CLEAN ENERGY SOLUTIONS CENTER
ASSISTING COUNTRIES WITH CLEAN ENERGY POLICY

Off-grid Solar Market: Trends, Challenges, Success Stories and Future Outlook (Part 2)

—Transcript of a webinar offered by the Clean Energy Solutions Center on 21 September 2018—
For more information, see the clean energy policy trainings offered by the Solutions Center.

Webinar Presenter

Hugo Lucas Porta Factor CO2

This Transcript Because this transcript was created using transcription software, the content it contains might not precisely represent the audio content of the webinar. If you have questions about the content of the transcript, please contact us or refer to the actual webinar recording.

Hugo Lucas Porta Hello, ladies and gentlemen, I'm very happy to welcome you to the second part of the module on the off-grid solar market. In the previous section, we have seen past trends and notable changes. This section is devoted to some of the remarkable success stories the industry has produced, as well as to a market outlook for the future.

I would like to thank the International Solar Alliance and the Clean Energy Solutions Center, who facilitate this webinar series.

My name is Hugo Lucas. I'm responsible for energy at Factor. Factor is an international consulting firm. I'm responsible for the office in Berlin.

The training that we are doing today is part of Module 7, and it focuses on the issues of off-grid solar markets and is the continuation of the lecture we had, the previous part that we had last week.

Recapping the learning objectives of this module on off-grid solar market. The module aims to provide focus on factor of success. They include company examples with success stories from the industry, while at the same time, the profitability of business models in the sector is scrutinized. Major determinants of sustained profits are evaluated, and a general market outlook, taking into consideration gamechangers and likely development, is provided. A vital starting point is understanding of off-grid solar as a technology for improving access to electrification, in conjunction with a reconsideration of how access should be defined. The second main takeaway constitutes an appraisal of the crosscutting benefits and spillover effects off-grid solar electrification strategy can bring for rural communities, beyond simple lighting. In front of this background, one can continue to conceptualize off-

grid solar in this private context, together with the opportunities and remaining challenges.

Similar to the introductory part on off-grid solar market, the understanding of this training module is trying to characterize the market and being aware of the low awareness and limited geographical presence that the off-grid markets have, up today, mainly in sub-Saharan Africa and India. In 2017, the sector by no means can be regarded as marginal anymore, with over 360 million people benefit from off-grid solar technologies. However, the market remains highly dynamic, and it has to be understood as such. It is, therefore, important to take into consideration the complexity of factors and drivers that continue to shape the market. Just a compare of this module explore the complex dynamics and analyze the future trends and trying to forecast how the market is going to evolve, both for _____ technologies and for plug-and-play solar home system.

So we will start, now, presenting success stories of companies that, at present, are making business and growing their market shares in the off-grid arena, mainly with solar technologies.

In the first part of this module, we have touched on the promising growth and trends of solar home system sector. A concerning issue that have been raised in the previous section is the high geographical concentration of off-grid services providers and the exhaustion of low-hanging fruits, one of the reasons for the recent slowdown in the sales growth. A selection of some of the most successful solutions providers in the solar off-grid sector are presented on this slide. East Africa is a main geographical hotspot of the industry, with Mobisol, M-kopa, Off Grid Electric, or Fenix International being among the leading companies in this region. Especially Kenya, Uganda, and Tanzania feature highly-competitive markets. In Asia, the largest market for solar home system is found in India, mostly serviced by Simpa Networks and SELCO. Nevertheless, other markets are continuously being explored. Lumos, for example, is active in Nigeria, Mobisol has pushed operation into Rwanda, Fenix International is active in Zambia, just to name a few examples. BBOXX, a company that we will learn a bit more later on this module, has also recently started to explore Democratic Republic of Congo, where they aim to provide 2.5 million people with electricity, by 2020.

