market.

Test methods and standards:

Lighting Global has developed four sets of tests that could be ideal in assessing conformity with regard to Sierra Leone Standards. The four tests include Quality Test Method (QTM), Initial Screening Method (ISM), Market Check Method (MCM) and Accelerated Verification Method (AVM). These methods are faster and less expensive but thorough in testing lighting products. The test method assesses the performance of individual components of the product, such as the LED, battery, and PV module, as well as system-level metrics such as run time, physical ingress and water protection, and durability. A summary of the different tests under the Lighting Global framework are summarised below:

Components Tests	Sampling	<ul style="list-style-type: none"> • Randomly selected from warehouse or marketplace
	Photometrics	<ul style="list-style-type: none"> • Luminous flux (lumens—total light output) • Standardised distribution (illuminance)
	Battery & Charge Control	<ul style="list-style-type: none"> • Battery capacity (amp-hours) • Protection (voltage cut-offs and durability)
	Solar Module	<ul style="list-style-type: none"> • Power output (watts) • Current-voltage characteristics (I-V curve)
System Test	Full-Battery Run Time	<ul style="list-style-type: none"> • Measured using standardised cycle (hours of operation)

	Solar-Charge Run Time	<ul style="list-style-type: none"> • Modelled estimate (daily hours of operation after solar charging)
	Physical Ingress & Water Protection	<ul style="list-style-type: none"> • Incorporates enclosure (IP class) and system level protection (coatings, etc.)
	Durability	<ul style="list-style-type: none"> • Drop test from one meter (pass/fail) • Switch and connector durability • Internal wiring and solder inspection • Lumen maintenance • Battery capacity loss after storage

Table 19: Adopted from Lighting Global Quality Standards Testing Framework

In order for Pico systems in Sierra Leone to be declared, they must meet the mandatory standards. The following requirements should be observed:

- **Truth-in-advertising:** accurate consumer-facing labelling (e.g., rated run time, light output, battery capacity, PV power)
- **Lumen maintenance:** after 2,000 hours, the product’s light output must not drop below 85% of the initial value (alternatively, products may meet this requirement by achieving 95% of the initial light output after 1,000 hours)
- **Battery:** must be durable and adequately protected
- **Health and Safety:** batteries may not contain mercury or cadmium; products are safe
- **Durability and quality:** products are designed and manufactured to avoid early failure
- **Warranty:** products have a consumer-facing warranty with at least one year of coverage
- **Performance Information:** Product packaging reports run time and brightness along with a note about the impact of mobile phone charging

The Quality Standards for SHS kits should be similar but with additional requirements regarding the voltage range of the ports, length of the warranty, information in the user manual, and the ability to replace the batteries should be included.

Testing and verification:

It is proposed that the testing and verification activities should be carried out in accordance with the Lighting Global Test Methods described above. Test activities are currently active in 6 laboratories in the network but additional laboratories are in the process of gaining accreditation. The government agencies that regulate importation of pico and SHS should try to work with the laboratories with the Lighting Global Quality Framework.

Regardless of whether the product submitted for testing has passed or failed, a detailed assessment report should be provided in quantitative and qualitative form and feedback on how the product can be improved especially from a manufacturing perspective. If the product does not meet the Lighting Global Quality standards, Lighting Africa, which is the main regional program in Africa, should work with the manufacturer or the distributor to resolve the issues. The manufacturer and the distributor should be allowed to re-submit the product once the indicated issue in the conformity form has been resolved. Conformity of the Lighting Global Quality standards comes with its share of benefits. A manufacturer or a product distributor who has met the set standards can become a Lighting Africa Associate.

Associates are eligible for business development services and outreach campaigns conducted by the regional programs. Some of the benefits may include:

- **Marketing products** in the associates section on the Lighting Global website.

- **Business development** including guidance on product development based on market, consumer and technical reports, advance access to market trend data and opportunities and after-sales service and maintenance training provided for wholesalers and retailers.
- **Business linkages** through invitation to trade fairs and exhibition, regular notification of the available grants and investment opportunities and business-to-business matchmaking with distributors, and other stakeholders along the supply chain.
- **Consumer education.** Invitation to participate in consumer education and product sensitization and in some extent access to media discounts for advertising consumer related education programs on solar products.
- **Market intelligence.** Access to reports on the sales, marketing distribution of the country, furthermore access to country level report on the available business opportunities.
- **Facilitation of access to finance.** Institutions that conforms to the Lighting Global standards are also are given a chance to network with financial Institutions through affordable credit lines.

Communication:

Whenever a laboratory within the Lighting Global network tests a solar product, the results are provided to Lighting Global. Lighting Global issues a verification letter and Standard Specification Sheet (SSS) for products that have passed the test. These documents are then displayed on the Lighting Global website so that the authenticity of verification letters and specification sheets can be easily checked by any interested party. Other participating parties such as manufacturers of solar products can use the SSS to provide verified performance data to potential buyers. For distributors, bulk-purchasers, and end-users, the SSS offers a trusted resource for performance verification. Lighting Global under the SSS implementation process, conducts awareness campaign about the means of quality verification.

There are a number of methods used by Lighting Global through its regional programs to communicate to the stakeholders. A summary is provided below:

Stakeholder	Communications method
Consumers	Advertising campaigns and consumer education conducted by Lighting Africa programs; SSS and website in cases where consumers have access
Manufacturers	Test reports, SSS, direct outreach by personnel associated with the Lighting Global and regional programs
Distributors, finance and microfinance, retailers, bulk purchasers, NGOs	SSS, website, direct outreach by personnel associated with the Lighting Global regional programs
Governments (e.g., customs officials)	Verification Letters, SSS, website, direct outreach by personnel associated with the Lighting Global and regional programs

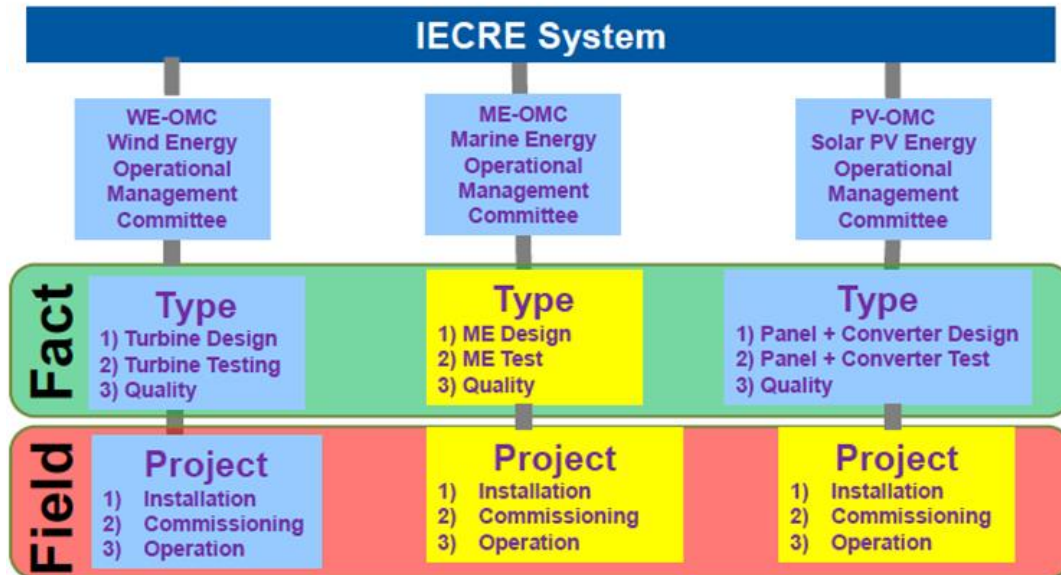
Table 20: Lighting Global Stakeholder Communications Method

7.4.2 IEC Testing for RE Components

IEC Renewable Energy is a conformity assessment system under the IEC. IECRE secures the correct implementation and execution according to selected international standards and certifies plants, equipment and services associated with Renewable Energy Systems. IECRE does not

write standards, this is left to the various technical committees such as TC82 (Solar PV Energy), TC88 (Wind Energy) and TC114 (Marine Energy). For Sierra Leone Grid Connect and Professional / Mini Grid an IEC Testing for renewable energy components is needed. A typical IECRE system is summarised below:

Figure 5: IECRE System



The IECRE system covers three main areas: (1) IEC Wind Energy Scheme, (2) IEC Marine Energy Scheme and (3) IEC Solar Energy Scheme. For the case of Sierra Leone, it is proposed that more emphasis should be on the IEC Solar Energy Scheme.

