

Country briefing



Accelerating access to electricity in Africa with off-grid solar

Off-grid solar country briefing: Sierra Leone

This country briefing is one of 13 prepared as part of a background study for the Energy Africa campaign launched by the Department for International Development (DFID) on 22 October 2015. The study was undertaken by the Overseas Development Institute (ODI), the Global Off-Grid Lighting Association (GOGLA) with SolarAid, and Practical Action.

The analysis and conclusions in this briefing, and other reports from study, are those of the authors and do not necessarily reflect the views of their organisations, ODI, GOGLA, Practical Action and SolarAid, nor those of DFID.

All project reports are available at: www.odi.org/publications/10200-accelerating-access-electricity-off-grid-solar



Background

Sierra Leone has a population of 6.4 million.¹ Fewer than 10% of the population have access to some form of power.² The power sector in Sierra Leone has been a focus of many development programmes through donors such as DFID and the World Bank who have sought to support the Government of Sierra Leone (GoSL) in reforming the sector.

Sierra Leone is one of the world's poorest countries. As of 2012, Sierra Leone ranked 177 out of 186 countries in the United Nations Human Development Index and had an estimated GNI per capita of \$580, placing it in the bottom third of countries in sub-Saharan Africa. The largest segment of the population is concentrated in the Freetown area, with one of the region's largest and poorest urban settlements. Poverty is even more severe in rural areas.

Gradually, post-conflict recovery has been sustained, characterised by strong economic growth, infrastructure development, improvements in governance and public sector capacity building. Unfortunately, due to the recent Ebola outbreak, many of the development programmes in the energy sector, and indeed in other non-essential areas, have had to take a backseat to the Ebola response. Rural Sierra Leone suffered significantly by isolations posed by Ebola quarantines, which further hampered the gains that had been made before this devastating setback.

Electricity access and demand in Sierra Leone are among the lowest in Africa. Sierra Leone's limited power infrastructure base on generation, transmission and distribution is a major constraint to expanding electricity access. Public electricity services are limited to selected areas. Its sparse coverage and unreliable service exacerbate poverty conditions. The national distribution network extends to Freetown and the surrounding Western Area (Freetown Capital Western Area), covering about 40% of their residents. Two isolated systems (Bo-Kenema and Makeni systems) provide coverage in limited areas in the south-eastern and northern regions. In rural areas, where the bulk of the

population reside, electricity access is practically non-existent.

Electricity tariffs remain among the highest in Africa, constraining energy consumption. The electricity tariff is 28 US cents/kWh, twice as much as the continental average. High tariffs are mostly caused by the reliance on expensive thermal generation and high transmission and distribution losses. The tariff is not cost-recovering and the national electricity utility remains strongly dependent on government subsidies. Low connection rates and affordability issues keep electricity consumption rates among residents very low. Because of scarce supply and high costs, electricity represents only 7% of total energy consumption. The large majority of Sierra Leone's population is forced to rely on inefficient and polluting traditional fuels to meet their basic needs, such as kerosene for lighting and fuel-wood and charcoal for cooking. This results in adverse impacts on personal health and safety as well as on the environment.

Current power generation capacity, transmission and distribution remains inefficient and inadequate to accommodate the country's overall power requirements. Government-owned installed capacity is estimated to be approximately 90 MW, which includes the 50 MW Bumbuna hydroelectric power plant, two thermal power plants at Kingtom (10 MW) and Blackhall Road (16.5 MW), that serve the Freetown Capital Western area. Hydropower from Bumbuna is seasonal, producing less than 20 MW during the dry season often being out of action for days or even weeks. With no availability of a local fuel resource, all the thermal plants are supplied by expensive and imported heavy fuel oil or diesel, which further complicates the electricity supply situation during the dry season.

Limited port facility and poor supply chain infrastructure often leads to periods of fuel crises, pushing up the price of diesel and creating fuel black-markets.

One of the largest industries in the country, contributing to its economic growth, is the mining sector. This sector relies primarily on self-generation by using large diesel generators to meet its power needs. The power demand of these mining companies is vast and an essential part of their operations, thus not awarding them the flexibility to be able to rely on the (unreliable) national power

¹ United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision.

² In 2012, 5% had access to electricity according to the IEA (*Africa Energy Outlook 2014*), and 14% according to SE4All's *Global Tracking Framework* (2015).

supply. Other large power consumers who depend on power, such as businesses, also depend on diesel generators as their primary power supply option. This inability to supply industry with its power needs creates a missed revenue generation opportunity for the government.

