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# Off-Grid Electricity in Africa

Market Review and Opportunities for the UK and Japan

August 2019

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Cover photo and above by Azuri

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# 1. Introduction

## 1.1 Scope and Purpose of this Report

This report has been prepared in advance of discussions at the 2019 Tokyo International Conference on African Development (TICAD) to showcase some of the pioneering British and Japanese businesses and organisations that are impacting the off-grid electricity sector as well as to consider the efforts of the British and Japanese Governments to deliver support for increasing access to reliable electricity services in Sub-Saharan Africa now and in future.

Off-grid electricity presents the opportunity to harness renewable energy technologies to deliver power to some of the most remote and poorest communities in Sub-Saharan Africa, delivering a range of environmental, social and economic benefits.

The report summarises the challenges, opportunities and progress made so far in the sector in order to inform British and Japanese Governments and businesses about how to tackle challenges and make progress towards achieving the Sustainable Development Goal 7 (SDG-7) to ensure access to affordable, reliable, sustainable and modern energy for all by 2030.

The report coincides with efforts by the British Embassy in Tokyo to increase dialogue between British and Japanese organisations in the sector, along with counterparts in Sub-Saharan Africa and further afield, to create new ideas and partnerships to increase the speed of progress towards universal access to energy including through the use of off-grid electricity solutions.

This report has been compiled by reviewing some of the latest publications from experts in the off-grid sector, with a full list of documents referenced at the end of the report. The report also draws on a number of interviews with selected organisations from the UK and Japan who are involved in the off-grid electricity sector, including Government officials, businesses, investors and trade groups.

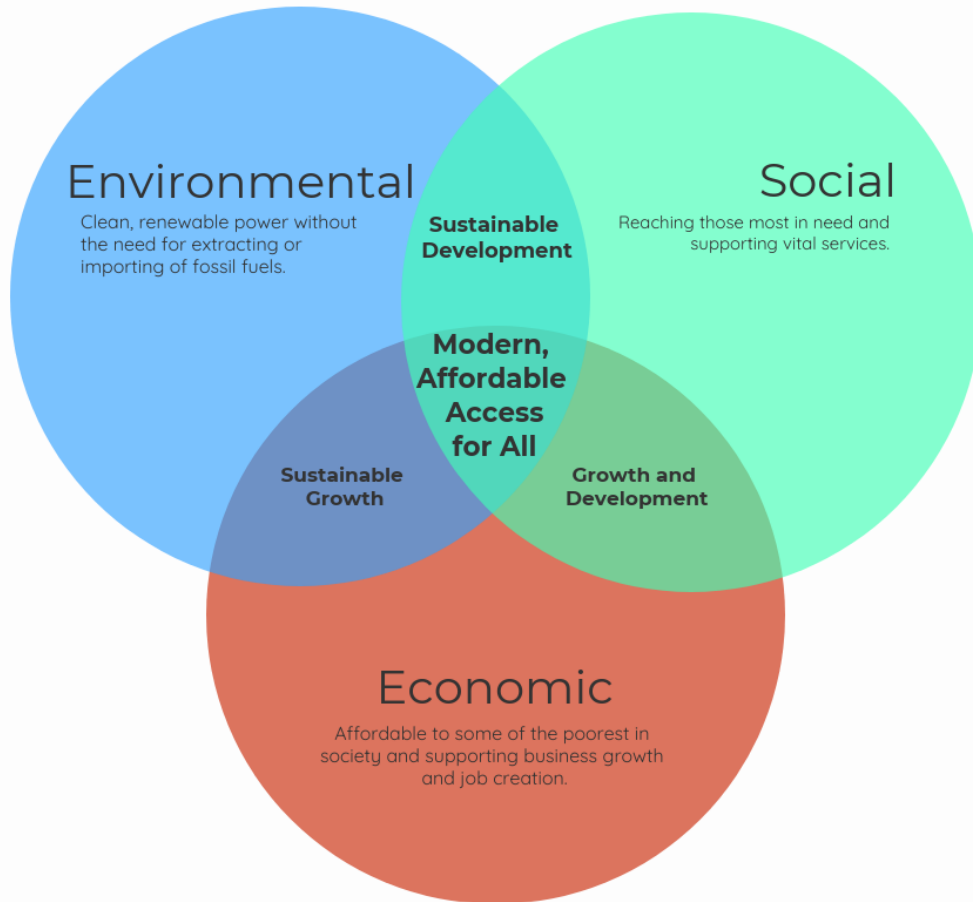
The report is by no means a comprehensive overview of the insights of all Japanese and British involvement in the sector but gives a useful insight into the latest thinking of some prominent stakeholders active in the market. Some of the organisations interviewed are profiled in the report while the full list of interviewees is detailed at the end of the report.

## 1.2 The Potential of Off-Grid Electricity

Despite progress in global efforts to achieve universal energy access by 2030 in line with the UN's SDG-7, there were still around 840 million<sup>i</sup> people in 2017 that lived without access to modern, affordable and sustainable electricity in the world. The majority of these people, some 570 million<sup>i</sup>, live in Africa.

In many cases, off-grid solutions are often the only viable option for some of the world's poorest communities to gain access to electricity. Furthermore, off-grid electricity from renewable energy sources, such as solar, wind or hydro, are becoming the cheapest long-term options and are driving out the need for reliance on polluting diesel generators, disposable batteries and harmful kerosene.

# What are the benefits of Off-Grid Electricity?



*Figure 1: What are the benefits of off-grid electricity?*

Off-grid electricity access has the potential to transform lives in Sub-Saharan Africa, creating jobs and improving access to and the impact of public services. At a very basic level, even access to a good quality, reliable electric light can make the delivery of healthcare safer and allow for more hours in the day where teaching and studying is possible. With more productive off-grid power there are opportunities to open businesses and carry out industrial processes to support jobs; to irrigate farmland to grow crops to sustain communities; and to refrigerate food and medicine to make communities healthier and more resilient. The ability for off-grid electricity from sustainable and renewable sources to positively impact development in such a wide range of ways, while doing so in an environmentally sustainable manner, has led to it being described as the 'Golden Thread' in development circles, with Duke University research suggesting that no less than 9 of the 17 SDGs<sup>ii</sup> can be positively impacted by energy interventions.

### 1.3 The Technology Basics

Off-grid electricity options can be broadly split into two categories: off-grid solar or solar home systems and mini-grids.

#### 1.3.1 Off-Grid Solar or Solar Home Systems

These systems provide access via standalone off-grid devices, the vast majority of which utilise solar photovoltaic (PV) energy to power lights, to charge mobile phones or to run basic appliances.

Off-grid solar systems or solar home systems generally consist of a small solar panel, a battery in order to store power during the day to be used at night and additional basic appliances, most commonly lights. Systems tend to be sold as individual consumer products to be used in households or institutions like a health centre or school.

Pico-solar systems are essentially very small-scale solar home systems and tend to be a single integrated unit combining a small panel, light and potentially a USB input to enabling charging of other devices. Some businesses also distribute home-scale batteries which are distributed from a central hub which can generate enough power to charge multiple batteries for a community.

Solar home systems are the cheapest option for delivering renewable electricity to remote and isolated areas and are increasingly affordable to some of the poorest communities in Sub-Saharan Africa. The most affordable pico solar home systems devices cost as little as US\$5, with larger systems with appliances or larger panels and batteries costing up to and over US\$100.

#### 1.3.2 Mini-grids

Larger systems can be categorised as mini-grids which use renewable sources for electricity generation and then distribute it through a small grid network, delivering electricity to multiple homes, communities, businesses, institutions and small industries. Mini-grids can deliver access to electricity for a few buildings or power entire villages or even small towns, depending on the size of the grid and the amount of energy that is generated. Mini-grids include a generation element, for example a single wind turbine or a small array of solar panels along with a battery storage system to ensure that power is available when needed.



Figure 2: Why Communities in SSA Choose Off-Grid Power

Mini-grids using diesel generators are already vastly popular across Sub-Saharan Africa, but do not represent a viable, long-term solution to improve electricity access while also tackling the negative impacts of fossil fuel use. Mini-grids utilising diesel power also require importing and delivery of fossil fuel and the associated uncertainties around prices for the fuel over the long term.

## 1.4 The Current Market

There are still 570 million people in Africa without access to electricity, mostly in Sub-Saharan Africa. Despite some progress, a step up in investment and activity is required in order to get close to meeting the UN’s 2030 target of providing access to sustainable energy for all.

According to the International Energy Agency’s World Energy Outlook in 2017<sup>iii</sup>, providing electricity for all by 2030 would require annual investment of US\$52 billion per year, with 95% needing to be directed to Sub-Saharan Africa.

The report notes that to achieve this at the least cost, 23% of the total of US\$391 billion in investment by 2030 would be in off-grid solar and 48% in mini-grids. This highlights the scale of the opportunity and the fundamental importance of off-grid electricity in achieving global goals. What these figures do not indicate is the scale of the effort needed not only to raise the appropriate level of investment, but also the effort required to overcome various barriers and risks before making those investments.

### 1.4.1 Off-Grid Solar

The benefits of reaching off-grid targets and increasing the size of the solar home systems market are clear. The Global Off Grid Lighting Association (GOGLA) estimates that globally there are around 108 million people currently benefitting from improved energy access thanks to off-grid solar products and that the devices have saved about 58.4 million metric tons of CO<sub>2</sub> while generating an additional US\$ 4.2 billion of income as a result of ownership<sup>iv</sup>.

It has been reported that solar home systems sales have now topped 3.9 million units with an installed stand-alone solar capacity of 32.39 MW across the globe.

Solar home systems continue to see an increase in sales. From July to December 2018, 480,000 were sold, a 77% increase compared to the same period in 2017 and a 133% increase compared to 2016.

