

Rwanda: Off-grid Sector Status Report 2017



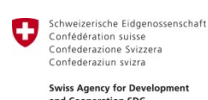
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1. Introduction

This annual issue of the off-grid sector status report for Rwanda provides an assessment of off-grid solar lighting and mini-grid market development in Rwanda, highlighting the sector's achievements and challenges. The market for solar lighting is now more dynamic, thanks to impressive growth seen in the solar home system (SHS) market segment, increasing interest from investors and financial institutions, an enabling policy environment, and regulatory conditions that have allowed the sector to operate with relative ease and minimal interference. The market dynamics have, however, shifted to a predominantly SHS-dominated, pay-as-you-go (PAYG) market, delivering a wide variety of product offerings. The mini-grid market remains nascent but has taken some strides forward. Four private actors are now operating mini-grids, and there is increased coordination among stakeholders to support market development.

The information and conclusions drawn in this report are based on industry interviews, discussions and sales data provided by more than 20 solar companies¹ engaged in the off-grid sector, mini-grid developers² and financial institutions³, as well as the lessons learnt from implementing the EnDev programme.

2. Status of the solar off-grid market

Size of the market

In 2017, according to EnDev calculations⁴ and self-reported company data, the solar lighting (SL) market in Rwanda provided improved access to energy to an estimated 125,000 households, or 550,000 people. These sales translate to an access rate of 5% of the national population (0.5% for solar lamps and 4.5% for solar home systems), compared to 4% in 2016. Cumulative sales of all solar lighting now amount to a total access rate of 12.3%, approximately 1.4 million people⁵.

The year saw significant strides in growth for the SHS market. Based on self-reported company data (Table 1), 2017 SHS sales had exceeded a growth rate of 130% compared with the previous year, with close to 100,000 systems sold. However, the market for lamps nearly collapsed; there was an 80% drop in sales, from 135,000 units in 2016 down to 30,000 units in 2017. A number of solar lamp companies have withdrawn from the market or downsized their local solar business. One of the major players withdrew from the solar lamp market entirely in Rwanda while restructuring the company's business model. Nevertheless, three new companies have recently entered the solar lamp market, with no sales record to report so far. This significant shift in market dynamics in terms

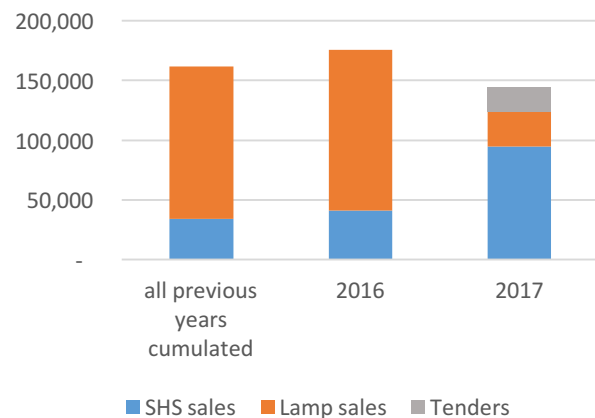


Figure 1: Number of solar lamp and home system sales 2017.

¹ 16 companies provided sales data for Rwanda, 14 companies reported sales data for 2017. Companies interviewed: Mobisol, Neseltec, OneAcreFund, SaferRwanda, Serve & Smile, Waka Waka, Ignite, Dassy, Nguvu, Nuru, SolarKiosk, BBOX, Intertech, Veer Energies, GLAS, Repro, Belecum, Bunga, Great Lakes Energy, Innotech Ltd. with OffGridBox, and 2 more.

² Operational mini-grid data was confirmed by EDCL, and, although no companies were formally interviewed for this report, EnDev, through its Village Grid program, has continuous rapport with the companies and is highly involved in sector development.

³ Four commercial banks were interviewed.

⁴ The following assumptions and data have been used: i) 4.6 people per household for SHS and 2 people per household for solar lamps; ii) population data obtained from the National Institute of Statistics of Rwanda, <http://statistics.gov.rw/file/4435/download?token=XvuSfVwO>, access: 18.04.2018.