Conformity assessment for PV systems:

Quality certification and standards for grid-connected solar PV systems are essential for the successful mass-scale implementation of solar technology. It is also imperative to put in place an efficient and rigorous monitoring mechanism, and adherence to these mandatory standards. IECRE has developed a number of quality standards that mainly cover the module quality, system design, installation quality, commission and operations and performance monitoring as indicated in Figure 5 above.

- **Module Quality.** IEC/TS/62941 provides a guideline for increased confidence in PV modules design qualification and approval. The main focus of this quality standard is on the PV-specific manufacturing processes and procedures to ensure quality and consistency. Modules manufactured with IEC standards are likely to perform according to a warranty of over 25 years. IEC has developed factory audits procedures that ensure the solar modules sold to the market have attained the required standards.
- **System Design Quality.** IEC 62548:2016 sets out design requirements for photovoltaic (PV) arrays including DC array wiring, electrical protection devices, switching and earthing provisions. The scope includes all parts of the PV array up to but not including energy storage devices, power conversion equipment or loads. Regulatory agencies in Sierra

Leone who are in charge of monitoring the importation of solar modules in the country should be keen to ensure that the PV system architectures, mechanical designs, safety issues, marking and documentations conforms to IEC 62548:2016 standards. New standard IEC 62738 is under development – Specific to utility-scale plants. Once available it should be incorporated to the mandatory standards of SL.

- **Installation quality.** IEC/TS 63049 provides comprehensive guidelines on the procedures to be adopted when installing a solar PV system. The Quality Standard also provides metric to use in order to ensure consistency in the installation procedures.
- **Commission and operations.** IEC 62446-1:2016 defines the information and documentation required to be handed over to a customer following the installation of a grid connected PV system. It also describes the commissioning tests, inspection criteria and documentation expected to verify the safe installation and correct operation of the system. It is for use by system designers and installers of grid connected solar PV systems as a template to provide effective documentation to a customer. The Ministry of Energy working with other national agencies in SL should inspect PV modules to ensure whether the minimum commission tests and inspections criteria have been met, minimum documentation to verify safe installation and operations as prescribed in the IEC 62446-1:2016.
- **System Maintenance.** IEC 62446-2:2016 highlight procedures that should be adopted by system designers and installers in providing maintenance services. It includes preventive and corrective maintenance procedures; safety-related and performance related procedures as well as the trouble shooting and proper documentation of the results.
- **Performance Monitoring.** Expanded series of standards covers a number of key elements in performance monitoring:
 - ✓ 61724-1 details system monitoring procedures
 - ✓ 61724-1 covers capacity evaluation methods
 - ✓ 62724-3 highlight energy evaluation methods

Most of these standards under the IECRE are being revised to a 2017 version which are due to changes in technology, services and market dynamics. Generally, for grid-connected systems in Sierra Leone to have lifetime operation and performance, there is a need to conform to international standards, which in this case is the IEC standards.

6.5 Case Studies

The following are three quality assurance practice case studies from which Sierra Leone can benefit from. The case studies cover quality assurance practices in Kenya, Ethiopia and Bangladesh, all developing renewable energy markets that have seen exponential growth in the last 10 years.

6.5.1 Kenya

Case Studies 2 Quality Assurance Practices from Kenya

Kenya is considered as one of the most dynamic and well-developed markets for solar products in Africa. In 2016, Lighting Global reported that close to 1 million Lighting Africa Verified pico systems were sold in the Kenya market. Although data on PV sales is not

mentioned explicitly, the market is quite active and growing at a rate of 15% annually. The private sector is the main driver for this growth and it is expected to remain the same with the government coming in as the market regulator. As the solar space in Kenya develops, the market has become competitive providing consumers with a variety of equipment and supplier choices at lower prices. Secondly, there has been a remarkable improvement in technology, which has been coupled with a dramatic drop in prices of inverters, batteries and modules. Thirdly, the government is putting more effort in licensing and regulating the market while at the same time there has been a great deal of support coming from donors, development agencies and finance institutions. Finally, as the market evolves, businesses in the sector are developing market niches through specialised solutions such as embedded systems for captive and utility-scale on-grid systems. The market is shifting towards on-grid, something that can be attributed to growth in appetite for commercial and institutional solar systems and the fact that different financing options are now available to both the developers and end-users. Most solar PV providers are now aware of the market opportunities in the on-grid sub-sector, and some companies are now just concentrating on this market. The positive trend to develop solar technology has prompted need for further regulation through standards in the sector in order to promote the growth.

It has not always been smooth sailing for the Kenyan off-grid market. In the late 1990s, a number of barriers initially slowed down the growth of the market. They included:

- ✓ Complexity and inconsistencies in the regulation of the market
- ✓ Influx of poor quality products
- ✓ Low consumer awareness on good and bad products
- ✓ Limited financing for solar companies

All of these barriers have since been addressed through the efforts of the government, private sector, donors and multi-lateral development agencies. Given the vital importance of addressing the needs of the private sector solar companies and consumers, mainly with regard to quality and affordability of solar products, the government has adopted a number of international standards framework, namely Lighting Global Quality Standard and the International Electrotechnical Commission quality standards. These frameworks have supported the dissemination of good quality products while restricting dissemination of poor quality products.

Kenya Quality Standards

The process of PV standardization and quality assurance began in 1999 but it was not until 2003 when the first standard was published. A Renewable Energy Technical Committee was formulated to work on the standards and members of this team later formed Kenya Renewable Energy Association (KREA) in 2002. The market needed quality standards for solar products owing to the fact that:

- There was proliferation of substandard PV products leading unfair competition
- Bad experience from consumers who had adopted the PV technology leading to market spoilage
- Need to give customers confidence in their products in terms of reliability, safety & durability.

While the market is driven mainly by the private sector, the government was needed. There was a need to protect consumers from low quality products and a need for standards for procurement purposes in implementing the rural electrification programs. This was taken up by the government.

To date, Kenya has over 72 active standards with 32 of them adopted from IEC. ISO/IEC Guide 21-1: 2005 forms the basis of Kenya Bureau of Standards procedure for adoption of international standards and adoption of ISO/IEC directive Part 2 has facilitated the process. Categories covered under the IEC in the Kenyan context include: performance; product; testing, sampling and analysis; pre-installation; installation; operation & maintenance. These standards are mainly used in:

- Implementation of KEBS certification scheme;
- Support the PVoC (Pre-shipment Verification of Conformity) scheme; and
- Supporting government legislation- Solar PV regulations gazetted in 2012.