Despite this, sales figures have not increased as quickly as some businesses and investors predicted, which has further increased uncertainty among the investment community.

In terms of regions within Sub-Saharan Africa, countries in East Africa including Kenya, Tanzania and Zambia helped to pioneer access to solar home systems where businesses such as M-KOPA, BBOX and Azuri have emerged. The most recent sales figures indicate that this trend is continuing with sales still higher in East Africa than in West and Central Africa. Despite this, enormous markets exist across Sub-Saharan Africa and there is potential for growth in all countries where access rates are still low.

## Investing in Global Electricity Access

If every household in the world had to have access to electricity by 2030 using the least cost method, a total investment of US\$391 billion would be required, with 48% for mini grids and 23% for off-grid solar solutions.

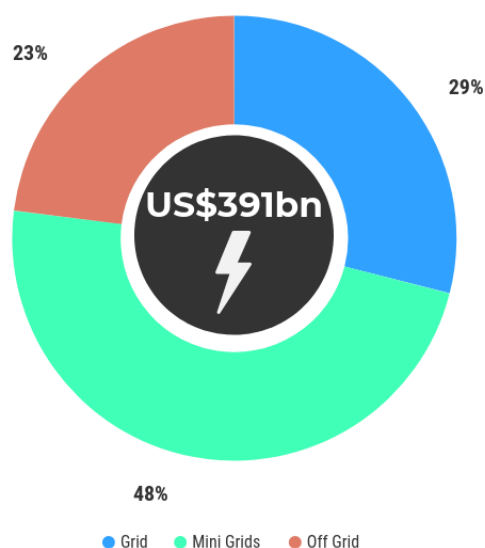


Figure 3: Investing in global electricity access

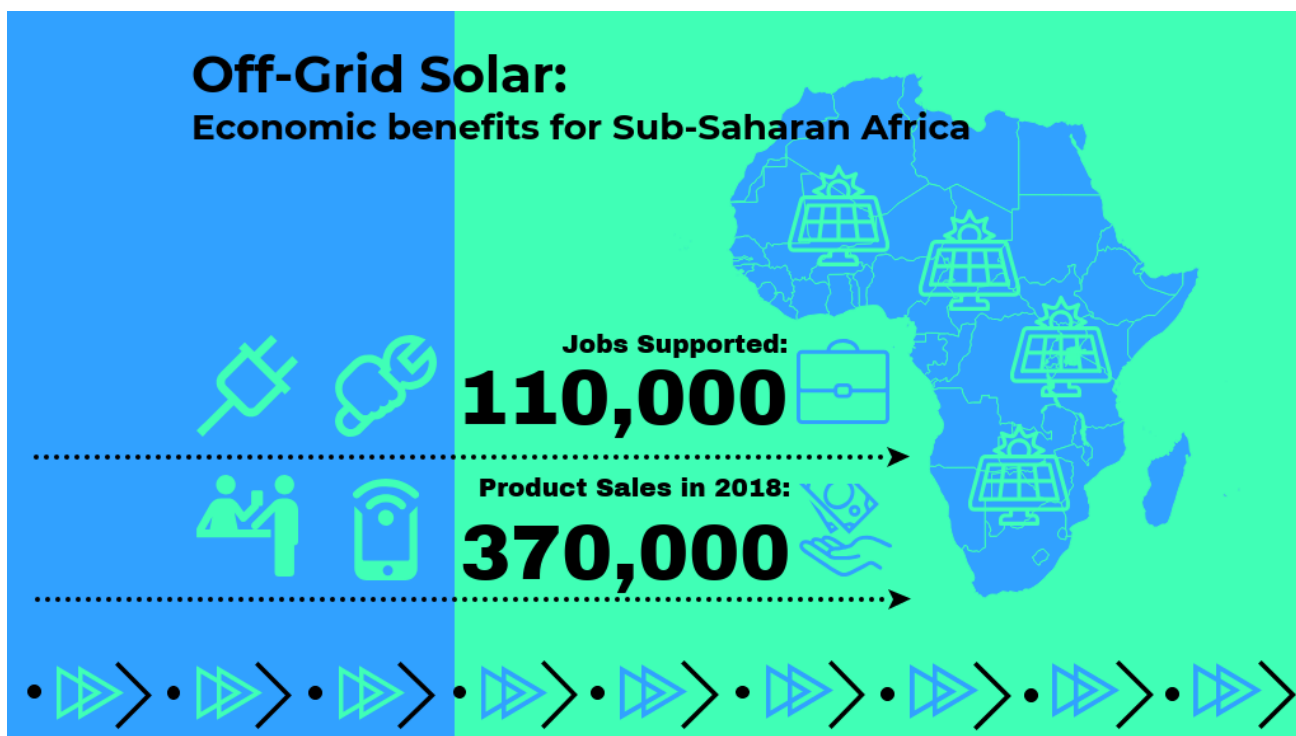


Figure 4: Economic Benefits for Sub-Saharan Africa

One reason for the relative higher growth in the East African market is that it coincided with growth in mobile money in countries like Kenya and Tanzania, which has made paying for solar home systems possible over time in small, incremental amounts, making them affordable for people with low and uncertain incomes. Mobile money markets are less well developed in other parts of Africa where the technology hasn't yet been fully introduced, such as Nigeria. Even in East Africa, markets such as Malawi, which is relatively poorer than Kenya and Tanzania, has struggled to entice private sector developers, while countries like Zambia have also found creating markets in remote regions a challenge.

#### 1.4.2 Mini-grids

The latest figures from the World Bank indicate that at least 19,000 mini-grids are installed in 134 countries, representing a total investment of US\$ 28 billion and providing electricity to about 47 million people<sup>v</sup>. Although this figure includes mini-grids using non-renewable sources, it does indicate the potential for the use of isolated networks and for renewables to displace diesel generation as the cost of renewable electricity generation continues to fall. Although Africa does not have the largest share of existing mini-grids it tops of the list in terms of planned developments with that number set to rise over the next decade as technical, financial and political barriers are overcome.

Since mini-grids have the potential to provide energy which can be used for the same tasks as on-grid power, there are opportunities to provide power to commercial and industrial users, with mini-grids in many cases being more dependable than relying on a national grid. This leaves the potential for creation of local jobs in poor communities.

Despite progress in testing and roll-out of donor supported developments, there is still a viability gap before a full commercial model which can be scaled-up is reached. Part of this challenge is an amplified issue of the challenge of affordability for solar home systems, that is, mini-grids have very high up-front costs that require lenders to have confidence in business models and requires some kind of proof of concept to highlight that entrepreneurs will be able to make returns.

In terms of viable markets for mini-grids, the current picture is one of varying degrees of success depending on the approaches of Governments and donors active in the markets. Evidence from the UK Government's Department for International Development (DFID) and their programmes in Kenya, Tanzania and Sierra Leone,

highlight the different challenges faced. In Kenya and Tanzania, difficulties in agreeing siting and tariffs with Governments have led to delay and uncertainties. In Kenya progress is now steady and a number of private operators are developing mini-grids and securing finance alongside support from DFID, the EU and the World Bank. Progress is also being made in Tanzania, despite the announced changes in Government support and legislation. In Sierra Leone, progress is slightly more promising as work continues to develop a supportive environment alongside the development of 94 mini-grids.

Other markets where Government intervention is less apparent, such as in Somaliland, means that restrictions on tariffs and siting are less important, but a lack of regulation means that affordability is an issue and consumer protection principles are not in place.

A more complete picture of mini-grid markets cross Africa can be accessed at the Green Mini Grids helpdesk, an initiative ran by the African Development Bank with donor support, including from DFID, which has advised 79 Green Mini-Grids developers in 36 African countries in areas including demand assessment, technical system design, business plan development and financial modelling<sup>vi</sup>.

## 1.5 The UK and Japan – Ambition and Potential in Electricity Access

Domestically, the UK and Japanese renewable energy markets are among the most pioneering and successful in the world. In the UK in 2018, 33.3%<sup>vii</sup> of total electricity consumption came from renewable sources, while in Japan, the same figure in 2017 was 16%<sup>viii</sup>. Ambitious and world-leading policies to support renewable energy in both countries have seen the industries develop and new businesses and talent emerge.

Although the off-grid electricity market in Sub-Saharan Africa is not comparable to the domestic electricity markets in the UK and Japan, there are undoubtedly a number of areas, including in research, development, engineering and other technical services, where skills are transferrable. This means there are opportunities for expertise developed in domestic markets to be utilised to increase access rates in Africa and create business opportunities. Some businesses which have been successful in domestic markets are already utilising and exporting this expertise into new markets, including in Sub-Saharan Africa and in off-grid electricity, while new innovative companies are starting up in the UK and Japan who are dedicated to the delivery of off-grid electricity.

In many cases these businesses benefit from the focus on energy as a priority for Official Development Assistance (ODA) by the UK and Japanese Governments as well as a strong network of country offices across Sub-Saharan Africa of development agencies, the UK DFID and the Japan International Cooperation Agency (JICA). The potential for continued collaboration between these agencies and businesses is high.

As well as the experience and presence of development agencies in Africa, Japanese and UK organisations have a track record of investing in Africa's power industry and therefore have contacts and market knowledge that can be transferred to growing off-grid markets. There are already examples of larger energy companies and investors from the UK and Japan who have experience in power sectors beginning to enter off-grid markets, with some detailed in this report.

Case studies for some businesses who are representative of the kinds of work being carried out in the sector are included following a short market review of the off-grid electricity sector and an overview of challenges and opportunities that these businesses now face based on interviews and reviewing recent market studies.



Photo: BBOX mini-grid development in Togo.