⁵ The GoR considers access to be a minimum of 3 lights. The GoR reported access rate for Q4 2017 is 10.2% or 248,502 HH

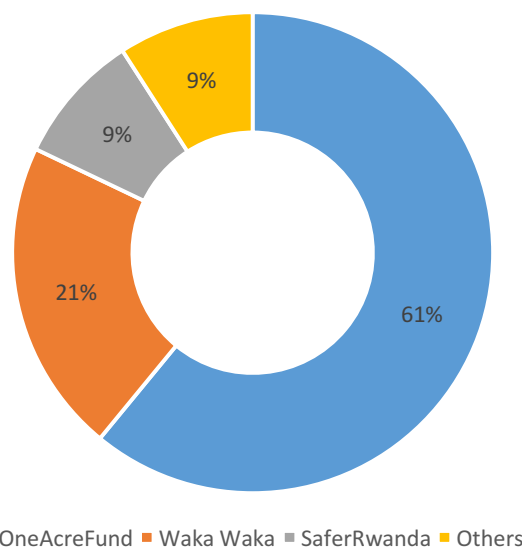
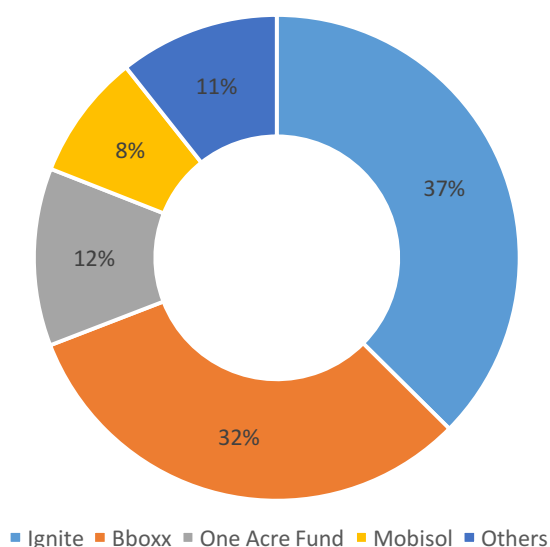


Figure 2: Market shares of 2017 solar home system sales by company (without tenders).

Figure 3: Market shares of 2017 lamp sales by companies (without tenders).

of the type of system sold (Figure 1) is largely a consequence of innovative PAYG financing models, aggressive expansion by larger multinationals, and government endorsement of SHS as a means of modern energy access for rural populations. At the end of 2017, there were more than 20 participating companies in the SL market. The sector is primarily dominated by large, vertically integrated multinationals (Figure 2), retailers/distributors and smaller local start-ups. Our data reveals that about 17% of all solar home systems sold in 2017, by the companies that contributed to the report, had been distributed via government-issued tenders (SHS) and NGOs (lamps and SHS) and other institutions.

Table 1: Market overview and sales 2017.

Product	2016 sales	2017 sales (without tenders)	Change in % of sales 2016	2017 sales by tender	Total # of systems sold in Rwanda (with tenders) as of 31.12.2017
Lamps	134,897	28,894	-78.6 %	1,511	293,439
SHS	41,019	94,741	+130.9 %	18,996	185,682
Total	185,682	123,635		20,507	479,121

Profitability and Growth

While the SHS system market has grown at an exponential rate over the past year, most companies are not yet profitable. With current growth trends, a few larger SHS retailers expect to achieve cash-flow break-even in 2018. This SHS growth in 2017, coupled with the fact that a number of companies were able to access local and international debt financing, signals that the SHS market is gradually reaching profitability. However, profitability and, more significantly, cash-flow will remain a challenge for PAYG companies. PAYG companies typically require a customer to make a small deposit. The customers are then required to make daily/weekly/monthly prepayments for the energy service (most often paid directly via mobile money and/or through agents). The financing terms are often structured so that the upfront payment is competitive and the total term is no longer than 36 months. If the customer stops payments, the company is able to shut down the energy service until the customer has credited their prepaid balance. The PAYG market is not only providing an energy service but also financial services to rural customers who may be accessing credit for the first time in their lives. This requires companies to engage in comprehensive credit risk management. It also means that the companies must seek investment and debt funding on the basis of future

receivables, which will take one to three years to recover (depending on the service offering). As long as the company can earn a higher interest rate on these receivables than the debt it takes on, the company can sustain growth.

In comparison to the companies selling solar home systems, nearly all pico-pv lamp companies have witnessed a momentous drop in sales compared to 2016, and their sales are now well below PAYG companies. Three companies who primarily sold lamps have withdrawn from the solar lamp market completely, claiming their business was not profitable and margins were too low. The contracting solar lamp market is unsurprising, given aggressive investment by PAYG companies and the promotion of larger systems by the Government of Rwanda (GoR). Nevertheless, it is unlikely that the lamp market will entirely disappear.

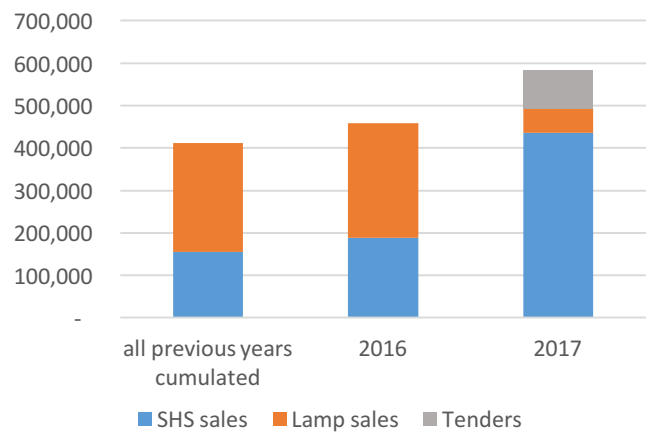


Figure 4: People connected with off-grid solar systems (lamps and solar home systems) in a single year.