More than 35,000 generators are currently in use and provide approximately an installed capacity of 180 MW. Generation capacity or lack thereof is only one part of this complex problem. Transmission and distribution, together with an appropriate electricity retailing mechanism, to allow for a financially sustainable sector, further exacerbates the situation. The national transmission system consists of only one radial 161 kilovolts (kV) transmission line extending for 205 kilometres from the substation at Bumbuna to the Freetown substation and connected to the distribution network. Both transmission and distribution capacity is severely constrained due to high losses of over 38%.

The Government of Sierra Leone sees the relevance of renewable energy in tackling acute poverty as evidenced by their support for one of the largest solar initiatives in the country, the Barefoot Women Solar Engineer Association of Sierra Leone (BWSEASL). The government has provided land and buildings as well as 1,500 solar lamp units from India to start the initiative. To date, BWSEASL has installed 1,850 solar power systems in 25 towns. As BWSEASL is heavily subsidised the challenge ahead will be to develop an operating model that can be commercially self-sustaining. This initiative in its current form is not sustainable, but there are some elements of the programme that may be adopted for a more commercially viable business model.

Policy environment

The institutional and regulatory frameworks of the sector are at an early stage of development. Oversight of the sector falls under the Ministry of Energy (MoE), which was constituted under the new government from the division of the previous Ministry of Energy and Water Resources into two independent Ministries. The MoE is understaffed and lacks the resources needed to run the sector efficiently. Unbundling of the sector was recently approved. The National Power Authority Act, 1982 established the National Power Authority (NPA), as a single, vertically integrated national utility. The National Electricity Act, 2011 (the Electricity Act)

repealed the National Power Authority Act, 1982 and established two state owned enterprises (SOEs) the Electricity Generation and Transmission Company (EGTC) and the Electricity Distribution and Supply Authority (EDSA). While EGTC and EDSA are legally established through the Electricity Act, they are new entities that are yet to take flight and function in their full and proper capacity. As a result the old structure seems to still be in place whilst these new entities build their foundations and capacity. Most of the background work for the appropriate functioning of the newly created entities as a result of unbundling has already been carried out with the support of DFID and the World Bank, but due to the outbreak of Ebola most of the work had to be put on hold.

There are signs of recovery and indications that early 2016 may see the unbundling of the sector resume through its development phase. Both the National Energy Policy 2009 and the National Water and Sanitation Policy 2010 stated the intent to establish an economic regulator for both water and electricity supply. This is essential for attracting the needed investments in both sectors, but especially electricity. The resulting Electricity and Water Regulatory Authority Act 2011 provided the legal framework for establishing the regulator, but it was not until the latter part of 2014 that the Chairman and Board were appointed, with the technical assistance of the DFID-funded Water Sanitation and Hygiene Support Programme. The Electricity and Water Regulatory Commission (EWRC) Act does not adequately enshrine the independence of the regulator, however, and there has been early evidence of political pressure with respect to recruitment of the administrative and technical wing. The EWRC is at a fledgling stage, and seeking to assert itself with the electricity utilities and the sector generally. Pricing and service delivery in both electricity and water sectors are contentious in Sierra Leone, and this allied to the technical complexities of the regulator's mandate, mean that it will need considerable donor assistance and support if it is to carry out its role effectively.

Currently there are no clear policies supporting the deployment of renewable energy technologies under a single national strategy, although the motivation and the intent certainly exist within the relevant government authorities. From the policy makers' point of view it as a national power

generation and distribution matter, the ambition being to create a national grid and supporting generation capacity. Various ministries seem to act independently of each other in relation to energy projects where all matters relating to energy generation have always been viewed as an MoE issue. As a result of this disconnect, an enabling environment to facilitate the growth of the sector does not exist. Even when a clear policy does exist, the respect and adherence to the policy is often overlooked and traditional transaction mechanisms take over.

Access to finance for the private sector

Access to finance for all sectors in Sierra Leone remains acutely underserved. As a post conflict country, severely underdeveloped with only a handful of financial institutions in the marketplace, almost all SMEs develop their business through self-financing, donor funding and NGO grants. As well as a lack appropriate financial mechanisms, Sierra Leone is plagued by problems such as poor road and transport infrastructure which increase the sale and revenue cycle. Most of rural Sierra Leone is only reachable through dirt roads or bush trails, and only in fair weather conditions as the rainy season often makes these routs impassable. This lack of access often results in delays of more than two months before a physical contact can be made in order to conduct financial transactions.