## 2. Market Review – Barriers and Opportunities

This section provides an overview of some key aspects of the off-grid electricity sector in Sub-Saharan Africa, gathering a range of opinions from organisations involved in the sector as well as reviewing recent reports and market intelligence. Some critical barriers and opportunities are also highlighted in each section and summarised in the figure below.



*Figure 5: Key Barriers and Opportunities*

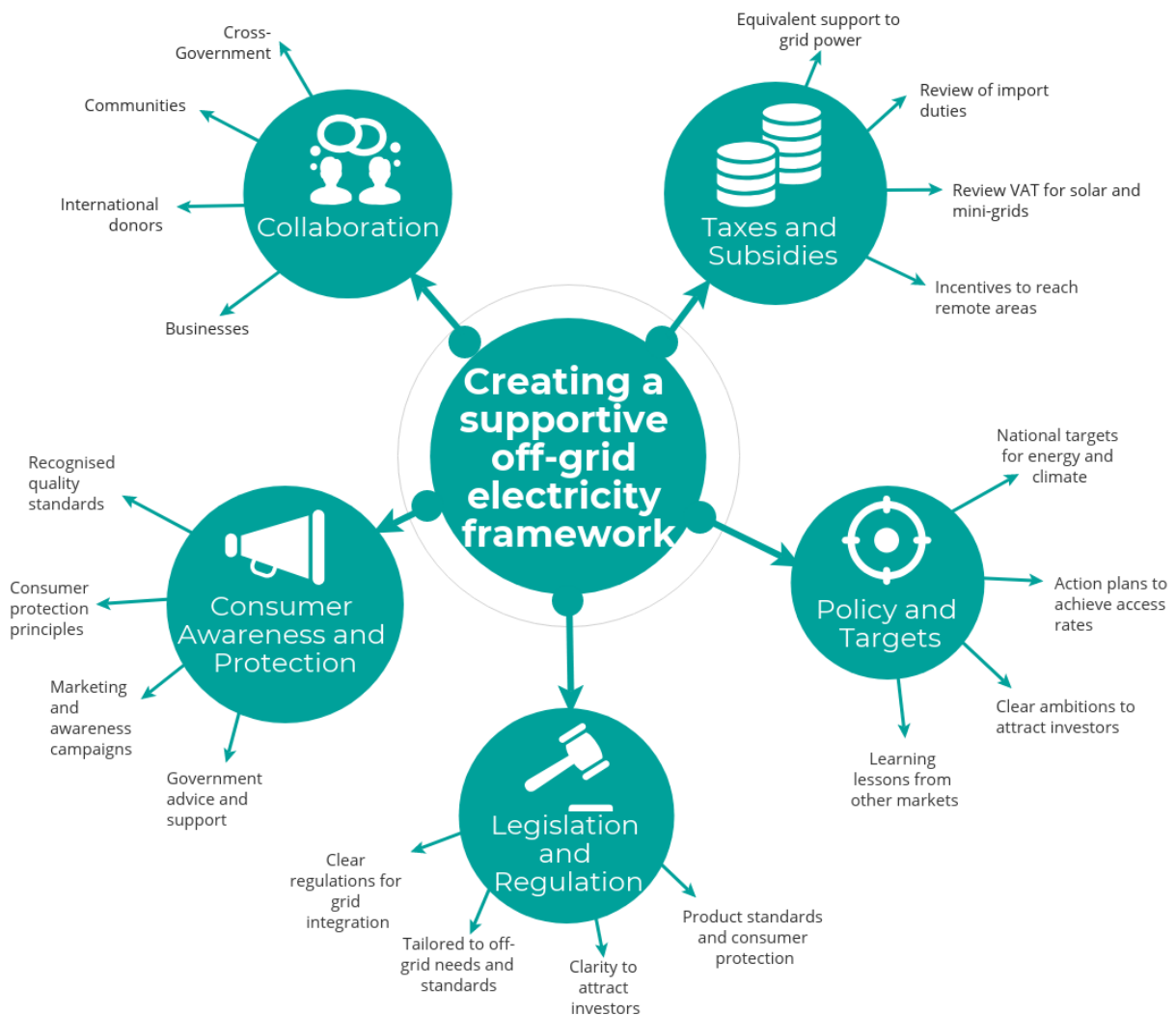
## 2.1 Policy and Governance

### Key Barriers and Opportunities Identified:

- **Clarity and certainty in policy frameworks to allow investors to develop businesses while creating consumer confidence.**
- **Changes to be made to support the sector in areas including product standards, taxation, subsidies and targets.**

Clear and supportive policies are critical to the growth and success of off-grid electricity. Existing energy policies in countries are often designed around a system which was set up to develop large, centralised power stations and grid networks and not to cater for distributed and decentralised electricity options such as mini-grids and solar home systems. However, it has been shown that countries that have increased their access rates the most since 2010 also show a noticeable improvement in policies for the off-grid electricity sector<sup>1</sup>.

Policies that need to be addressed are wide-ranging and need to be tailored to meet the needs of the new off-grid sector which has a number of different characteristics. It is also the role of Governments to be able to ensure that should the industry begin to grow, clearer standards are set which will both attract investors who can assess investments against clear regulations as well as being robust enough to protect the consumer. The following figure shows some of the considerations a Government should make in setting policy frameworks for off-grid electricity access.



**Figure 6: Creating a supportive off-grid electricity framework**

Evidence of how important the roles of decision makers and Governments are is highlighted by a recent report from the World Bank Energy Sector Management Assistance Program (ESMAP) where four out of five of the report's key recommendations for progress in mini-grid development<sup>v</sup> included some kind of call to action in policy or governance as shown in Figure 7.

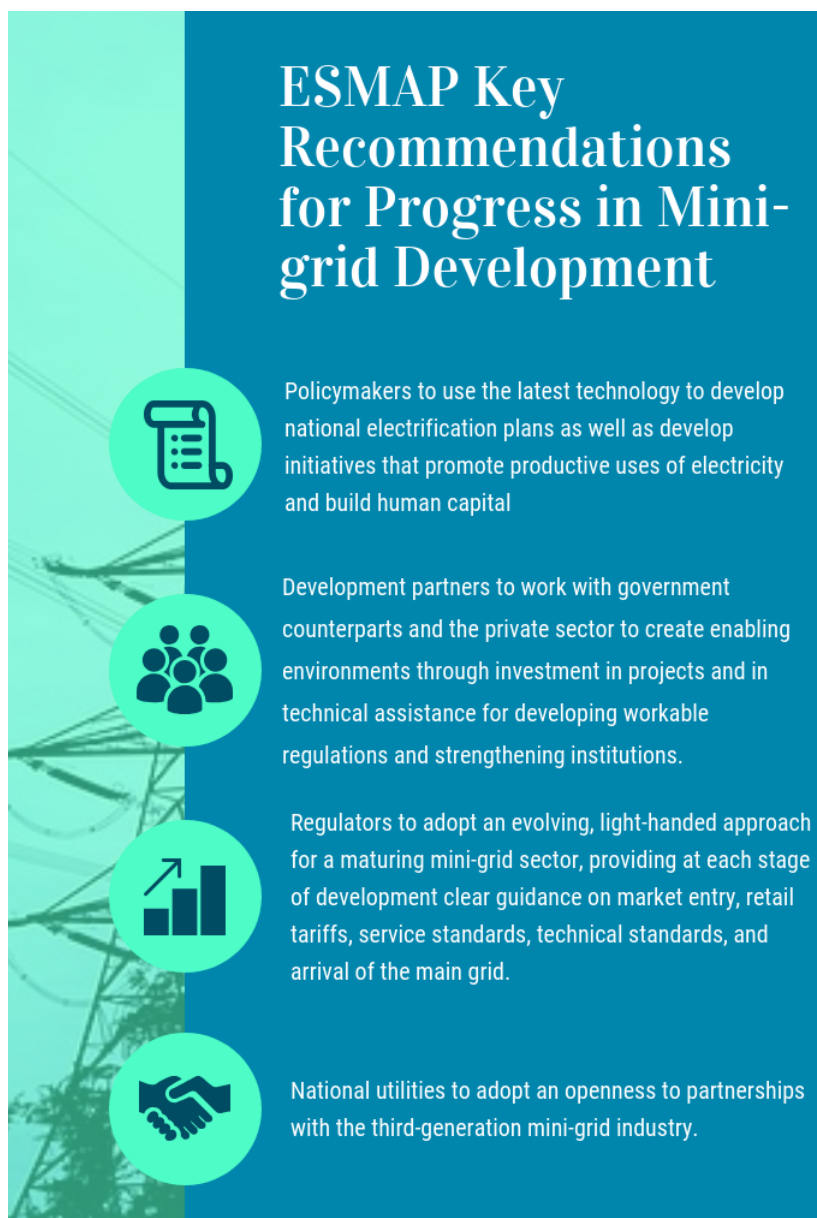
Similarly, in the off-grid solar sector, GOGLA's Guidance for Governments report highlights a variety of aspects in which progress can be made to increase chances of the industry's growth in Sub-Saharan Africa. This includes recommendations for Governments which covers areas such as:

- The establishment of a robust policy framework for stand-alone solutions helps to create certainty, increase the predictability of the policy environment, and attract investment.
- Highlighting where tax breaks or lower taxes on off-grid products could encourage positive growth for the sector and present an economic benefit for the country as a whole.
- How to better utilise public funding to increase private investments in the sector.
- Building public awareness and trust in the sector including introducing consumer protection principles and product standards.

These recommendations continue to rely on the private sector to deliver projects and to innovate and drive down costs, but it is clear that policy and governance has a huge part to play in enabling that process to happen as quickly as possible.

Alongside Governments, external support from donors and international organisations is also an important factor in this process. Although the UK and Japan cannot claim to have vast experience in building comprehensive off-grid electricity policies in their own countries, other aspects from the power sector or other industries can be useful in supporting Governments in Sub-Saharan Africa to develop the right industry frameworks. This should include donor governments using expertise that has in the past been able to support developing renewable energy industries in their own domestic settings, including expertise on setting the right tax and customs frameworks, promoting the industry through subsidies or implementing product and service standards and regulations.