Business Models

The off-grid SL market remains a dynamic and evolving market, as a number of products, business models and financing structures are still being tested, adapted and honed in Rwanda and beyond.

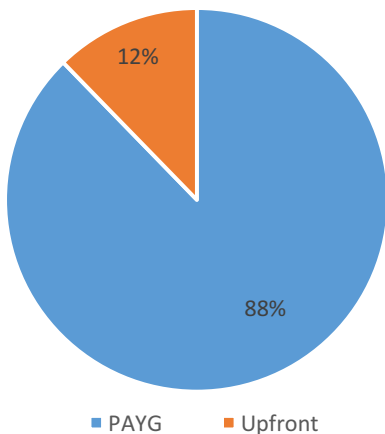


Figure 5: PAYG and upfront shares in all 2017 solar home system and lamp sales.

Depending on the size and complexity of the system and its offerings, prices for SL differ. While small lamps or a simple SHS can be affordable for middle and low-income groups with upfront payments, this is not the case for larger systems, which are rarely affordable without some form of support. Most solar lamps have a price range between USD 2 and USD 40, while the cost of an SHS ranges between USD 80 and USD 1600. Over the past year, the market has evolved to become dominated by credit sales, led primarily by SHS PAYG companies (Figure 4). Although most companies prefer upfront payments, the market has forced most of them, including companies that exclusively sell lamps, to include PAYG in their business offering. This means that the business models of these companies have evolved from that of energy services retailers to financial institutions.

Some companies, due to difficulties in competing in the PAYG market, are diversifying their customer base by targeting sales to cooperatives and NGOs and by bidding on government tenders. Other companies have started offering supplementary services such as consulting, repair and maintenance, and have expanded to other countries to take advantage of less-developed markets. Interestingly, SHS PAYG companies have also started to offer lamps in their packages, demonstrating the demand for portable lighting, while lamp sellers have also started to offer SHS.

With this shift toward an SHS-dominated market in Rwanda, appliances begin to play a critical role in increasing energy services and revenue streams. This year, several companies have introduced DC appliances, in particular TVs and hair clippers, but also fridges, solar streetlights, solar pumps, solar garden lamps and solar security lights. These new products will primarily target (peri) urban customers rather than rural off-grid customers.

Most PAYG companies continue to implement a sales model focusing on retail outlets coupled with commission-based agents. However, with the rapid growth witnessed over the past year, larger companies have expanded to add additional offices and shops throughout the country. This has resulted in organizational restructuring for a number of organizations, with new hierarchical levels introduced and various units reorganized.

Customer Payment Capacity

PAYG companies in Rwanda, for the most part, offer a rent-to-own or fee-for-service financing mechanism. They are targeting the rural poor, who do not have sufficient means to provide a guarantee of payment. Most financing agencies are not interested in providing a loan for energy services, or do so at prohibitively high rates. Therefore, PAYG companies need to carefully assess their customers' ability to pay and target their services to ensure full credit recovery.

Larger companies have developed their own methods to assess their customers' capacity to pay. Most use call centres and field agents to collect data, which is then processed using benchmarking and IT-supported decision systems to assess creditworthiness. Some assessment procedures seem to work better than others, as default rates vary among companies, ranging from a reported 1% to over 20%. The companies did not share details of their methods, and it appeared that many are still refining their assessment systems. Smaller companies, which lack the resources and capacity to develop their own assessment procedures, mostly partner with cooperatives, SACCOs, churches and NGOs. These organisations typically pay upfront and fully or partially take over credit risk.

Most companies have managed to keep their default rates low, according to reports, and attribute this to their improved customer assessment models. Nevertheless, some players reported increased default rates, up to 20%, due to increased competition and other uncertainties. This unveils the inherent risk of the PAYG approach; PAYG is essentially part energy-service business and part micro-finance. One major risk includes the long-term payment model, compared to the typically short-term micro-finance to which customers may be more accustomed. A long-term model doesn't take into account unexpected financial challenges rural customers may face, such as dependence on harvest, costs related to ill family members, funerals and weddings or unemployment.



Figure 6: Elderly woman using a solar lamp in the kitchen.