Our first example for success story is the German company Mobisol. Mobisol is selling solar systems to off-grid households and small enterprises in rural Africa. The company was founded in Berlin in 2010, and launched its first pilot in Tanzania and Kenya in 2012. In 2014, commercial operations were extended into Rwanda. By the end of 2017, the company has grown to be the largest off-grid solar provided in _____ Africa, with more than 10 megawatts of installed capacity, and more than 500,000 people electrified. As part of its commercial strategy, Mobisol has recently grown its workforce, to develop a number of business-to-business partnership and support solar providers in additional nine countries. The company strives to alleviate poverty, by providing sustainable and affordable energy solution to 20 million people by 2023. Mobisol wants to plug-in the world.

Mobisol's service offering includes solar home system, home and productive use appliances, as well as inhouse pay-as-you-go software. Mobisol targets an emerging middle-class in African villages. The plug-and-play solar home systems they provide range from 80 to 200 watts, and are bundled with DC appliance. Customer research has shown that the entry-level and best-selling package includes an 80-watts solar home system—which consists of a panel, a battery, and a controller—4 lights, LED lights, a phone charger, a solar lantern, a radio, and a 19-inch TV, which are displayed in the left picture. Recently, Mobisol has even partnered with the company StarTimes, making pay-TV entertainment accessible to east African off-grid population. Mobisol claims that nearly a third of their customers generate incremental income with their solar system. A prominent example of an entry-level productive use appliance is the so-called Mobi Charger. Other appliances such as hair cutters or bar entertainment systems are also offered. The productive use appliance sector is one of Mobisol's more active aims to extend operation in.

Mobisol is more than a solar product provider. Mobisol works on a highly-integrated value chain; this is mainly driven by the need to control customer experience across the value chains, given that quality long-term customer relationship, which drive payment recovery and upscaling, are crucial to the business model. Besides the solar home system, the design and provision of DC appliances is one example of such integration, but also the services Mobisol offers over its pay-as-you-go platform are unique features of their business model.

Mobisol has started as one of the pay-as-you-go pioneers, and has become one of the pay-as-you-go market leaders, with their own hardware agnostics, Paygee software. Paygee aims to provide households at the base of the pyramid with easier and more affordable access to large range of solar products and associate product use appliances. Paygee offer cost-effective solutions for the most common last mile distribution challenges. Typically, the high upfront cost of solar home systems can be split into easy-to-pay installment. A pay-as-you-go financing plan makes the system affordable, with entry-level system costing a similar amount per day to what the typical customer would otherwise spend on kerosene, candles, batteries, and mobile phone charging. These small payments for energy services also add up towards the total purchase price, and once fully paid, the customer owns the system, enjoying clean reliable electricity for free. Further, the company can utilize real-time data analysis for distribution monitoring and data-driven reporting, and offering key performance indicator that can help the company to attract investors.

At the core of Mobisol pay-as-you-go service is the machine-to-machine connectivity and mobile money: a SIM card imbedded in the solar home system enables two-way communication via the GSM network between the system and Mobisol central server, which hold customers' account and payments information. Customer pay by dialing a short code for mobile money service, and select a bill payment option. They enter Mobisol's bill pay number, their customer account number, and the account. The payment is sent to Mobisol merchant account, through the communication provide the mobile

telephone networks, and through integration with Mobisol's central server, record of the payment is immediately updated in Mobisol account. Mobisol's central servers calculate the days of credit to be added to the account, based on the payment amount, and switch the unit on according to the balance.

Where does the company come from, and how does it finance its operation expansion in untapped markets. Initially, a German solar industry financed Mobisol's initial product development and first employees. After successfully completing the pilot phase, the company was able to attract further investors and development banks, such as the German DEG. Grants from international donors were particularly relevant for project scaling and early project development phases. Investec made an initial equity investment in Mobisol, in late-2016, leading a consortium that included the International Finance Corporation and the Dutch development bank FMO. Since then, this consortium has supported Mobisol continued growth in its existing markets, and those aims to expand it. Investec made, also, a new equity investment in 2017; combined with previously concluded debt finance deals means that Mobisol has secured over $25 million funding in the second half of 2017. This equity finance is highly important, especially for the geographical expansion of services into harder-to-reach regions, but also, for the continuous development of newer and better products.