Kenya Bureau of Standards (KEBS) works closely with other state institutions including the Energy Regulatory Commission and Kenya Revenue Authority to ensure the solar products manufactured, imported, and distributed into the Kenyan market meet the set minimum standards.

Other quality standards that have been largely adopted in Kenya is the Lighting Global Quality Standards. Lighting Global through its regional program Lighting Africa implemented a Quality Standards procedures in Kenya in 2007. The main goal of implementing the program was to mobilize and provide support to the private sector to supply quality, affordable, clean and safe lighting to millions of households in Kenya by facilitating the sale of off-grid lighting units while, at the same time, creating a sustainable commercial platform that would realize the vision of providing millions of people with modern off-grid lighting products by 2030 across Kenya and Africa in general. To date, Lighting Africa has closely worked with different government agencies in incorporating the Lighting Global Quality framework to Kenya minimum standards. Furthermore, Lighting Africa has gone further in involving the newly formed county governments in the implementation of the quality standards.

Outcomes

- ✓ Standards have facilitated the deployment of PV technology in Kenya
- ✓ Quality-verified products represent roughly 50% of the solar market in Kenya (this based on Lighting Africa Research)
- ✓ Increased financing from donors and development agencies
- ✓ Brand reputation and new market entrants
- ✓ New cheap credit lines have been rolled out by a number of financial institutions
- ✓ Innovative business models including the PAYG model that has been widely used by solar companies such MKOPA, Azuri Technologies and Mobisol.

Lessons to be learned from Kenya

- ✓ Ensuring quality control is a key part of consumer protection and achievement of overall access objectives.
- ✓ Coordinated effort is needed from different government agencies
- ✓ To successfully implement the standards, there is also a need to work with the local governments - in this case the county governments
- ✓ The Quality Standards formulated should be clearly communicated to the private sector.

6.5.2 Ethiopia

Case Studies 3 Quality Assurance Practices from Ethiopia

Ethiopia has the second most active off-grid market in Africa after Kenya. Between 2003 and 2007¹⁰, about 3 million solar lanterns and 150,000 solar home systems (SHS) were disseminated/sold in the market. In 2013, nearly 400,000 pico solar units were distributed. In 2014, over 350,000 PV modules were sold. These market values are nearly US\$9.7 million and US\$9 million, respectively. Recent statistics by Lighting Global estimated over 600,000 pico units were sold into the market. While the market was initially concentrating on off-grid markets for energy access, the focus has been shifting to embedded power on-grid markets in the recent past mainly in residential and commercial sectors.

There have been several government-led initiatives for off-grid household solar technologies. Still, the informal unregulated market outstrips the formal, approved quality market, especially for low cost LED and lighting products. Virtually all low-cost products are sold over the counter, with almost no market in Pay-As-You-Go (PAYGO) solutions. Generally, the solar market has been increasing and the government is stepping in to regulate the market through implementation of minimum equipment standards.

Ethiopia Quality Standards

The Ethiopian Standards Agency (ESA) adopted IEC T/S 62257-9-5 as a Voluntary Ethiopian Standard in October 2013. However, the adopted standards did not ensure quality products were being sold into the market. Furthermore, the implementation of new standards, testing and approval procedures lacked clarity and had adversely burdened importers with extra procedures, costs and considerable delays at customs. The Government moved to work with the Lighting Global to improve the regulatory environment. In order to send a clear message on the quality of solar products that should be imported and distributed, the government adopted the Lighting Global Quality standards and made them mandatory through the development of a mandatory Ethiopian Standard while also referencing the IEC T/S 62257-9-5. Currently the standards are being implemented by Ethiopian Standards Agency in close consultation with Ethiopian Energy Authority.

Ethiopia is also working with Lighting Africa Program to establish an Ethiopian Conformity Assessment Enterprise (ECAE) in Addis Ababa, to act as one of the laboratories among the network of Lighting Global Labs of testing the quality of solar products.

Outcomes

- ✓ Market share of quality-verified pico-powered lighting systems has dramatically increased
- ✓ Quality verification has contributed strongly to decisions at several core points of the supply chain
- ✓ Increased awareness about quality products
- ✓ Availability of choices for consumers especially for Bottom-of-the-Pyramid (BOP) segment

¹⁰ Lighting Africa Program: Ethiopia Market Intelligence

- ✓ Brand building companies
- ✓ Increased financing from development agencies and donors

Lessons Learned from Ethiopia

- ✓ Ensuring quality control is a key part of consumer protection and achievement of overall access objectives.
- ✓ Lighting Global is positioned to work with governments to improve the quality standards and also conduct awareness campaigns.
- ✓ To ensure products distributed in the market are of good quality, the standards should be listed as Mandatory.

6.5.3 Bangladesh

Case Studies 4 Quality Assurance Practices from Bangladesh

Bangladesh has the largest off-grid solar market in the world and has been growing rapidly in the last decade. Bangladesh has significantly more SHS than Africa due to a very successful, long-running implementation program, with around 4 million SHS installations in place as of April 2016. A report by Power for All estimated that there are over 46 registered solar companies selling quality solar products.

In addition to the positive growth largely driven by the private sector, the government has taken keen interest in recognizing small-scale solar PV as part of a ‘package’ of solutions for electrifying off-grid and under-electrified consumers. This is by use of broad energy policies, which fully define how off-grid approaches contribute to rural electrification. Furthermore, the government established the Infrastructure Development Company Limited (IDCL), a non-bank financial institution that finances renewable infrastructure projects. IDCL is credited for establishing a QA framework that has greatly driven the success of solar market in Bangladesh.

Bangladesh Quality Standards

IDCL solar program was launched in 2003 as part of the Rural Electrification and Renewable Energy Development Project (REREDP) of the World Bank. Currently, the program is operational only in regions recognised as off-grid by the government of Bangladesh—covering approximately 17 million off-grid households. So far, the program has invested over US\$600million since 2015 and billions more are expected before the end of 2017. Only SHS are supported in the program as the government considers households using SHS as electrified.