Customer Segmentation

All companies interviewed have defined their main customer group as poor, small-holder farmers living in rural off-grid areas. However, claim verification data collected by EnDev Rwanda reveals there are wider customer segmentations, particularly highlighted across product price points. For example, a customer buying an SHS must pay anything between USD 3 and USD 20 per month for his system, whereas a solar lamp customer could pay as low as USD 5 for a solar lamp. This displays a broad spectrum of purchasing power, and it's likely that there's a wider range of customer segments beyond poor small-holder farmers.

According to the national Ubudehe classification⁶, only 16% of the population fall under Ubudehe 1; 29.8% fall under Ubudehe 2; and 53.7% fall under Ubudehe 3, with the rest (0.5%) falling under Ubudehe 4⁷. However, some groups like refugees or foreigners are not classified. As expected, companies offering smaller systems have more customers in the Ubudehe 1 category than companies offering SHS. However, Ubudehe 1 customers are not as underrepresented as one might think when it comes to SHS. According to EnDev Rwanda data, 5% of all SHS

⁶ Government of Rwanda classification of Rwandan households based on economic status, with Ubudehe 1 being the lowest income category

⁷ MINALOC 2016, Social Protection Forward Looking Joint Sector Review Report 2016/2017, http://minaloc.gov.rw/fileadmin/documents/SP_Joint_Sector_Review_2016-17_Report.pdf, access: 27.04.2018.

customers claimed to be Ubudehe 1, highlighting that some Ubudehe 1 customers are able to afford an SHS. This also demonstrates that the SHS market is largely reaching (and perhaps unknowingly targeting) Ubudehe 2 and 3 categories (Table 4). It appears that companies have not yet explicitly identified customer groups and deeper customer segmentation and market research will be required to effectively target sales in the future. Meanwhile, PAYG companies, through their vetting procedures, digital payments and interactions during customer service, are acquiring massive amounts of data on their customers, which will ultimately allow them to build informed and accurate customer profiles.

Table 2⁸: Ubudehe categories of customers by system type (EnDev Rwanda data, no person with Ubudehe status higher than 3 was reported).

	Ubudehe 1	Ubudehe 2	Ubudehe 3	Other (without classification)
SHS Market	5%	41%	50%	4%
Lamp Market	9%	35%	42%	14%

Job creation

According to EnDev RBF program data, solar lighting companies have created approximately 3,000 full-time jobs along with 2,300 sales agents and other part-time jobs to date (i.e. security)⁹. Women made up 36% of the full-time workforce and 19% of the non-permanent staff. Most of this employment has been generated recently in the past 2-5 years.

3. Status of the mini-grid market

The mini-grid market in Rwanda, while remaining at a nascent stage of development, has made some strides over the course of 2017. This has resulted in four companies commissioning, operating and even expanding their mini-grid operations in 2018. Furthermore, donors, organizations and financial institutions are stepping up their financial support for privately owned and operated mini-grids. Nevertheless, the deployment of privately operated mini-grids in Rwanda is still limited. A coordinated effort, through the provision of grants and technical assistance, combined with access to finance and an enabling regulatory and planning environment, will be needed to realise market development.

Market Size

Over the past year, Rwanda has seen the commissioning of two solar Alternating Current (AC) mini-grids, the successful operation of a hydro mini-grid, and expansion of the Direct Current (DC) mini-grids operated by MeshPower (Table 3). Notably, all of these projects have been developed and operated by privately owned micro-utility companies. One community-owned hydropower project remains, although it is likely that this will be connected to the grid in the near future, signalling toward privately-led sector development.

Table 3: Operational mini-grids in Rwanda

Company/Project	Technology	Size	Ownership	No. of HH connected	Grant support
Neseltec	Solar AC	30kW	Private	100	EEP
ECOS	Hydro	11kW	Private	266	EnDev
RENERG	Solar AC	30kW	Private	121	USADF
MeshPower	Solar DC	1kW → 69 sites	Private	2300	EEP & EnDev
Rushaki*	Hydro	40kW	Community	295	

*This project is likely to be connected to the grid in the near future

⁸ Information gathered by EnDev through sales verifications

⁹ These numbers refer to direct employment. Jobs created through indirect employment such as cleaning services, construction or security companies contracted by solar companies are not included.

Despite the relatively small number of projects, interest by private mini-grid operators continues to grow. EnDev received 25 submissions to its Call-for-Proposals in 2017 and signed contracts with two AC mini-grid developers. The SIDA-funded Scaling-up Off-Grid Energy (SOGER) program in Rwanda, implemented by Energy 4 Impact, has resulted in the provision of support for the development of 10 pico-hydro projects (below 50kW), through up-front grants, with additional technical support for a total of 37 isolated mini-grid projects in Rwanda. Furthermore, an ongoing consultancy commissioned by the utility's development arm, Energy Development Corporation Limited (EDCL), and funded by the African Development Bank-hosted Sustainable Energy Fund for Africa (SEFA), has identified over 200 villages as potentially feasible sites for mini-grids and will eventually provide advanced feasibility studies for up to 20 sites.