There are many examples of this type of donor supported work to influence policy and regulation in a positive way. For example, creating agreed quality standards means products made in or entering a market are of a



**Figure 7: ESMAP Key Recommendations for Progress in Mini-grid Development**

high standard and consumers can be sure that they are buying a quality product that will stand the test of time and be of good value, building trust in the sector. The World Bank's Lighting Africa programme, which is supported by the UK Government, has developed and introduced internationally recognised standards and countries across Sub-Saharan Africa are beginning to adapt them to their own markets.

Furthermore, the UK and Japanese Governments have the ability to work alongside umbrella groups like the Associations for Rural Electrification (ARE) and GOGLA, as well as directly with businesses and Governments in Sub-Saharan Africa to understand and assist in setting new supportive frameworks which can enable growth. The development of trade associations in individual countries alongside more international trade groups in countries is an essential step in making this happen, with evidence from countries like Sierra Leone where strong and organised trade associations can have a role to play in presenting clear cases for policy change.

Businesses have also confirmed that getting policy right does have an impact. Referring to a Government subsidy programme in Togo, BBOXX CEO Mansoor Hamayun noted following expansion in the country that, "It is exciting to see that under the right framework private companies can operate effectively and scale up operations. For too long barriers have been preventing distributed solar businesses from growing and developing. But with the right framework in place, we can break down these barriers. I believe data and technology can act as a springboard to leapfrog traditional expensive grids and opt for smarter grid solutions, and truly transform Africa's utility sector from the ground up"<sup>ix</sup>.

There are encouraging signs that the need for development of suitable policy and regulatory frameworks is being recognised by some of the countries that are most in need, with Governments of 17 of the top-20 electricity access-deficit countries now having set clear targets to achieve or approach universal access by 2030<sup>v</sup>.



**"It is exciting to see that under the right framework private companies can operate effectively and scale up operations"**

*BBOXX CEO Mansoor Hamayun*

## 2.2 Technology

### Key Barriers and Opportunities Identified:


- **Using data to increase knowledge in the sector, to get the right developments in the right place and to tailor business models and packages to work best for customers.**
- **Continuation of research and development of new technologies to increase the productivity of off-grid electricity, especially for productive uses, and to introduce useful, low-power appliances which can work with solar home systems and mini-grids.**

Advances in technology across the off-grid sector continue at pace and there are a number of innovations which are not only bringing the cost of hardware down but also innovations in software which are making the industry more efficient and more useful and convenient for customers.

Growth in the off-grid electricity market has coincided with the spread of mobile connectivity in Sub-Saharan Africa, and not by accident. The widespread use of mobile phones and now the growing use of the internet and smartphones means that businesses can interact with customers in very remote areas to manage payments and share information. On a basic level, this means that when previously a customer might only have had the option of purchasing an off-grid system outright, there is now an ability to use pay-as-you-go technology to make incremental payments over a longer period of time. Similarly, where there is a remote mini-grid the owner or operator no longer needs to collect payments by hand or customers don't need to travel to purchase power.

As well as payments, mobile connectivity can also ensure that servicing and maintenance is improved by allowing companies to remotely monitor the performance of mobile devices or connections, or for customers to be able to contact vendors or repair services more easily.

Remote data collection is also allowing businesses to capture levels of demand in very remote areas and understand more about customer needs. This might allow a business to understand there is a very high demand for power in a region which already has a high penetration of solar home systems which could give them increased confidence in making an investment in a larger more productive mini-grid which in turn will increase the number of services a community can benefit from.



“African consumers and their demand for modern services and energy efficient devices is driving innovation across the off-grid sector”.

*Simon Bransfield-Garth, CEO of British off-grid energy company, Azuri Technologies*

The new technology is also being introduced in response to demands from customers, as Simon Bransfield-Garth, CEO of British based company Azuri highlights, “African consumers and their demand for modern services and energy efficient devices is driving innovation across the off-grid sector”. More recently, a new generation of appliances which can be used in conjunction with off-grid generation have further developed the sector by increasing the number of potential uses for off-grid power. In many cases, the same technology companies who have developed off-grid systems have also developed appliances such as fridges,

televisions and cookers for use in conjunction with their generating equipment. Improving the services on offer for off-grid customers is clearly good for the consumer but it is also an important factor in the industry becoming more profitable, as discussed below.

Continuing technological advances in generating and storage equipment, especially in the cost and efficiency of solar panels and batteries, mean that prices for off-grid systems, from the smallest off-grid solar devices to larger mini-grid networks, are still coming down. The figures are already encouraging, with estimates for the cost of energy from a solar home systems which is estimated at US\$ 0.55 per kWh and for a micro-hydropower plant at US\$ 0.24 per kWh, compared with US\$ 0.60 per kWh for diesel generator sets<sup>x</sup>. These figures don't include the all-important storage element, but again, that is an area where costs are falling to the extent that parity of renewable generation plus battery storage is getting closer than ever to the cost of generating on demand from fossil fuels.

## 2.3 Skills and Capacity

### Key Barriers and Opportunities Identified:

- **Eclectic skills need to be developed (engineering, sales, management etc) at all education levels to meet future market demand.**
- **Promotion of the sector to indicate the potential for future employment and growth and to prepare people to train and re-train.**

If the off-grid electricity sector is going to fulfil its potential to bring access to millions more in Sub-Saharan Africa, local skills and qualifications to work in the sector are going to be fundamental to the industry's growth.

Meeting the demand for skilled labour will not be straightforward, with a diverse industry meaning that there are potentially growth areas across different disciplines including retail, distribution, management, product development, business development, installation and maintenance. Companies also have to be able to seek out and find investment and often in order to grow in the industry will have to have relevant expertise in structuring, securing and managing these investments.

As well as the complexity and diversity within the industry, the number of growth sectors in Sub-Saharan Africa means that competition for attracting the best staff is high. Chris Baker-Brian of the British-based off-grid energy company BBOX confirmed this by noting that, “attracting the best area and middle managers is a challenge with strong competition from growing retail sectors. We have started a future leaders programme in Kigali to train the best and brightest talent to reach these positions”.

Feedback from the organisations working in Japan and the UK, whether investment funders or off-grid and mini-grid developers, highlights that some kind of capacity requirement has come across as a clear gap in the ability for the sector to grow.

It is also not only the direct impact of the ability for firms to hire skilled staff to help with business growth, but also the issue of capacity in the wider business ecosystem across markets in Sub-Saharan Africa. These problems are also diverse, spanning from poor physical infrastructure making distribution difficult, to inefficient banking systems making basic business functions like payments and invoicing challenging. The developing nature of the capacity across many different aspects of these markets is inevitably part of why investments are seen as a risk.

However, given the potential importance and scale of these markets, it makes sense for government in Sub-Saharan Africa to begin to develop appropriate curricula and qualifications which can help to serve the industry over the long term, and to promote the sector and raise awareness about its long term-prospects and benefits.



**“attracting the best area and middle managers is a challenge with strong competition from growing retail sectors”.**

*Chris Baker-Brian of the British-based off-grid energy company BBOXX*

## 2.4 Business Models

### Key Barriers and Opportunities Identified:

- **Businesses to explore opportunities to become less vertically integrated to increase specialisation and efficiency within the sector, increasing transparency and reducing risk for investors.**
- **Continuous focus on increasing demand and improving user experience by addressing ease of delivery and payment, increasing affordability and maximising benefits such as bespoke appliances.**

Off-grid electricity companies must consider a range of different factors to try to reach a profitable and scalable model – a recent World Bank paper<sup>xi</sup> highlighted a number of key areas for off-grid companies including technology, affordability, awareness, availability, ease of use and acceptance. The following diagram highlights these factors, among others, and shows the basic considerations and steps an off-grid electricity business would have to take to produce a viable and scalable product or service.



**Figure 8: Business Model Basics**

Per unit of electricity delivered, off-grid solutions cost more for the end user if the alternative is a connection to a well-managed and efficient national grid. However, in the case of some of the poorest and remote communities in Sub-Saharan Africa, where grid connection is not feasible, off-grid renewable electricity is often not only the cheapest but, in many cases, the only option available.

Even where off-grid (solar home systems or mini-grids) is the only option for a community, the up-front costs are still often a major barrier. Businesses face a credit challenge in many African countries due to high and fluctuating interest rates and a customer base, particularly those in more remote locations, who have uncertain and very low incomes. All of this makes lending a challenge and returns uncertain. To get around these challenges businesses in Sub-Saharan Africa have to be innovative in trying to ensure they have the best possible business models for uptake and growth of the sector.

Solar home systems are primarily sold via pay-as-you-go finance, which partly gets around the challenges of high up-front costs, with customers paying vendors remotely and digitally. There is a continuing rise in popularity of this kind of business model - a 30% increase in sales from the first half to the second half of 2018, reaching a volume of 950,000. In another sign that pay-as-you-go is growing in dominance in the sector, cash sales did not grow over the same period.

For mini-grids, despite progress in testing and roll-out of donor supported developments, there is still a viability gap before a full commercial model is achieved, with capital costs for individual developments being even more of an issue than solar home systems.

However, with costs falling rapidly and huge numbers still without power, the tipping point towards commercial success could be close-by. Where donors meet the remaining viability gap, the signs are good that the positive impacts of mini grid developments in rural communities are being realised, that there is clear demand for the developments, and that support in the form of results based financing (RBF) could lead to a fully commercial model in time, ideally replicating the patterns of support to early stage development of renewables in developed countries such as the Feed-in Tariff or Renewables Obligation in the UK.