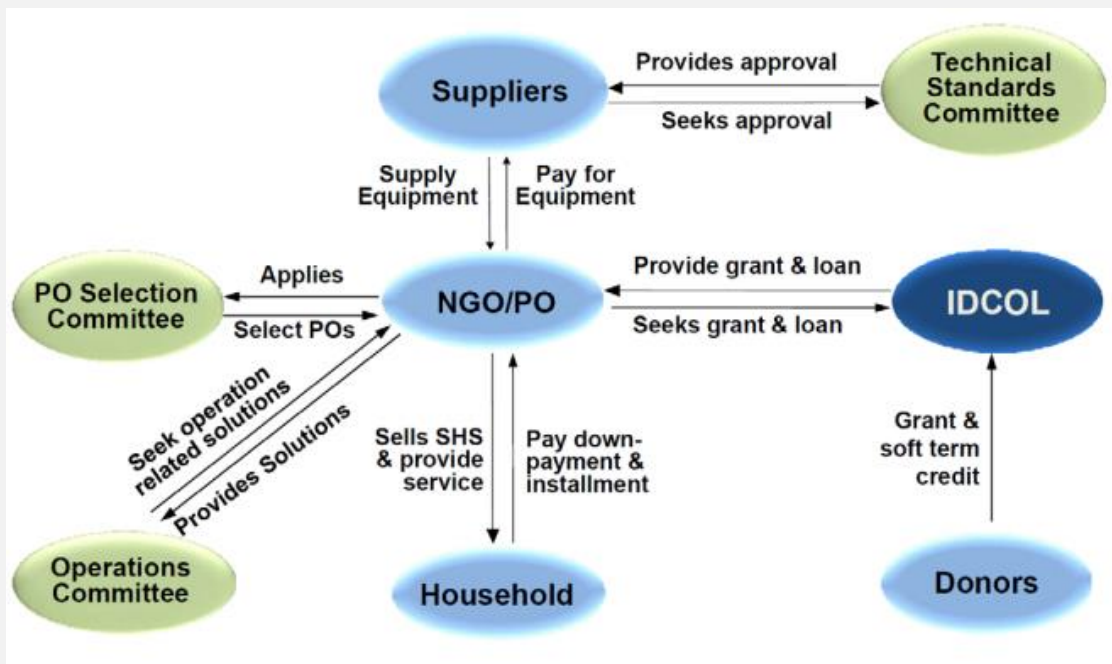
IDCL program has a quality assurance approach that is principally designed to operate in the context of Bangladesh off-grid market. The QA framework combines testing of SHS components and financing for approved packages with field inspections of selected installed systems and strong and enforceable warranty requirements. The use of component testing and restriction of financing for approved SHS packages helps ensure that systems sold meet a basic set of component quality and system design requirements. Furthermore, IDCL use of some strong and enforceable warranty requirements, reduces the need for more comprehensive product testing, since manufacturers of solar products must deliver high quality in order to avoid the cost of servicing a significant number of warranty returns. Field

inspections of installed systems round out the framework, as SHS vendors know that at least some of their installed systems will be inspected to evaluate compliance with IDCOL requirements.

Other key features of IDCOL QA framework:

- ✓ Support rural electrification goals by delivering concessional finance to off-grid consumers to install SHSs and supporting the sustainability of the installations through a QA framework.
- ✓ It is a component based testing. Each SHS component has to be tested before being used in the IDCOL financed SHSs. Five percent of newly installed systems are inspected before funds are disbursed.
- ✓ SHS specifications developed specifically for use in Bangladesh for the IDCOL SHS Program. PV modules are evaluated using IEC standards just like Kenya and Ethiopia.
- ✓ Technical inspectors are employed from all over the country to regularly inspect SHSs. An independent audit is also conducted annually to inspect the SHSs available in households and suppliers' shops.
- ✓ A range of minimum warranties are required for each component including at least 20 years for PV module power output, 3 or 5 years for batteries, and 3 years for charge controllers and LED lights
- ✓ IDCOL also provides training and marketing and monitors the implementation of the program, mainly the quality assurance component.

Figure 6: IDCOL Solar Home System (SHS) Program Structure



The approach can be said to be logical for the Bangladesh market, given IDCOL's position in the sector and the limited geographic extent of the market. It has had substantial success in supporting the development of markets for off-grid solar systems. In this case, an effective quality assurance framework has proved to be an essential element of this success.

Outcomes

- ✓ Market share of quality-verified solar home systems has dramatically increased since 2003
- ✓ Increased in financing from multilateral agencies/donors (such as the World Bank) to the Government of Bangladesh and then to IDCOL
- ✓ More solar suppliers entering the off-grid market
- ✓ Increased awareness on the quality of solar products

Lessons to be learned from Bangladesh

- ✓ Needs to have a standard that is contextualised to suit the country structure.
- ✓ There is a need to have a coordinated effort to successfully implement Quality Standards.

Annex 1 Terms of Reference

TERMS OF REFERENCE (ToR): **TECHNICAL ASSISTANCE TO THE RENEWABLE ENERGY** **ASSOCIATION OF SIERRA LEONE (REASL)**

Background

1. The UK government signed the first Compact Agreement under its Energy Africa Campaign with the government of Sierra Leone (GoSL) at The Energy Revolution Event held in Freetown, Sierra Leone on May 10, 2016. The primary objective of the Compact is to put Sierra Leone on the path to universal energy access through market-led accelerated adoption of renewable energy.
2. Energy access in Sierra Leone today stands at less than 10% in urban areas and less than 1% in rural areas. The Compact is being implemented by the Sierra Leone Ministry of Energy (MoE) and the UK Department for International Development (DFID). The Compact has immediate goals of:
 - a. Working with government agencies for improved transactional processes that will enable renewable energy businesses in Sierra Leone to import and install 50,000 units of small solar home systems for lighting and mobile charging by the end of 2016 and 250,000 units by the end of 2017.
 - b. Mobilizing government, NGO and private sector stakeholders for the development of an efficient renewable market in Sierra Leone.
3. A significant outcome of the Compact campaign is the formation of the Renewable Energy Association of Sierra Leone (REASL), a trade association focused on the development of an efficient and thriving renewables market in Sierra Leone. REASL is in its formative stage and has set itself the following goals:
 - a. Represent the renewable energy industry to government, consumers and other stakeholders through advocacy, lobbying and marketing.
 - b. Educate consumers, GoSL, financial sector decision makers and other renewable energy stakeholders on the economic, social and environmental benefits and issues around renewable energy adoption into the national energy market.
 - c. Proactively work to hasten the uptake of affordable, safe and reliable renewable energy products that meet international standards in Sierra Leone.
4. REASL is a new organisation that has a membership consisting mostly of new small businesses. It needs financial and technical support to be able to perform to scale and

accomplish the ambitious national goals it has set itself. As part of its ongoing commitment to the Energy Africa campaign, DFID has agreed to provide technical assistance in order to:

- a. Establish efficient operational structure and processes for REASL; and
- b. Establish connections and build awareness amongst supportive international investors and funding organisations.

Technical Assistance activities:

5. The TA Provider will:
 - a. Identify and shortlist the most relevant international renewable energy industry partners, for REASL to support delivery of its objectives. This may include the Global Off-Grid Lighting Association (GOGLA), manufacturers, EPCs, investors and others;
 - b. Identify and shortlist the most relevant international and national renewable energy, Climate Change and Sustainable Development institutions and interest groups that are well placed to support REASL and its objectives. This may include the Energy Revolution Taskforce, IFC Lighting Africa, World Bank and others.
 - c. Identify the information and data requirements of REASL and key stakeholders and propose efficient management systems and processes to meet requirements.
 - d. Develop an efficient regime for collaborating with Standards Bureau for establishing, monitoring and enforcing the minimum quality standards for renewable energy equipment that is imported into the country for resale.
 - e. Develop training needs and curricula in renewable energy in partnership with recognised technical training institutions.

Outputs from the TA Provider

6. The TA Provider is expected to deliver the following outputs which should be reviewed by the TA Facility Supplier prior to submission to REASL and DFID:

Day 14 (Working Day 10)	A report recommending the most appropriate partner institutions together with short and medium term sources of funding to support REASL’s activities
Day 28 (Working Day 15)	A set of procedures, databases and forms that capture REASL’s information requirements.
Day 35 (Working Day 18)	A set of minimum standards for all categories of RE equipment and a procedure for collaborating with Standards Bureau for monitoring and enforcing minimum standards
Day 42 (Working Day 25)	A training Needs Analysis Report and a set of training curricula developed with and approved by GoSL recognised training institutions.