Operational excellence and innovativeness is crucial in difficult ecosystems. For Mobisol, sales and marketing activities combine national and promotion efforts, local market demonstration, door-to-door activities. Mobisol work with a large network of sales agents, paid on commission. These agents are being trained during two weeks in the field and at the inhouse training center called Mobisol Akademie. In order to encourage word of mouth, Mobisol has set a customer refer program, and technicians and other field staff also earn a commission when they identify new customers. Once a customer is interested in Mobisol product, he or she must go through a credit assessment process, before signing up. The individual then pick up his solar home system at one of the Mobisol store called Mobishops, spread all over the country. Customers bring their solar home system home, and call a certified technician who comes and completes the installation within the next 48 hours. The actual installation takes about one hour. After this, maintenance and service is provided free of charge during the initial three years. Lastly, the customer finance team deals with late payers, calling or visiting them, to maintain a low default rate for the initial installment.

Here we can see, in the bottom-right, one of these Mobishops, in Africa, in Uganda this case, but also, the offices of Mobisol in Berlin, and their control center. Mobisol is a highly dynamic fast-growing and innovative company. They manage all these operations from these headquarters in Berlin. From these screens that we see in the photo in the left, they can monitor half-million people that they are electrifying.

The second successful company we are having a look at, as a part of this module, is BBOXX. Three students at Imperial College London, while studying electrical and electronics engineering, founded a successful student

charity, which exposed the potential for off-grid solar solutions in the developing world. BBOXX is the resulting for-profit venture, and started in March 2010. Since then, more than 150,000 BBOXX products have been sold in more than 35 countries, improving the lives of more than 675,000 people. Since then, the vision of BBOXX is to provide 20 million people with electricity by 2020.

These efforts do not stay without impact. As a result of the total operation of BBOXX around the world, almost 4 gigawatt hours of energy have been generated from solar, $2.4 million have been saved by their customers on energy expenses, and over 40,000 tons of CO2 have been offset. Over 63,000 school-aged children can study comfortably without straining their eyes in bad lighting conditions. And finally, over a quarter of a million people have access to electricity, thanks to BBOXX efforts.

BBOXX also has a fully vertically integrated business model, they have their own design, manufacturing and distribution networks. BBOXX Home comes with a 50-watts roof-mounted solar panel, and can be purchased on a 3-year payment plan. BBOXX offer a range of energy-efficient DC-powered appliances, to be used in conjunction with their plug-and-play BBOXX Home system.

In late-2015, BBOXX have been in the news for announcing Africa's first securitization deal for off-grid solar. Innovation in funding Africa's solar evolution has always likely been the key to unlock the countries' vast PV potential, and a new investment model that seeks to bring securitization to the off-grid sector. Oikocredit International, an investment firm headquartered in the Netherlands, together with BBOXX, replicated the US model of securitizing residential solar installation across Africa off-grid solar market. The securitization structure was created by setting up a special-purpose vehicle, a company called BBOXX DEARs. It bundled the contracts of BBOXX customers who have bought solar home systems which are paid off installment. BBOXX DEARs then issues notes and sells them to Oikocredit. The value of these notes is based on the future receivables on the customers' contracts. The sale of these contracts provides BBOXX with capital to supply new solar home systems to households. Clearly, innovative funding strategies can pave the way for more investment in the sector.

But innovative funding does not stop here. Recently, BBOX have partnered with the online positive impact investment platform Lendahand Ethex, to launch a new campaign that integrates £2.5 million a year, through retail-focused investments that will deliver up to 6 per cent annual return for participants and contributors. The partnership is part of the Energize Africa scheme that was launched in 2017. Notably, this is the first Energize Africa scheme that will directly seek to tap into the active UK crowdfunding space. In early-2018, BBOXX had also partnered with TRINE, and launched the first of six crowdfunding rounds. The €1 million target has been reached, already, within a month time, through the crowdfunding platform. This loan is meant to bring 10,300 solar home systems and appliance to people in rural

Kenya. The expected return for this funding round is 6.75 per cent, and the estimated CO2 offset is almost 15,000 tons per year.