Several local companies who are active in supplying the Solar PV market were interviewed in order to prepare this briefing. Most SMEs are highly entrepreneurial in their approach and due to their familiarity with the local business environment, they generally do not seek local operation or start-up finance. Often the greatest complaint about finance is the poor or lack of efficient banking and financial institutions to facilitate efficient fund transfers locally or internationally. All banking must be done in person and in a specific branch, sometimes with a waiting time of hours, taking time away from core business activities. All companies active in the market are supported by international parent company, diaspora/family members and friends, or benefit from having access to some sort of funding through a donor agency.

For some organisations, such as Azuri, working with a franchising model, the availability of finance for regional and remote sub-agents or franchises would

be very helpful, as entrepreneurs in remote locations often lack the international connection and access to finance that people in Freetown have. This perhaps is one of the key bottlenecks for companies hindering their steady growth and expansion.

Import of solar household related equipment and fiscal barriers

The GoSL in November 2011 passed a law waiving import duty on photovoltaic system equipment and low energy or energy efficient appliances for resale or use by third parties, for three years. However, not all the companies interviewed had knowledge of the law. Whilst this is a good incentive, many new companies are worried about their profitability once the three-year period is over and cite it as a significant barrier to growth. More mature companies also cite import duty combined with Government Service Tax (GST) as one of the largest barriers to scaling-up.

In general, the import clearance procedures and timings were seen as overly lengthy and burdensome, with delays in clearances creating operational and financial issues. From the point of importation at the port, all the way to its final destination, these product are subject to the usual official or 'unofficial' taxes and charges which has been reported to be almost 50%. Companies interviewed also were of the view that due to uncertainty about the length of delay that is caused during the customs clearing process, it is often easier to just pay the requested fees and charges in order to ensure timely delivery of the equipment to the end user. Overwhelmingly stakeholders indicated that the lack of transparency in this aspect of the business is the main cause of uncertainty and is a barrier to long-term expansion plans.

Consumer protection and quality assurance

There are no national standards or consumer protection policies in place for solar in Sierra Leone. In fact, sub-standard consumer products of all kinds ranging from light bulbs, televisions and generators are in wide circulation. Solar power equipment is no exception where small solar panels for mobile phone charging are sold by street vendors or in the market with no discernible brand name, warranty or quality certification.

Consumer awareness

There has been a great deal of exposure to solar equipment both in urban and rural parts of the country due to installations on some public facilities and NGO-sponsored initiatives. By and large, people are aware of benefits of solar but the main barriers seems to be perceptions of high cost, poor quality, reliability and the resistance to change. Some consumers expressed dissatisfaction with solar equipment due to their experience of using substandard equipment. The key complaint is often the low level of light output as well as the unreliability and short life of these equipment.

Some companies have had a great deal of success when they have been able to hold community education events and provided a replacement guarantee for malfunctioning equipment. These village scale demonstrations carried out by staff with a company uniform and a professional approach, together with the low-cost entry point, have proven to be the most effective model thus far in Sierra Leone.

Providing a level playing field

There are no particular policies that provide unfair advantage to other forms of lighting or power. Sierra Leone does not have a kerosene or diesel subsidy in place and grid power is amongst the highest priced in Africa. Potentially a few small intervention measures, particularly from the supply chain aspect of solar power industry, could stimulate the development of a vibrant market.

All large donors are focusing on grid power and the development of a national utility infrastructure. Although this is an essential part of the development of any country, the impetus that has been awarded to the 'big power' is disproportionately targeted to a few, key population centres such the Western Area (Freetown peninsula), Bo and Kenema thereby neglecting the needs of the majority of the population who reside in the rural parts of the country.

Availability of consumer financing

It has been suggested that consumer finance is not a major issue as the cost of diesel and grid power is high making it relatively easy to support the business case for solar home systems. However, this is only true for pay-as-you-go (PAYG) propositions or suppliers who may have some sort of pre-paid or mobile payment system in place. Currently the only such company in the market that supplies rural Sierra Leone with such a model is Azuri, which has a pre-paid scratch-card system. Other companies are mostly focused around Freetown where the income levels are higher and people may spend \$ 200 for a system with two lights and a mobile phone charger. The larger systems available in the market are also supplied in Freetown, mostly to NGOs who have access to funding for the cash purchase of such systems.

Level of local skills

Sierra Leone is a post-conflict nation that suffered a great deal of human resource depletion both during the conflict period and throughout the post-conflict era, as people continue to leave the country. That said, the population is very motivated and entrepreneurial. Any company entering the market must be prepared to employ and train unskilled labour as part of their business model. Companies interviewed cited investment in training of new staff as an unknown quantity where the value of the investment is often unquantifiable.