DFID Coordination

7. The client for this technical assistance in the Renewable Energy Association of Sierra Leone (REASL).

8. The TA Provider will be contracted and work jointly with the TA Facility Supplier. Both the TA Provider and the TA Facility Supplier will be providing services under the CEIL PEAKS Contract which is managed by DFID Africa Regional Department's (ARD) Programme Manager. Outputs will be reviewed and approved by DFID country office adviser on Energy Africa, who will co-ordinate with REASL.

Budget

9. The TA Provider is expected to provide the services outlined in these terms of reference within 25 consultant days at the appropriate rates as negotiated under the CEIL PEAKS Contract.
10. If the TA Provider is not based in Sierra Leone, travel to the country is required and expenses relating to up to two country visits of one consultant may be charged to this assignment. The TA Provider must follow DFID policy on travel and expenses and make their own travel and transport arrangements.

Required Expertise

11. The **TA Provider** should have a total of at least 10 years' experience in international development and proven expertise in the following areas:
 - a. Sierra Leone country experience
 - b. Renewable energy industry, equipment quality standards, training, policies, regulations and institutional arrangements, particularly household solar energy
 - c. Management systems and capacity building
 - d. Private sector development

Contract Management

12. The TA Provider will be contracted by and report to the TA Facility Supplier.

Responding to the ToR

13. In responding to these terms of reference, interested consultants should:
 - e. Provide a CV and covering letter outlining their experience and ability to provide the TA services required;
 - f. State their availability for conducting the TA services;
 - g. Provide a budget for the in-country visit and travel expenses in accordance with DFID's travel policy;

Duty of Care

14. The TA Provider is responsible for ensuring appropriate safety and security briefings for all of their Personnel working under this Contract and ensuring that their Personnel register and receive briefing as outlined above. Travel advice is also available on the FCO website and the TA Provider must ensure they (and their Personnel) are up to date with the latest position. In case of a situation where new security information, which is not in the public domain or would not be easily obtained by the TA Provider, is made known to DFID, a named person from the contracted organisation should be responsible for being in contact with the HTSPE Ltd and IMC Worldwide Joint Venture to ensure information updates are obtained. There should be a process of regular updates so that information can be passed on (if necessary). This named individual should be responsible for monitoring the situation in conjunction with the HTSPE Ltd and IMC Worldwide Joint Venture.
15. The TA Provider is responsible for ensuring that appropriate arrangements, processes and procedures are in place for their Personnel, taking into account the environment they will be working in and the level of risk involved in delivery of the Contract (such as

working in dangerous, fragile and hostile environments etc.). The TA Provider must ensure their Personnel receive the required level of training and safety in the field training prior to deployment.

16. Tenderers must develop their Tender on the basis of being fully responsible for Duty of Care in line with the details provided above and the initial risk assessment matrix prepared by DFID (see **Annex 2** to this Terms of Reference) or any other information provided by the HTSPE Ltd and IMC Worldwide Joint Venture with this ToR. They must confirm in their Tender that:

- a. They fully accept responsibility for Security and Duty of Care.
- b. They understand the potential risks and have the knowledge and experience to develop an effective risk plan.
- c. They have the capability to manage their Duty of Care responsibilities throughout the life of the contract.

They will give responsibility to a named person in their organisation to liaise with the HTSPE Ltd and IMC Worldwide Joint Venture and work with the HTSPE Ltd and IMC Worldwide Joint Venture to monitor the security context for the evaluation

17. If you are unwilling or unable to accept responsibility for Security and Duty of Care as detailed above, your Tender will be viewed as non-compliant and excluded from further evaluation by the HTSPE Ltd and IMC Worldwide Joint Venture.

18. Acceptance of responsibility must be supported with evidence of capability (no more than 3 A4 pages) and the HTSPE Ltd and IMC Worldwide Joint Venture reserves the right to clarify any aspect of this evidence. In providing evidence Tenderers should consider and answer yes or no (with supporting evidence) to the following questions:

- a. Have you completed an initial assessment of potential risks that demonstrates your knowledge and understanding, and are you satisfied that you understand the risk management implications (not solely relying on information provided by the HTSPE Ltd and IMC Worldwide Joint Venture)?
- b. Have you prepared an outline plan that you consider appropriate to manage these risks at this stage (or will you do so if you are awarded the contract) and are you confident/comfortable that you can implement this effectively?
- c. Have you ensured or will you ensure that your staff are appropriately trained (including specialist training where required) before they are deployed and will you ensure that on-going training is provided where necessary?
- d. Have you an appropriate mechanism in place to monitor risk on a live / on-going basis (or will you put one in place if you are awarded the contract)?
- e. Have you ensured or will you ensure that your staff are provided with and have access to suitable equipment and will you ensure that this is reviewed and provided on an on-going basis?
- f. Have you appropriate systems in place to manage an emergency / incident if one arises?

Annex 2 List of Stakeholders Consulted

Department	Stakeholder	Contact Details
Ministry of Energy	Eng Bengamin Kamara, <i>Director of Energy</i>	Tel: +232 76 369538 E: benshinoh@gmail.com
Ministry of Energy	Robin F Mansaray, <i>Head Renewable Energy</i>	Tel: +232 76 574842 E: robinmans2014@gmail.com
Energy for Opportunity	Simon Willens,	Tel: +232 76 506753 E: simon@energyforopportunity.org
SL Standards Bureau	Ing. James Saio Dumbuya, <i>Executive Director</i>	Tel: +232 78 334134 E: jamesaiodumbuya@yahoo.com
Welt Hunger Hilfe	Xavier Castellvi, <i>Head of Project</i>	Tel: +232 99 103043 E: xavier.castellvi@welthungerhilfe.de
UNOPS	Nick Gardner, <i>Country Manager</i>	Tel: +232 30 914073 E: nickg@unops.org
USAID, Power Africa	Rockefeller Herisse	E: rherisse@usaid.gov
CTI	Hugh Fraser	Tel: +232 78 934083 E: hkfraser@kpmg.com
SOBA	Alba Topulli, <i>Renewable Energy Policy Advisor</i>	Tel: +232 78 8890890 E: alba.topulli@sobasf.org
Oxfam IBIS	Kevin Johnstone, <i>Renewable Energy Sector Lead</i>	Tel: +232 78 376721 E: kevin@ibissierraleone.org
IFC Lighting Africa	Nana Nuamoah Asamoah-Manu, <i>Program Lead for Lighting Africa Kenya</i>	Tel: +254 720 788 999 E: nasamoahmanu@ifc.org
Energy4Impact	Shashank Verma, <i>Head of Advisory Services</i>	Tel: +254 20 2714 165 E: shashank.verma@energy4impact.org

Annex 3 List of REASL Members

Name	Organisation	Email
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Alexandre Touew Alie Lamin	Easy Solar	alex@easysolar.sl
Asteway Yigenu Chernor Jalloh	Supreme Ventures Aptech Africa Ltd	lamin.alie@gmail.com asteway@aptechafrica.com
Dilip Narwani	Energy for Opportunity	jalloh@energyforopportunity.org
Eugene Tani-Luke Foday Suma	Insons World Hope International	dilipnarwani@yahoo.com eugene@mobile-power.co.uk
Jonathan Jonah Kofie Macauley MAHMOUD Kargbo Muctarr Turay	FLS Group (SL) Ltd Energy Efficient Solutions	foday@flsgroup.sl jo_jonah@yahoo.co.uk
Rene Bangura	SERL	kofie.macauley@camserv.dk
Sam Zoker	Ignite	mahmoudkargbo80@gmail.com
Sophie Johnson Wordsworth S Cole	Sinergy SL Helios Solutions	muctarr@sinergysl.com reneb_14@hotmail.com
	Energen WAO	sam.zoker@wao-grud.com
	Solar Era	sophie@solarera.eu
	Bbox SL LTD	wcole@bbox.sl

Annex 4 Questionnaire Insights on the Role of REASL

N =12

Q1: Please rank what should be the most important roles of REASL? Rank from 1-7, 1 being most important and 7 being least important.