Last, but not least, BBOXX is striving to become a next-generation utility, and has launched a pilot to provide Internet access for communities in Rwanda. Internet is the logical next-step in the service offering, with other utilities such as water and gas likely to follow. This effort is likely to have powerful impacts on the lives of many, since only 25 per cent of people across Africa has access to the Web. Availability, affordability, and awareness are major barriers to the rapid expansion of Internet usage, which significantly slow economic and social development.

The third and last company, so, case in this lecture as a success story, will be SOLshare, an enterprise that has successfully piloted the world's first peer-to-peer electricity trading network for rural households, with and without solar home system, in Bangladesh. Along with its implementation partner, the NGO Ubomus, its financing partner IIDCOL, and research partner The United International University, SOLshare combines solar home systems and centralized mini-grids, to enable rural households to access renewable electricity at a lower cost. Trading renewable electricity through SOLshare village grid can unlock at least up to 30 per cent excess generation capacity of existing solar home system. Through usage of the full power generation capacity, more people benefit from a clean reliable source of electricity, at a low cost. Further, the SOLshare trading platform can turn excess generation of households' solar home system into financial overturns. SOLshare expects to operate more than 20,000 nanogrids, by the end of 2030, which are expected to supply more than 1 million customers in Bangladesh.

How do these village grid works. It all starts with SOLbox, which is the product SOLshare is producing and selling. The SOLbox is a direct current bidirectional power meter, solar charge controller, and machine-to-machine communications enabled end-user device that functions as an individual node of the electricity trading network. The plug-and-play nature of the SOLbox allows the trading network to grow dynamically from the bottom up, as more users connect over time. The ICT backend facilities secure peer-to-peer electricity trading between users, integrating mobile money payments, data analytics, and grid management services. As the SOLshare network grows, it can connect with the national grid, operating in an island mode when the grid is unavailable, and drawing power from the grid when it is available, metered at a single central location. This solution creates last mile power distribution infrastructure, and demonstrates the ability for this technology to integrate with the expanding rural electricity grid.

The vision behind the smart village concept is to enable improved energy services and technologies, deliver smarter inclusive financial services, foster existing entrepreneurial capacity, and encourage development through education. This system offers several benefits to the village inhabitants: they have an inexpensive and reliable energy source, and are not dependent on the central energy system; they can develop economic activities that consume energy, notably, of agricultural nature; their life quality improves through

better connectivity; and by selling their excess energy, homes equipped with solar home systems have a new income source.

One final success story should be mentioned; it can only be attributed to the industry as a whole. Companies that build, install, and maintain standalone systems are rapidly scaling up operation and creating jobs along the value chain. For example, d.light, which manufactures and retails solar lanterns and solar home systems, has sold over 10 million solar products, employing over 400 staff. M-kopa has sold over 300,000 solar home systems in Kenya, Uganda, and Tanzania, and created more than 700 fulltime jobs, along with 1,500 sales representatives. Similarly, several other companies are serving vast populations and creating jobs in sub-Saharan Africa and Southeast Asia.

Of the three companies that have been exemplified as success stories, Mobisol and BBOXX certainly have already great impact in the lives of many and in the off-grid solar sector in general. SOLshare is innovative and promising, but it is too early to evaluate its likely impact. Nevertheless, a recent report by the Global Off-Grid Lighting Association has found only very few off-grid solar companies to be declaring profits today, exacerbated by the rising price competitiveness in hotspot regions. There are features that can render the profitability of off-grid companies more likely. A reach across multiple countries, as opposed to a narrow geographic focus, is one option. Both BBOXX and Mobisol follow this strategy, by continuously pushing to extend their operations. Extending product portfolios in order to become a larger part of consumer life, and consequently, tap into a larger share of people's disposal income is also helpful and further brings down the per unit customer acquisition cost.

We have, for example, seen that Mobisol is trying to extend their product offering in both consumers and business direction. BBOXX, on the other hand, is turning itself into a next-generation utility or _____ utility, striving to extend their services to also include Internet access provision. Low-cost manufacturing will continue to be highly decisive for the profitability of off-grid solar services, because ultimately, the price of the products remains a major determinant for the demand of those targeted.