Over the next year and half BWSEASL are training 150 women, representing all 149 chiefdoms across the country, to become community solar representatives.

Summary and recommendations

Sierra Leone is one the world's poorest countries which recently suffered yet another setback with the Ebola crisis. The government is grappling with large and complex issues for which they are ill-equipped and poorly resourced. Any intervention to support the deployment of solar power lighting systems in the country will have immediate results, but the challenge is to design interventions in such a way that the balance of interaction is less dependent on the government and more focused on the beneficiaries at the point of demand.

Any successful programme must engage at the local level.

Azuri have shown that ability to pay for PAYG systems is strong with less than a two percent default rate which has been mostly down to poor access and not the customer's willingness to pay. Supporting companies by creating an enabling environment which removes the key barriers for these types of organisations is the key to achieving wide-ranging success in the shortest possible time.

The franchise model where local agents are also community members ensures grassroots participation and development of local economies. Experience that international parent companies bring in this sector is extremely valuable. It would be very difficult, if not impossible, to develop new companies with such a wealth of knowledge which has been gained through many years of operation in other parts of Africa by companies like Azuri.

In summary, an entity, which may be partner of DFID and the GoSL, could be set up to develop the enabling environment to boost private-sector investment in the segment of the solar industry that focuses predominantly on solar home systems. Such an entity might have the mandate to:

- Ensure creation and delivery of an efficient supply chain process
- Develop/adopt minimum performance standards
- Put in place consumer protection guidelines
- Develop training programmes
- Act as an independent body to liaise between the industry and government

Negotiate with financial community in order to prepare tailor made financing mechanism both upstream and downstream.

Area	Situation	Opportunities
Policy Framework	Current policies both for suppliers and consumers are absent.	A specific policy addressing the SHS market would target the need and clarify the desired result.
Access to Finance	Access to finance is critical but very limited; currency fluctuations pose a high risk for companies; high interest rates at commercial banks prohibit access to local finance.	Work with international development banks and donors to channel finance at favourable terms into the country
Fiscal Barriers	High VAT rates and tariffs on solar products drive up the costs for end-users in a very price sensitive market.	VAT and tariff exemptions for all solar products can help to kick start the market and help companies to mitigate currency fluctuation risks. These interventions need to be planned for a minimum of 10 years as the lead time for building a solid foundation for these type of business is quit lengthy
Consumer Protection and Quality Assurance	Sierra Leone is not in a position to enforce such policies.	Provision of support only for companies with established and vetted products who provide PAYG systems will serve as a self-regulating mechanism to ensure consumer protection.
Consumer Awareness	Awareness for solar portable lighting products and home systems is fair; technology reputation of solar is not good	Government has substantial experience in consumer awareness campaigns in the health sector and more recently with the Ebola response. In cooperation with the private sector the experience could be leveraged to implement campaigns on the benefits of solar lighting
Consumer Financing	Finance specifically was not recognize as a significant barrier particularly with PAYG propositions	PAYG propositions are the key to overcoming consumer finance constraints.
Level of Local Skills	Level of local skills is low, companies are training their own staff	Develop vocational training for solar entrepreneurs and offer it especially in rural areas. Enhance initiatives such as the Barefoot Women Solar Engineer Association of Sierra Leone (BWSEASL)



ODI is the UK's leading independent think tank on international development and humanitarian issues.

Our mission is to inspire and inform policy and practice which lead to the reduction of poverty, the alleviation of suffering and the achievement of sustainable livelihoods.

We do this by locking together high-quality applied research, practical policy advice and policy-focused dissemination and debate.

We work with partners in the public and private sectors, in both developing and developed countries.

Readers are encouraged to reproduce material from ODI Reports for their own publications, as long as they are not being sold commercially. As copyright holder, ODI requests due acknowledgement and a copy of the publication. For online use, we ask readers to link to the original resource on the ODI website. The views presented in this paper are those of the author(s) and do not necessarily represent the views of ODI.

© Overseas Development Institute 2015. This work is licensed under a Creative Commons Attribution-NonCommercial Licence (CC BY-NC 4.0).

ISSN: 2052-7209

Overseas Development Institute
203 Blackfriars Road
London SE1 8NJ
Tel +44 (0)20 7922 0300
Fax +44 (0)20 7922 0399



This material has been funded by UK aid from the UK Government, however the views expressed do not necessarily reflect the UK Government's official policies.