Figure 7: Power house of a 11kW hydro power mini grid.

Policy, Planning and Regulation

Supportive policies and regulatory frameworks are crucial to developing a privately led mini-grid market. The Rural Electrification Strategy (RES), published in June 2016, sets out a clear development plan for the off-grid sub-sector. Within the RES, Programme 3 aims to facilitate the development of mini-grids by the private sector, with government institutions playing a key role in identifying sites and establishing a framework through which these can become financially viable investments. Rwanda's Utility Regulatory Authority (RURA) introduced a Simplified Licensing Framework for off-grid renewables in 2015, which provides a supportive and stable legal framework to the sector.

As Rwanda enters a new phase of development, targeting universal access by 2024 (52% on-grid and 48% off-grid), with increased focus on off-grid access, a least-cost approach to energy planning management is crucial to ensure cost-effective implementation of its national targets and its RES. In light of this, Rwanda's national utility, Rwanda Energy Group (REG), initiated a planning study to demarcate all off-grid and on-grid areas over the

next seven years, which will result in a National Electrification Plan (NEP). This step of integrating mini-grids into rural electrification planning can provide further assurances to the private sector, by removing the threat of grid extension as a barrier to entry, if designed and implemented successfully.

Mini-grid business models and financing

Existing privately-owned mini-grids in Rwanda are operated by four developers and demonstrate a range of technologies, from pico-hydro to AC Solar PV and DC Solar PV. The customer base for these mini-grids is largely households, with a small percentage comprised of small businesses (primarily shops and restaurants/bars) and a few social institutions (i.e. health centres). The overall consumption of energy and ability to pay in rural areas in Rwanda remains low, with household demand ranging from 2 kWh–7 kWh/month¹⁰. Furthermore, PUE and business

¹⁰ According to EnDev empirical evidence

consumption often increase more slowly than expected without external support targeting these users. Only two sites connect to one to three larger productive uses (i.e. mills, carpenters). MeshPower, a low-cost DC grid, provides a simple and more easily scalable solution, with 1 kW 'pico' or 'nano' grids supplying energy mainly to households and some small businesses. The AC Solar PV and pico-hydro grid are in the 10 kW–30 kW range and have relatively larger upfront costs, requiring a minimum number of connections and demand to ensure sustainability. Mini-grid costs in Rwanda range between USD 4,000 up to USD 8,000 per kW. This high upfront cost, coupled with a customer base dominated by households, means that even the most cost-efficient business models are not able to ensure an adequate return using a reasonable tariff that would not be far overpriced for the rural consumer. Therefore, the development of income generating activities through productive uses of energy is necessary to ensure the financial viability of the mini-grid.

To date, mini-grids in Rwanda require considerable grant support, ranging from 40% to 70% of CAPEX, with most existing and imminent projects either testing business models to be replicated at scale, or focusing on individual sites. The necessity for grants is not likely to change in the short to medium term, until the market reaches sufficient scale. Therefore, while debt financing does remain an element of the financing mix, as either supplementary financing to grants and equity, financial institutions alone cannot be expected to support mini-grid development in Rwanda. In this context, the newly launched World Bank Scaling-Up Renewable Energy Program (SREP)-funded Renewable Energy Fund (REF) has been developed to introduce financing for mini-grid projects, working closely with grant providers while building the relevant capacities within the administering organization, Rwanda's Development Bank.

4. Challenges for solar off-grid market development

The off-grid solar sector has taken significant strides and, for the most part, has experienced organic and inclusive market development, which has resulted in momentous growth for the SHS market. In general, complaints regarding import delays and taxes have been reduced, with a few individual cases remaining when customs is unable to identify and classify individual solar components. Most companies expressed some concern about policy implementation risks. They fear that a drastic and unexpected execution of the RES could exacerbate uncertainty among market participants and even destabilize the market entirely.

Policy risk

During the first two quarters of 2017, the GoR and other institutions funded and organised the distribution of free solar systems to rural customers. These tenders, for SHS, raised awareness for and provided support, through improved energy access, to the poorest populations. However, most companies suspected a negative impact on the market (reduced sales), due to customers anticipating a free solar system. Nevertheless, SHS witnessed remarkable growth in 2017. All companies supported developing a market-friendly approach to support the poorest populations and discontinuing free distribution so as to stabilise the market. The companies maintained that, should free distribution continue, a strong communication campaign be developed to mitigate rumours and ensure that communities are well aware of who the beneficiaries of the free systems will be. The companies also encouraged development of clear standards and competitive bidding for the tenders. They also expressed concerns that wider free distribution could result in a market collapse, threatening their significant investments in the development of infrastructure, distribution networks, products and customer acquisition models to reach rural customers.