The success of pay-as-you-go is also going beyond household ownership and being adapted for use in mini-grids with businesses now adapting the model to serve other rural and off-grid sectors. This includes sectors like agriculture where irrigation pumps powered by solar is growing in popularity and where payments can be tailored to agricultural output, making better technology to reach higher yields more affordable without the need for large capital investments. The Food and Agriculture Organisation (FAO) estimates that 2,000 solar borehole pumps and 1,000 solar surface pumps (under 2.5 kW) are in operation in Kenya<sup>xii</sup>, highlighting evidence of growth in the sector in line with the growing appetite for credit and pay-as-you-go models from banks and microfinance institutions. A range of other commercial and industrial uses for off-grid electricity from supermarkets to mining also have potential.



*Photo: Mobile Power Hub for charging battery packs and acting as a focal point for local communities.*

The commercial and industrial business model also provides a secure customer for the mini-grid developer, creating regular income and leaving open the opportunity for additional services and access to be provided to the local community from excess energy supplies. British start-up Mobile Power offers portable battery packs that can be charged from excess power in mini-grids and then distributed to even more remote off-grid communities on a pay-as-you-go basis. Luke Burras, COO at Mobile Power, points out that, “using excess power which would otherwise go to waste to deliver services to people off-grid not only improves the business case for developing a mini-grid but at the same time gives some of the poorest communities the chance to benefit from affordable electricity and creates jobs in the local area”.

It is also clear that businesses in the sector are building longer-term and closer relationships with customers, highlighted by the development of appliances and a number of supply-side innovations and offerings which can increase the demand for electricity. These developments are making the sector more attractive to investors with more revenue streams from customers.

One downside to the increasing number of services and activities off-grid electricity companies are involved in is the complexity of these organisations who simultaneously can be handling technology development, distribution, operations and maintenance, and finance. Alongside this complexity within operation, small start-up companies are also often working across larger and more markets than you would expect companies of a similar age and scale in other markets, often setting up projects across multiple regions and countries in Sub-Saharan Africa. As a result of this complexity feedback from businesses and investors suggests that the sector could go through a period of disaggregation which could result in increases in efficiency, specialisation and profitability. In turn, this makes the proposition for prospective investors simpler to understand and risk-assess.

As well as the complexity of businesses, there are further business model challenges when considering the scale of the challenge in the context of achieving SDG-7, which aims for energy access for all by 2030. Many communities in Sub-Saharan Africa are extremely remote, which can go hand in hand with even higher relative levels of policy and uncertain incomes. One challenge for donors and businesses is how to structure support and businesses models to be able to reach these groups. This is where the charity sector can also play a role, with SolarAid, a British organisation, focussed on the hardest to reach population to try to test and prove new business models and open up difficult to reach markets. Mitsubishi, a Japanese trading company, supports SolarAid in these efforts by providing them with funding, further highlighting strong links between the countries in the sector.

## 2.5 Investment

### Key Barriers and Opportunities Identified:

- **Increasing coverage needed for risk and first loss to enable early-stage companies and growing businesses and to attract further private sector investment.**
- **Increased collaboration between larger funders and businesses with experience in energy markets in Sub-Saharan Africa to help support capital intensive operations for growing off-grid businesses.**

The potential for investment in off-grid electricity has been clearly recognised by a wide range of groups including development financiers, private sector venture capital, multinational businesses and crowd-funders.



“Using excess power which would otherwise go to waste to deliver services to people off-grid improves the business case for developing a mini-grid and gives some of the poorest communities the chance to benefit”

*Luke Burras, COO for Mobile Power*



A number of organisations and individuals have already made significant investments in the sector, including those from the UK and Japan and a range of different funds are running to work specifically with off-grid electricity businesses.

Despite the level of interest, the funds committed by the public and private sector are still nowhere near the levels required in order to ensure access for all in Sub-Saharan Africa, while existing funds with support earmarked for investment in off-grid electricity often struggle to find suitable projects and businesses to invest in.

The Alliance for Rural Electrification highlights this is an issue and states, “access to finance remains a huge barrier limiting the growth and rapid upscaling of clean rural electrification. In particular, off-grid companies often struggle to access working and medium to long-term capital, whether through debt or equity”<sup>xiii</sup>.



“PAYG companies need to reach scale, which will require large amounts of finance. Because servicing is so important to the success of these companies and their investors, the industry needs to put more effort into reducing this risk”

*Geoff Manley, CDC*

The dual opportunity and risk posed by scaling-up off grid companies, particularly in the solar home systems sector, is made clear by Geoff Manly of CDC, a development finance group funded by the UK Government, “These businesses have the chance to reduce the energy poverty gap, drive financial inclusion and improve quality of life for millions of people. But to do so, pay-as-you-go companies need to reach scale, which will require large amounts of finance. Because servicing is so important to the success of these companies and their investors, the industry needs to put more effort into reducing this risk. For example, by developing back-up servicing plans. This will unlock more and better financing and significantly improve the whole industry’s prospects.”

Risk levels in the sector are impacted by a range of different factors and include a mix of the issues highlighted in the report so far including using new technology, new and complex business models, working in markets with poor governance, as well as the simple fact that the market relies on consumers who have extremely low and unstable incomes. Only by making progress across all of these areas will investors be more willing to make more commitments to the sector.

Despite these uncertainties, there have been significant investments made in the sector in recent years, and although that is generally a positive story, inevitably there have been some high-profile failures in the market following investment. This is part of a continuing learning curve for businesses and investors about how best to run and to scale-up in the off-grid sector.

It is also true that there is a clear track record of international companies, as well as investment funds, collaborating with local businesses who are already operating on the ground in Sub-Saharan Africa. For the sector to grow significantly in scale, this is a trend which has to continue. ESMAP’s report, ‘Mini-grids for Half a Billion People’<sup>v</sup>, notes a number of already promising partnerships including Caterpillar and PowerHive joining forces in African markets, and Schneider Electric teaming up with EM-ONE and GVE in Nigeria. In off-grid solar, the number of deals between international groups and off-grid solar businesses is also growing with Engie investing in Fenix and EDF partnering with BBOX in Togo.

In a similar fashion Japan’s Marubeni Corporation and Azuri Technologies from the UK have recently joined forces with the Japanese trading-company making a significant investment and highlighting the strong potential for Japanese and UK businesses to work together in the sector. This could be particularly effective when combined experience on the ground in Africa in off-grid energy is paired with larger global businesses who have experience in energy markets in Africa and significant capital in which to invest in scaling-up a smaller off-grid company’s reach.

Feedback from some smaller organisations also suggests that some of the funds earmarked for investment are not being utilised as the current market maturity levels mean that there are limited investments for funders to make, particularly if they are looking at investing large sums in individual businesses. Businesses suggest that at this stage of market's evolution, what the sector needs is likely to be higher risk, smaller and longer-term investments. However, many funds are set up to look at the bigger players in the market. Again, this is where development finance backed by donors could be utilised.

There was a clear indication from businesses who were interviewed in this report that donor-backed investments could take on the first loss risk which in theory could lead to a multiplier effect whereby investors from the private sector are willing to join forces due to the reduced overall risk from the investment.



*Photo: Azuri customers watching television*

## 3. UK and Japanese Involvement

The following section outlines some of the different groups from the UK and Japan who are involved in the sector, as well as detailing current and planned activities the UK and Japanese Governments are involved in. This is by no means a comprehensive guide to the organisations involved in the sector or the support offered by the UK or Japan but presents a picture of the diversity of the organisations involved, the projects underway and the progress being made.



*Photo: Kenyan customer using the Azuri solar satellite TV system*

### 3.1 Governments

#### 3.1.1 The UK Government

The UK Government has a number of different programmes which support off-grid electricity access in Africa. Most of these are funded by or coordinated and managed by DFID, although some official development assistance for energy is also managed by the Department for Business, Energy and Industrial Strategy (BEIS).

UK Government support spans a variety of activities in off-grid electricity, from equity investments in emerging and established businesses through to support for technical assistance and efforts to develop the wider off-grid ecosystem.

Programmes include, among others, the Africa Clean Energy (ACE) programme which supports the off-grid solar sector with the development of policy and regulatory change across 14 African countries as well as providing grants and loans to companies to develop in new markets in Sub-Saharan Africa.

The Transforming Energy Access programme is a multifaceted initiative which supports different aspects of the off-grid electricity sector's development including investing in promising and innovative companies who becoming an ever more important part of the off-grid solar and mini-grid industry