Rank	Roles	Majority (%)
1	Lobbying for policies and regulations	81%
2	Improvement of quality/standards regime for products in Sierra Leone	54%
3	Networking opportunities	45%
4	Updates on Renewable Energy trends in Sierra Leone	27%
5	Training opportunities	36%

6	Market data information	18%
7	Linkage to financing	27%

Q2: In your opinion, does REASL need to establish a secretariat with operational staff?

Level	Majority (%)
Strongly Agree (100%)	100%
Agree	0%
Neutral	0%
Disagree	0%
Strongly Disagree	0%

Q3: Part of REASL's role is information gathering and knowledge sharing. Indicate what is the most important to least important?

	Most Important	Important	Neutral	Not Important	Least Important
Access to market and policy information		54%			
Consumer awareness of renewable energy technology		63%			
Funding opportunities	36%		36%		
Partnership opportunities with industry actors		63%			
Training and capacity building		45%			

Q4: In representing the renewable energy industry in Sierra Leone, which is the most important for effective change? Indicate what is most important to least important, 1 being the most important and 3 being the least important.

Rank	Action	Majority (%)
1	Lobbying: Government, donors and other players to support renewable energy	54%
2	Marketing: helping create opportunities in the renewable energy sector for members	36%
3	Advocacy: raising awareness of renewable energy to all Sierra Leoneans	54%

Q5: Of the below activities offered to members, indicate which would be viewed as most valued to least valued by your organisation. Rank as 1 being the most valued and 6 being the least valued.

Rank	Activities	Majority (%)
1	Policy & Regulatory Support	45%
2	Market Intelligence	27%
3	Access to Finance	18%
4	Business Development Support	27%
5	Quality Assurance	27%

6	Capacity Building	45%
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Q6: What is the most realistic way for REASL to be financed? (Select one)

Rank	Finance Option	Majority (%)
1	Membership Fees & Services in the RE sector	36%
2	Donor Grant Finance	27%

Q7: Please indicate how the following barriers effect the growth of the renewable energy sector.

	Major Barrier	Slight Barrier	No Effect on Market	Minor Barrier	No Barrier
Poor quality of equipment services		54%			
High price of equipment	54%				
Undeveloped government policy	54%				
Unavailability of finance to consumers and dealers	72%				
Poor capacity of market players		72%			

Q8: What types of training and capacity building does the sector require? Indicate which are most important and which are least important.

	Very Important	Important	Neutral	Not Important	Least Important
Technical vocational training on solar technology	63%				
Business development support		45%			
Development of finance schemes	63%				
Product development			54%		
Supply chain development		63%			
Administration / Operation Management			45%		

Q9: Which renewable energy sub-sector/technology should REASL be involved in. Rank from the most important to the least important.

	Very Important	Important	Neutral	Not Important	Least Important
Pico and Solar Home System	90%				
Mini grids	81%				
Grid connected solar	45%				
Improved stoves		36%			
Bio gas		54%			
Hydro		36%			

Q 10: What do you think are the main challenges & opportunities in the market in Sierra Leone in the renewable energy sector? Also, how can REASL be more effective in growing the renewable energy sector in Sierra Leone?

Question	Respondent	Answer
Challenges	#1	Finance; efficient coherent government policy; poor national business infrastructure (internet, telecom, banking services, etc)
Opportunities		Untapped market; growing global/donor/government focus on energy access, environmental damage from energy use and poverty reduction that may lead to structured support facilities for RE businesses.
Increase Effectiveness		Have a competent full-time executive secretary to manage and focus its activities; establish linkages to positive stakeholders.
Challenges	#2	Finance
Opportunities		N/A
Increase Effectiveness		N/A
Challenges	#3	Poorly Informed Market/Consumers
Opportunities		Still a large market to penetrate
Increase Effectiveness		N/A
Challenges	#4	Policy environment and access to finance
Opportunities		Strong demand for energy of any sort/type of generation
Increase Effectiveness		Private sector to mobilize adoption of renewable technologies
Challenges	#5	Financing
Opportunities		A virgin Market
Increase Effectiveness		A very high political commitment shown
Challenges	#6	Recruiting quality, well-trained staff (technical and operational); legal advice on operating in country; poor mobile money penetration
Opportunities		Few mature market players; mobile money expansion
Increase Effectiveness		Regular knowledge-sharing events and webinars (regulatory environment, market intelligence, funding and training opportunities etc).
Challenges	#7	Poor knowledge on renewable products due in part from poor quality products. Low public awareness and access to finance to both suppliers and consumers. NGOs with donor financing distorting the market.
Opportunities		Market is virgin and there is huge donor interest in developing the RE sector in the country
Increase Effectiveness		If mandated to qualify every RE product for conformity to IEC specs, highly trained staff and financial support to mitigate bad sales especially for the SHS and Pico
Challenges	#8	Lack of strong quality standards for products, the high price of products due to the general economic situation in the country, lack of well trained and professional manpower

Opportunities		Good level of awareness among the population, lack of electricity coverage, availability of renewable resources abundantly, willingness of the government to diversify energy and opting for renewable energy
Increase Effectiveness		Strengthen REASL into a strong institution, solicit for funds from members through some paid up services, from donors, from membership fees, etc, be represented in government's relevant line ministries, actively receive feedbacks from its members and protect members from bureaucratic sabotages and corruptions
Challenges	#9	Policies / Finance
Opportunities		Raw Market
Increase Effectiveness		Services

Annex 5 List of Respondents Targeted for the Questionnaire

Below is the list of intended respondents for the questionnaire. They have been color-coded into who responded and who did not respond.