The final point, access to low-cost capital, is a difficult one. Naturally, the recency of the sector and the business model, together with the high risk of default of the consumer base of the company, does not make the sector highly attractive to large-scale and foreign investors. Innovative strategies and instruments are needed, potentially, facilitated by data-driven risk analysis and key performance indicators, in order to leverage needed investments. Taking these aspects into account, and after having seen how some of the highly valued representatives of the sector are managing to cope with the challenging off-grid environments, we will now turn to a more global appraisal of the potential future outlook of the market.

In Part One of this module, we have seen the impressive growth of the sector, albeit with some slowdowns in sales growth in recent years. Projections for the two most important product categories in the off-grid solar sector forecast continuously growing markets. By 2022, the solar home systems sector is

estimated to have grown to a third of the total off-grid solar sector, with an annual unit sales of 20 million. These estimates are depending on assumptions of the state of a wide range of factors, that will determine the development of the off-grid solar market worldwide. Developments will depend on the ability of service providers to penetrate untapped but potentially less lucrative markets, as well as on the willingness of major cooperation to enter the segment. Further, mobile money penetration increases in key off-grid solar markets such as India, Nigeria, and Ethiopia will be a decisive factor. Also playing a substantial role are ongoing efforts to revise potential ways to increase financing and funding; also, policy support and the development of quality standards will be influential. Last, but not least, it is certainly the growing demand for productive use appliance that will manifest as a gamechanger.

It is difficult to assess the likelihood and the impact of these determinants and gamechangers, however, tentative rankings such as this can give a taste of how markets may evolve. Notable is, for instance, the weight given to appliance and productive use cost, on the far-right of the impact axis and toward the middle of the likelihood axis. This may be indicative of the huge potential impact this development is already having and, hence, likely to continue to have in the future. It has to be kept in mind that this is a rather subjective ranking of potential factor compiled by the Global Off-Grid Lighting Association, GOGLA, and very little is certain with respect to these gamechangers. Nevertheless, what the industry tends to agree on is that the overall off-grid solar market will remain to grow dynamically. The following slide will provide several reasons as to why this assumption is very likely to hold.

Market forecasts for the off-grid solar continue to paint a buoyant future. Most importantly, this will be due to large remaining potential market of households with unreliable or no access to the grid. But also, the real income growth of many affected households drives expansion, although past projections have been too optimistic in this context. Infrastructure and policy environments tend to develop into an enabling environment, and technology innovation has the potential to further decrease transaction costs and facilitate the utilization of the natural resources. Ergo, while the off-grid solar sector is maturing, it has not lost its hunger for further expansion.

Additional factors keeping the off-grid solar market buoyant are, for example, the fact that maintenance, replacement, and upgrade cycles are starting to set in. This means that current off-grid consumers represent a promising source of sales growth, because they are, for example, willing to reinvest generated incomes into higher capacity or new appliances. At the same time, customer acquisition costs are falling in established and, hence, price-sensitive markets, making it more likely that, for example, previous PICO customers expand their setup and move into solar home system.

So, concluding remarks. The cases of BBOXX, Mobisol, and SOLshare exemplify, to some extent, the overall success that the sector can be proud of. But these companies also feature distinctive characteristics that explain why

they are potentially more successful than others. The ecosystems in which these companies try to gain profitability is challenging, and demands the continuous evolvement of business models in order to stay profitable, in order to reach new markets, or, for example, in order to service changing consumers' demand. While these challenges remain, and initial growth trends are unlikely to be repeated, the sector is likely to continue to manifest as a vibrant and dynamically growing market. Certainly, the large remaining potential is carrying this optimistic stance to a large extent, nevertheless, the market outlook depends on a rich set of interdependent factors and gamechangers.

At this point, we come to the end of the second part of this module on off-grid solar market trends. I would like to thank you for attention. As before, you are invited to test your understanding of the concepts, in the following small quiz.

Thank you very much.