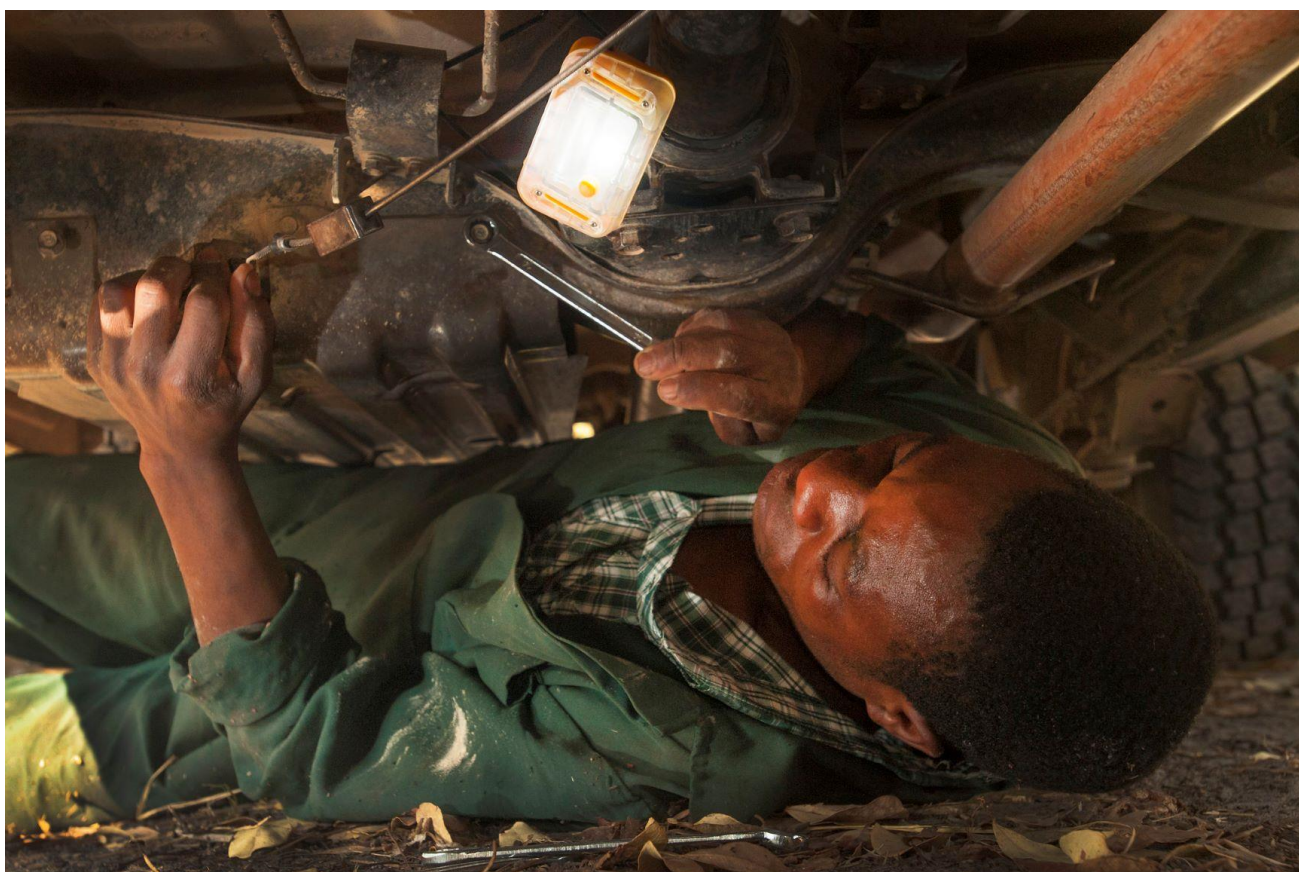
The UK Government are also supporters of mini-grid developments in a number of markets in Sub-Saharan Africa via their Green Mini-Grids programme, which also contributes to knowledge sharing and advice provision globally. Part of this support is channelled to developing the Green Mini-Grid Helpdesk<sup>xiv</sup>, an online and bespoke technical assistance resource partly managed by the African Development Bank. Other in-country support to develop markets through the Green Mini-Grids programme includes working with Governments and regulators to make changes to policies and regulation and supporting companies to pilot and test businesses models across a number of different countries in Sub-Saharan Africa.

The Renewable Energy Performance Platform (REEP) funded by the UK Department for Business Energy and Industrial Strategy (BIES) and the International Climate Finance initiative and managed by Camco Clean Energy, provides assistance to developers from inception to construction through a broad range of financing products, services and experience depending on the developer's needs. This fund was recently scaled up to £148 Million (around US\$179 Million) and is expected to include mini-grids in its remit as it expands.

The UK Government also recognises importance of investment capital in the sector and CDC, the UK's development finance institution, have funds dedicated to supporting off-grid electricity. They have already made high profile investments in the sector and more funding is available. CDC also deploys capital through various fund managers that support and invest in off-grid projects in Africa.

### 3.1.2 The Japanese Government

The Japanese Government's development agency, JICA, has for many years been committed to achieving better access to electric power and more stable power supplies in developing countries by supporting the reinforcement of national grids and the development of the grid-connected power sector. However, the agency has an active and growing interest in off-grid solutions and is looking at how best to support mini-grids



*Photo: SolarAid customer and mechanic using off-grid lighting at work*

and off-grid solar in Sub-Saharan Africa.

JICA hope to carry out a detailed scoping exercise following the TICAD conference in 2019 to better understand the off-grid electricity sector, leaving open the possibility for strong collaboration with DFID, who may be able to share a number of lessons learned from their recent experiences. There are also clear opportunities for existing international partnerships, including those involving the UK Government, to benefit from JICA's and the Government of Japan's expertise and funding. Examples of relevant partnerships that JICA could be more active in including groups such as the Mini-Grids Partnership, which brings together stakeholders in the sector to exchange ideas and shape policy in the market.

Although JICA will ramp-up efforts in the off-grid sector soon, there are still examples of ongoing support for the off-grid electricity sector. One prominent example is the investment in the Japanese start-up, WASSHA. This was the first JICA project to be conducted in Sub-Saharan Africa since the resumption of JICA private sector investment financing in October 2012.

## 3.2 Businesses and Other Organisations

### 3.2.1 Japan

One of the most significant recent developments in the off-grid electricity sector is the interest of larger Japanese trading companies who are keen to enter the market. The motivation for doing so could be down to a number of different factors but there has clearly been an identified potential in the market for firms as large as these companies to become interested. Significant deals include Mitsui's and Sumitomo's recent investments in the Kenyan company M-KOPA and Toyota Tsusho's recent investment in US the US off-grid electricity company Powerhive as well as Marubeni's investment in the UK off-grid electricity company Azuri.

Although less active in the start-up market than the UK when it comes of off-grid businesses, Japan does have some examples of companies who are interested in developing in the Sub-Saharan Africa market for off-grid electricity. WASSHA, who were mentioned earlier as being linked to JICA support, have also benefitted from investment from the Marubeni Corporation while Sucre Cube, who are based in Paris, are developing remote internet connectivity for hospitals in Senegal using off-grid electricity.

### 3.2.2 UK

The UK has a number of relatively new and start-up companies who are at the forefront of the off-grid electricity sector in Africa. Some of the companies detailed in this report such as Mobile Power, BBOXX and Azuri have developed new technologies to meet the needs and demands of the market in Sub-Saharan Africa and are now some of the most experienced businesses in the sector.

The UK Government has provided a number of innovation-focussed programmes which many of these companies have benefited from, while they have also been successful in developing partnerships with international finance groups and funders to partner with to make investments in growing businesses in the sector.

Alongside businesses working on the front-line of the sector, there are other organisations who exist to support the sector including charities like the Shell Foundation, Practical Action and SolarAid, investment platforms like Energise Africa, and a number of energy consultancies who are involved in assisting off-grid developments as well as having expertise in the power sector in general.

This diverse mix of organisations in the UK who have an interest in the sector means the UK Government has an excellent opportunity to be able to support these businesses and also to receive first hand feedback about how to design and implement different types of support through consultation with them.

## 3.3 Case Studies

### 3.3.1 Marubeni Corporation

The Marubeni Corporation are one of Japan's largest trading companies founded in 1858, currently with 136 branches and offices in 67 countries and regions. In Sub-Saharan Africa, Marubeni has field offices in South Africa, Kenya, Ghana, Côte d'Ivoire, Angola, Mozambique and Nigeria. Along with a number of other markets, Marubeni has been a global player in providing energy solutions and power services since 1960's.

In 2018 Marubeni started to work on community-based power systems having invested in WASSHA in Tanzania, a Japanese start-up company which has also benefitted from support and investment from JICA. Following that investment, Marubeni again entered the de-centralised power business in May 2019 after investing in the British company, Azuri Technologies, with the aim of continue providing electricity services to off-grid areas in Africa and accelerating Azuri's expansion plans.

As part of its long-term commitment, Marubeni also provides WASSHA with human resources. To show one example, Tetsuya Okiyama is a Marubeni employee currently working with WASSHA as its business development manager. In his previous role at Marubeni, Okiyama worked on large-scale projects in Africa and the Middle East, such as the investment to a 2,000-megawatt power plant. In contrast, he now talks to kiosk owners about generating 60 kilowatts of electricity via a rooftop solar panel. Nonetheless, he remains fascinated seeing the visible impact that WASSHA is making on the lives of people.



*Photo: Marubeni employees using their experience to assist off-grid companies*

"A mother said to me, 'Cooking became an enjoyable thing after I began to use a WASSHA lantern,'" he recalls of an early visit to one of Tanzania's many villages. Previously, she was cooking in dim light, unable to clearly see the colour or shape of ingredients. A vendor at the market, who used to call it a day after dark, told Okiyama that the lantern made it possible for him to work longer and increase his income. "I understood that our lanterns really changed their lives."

### 3.3.2 Azuri Technologies

British company Azuri is a prominent pay-as-you-go solar home systems business delivering off-grid systems in Africa. Combining solar innovation and mobile with solar panels and other appliances. Azuri aims to bring affordable energy, and along with it, modern goods and services, to those without power in Sub-Saharan Africa.

Azuri's solar technology is providing energy household by household rather than providing it on a grid scale and delivering the services that add the most value to individuals. Azuri pay-as-you-go solar is not only delivering clean energy but connecting off-grid households to the modern digital world. From home lighting to satellite TV, Azuri-designed solutions deliver these services to customers who live away from the main power grid, often in locations which have no near-term prospect of being grid-connected.

The company has operations in Nigeria, Kenya, Tanzania, Zambia and Uganda and to date has delivered solar home systems in 12 countries across sub-Saharan Africa, helping nearly 1 million people access clean, reliable energy. Pay-as-you-go solar home systems typically comprise of equipment placed in the customer's home and then the cost of the system is paid for as it is used over a period of time (typically 1-3 years). This makes such systems affordable and the sector has grown rapidly in recent years to over 2 million households in 2018.