	Name	Email	Organization	Replied
1	Alexandre Touew	alex@easysolar.sl	Easy Solar	NO
2	Alie Lamin	lamin.alie@gmail.com	Supreme Ventures	YES
3	Asteway Yigenu	asteway@aptechafrica.com	Aptech Africa Ltd	YES
4	Chernor Jalloh	jalloh@energyforopportunity.org	Energy for Opportunity	NO
5	Dilip Narwani	dilipnarwani@yahoo.com	Insons	YES
6	Eugene Tani-Luke	eugene@mobile-power.co.uk	World Hope International	NO
7	Foday Suma	foday@flsgroup.sl	FLS Group (SL) Ltd	NO
8	Jonathan Jonah	jo_jonah@yahoo.co.uk	Energy Efficient Solutions	NO
9	Kofie Macauley	kofie.macauley@camserv.dk	SERL	NO
10	Mahmoud Kargbo	mahmoudkargbo80@gmail.com	Ignite	NO
11	Muctarr Turay	muctarr@sinergysl.com	Sinergy SL	YES
12	Rene Bangura	reneb_14@hotmail.com	Helios Solutions	NO
13	Sam Zoker	sam.zoker@wao-grud.com	Energen WAO	YES
14	Sophie Johnson	sophie@solarera.eu	Solar Era	NO
15	Cole S Wordsworth	wcole@bbox.sl	Bbox SL LTD	NO
16	Ghulam Sherani	ghulam.sherani@undp.org	UNDP	NO
17	Nick G	nickg@unops.org	UNOPS	NO
18	Ioannis Papageorgiu	ioannis@unops.org	UNOPS	NO
19	Alari Madhi	amahdi@worldbankgroup.org	World Bank	NO
20	Jamall Zayid	j.sayid@afdb.org	AFDB	NO
21	Sandy Musa Jambawai	s.jambawai@afdb.org	AFDB	NO
22	Giima Mabel Lavaly	glavaly@ifc.org	IFC	NO
23	Rockfeler Herisse	rherisse@usaid.gov	USAID	YES
24	Simon Willans	simon@energyforopportunity.org	Energy for Opportunity	YES
25	Hugh Kweku Fraser	hkfraser@kpmg.com	KPMG	YES
26	Francis Stevens George	francis@innovationafrica.org	Innovation Africa	YES
27	Wilben Short	wilbenshort@icloud.com	CTI	NO
28	Benjamin Kamara	benshinoh@gmail.com	Director, Ministry of Energy	NO
29	Robin F. Mansaray	robinmans2014@gmail.com	Head of RE, Ministry of Energy	YES
30	Alba Topulli	alba.topulli@sobasl.org	SOBA	NO
31	Chukwu-Emeka Chikezie	chukwu-emeka.chikezie@sobasl.org	SOBA	NO
32	Kevin Johnstone	kevin@ibissieraleone.org	Oxfam IBIS	YES
33	Jill Gavin	JillGavin@worldhope.org	World Hope International	YES
34	Ami Dumbuyu	amie@powerforall.org	Power4All	NO

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Annex 7 Market Study Guide Questions

SUPPLY SIDE

1. Which organization best describes the business?

- a. Agricultural inputs trader
- b. Electrical shop
- c. Field agent
- d. Franchise
- e. Hardware store
- f. NGO
- g. Solar specialist

2. **How many years have the business has been operational?**
 - a. Less than 2 years
 - b. Between 2 and 5 years
 - c. Between 6 and 10 years
 - d. More than 10 years

3. **Who are main customers?**
 - a. Households
 - b. Small scale businesses
 - c. NGOs
 - d. Distributors/ field agents

4. **Where does companies average solar customer live?**
 - a. Rural
 - b. Urban
 - c. Peri-urban

5. **What is the gender of your average solar client?**
 - a. Male
 - b. Female

6. **What types of off-grid lighting products do they sell?**
 - a. Dry-cell torches
 - b. Solar lanterns
 - c. Solar panels, solar home systems (0-10 watt)
 - d. Solar panels, solar home systems (10-20 watt)
 - e. Solar panels, solar home systems (more than 20 watt)
 - f. Solar plug and play systems

7. **Which product(s) sold best for the last one year?**
 - b. Dry-cell torches
 - c. Solar lanterns
 - d. Solar panels, solar home systems (0-10 watt)
 - e. Solar panels, solar home systems (10-20 watt)
 - f. Solar panels, solar home systems (more than 20 watt)
 - g. Solar plug and play systems

8. **From which suppliers do they currently get your products?**

9. **Which of the below services do they offer?**
 - a. Delivery
 - b. Installation
 - c. User instruction
 - d. User manual (printed)
 - e. Sticker with basic information
 - f. Warranty

- g. After Sales Service
- h. Credit/payment in instalment

10. What convinces them of the quality of a solar product?

- a. Buying at the source
- b. Government recommendation
- c. Judge by the packaging
- d. Prize winning product
- e. Sales representative
- f. Sierra Leone Standard Mark sign
- g. Warranty certificate

DISTRIBUTION CHANNELS

1. What type of distribution channels does the business use?

- a. Sell directly to customer
- b. Sell to family member of customer
- c. Sell to field agent
- d. Sell to financial institutions (like MFIs etc.)
- e. Sell to market (farmers', fishers', other products)
- f. Sell to other business
- g. Sell to community head/chief

2. What kinds of marketing strategies does the business use?

- a. TV
- b. Promotion through local networks (such as churches, community groups, associations)
- c. Promotion through financial institutions
- d. Newspaper
- e. FM radio
- f. Demonstrations onsite home samples
- g. Demonstrations at events
- h. Community radio
- i. Brochures

3. What kinds of marketing works best for the business?

- a. Promotion through NGOs
- b. TV
- c. Newspaper
- d. Promotion through local networks (such as churches, community groups, associations)
- e. Promotion through financial institutions
- f. Posters
- g. FM radio
- h. Demonstrations onsite home samples
- i. Demonstrations at events
- j. Community radio
- k. Brochures

BARRIERS TO GROWTH

1. Which of the below factors are the most important obstacles to growing sales of solar products?

- a. Customers are not aware Customers cannot access credit
- b. Customers do not have confidence in solar
- c. Customers lack money
- d. I need more sales staff I need credit to grow this business
- e. Companies stock is insufficient to keep up with demand

FINANCE

1. How is the business financed?

- a. Government support
- b. Bank loan
- c. Microcredit from MFI
- d. Supplier Credit
- e. Cooperative members have paid up
- f. Loan from friend/ family/ local connection
- g. Financed through private capital
- h. The business is self-financed
- i. Privately financed
- j. Other

MARKET SIZE AND GROWTH

1. How many fixed/ mobile solar units did you sell overall last month?

2. At what price do you sell the products?

3. Brand of the products sold?

4. Total Annual Turnover of the retailer:

5. Volume of Products Sold (number of units) in that year:

6. Identified vicious cycle hampering growth of the solar market:

DEMAND

CURRENT ACCESS TO AND USE OF ENERGY SOURCES

1. What sources of energy does the household use?

- a. National grid
- b. Local mini-grid

- c. Biogas
- d. Candles
- e. Diesel/Petrol Generator
- f. Kerosene
- g. Non-rechargeable batteries
- h. Rechargeable batteries
- i. Solar energy

2. How reliable is the current sources of energy?

- a. Extremely unreliable
- b. Not so reliable
- c. Moderately reliable
- d. Very reliable

3. Which of the following appliances does the household have?

- h. Cell phone
- i. Radio
- j. Flashlight/torch (rechargeable)
- k. TV
- l. Refrigerator
- m. Computer
- n. Electric stove
- o. Other electrical-powered appliances
- p. None

CURRENT ACCESS TO AND USE OF OFF-GRID LIGHTING PRODUCTS

1. What are the current lighting source(s) used by your household?

- a. Fire fuelled by charcoal/firewood
- b. Candles
- c. Flashlight/torch (dry batteries)
- d. Flashlight/torch (rechargeable)
- e. Kerosene lamp
- f. Light powered by home battery/automotive battery
- g. Solar powered light source (fixed system)
- h. Solar powered light source (mobile system)
- i. Electricity powered lighting fixture (grid powered)

2. On average, how much time does it take to travel to pay for electricity or purchase lighting products per week?

- a. More than 2 hours
- b. Between 1 - 2 hours
- c. Between 30 - 60 minutes
- d. Between 10 - 30 minutes
- e. 0 to 10 minutes

DEGREE OF SATISFACTION WITH OFF-GRID LIGHTING PRODUCTS

1. How satisfied are you with your current lighting source?

- a. Extremely unsatisfied
- b. Not satisfied
- c. Moderately satisfied
- d. Very satisfied

COMPLEMENTARITY OFF-GRID LIGHTING PRODUCTS AND ELECTRICITY SERVICES

1. What [other] sources of energy does the household use? Complementarity off grid products and electricity

- a. None
- b. Biogas
- c. Candles
- d. Kerosene
- e. Non-rechargeable batteries
- f. Rechargeable batteries
- g. Solar energy