Standards

Currently, the GoR is developing a national standard for solar systems, following the guidance of Lighting Global certification. Most companies have not yet been made aware of this process but support the development of standards, understanding the importance of keeping low-quality products out of the market. However, they are also

concerned about potential administrative burdens and delays in importing new products should the standards be developed without sector-wide consultation. All of the companies emphasized that a Rwandan standard aligned with Lighting Global Certification, an internationally agreed-upon quality assurance standard, will ensure that low-quality products do not flood the market and decrease customer confidence. Companies further highlighted that quality standards, if not

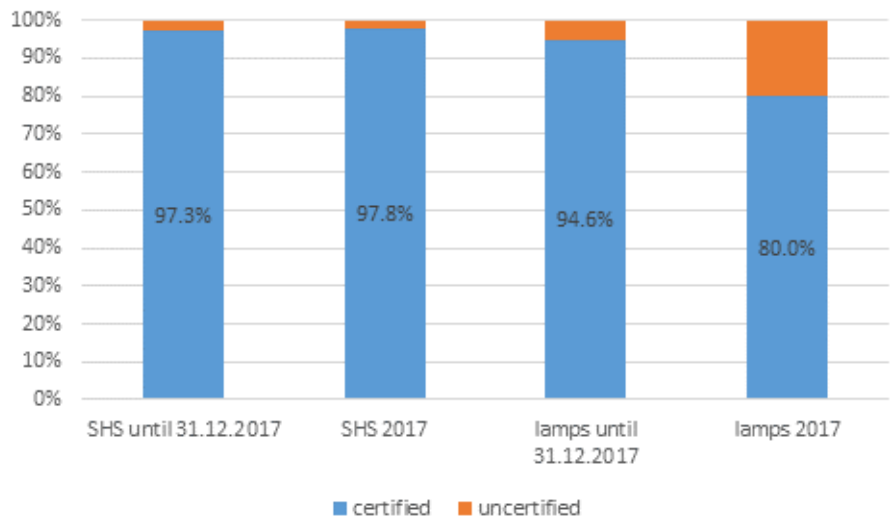


Figure 8: Percentage of reported sales that are LG Certified

designed well or through a process of stakeholder coordination, can potentially create import bottlenecks, increase costs, and stifle business growth. Currently, nearly all SHS products meet Lighting Global Quality Standards (figure 8). Non-certified lamps are seemingly increasing although over 90% of the uncertified lamps are currently undergoing Lighting Global certification.

Policy Wish-List

Companies were asked about what actions the GoR could take to strengthen the sector and create an enabling and conducive environment for investment. All companies welcome the RES and its ambitious targets, with the exception of free distribution (Program 1). The following interventions have been proposed by the companies interviewed:

- Providing financial guarantees to help companies access local currency financing
- Stabilising the market by discontinuing free distribution and using a market-based approach to support the poorest populations
- Conducting a visible campaign to promote the use of solar systems, whereby the GoR would focus on raising awareness with nation-wide campaigns to support companies and end-users of SHS
- Producing a detailed roadmap of the Rural Electrification Strategy

5. Challenges for mini-grid market development

Institutional, regulatory and planning

The GoR has taken strides toward developing an enabling policy, regulatory and planning environment over the past few years. Nevertheless, several ambiguities continue to foster unease and to postpone development in the sector.

The adoption of the PPP law in 2016 created uncertainty in the market as it raised the question of whether some or all mini-grids need to be procured as part of the PPP procedure. The risk was that the PPP law would apply to mini-grids of all sizes, without exemptions for capacities below a minimum threshold. The complicated and



Figure 9: Shop powered by a solar home system and lamp.

lengthy PPP procurement process, with its high transaction costs compared to the relative size of the projects considered, would obstruct mini-grid sector development in Rwanda. Energy stakeholders participated in a positive, solution-oriented dialogue that brought together the Ministry of Infrastructure (MININFRA), EDCL, Rwanda's Development Board (RDB), and development partners, among others. This recently resulted in a decision that isolated mini-grids with no off-taker commitment from the GoR do not fall under the PPP Law and are governed by the RURA Simplified License. This successful coordination further highlights the government's commitment to supporting the market development of privately operated mini-grids in Rwanda.