*Photo: Azuri engineer installing a solar panel on a rooftop*

Azuri are demonstrating the potential for Japanese and British collaboration and recently announced a US\$26 million capital equity investment led by Marubeni. The investment will accelerate Azuri's expansion plans and will help even more off-grid customers across Sub-Saharan Africa benefit from affordable, clean and reliable energy, as well as having access to modern energy-efficient appliances.

Feedback from Azuri customers highlights the opportunities that the sector can create. Restaurant owner Alubanus Ndolo from Kitise in Makueni County, Kenya, previously had to close the doors when the sun went down. That was before pay-as-you-go solar lighting and satellite TV allowed him to stay open and attract more customers for the food, the entertainment, and the light. Typically, Alubanus would close around 7pm and serve 40 customers, now he stays open until 11pm and serves between 80-100 customers. He also had to employ three additional people to assist him with cooking and serving. Alubanus has a TV, lighting system, rechargeable torch, radio and a mobile charging port and is now confident in the future of his business: "When the power goes or when the darkness arrives, people know they can come to my place as the power is always on. After all, no one wants to eat in the dark!"

### 3.3.3 Mobile Power

Mobile Power (MOPO) is a UK company that develops and operates flexible energy distribution systems for the off-grid market in Sub-Saharan Africa. They have developed a pay-per-charge rental model to supply smart battery packs at a price affordable to low-income households and businesses. The packs can be used to provide electricity that can be used in a whole range of ways including powering TVs and fans, providing lighting across a household, or charging devices including mobile phones. The idea was designed in Europe, tested in The Gambia and is now being deployed across Africa.

Africa has 500 million mobile phone subscribers who live off-grid and the number continues to grow. Many of them pay for every phone charge (usually walking long distances to charge with a diesel generator) and buy disposable batteries for lighting, which is expensive and polluting.



*Photo: MOPO Battery Pack and App*

MOPO offers a cleaner, accessible and safer alternative. It is a scalable battery rental platform, which requires no deposit, has no credit checks, requires no fixed payment structure, and can be rented on a daily basis. It also works in areas with no network coverage and customers can pay with cash. The approach consists of selling and deploying MOPO Hubs (typically powered by solar panels) where batteries are charged and then field agents take care of distributing them to customers (end-users). The field agents pre-purchase activation credits from MOPO using mobile money and customers pay the agent using cash, mobile/money/other; the agent uses their credits to activate the battery. Once the rental period is finished, the agent collects the battery and returns it to the Hub for a new cycle.

Key advantages of this system are that it allows operation at scale and easy entry of customers with no financial commitment.

There are also advantages to having a central hub with a larger power supply as well as a distribution network of agents delivering off-grid electricity access including for electric mobility using battery technology and a central hub for charging; healthcare including battery powered ultra-scanning; refrigeration at MOPO hubs and a postal service also operating from the hubs.

The technology has also been tested in educational facilities where, in Sierra Leone, MOPO is installing hubs at schools where power is used for lighting classrooms, allowing children to study after dark.



### 3.3.4 BBOXX

BBOXX is a next generation utility committed to using technology to transform lives and unlock potential through the provision of essential modern utilities.

When the three founders of BBOXX met at Imperial College London as engineering students, they had seen first-hand how unreliable electricity supply in the developing world was hindering business development, community cohesion and economic growth. This inspired them to explore the potential for an affordable off-grid solar solution, and to launch BBOXX in 2010.

BBOXX has delivered clean energy to nearly one million people and operates in 12 countries across Africa including in Rwanda, Kenya, the Democratic Republic of Congo (DRC) and Togo. It has scaled rapidly through a series of strategic partnerships with investors, governments, telecommunications firms and global energy providers. For example, BBOXX is already working with Orange in West Africa, EDF in Togo and General Electric in the DRC.

In 2019, BBOXX has gone a step further in articulating the vision for the future. In April it launched its community of the future project in a village in Togo called “Tomorrow’s Connected Community” alongside EDF. This village runs on a micro-grid as well as solar home systems, providing access to a range of utilities including clean cooking solutions, street lights, internet services and water pumps.



*Photo: Solar street lighting at the BBOXX and EDF “Tomorrow’s Connected Community” in Togo*

In July the company piloted its new product range, BBOXX Cook, enabling it to provide clean cooking services for both urban and rural areas through LPG and biogas solutions. BBOXX is the first company to combine pay-as-you-go solar energy services with pay-as-you-go cooking solutions which marks a major stride towards tackling the global clean cooking crisis and reducing greenhouse gas emissions.

BBOXX has ambitious plans to deliver other utilities and products in new markets and work with additional partners to scale up and deliver on its mission.

### 3.3.5 CDC

CDC is the UK's development finance institution, with a focus on investing in countries where the private sector is weak, jobs are scarce, and the investment climate is difficult, but particularly in sectors where growth leads to jobs and poverty alleviation. CDC is entirely funded by the UK Government through DFID but acts at arms-length from Government departments to determine where and how investments are made.

Alongside a number of investments in large-scale renewables developments and other investments in the power sector, CDC have a focus on off-grid solar businesses, increasing investments in resource efficiency such as replacing diesel with solar, and also commercial and industrial solar development.

To support the growth of the off grid-electricity sector, CDC have launched an off-grid solar debt facility to provide working capital to pay-as-you-go solar companies. CDC see local currency debt financing is a critical gap in the market and make it available directly in partnership with local banks or through specialist debt funds. CDC also promotes strong environmental management standards and consumer protections alongside investments. Through 'CDC plus', the technical assistance facility funded by the UK's Department for International Development, CDC are helping finance the development of industry-wide consumer protection principles under a program led by the Global Off-Grid Lighting Association, the global industry association for off-grid lighting.

Alongside direct debt investments, CDC also offer direct equity investments and investments via intermediaries. Recently, Gridworks, a CDC-backed company that develops and invests in electricity networks committed c.US\$7.5 million to Mettle Solar Investments, a pan-African commercial and industrial solar company.



***Photo: An M-KOPA device in use in Tanzania. CDC have invested in the business in Sub-Saharan Africa.***

Since the beginning of 2017, CDC has been an investor in Kenyan company M-KOPA, which was co-founded by the British businessman, Nick Hughes, when they made a US\$12 million equity investment. An additional investment of US\$20 million was made from the local currency debt fund to help the company install solar panels in a further one million homes. The finance was part of a syndicate of lenders providing US\$80 million, the largest commercial debt facility in the off-grid energy sector. This investment highlights the potential for public sector and donor investments to encourage others in the private sector to invest.

### 3.3.6 Energise Africa

Energise Africa is a UK crowd-funding investment platform focusing on providing clean access to energy in Africa and contributing to climate change mitigation. Within that, and through Innovative Finance ISA (IFISA) tax payers can invest up to £20,000 (around US\$24,300) in projects and get 6% tax-free return on investment. Several solar businesses including Azuri and BBOXX from the UK work with Energise Africa and sell small solar systems to families throughout Sub-Saharan Africa. Energise Africa aims to ensure access to affordable, reliable and sustainable energy in areas where it is most needed. Falling costs of solar technology has created a new set of pioneering businesses working on installing life-changing solar systems in homes in Sub-Saharan Africa. Energise Africa works to provide 111,000 homes in rural areas with clean and affordable energy, providing a platform for supporting the achievement of energy for all by 2030.

Investments in solar businesses through Energise Africa can start at as little as £50 (around US\$60) alongside other investments as part of a crowd.

Energise Africa has completed 72 projects across several Sub-Saharan African countries and has invested over US\$10 million.



*Photo: Azuri lighting system operating at night*

The UK Government is providing match funding to Energise Africa projects, effectively co-investing alongside UK-based investors, thereby enabling the public to steer the flow of a proportion of UK aid funding and boosting the overall impact on the ground.

One Energise Africa investment is Sollatek in Kenya. Sollatek is 100% Kenyan owned and managed and has been operational in East Africa for over 30 years. It sold more than 800,000 lanterns and solar home systems over the last 8 years and, through Energise Africa, is now focusing on raising funds to procure, import and install solar plus battery fridge/freezer systems to be sold to households, businesses and community organisations which are off-grid. Sollatek expects that almost 80% of the systems supplied will be for productive use to help earn income. For farmers and fishermen, cold storage allows for greater control over when and at what price they can sell their produce. Most Kenyan fishermen estimate that on average around 30% of their catch is lost due to spoilage whilst those small-hold dairy farmers without adequate cold storage can lose close to 10-15% of their daily milk produce.

### 3.3.7 SolarAid

SolarAid is an international development charity headquartered in the UK with the mission of leaving no one in the dark by 2030. Working through its social enterprise, SunnyMoney, SolarAid adopts a business-based model to create demand and awareness for off-grid solar products where no one else will go.

Since 2006, they have directly enabled 11 million people to switch from kerosene and candles by selling over 2 million solar lights.

Their last mile model, working through schools and entrepreneurs, helped catalyse the two of the first solar lighting markets in Africa - Kenya and Tanzania. This approach allows SolarAid to pass the market over to private players so they can focus on other areas of market failure.

SolarAid attempt to reach underserved populations in difficult to reach or particularly poor areas in order to offer the chance for communities to purchase solar lights at a price they can afford alongside other activities including educating people about the benefits of solar, instilling trust and building demand for the products. Given this additional work, and that SolarAid and SunnyMoney work in markets which are not commercial, they rely on charity funding and contributions.



*Photo: SolarAid customer with pico solar lights*

While pushing this market model as far as possible, it does not reach everyone. Therefore, SolarAid is now pioneering innovations to reach those beyond the market to ensure they too can join the solar revolution. All of these new innovations and efforts require additional funding, time and staff, so partners are an essential part of the model.