2. What kind of solar product(s) do they have? Solar Home System owners only.

- a. Fixed Solar home system (0-10 watt)
- b. Fixed Solar home system (10-20 watt)
- c. Fixed Solar home system (more than 20 watt)

3. What kind of solar product(s) do they have? mobile solar systems only

- a. Single light with phone charger
- b. More than one light with phone charger
- c. More than one light without phone charger
- d. Single light without phone charger

4. What are the main uses of solar product(s)?

- a. Children studying
- b. Charge phone business
- c. Charge phone home
- d. Light/power business
- e. Light/power home
- f. Phone charging business
- g. TV watching
- h. Cook or dry food
- i. Other

SOURCE OF PURCHASE AND PRODUCT SATISFACTION

1. Where did they buy your solar product? fixed solar systems, mobile systems

- a. Electronic/hardware shop
- b. Field agent
- c. Mobile phone company
- d. NGO
- e. SACCO/MFI

- f. Solar specialist
- g. Other

2. Where did they buy solar product? Solar Home System owners, mobile system owners

- a. Electronic/hardware shop
- b. Field agent
- c. Mobile phone company
- d. NGO
- e. SACCO/MFI
- f. Solar specialist
- g. Other

3. When did they buy the solar product?

- a. Less than 3 months ago
- b. Between 3 and 6 months ago
- c. Between 6 months and 1 year ago
- d. Between 1 and 2 years ago
- e. Between 2 and 4 years ago
- f. Between 4 and 6 years ago
- g. Between 6 and 8 years ago
- h. Between 8 to 10 years ago
- i. More than 10 years ago

4. Is the solar product still working?

- a. No, it never works.
- b. Yes, it works sometimes, but not well.
- c. Yes, it works well sometimes.
- d. Yes, it always works well.

5. How satisfied are they with the current solar product?

- a. Not satisfied
- b. Moderately satisfied
- c. Very satisfied

6. Do they think solar powered products can be trusted?

- a. Yes
- b. No

7. In their opinion is having a solar product an indication of a modern household?

- a. Yes
- b. No
- c. I don't know

DEMAND DRIVERS OF OFF-GRID LIGHTING PRODUCTS

1. Which of the following benefits of modern lighting are most appealing?

- a. Cost savings

- b. Improvement in health
- c. Modern lifestyle
- d. Safety (fire hazard)
- e. Time savings
- f. Reliable power for other electricity base solar appliances (TV, radio, electric stove, etc.)
- g. Reliable power for phone
- h. Security (outside security light)
- i. More reliable and better quality light indoors

2. Reasons for not purchasing a solar product till now

- a. Afraid to pay too much
- b. Do not have money
- c. Do not know where to buy
- d. Not convinced of the quality
- e. Other financial priorities
- f. Saving for a large solar system

3. What convinces them of the quality of a solar product?

- a. Buying at the source
- b. Government recommendation
- c. Judge by the packaging
- d. Prize winning product
- e. Sales representative
- f. Somalia Bureau of Standards sign
- g. Warranty certificate
- h. I don't know

4. Would they be willing to [promote solar products] if you were offered an incentive?

- a. No, I wouldn't
- b. I don't know
- c. Yes, I would

5. Were they offered an incentive to promote a solar product?

- a. No, I wasn't offered an incentive
- b. Yes, I was offered an incentive

CURRENT USE OF MOBILE PHONES

1. How many cell phones does they household have together?

- a. 1
- b. 2
- c. 3
- d. 4 or more

2. What is (are) the current cell phone charging source(s) used by the household?

- a. Purchase solar charging time outside home
- b. Charge at home

c. Other

3. What is the distribution of mobile phone charge costs / How much do you spend on average for each, per week?

BRAND AWARENESS AMONGST HOUSEHOLDS

1. Which solar brands have they heard of?

BRAND AWARENESS AMONG SOLAR SYSTEM OWNERS

1. What brand is (are) their solar product(s)?

HOUSEHOLD SPENDING

1. How much of their household income do they spend on the following items on a monthly basis?

- a. Health care
- b. Transport
- c. Clothes
- d. Energy / fuel
- e. School fees
- f. Food
- g. Housing / rent
- h. Other

2. How much of the household income do they spend on energy on a monthly basis?

3. How much do they spend on average for each lighting source, per week? (Recurring costs)

4. Distribution of off-grid lighting (including phone charging) weekly expenditure: How much do they spend on average for each, per week?

5. Do they feel that a significant share of the household income is spent on lighting and phone charging?

- a. Extremely insignificant
- b. Not significant
- c. Moderately significant
- d. Very significant

6. Do the local clinics and/ or schools use solar power? [Correlation of having solar at home and institutions]

- a. Yes, they use solar
- b. No, they don't use solar

- c. I don't know

CURRENT DEMAND AND CONSUMER SPENDING TRENDS

AWARENESS OF OFF-GRID LIGHTING PRODUCTS

1. Do they know what solar power is?

- a. Yes
- b. No
- c. I have heard of it, but I am not sure what it is

2. Do they know where to buy solar products?

- a. Yes
- b. No

3. How much would they be willing to pay for the chosen product?

- a. Fixed solar home system (0-10 watt)
- b. Fixed solar home system (10-20 watt)
- c. Fixed solar home system (more than 20 watt)
- d. Single light without phone charger (mobile system)
- e. Single light with phone charger (mobile system)

4. Would they be (more) interested in buying solar products if you were able to take out a loan to finance the purchase?

- a. Yes
- b. No
- c. I don't know

5. Would they be (more) interested in solar products if you were able to rent or lease them?

- a. Yes
- b. No
- c. I don't know

6. Does the household income have strong seasonal fluctuations?

- a. Strongly fluctuating
- b. Somewhat fluctuating
- c. Neutral
- d. Somewhat stable
- e. Very stable

7. Are there multiple income earners in the household?

- a. Yes
- b. No

8. In which month(s) do the household have most income? (Check all months that apply)

- | | | |
|--------------------------------|------------------------------|---------------------------------|
| <input type="radio"/> January | <input type="radio"/> May | <input type="radio"/> September |
| <input type="radio"/> February | <input type="radio"/> June | <input type="radio"/> October |
| <input type="radio"/> March | <input type="radio"/> July | <input type="radio"/> November |
| <input type="radio"/> April | <input type="radio"/> August | <input type="radio"/> December |

- All months are equally likely

WILLINGNESS AND DEMAND OF NON-SOLAR-OWNERS

1. If they had greater access to energy, what other activities would they use the new energy for?

- a. Business
- b. Cell phone charging
- c. Computer usage
- d. Lighting
- e. Powering other appliances (like radio, fridge, washing machine)
- f. TV

2. Which type(s) of solar product(s) would they be willing to buy?

- a. Fixed solar home system (more than 20 watt)
- b. Fixed solar home system (10-20 watt)
- c. Fixed solar home system (0-10 watt)
- d. More than one light with phone charger (mobile system)
- e. Single light with phone charger (mobile system)
- f. Single light without phone charger (mobile system)
- g. Other

3. What would they buy?

- a. Fixed solar home system (more than 20 watt)
- b. Fixed solar home system (10-20 watt)
- c. Fixed solar home system (0-10 watt)
- d. More than one light with phone charger (mobile system)
- e. Single light with phone charger (mobile system)
- f. Single light without phone charger (mobile system)