While Rwanda's enabling environment is relatively favorable to the off-grid sector, developers still remain wary of the threat of grid extension. The RURA Simplified License provides three options upon grid arrival¹¹, but developers find these options imprecise and remain cautious because the rules governing these options have not yet been applied. Therefore, some refinements to regulation and planning are still needed to fast-track private investment and project development. The utility and the regulator are both working toward such improvements. The National Electrification Plan study commissioned by the utility will clearly demarcate on-grid and off-grid areas in Rwanda. This study, due in the second quarter of 2018, has caused some delays to mini-grid site approvals, which are dependent on its provisions. However, the decision to integrate decentralized energy access planning marks a bold move away from traditional large-scale generation linked to the central grid, and will ultimately be to the benefit of private-sector mini-grid operators, if implemented effectively. RURA also plans further improvements to its Simplified License including the development of technical standards for mini-grids, tariff principles and more details on compensation procedures and processes.

Lack of productive uses of energy

Serving productive uses of energy (PUE) will play a key role in the development of the mini-grid sector in Rwanda. As consumption of energy by rural households is low, the viability of the mini-grid is reliant on commercial and productive activities, which can ensure reliable revenue at sufficient scale to support the investment. Mini-grids, unlike solar lighting, have the advantage of being able to support larger loads, but finding a practical approach to identifying, linking and fostering PUE activities to stimulate consumption remains a challenge. Uptake of productive use upon completion of a mini-grid has often fallen short of expectations, and developers struggle to achieve a strong increase in demand and revenues. Nevertheless, mini-grids provide a unique opportunity for rural economies to develop linkages to agricultural value chains and external markets, thereby not only enhancing access but also supporting rural economic development. Currently, productive use in rural areas is limited by several factors: lack of capital to purchase appliances/equipment, lack of skills, lack of market/value chain linkages, and lack of financing to develop income-generating activities.



Figure 10: Productive businesses are essential for a financially feasible mini grid.

¹¹ 1) Switch the company's license to a small power distribution and generation license, which will be valid for the remaining period of the original license (effectively splitting the business into a generator that sells to the grid and can qualify for feed-in tariffs, and an electricity retailer that buys from it).

2) Negotiate the acquisition of the project by the national utility.

3) Relocate the assets where possible and, in exchange for a relocation fee, operate for the remainder of the license period.

Programs like SOGER have begun to address and effectively support PUE development for mini-grids, with some developers exploring PUE development in their business models. Nevertheless, the development of PUE requires research, investment and carries its own set of risks. Therefore, further integration and linkages between mini-grids and existing and upcoming rural economic development, agricultural processing and irrigation projects are encouraged.

6. Access to Finance

Access to finance remains a key constraint for the off-grid solar market in Rwanda for both solar lighting and mini-grids. Nevertheless, larger SL companies are attracting both foreign and local debt, while the launch of the SREP-funded Renewable Energy Fund marks a significant step toward catalysing the private sector's investment in off-grid energy solutions.

Solar Lighting

According to back-of-the-envelope calculations¹², USD 34m had been invested in the Rwandan SHS sector by December 2017, with USD 15m alone invested in 2017. These investments have resulted in aggressive customer acquisition and are highly concentrated, with two companies accounting for 70% of sales in 2017. The larger companies have been raising debt and equity financing at a voracious level, primarily through Development Financial



Figure 11: Solar home systems and minigrids can power divers appliances.

Institutions (DFI's) and impact investors. Mobisol raised over USD 35m¹³ in 2017 alone, and Offgrid Electric secured USD 55m in January 2018¹⁴, although neither amount is exclusively for Rwanda. As PAYG companies are reaching a period of high growth, they face increasing inventory-finance constraints, and their working capital requirements increase. This type of financing, which is better suited for debt, has resulted in some of the larger companies shifting their focus toward commercial debt funding.

The increasing reliance of the sector on international investors can be risky due to currency volatility; companies will have to repay their loans in foreign currency while collecting revenues in a depreciating local currency. Therefore, the need for local commercial debt is high. However, local commercial debt remains out of reach for most market players. The local banks remain conservative, focusing their attention on financing traditional sectors. Among local lenders, there is a high perception of risk and a poor understanding of the off-grid sector, which results in strict lending conditions (i.e. high collateral, guarantees required) combined with high interest rates (typically 18% to 21%). Nevertheless,

¹² Calculated using the estimated upfront price of all systems sold in Rwanda minus 30% assumed margin

¹³ <http://plugintheworld.com/press-releases/with-new-investec-funding-mobisol-secures-over-us25-mio-funding-in-past-6-months/>

https://www.finnfund.fi/ajankohtaista/uutiset17/en_GB/mobisol_loan_facility/

¹⁴ <https://www.bloomberg.com/news/articles/2018-01-19/san-francisco-startup-nabs-55-million-to-expand-solar-in-africa>

Rwanda's solar lighting sector has witnessed its first local lending activity in the past six months: BBOXX secured a USD 2m line of credit from Bank Populaire Rwanda (BPR¹⁵), while another company also secured financing, signalling some movement in lending to the sector. However, structuring these types of deals is a lengthy process, as banks grapple with evaluating these new and complex PAYG business models.