The charity has long-standing links with Japan in this area through its 5-year relationship with Mitsubishi's MCFEA (Mitsubishi Corporate Fund for Europe and Africa). Over more than two decades, the MCFEA has been engaging with a wide variety of partner organisations throughout Europe and Africa, supporting innovative projects which align with its aims. This includes SolarAid's 'Lighting up Malawi' project which is creating a market for solar lamps in rural Malawi, where there are far fewer commercial businesses operating than in other countries in the region.

### 3.3.8 Crowd Credit

Crowd Credit are a Japanese crowd funding platform who provides loans to companies they invest in. Crowd Credit organises loans to borrowers overseas from contributions made by Japanese investors. Investors can fund these companies for as little as US\$100. Co USD. The company is mainly focussed on non-bank financial service companies, but has a growing interest in off-grid electricity companies, many of which also operate as a finance provider through the provision of credit for pay-as-you-go purchases.

The company is currently invested in three different off-grid electricity companies, including a US\$1m investment in a British firm, further outlining the links between Japanese investors and UK companies in the sector.



*Infographic: demonstrating Crowd Credit's investment model.*

Crowd Credit hope to grow in the sector and highlight the SDGs and social benefits as one of the main drivers behind the company's investments.

Crowd Credit are purely funded by private investors and do not currently have additional support from donor investors. This means returns need to be relatively high to ensure that all elements of risk are covered. The company pointed out that for new markets in Sub-Saharan Africa this offers a range of challenges including operating in an immature banking sector. However, the flexibility offered by the business means they can adapt to these challenges with the company offering, for example, loans in local currency and accounting for the risks in their offerings. In terms of reducing risks, Crowd Credit noted the benefits of teaming up with a UK company in the sector, given the certainty and maturity found in the UK financial system.

The potential for scaling-up in the sector for Crowd Credit is high given their expertise in supporting non-bank financial institutions and given the need for microfinance and credit to be an integral part of the off-grid electricity industry in Sub-Saharan Africa. Since the company offers loans, and not equity, it is relatively quick for businesses who are at the point of having a clear business plan to be able to utilise the crowdfunding platform to help meet capital demands which will expand operations and growth.

## 4. Conclusions and Recommendations

Despite only speaking to a selected number of groups from the UK and Japan alongside reviewing the latest industry reports and publications, it is clear that there are common issues and opportunities across the sector in aspects including finance, risks, capacity, governance and technology.

For the UK and Japan there are encouraging signs that these issues are being tackled utilising current and planned support from Governments as well as the ingenuity, experience and resources deployed by businesses and other organisations in both countries.

There are also examples emerging where collaboration between the UK and Japan is helping to drive development in the sector by combining different essential attributes and resources, with new partnerships emerging.

This progress can be continued and built-on by continuing to work together and collaborating more. The report be published in advance of the forthcoming TICAD event and should continue to inform discussion between stakeholders in the UK and Japan beyond that. In advance of those discussion, the following offers an overview of the potential next steps to take and key areas to work on.

### 4.1 Collaboration and forming partnerships

#### 4.1.1 Government to Government:

There is a clear opportunity for JICA and DFID to collaborate more closely in the future on energy related issues. Both development agencies have a good track record in the energy sector and geographically both organisations have a good network of offices across Sub-Saharan Africa. The timing for this increased collaboration in the off-grid electricity space is now given JICA's intention to review the market and determine where their efforts should be focussed. DFID have an opportunity to share knowledge and expertise from previous and ongoing programmes and also to highlights where existing gaps remain or where there are existing partnerships for JICA to join.

As always, alongside DFID and JICA collaboration, the UK and Japanese Governments should ensure development of activities are also carried out in close collaboration with Governments in Sub-Saharan Africa and with other government departments assisting with contacts and links to relevant in-country officials.

#### 4.1.2 Business to Business:

There is already concrete evidence of the positive impacts of increased engagement and collaboration. This trend could continue, particularly with the interest in investors from some of Japan's large trading companies who are increasingly investing in relatively small businesses who are already active in the Sub-Saharan African market and delivering off-grid electricity. There are opportunities here not only to share investment capital but also to share experiences and contacts across the continent, with many firms from both the UK and Japan being active in the power sector in Sub-Saharan Africa for a number of decades.

Increasing collaboration can also result in more companies using collective knowledge and information to make the case for positive changes to be implemented to support the sector, often through umbrella groups such as ARE and GOGLA as well as through local trade groups which Japanese and UK companies should be encouraged to interact and engage with.

### 4.1.3 Government to Business

Engagement, interaction and consultation with businesses who are active in the sector is essential in designing any new programme of support in the off-grid electricity sector and as such dialogue between Governments and businesses in Japan and the UK with agencies like DFID and JICA should continue and increase. Furthermore, other Government departments with a responsibility to promote business and international relations, such as the Department for International Trade, and the Foreign and Commonwealth Office in the UK, can also play a role in supporting the development of the sector and assisting businesses with the many challenges of entering new, complex and developing markets in Sub-Saharan Africa.



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## Interviews:

The following organisations were interviewed in gathering evidence and opinions for the report:

- The Alliance for Rural Electrification (ARE)
- Azuri Technologies
- BBOX
- CDC
- Crowd Credit
- Energise Africa
- Japan Bank for International Cooperation (JBIC)
- Japan International Cooperation Agency (JICA)
- Marubeni Corporation
- Mobile Power
- SolarAid
- The UK Government (including the Foreign and Commonwealth Office, the Department for International Development and the Department for Business, Energy and Industrial Strategy).

## References:

<sup>i</sup> Tracking SDG7 report, executive summary, World Bank (2019) –

[https://trackingsdg7.esmap.org/data/files/download-documents/2019-tracking\\_sdg7-execsumm-withoutembargoed.pdf](https://trackingsdg7.esmap.org/data/files/download-documents/2019-tracking_sdg7-execsumm-withoutembargoed.pdf)

<sup>ii</sup> Energy as the Golden Thread: What Do We Know? Duke University (2018) –

<https://nicholasinstitute.duke.edu/articles/energy-golden-thread-what-do-we-know>

<sup>iii</sup> Energy Access Outlook, International Energy Agency (2017) – <https://www.iea.org/access2017/>

<sup>iv</sup> Investing in the off-grid solar sector: What you need to know, GOGLA (2019) –

[https://www.gogla.org/sites/default/files/resource\\_docs/gogla\\_investment-guide\\_def-web\\_opt.pdf](https://www.gogla.org/sites/default/files/resource_docs/gogla_investment-guide_def-web_opt.pdf)

<sup>v</sup> Mini-grids for Half a Billion People: Market Outlook and Handbook for Decision Makers, ESMAP (2019) –

[https://www.esmap.org/mini\\_grids\\_for\\_half\\_a\\_billion\\_people](https://www.esmap.org/mini_grids_for_half_a_billion_people)

<sup>vi</sup> Update on UK DFID support to the Green Mini-Grids sector in Africa, DFID (April, 2019) –

<https://minigrids.org/update-on-uk-dfid-support-to-the-green-mini-grids-sector-in-africa/>

<sup>vii</sup> Energy Trends, Press Release, UK Government (March 2019) –

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/791297/Press\\_Note\\_March\\_2019.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791297/Press_Note_March_2019.pdf)

<sup>viii</sup> Japanese Energy Statistics for 2017, Government of Japan (June 2019) –

[https://www.enecho.meti.go.jp/en/category/brochures/pdf/japan\\_energy\\_2018.pdf](https://www.enecho.meti.go.jp/en/category/brochures/pdf/japan_energy_2018.pdf)

<sup>ix</sup> Africa's Energy Revolution is Underway But Challenges Remain, News Story, ESI Africa (2018)

<https://www.esi-africa.com/event-news/africas-energy-revolution-is-underway-but-challenges-remain/>

<sup>x</sup> Pioneering Power, ODI (2017) - <https://www.odi.org/publications/11098-pioneering-power-transforming-lives-through-grid-renewable-energy-africa-and-asia>

<sup>xi</sup> Bringing Solar home systems to Off-Grid Communities, World Bank Group and Social Enterprise Innovations

(2017) [https://endeava.org/wp-content/uploads/2017/06/energy\\_solar-home-systems-2-pager\\_july11.pdf](https://endeava.org/wp-content/uploads/2017/06/energy_solar-home-systems-2-pager_july11.pdf)

<sup>xii</sup> Off-Grid Renewable Energy Solutions - Global and regional status and trends, IRENA (2018) -

[https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jul/IRENA\\_Off-grid\\_RE\\_Solutions\\_2018.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jul/IRENA_Off-grid_RE_Solutions_2018.pdf)

<sup>xiii</sup> High-profile bankruptcies in the off-grid sector: Where do we go from here?, Alliance for Rural Electrification (2019) –

---

[https://www.ruralelec.org/sites/default/files/ARE%20Advocacy%20article%20-%20High-profile%20bankruptcies%20in%20the%20off-grid%20sector%20where%20do%20we%20go%20from%20here\\_0.pdf](https://www.ruralelec.org/sites/default/files/ARE%20Advocacy%20article%20-%20High-profile%20bankruptcies%20in%20the%20off-grid%20sector%20where%20do%20we%20go%20from%20here_0.pdf)

<sup>xiv</sup> Green Mini Grid Helpdesk, Sustainable Energy for All - <https://greenminigrad.se4all-africa.org/>

Companies websites:

Azuri: [www.azuri-technologies.com](http://www.azuri-technologies.com)

Solar Aid: [www.solar-aid.org](http://www.solar-aid.org)

Marubeni Corporation: <https://www.marubeni.com/en/>

Mobile Power: <https://www.mobile-power.co.uk>

BBOX: <https://www.cdcgroup.com/en/>

CDC: <https://www.cdcgroup.com/en/>

Energise Africa: <https://www.energiseafrica.com>

Crowd Credit: <https://crowdcredit.jp/global/overview>