While there are some signals of an overall increase in willingness to lend to the sector, this is currently exclusively for the larger players and under relatively unfavourable lending conditions. A number of companies and banks recommend creating a loan guarantee program for banks, which would allow the banks to shift some of the loan recovery risk.

Mini-Grids

The mini-grid sector remains relatively nascent and has, therefore, not been active in raising debt financing. While SL companies are primarily seeking working capital to finance their PAYG business, mini-grid operators require loans to construct their plants, which often have a longer payback period, no offtake agreement and, for most operators in Rwanda, a limited track record in the sector. In addition, the projects are too small to attract international lenders; hence, projects must often develop a financing structure that includes equity, grants and local debt. Nevertheless, one project has received commercial funding from a local financial institution supported by EnDev, signalling that banks may be willing to support projects that are backed by grants. While it is expected that mini-grid projects in Rwanda will continue to require grant support in the range of 40% to 70% in the near future, a growing pipeline of projects supported by EnDev, SOGER and other regional donors will require debt from local financial institutions, where the SREP-funded Renewable Energy Fund is expected to play a significant role through its direct lending window to mini-grids.

SREP-funded Renewable Energy Fund (REF)

The launch of the SREP-funded Renewable Energy Fund (REF), facilitated by Rwanda's Development Bank (BRD), in November 2017 will unlock a staggering USD 50m capital geared toward the off-grid sector. The objective of Rwanda's SREP Investment Plan is to accelerate off-grid electricity access through stand-alone solar systems and renewable energy-based mini-grids. The REF will directly support the implementation of RES Programme 2 and 3¹⁶.

The REF, which will be implemented by BRD, will provide local currency financing through four financing windows:

- a) Window 1 - On-lending through SACCOs to households and micro-enterprises
- b) Window 2 - On-lending through banks (commercial and microfinance) to households and small and medium enterprises (SMEs)
- c) Window 3 - Direct financing to mini-grid developers
- d) Window 4 – Direct financing of locally registered OSCs supporting Tier 1 or higher solar systems

As the fund was not yet launched during interviews with solar companies and banks, most remained unsure of its impact; some companies feared that only large multinational companies would meet the criteria and be able to access the funds, while others anticipated bureaucratic hurdles and complicated lending processes and terms. A number of companies also expressed a preference for direct lending to solar companies (Window 4), which has been postponed until a detailed assessment of the existing windows is conducted one year after project implementation. Overall, the sector was not yet aware of the specifics of the fund and was awaiting further information. Off-grid

¹⁵ <http://www.bboxx.co.uk/bboxx-secures-unique-financing-facility-with-bpr-to-support-the-governments-off-grid-electrifications-goals/>

¹⁶ **Programme 2:** Government will establish a risk-mitigation facility targeting the private sector such that solar products will be made available on financial terms that the population can afford. **Programme 3:** Mini-grids will be developed by the private sector with Government playing a key role in identifying sites and establishing a framework through which these become financially viable investments.

lending is a new business for BRD and it is likely that putting this fund into operation will require time and capacity building within BRD. Nevertheless, the REF has the potential to transform the off-grid sector, for which access to finance remains one of the most crucial barriers.

7. Conclusions

The off-grid sector in Rwanda remains dynamic, with momentum continuing from the previous year. The solar lighting market witnessed rapid acceleration led by the larger SHS companies, with 2017 sales growth more than doubling from the previous year, resulting in solar home systems being available in every province in Rwanda. The segment is pursuing aggressive customer acquisition through a flood of investments witnessed over the past few years, which are not slowing down. A few major companies are also reportedly reaching profitability in Rwanda, resulting in decreasing reliance on grants and equity investments and greater demand for commercial financing. Significantly, for the first time, local banks have provided debt to solar companies and the Renewable Energy Fund, launched in November, will unlock up to USD 50m of capital for the Rwandan off-grid energy sector in 2018. The solar lamp segment saw a significant market contraction, as companies have witnessed lower margins, largely due to the aggressive PAYG customer acquisition and pressure to offer a PAYG service. Nevertheless, the solar lamp segment is unlikely to entirely collapse due to the portable and affordable nature of the product. The mini-grid sector, while still facing significant market access hurdles, has taken some quiet strides forward. A small technology-diverse portfolio of privately owned mini-grids are now operational in Rwanda, and increased coordination exists among stakeholders to foster market development. With the ongoing implementation of the RES and the imminent National Electrification Plan, the GoR will need to ensure that support does not distort off-grid market conditions, particularly for the heavily leveraged PAYG sector, which will be especially sensitive to market shocks.



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