



Understanding the Impact of Distribution Costs on Uptake of OGS Products in Select SSA Countries



AFRICA CLEAN ENERGY (ACE)
TECHNICAL ASSISTANCE FACILITY (TAF)

Understanding Impact of Distribution Costs on Uptake of OGS Products in Select SSA Countries

Foreign, Commonwealth and Development Office (FCDO) Africa Clean Energy Technical Assistance Facility

© October 2020

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This report was co-authored by the Africa Clean Energy Technical Assistance Facility and Open Capital Advisors.

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Cover page: Photo credit: www.lightingglobal.org

Title page: One of 12 security lights installed in a village in Kenya, powered by a PowerGen solar micro-grid. Women, in particular, are ecstatic with the new safety they are afforded when walking home at night and theft has been deterred. This photo was taken by PowerGen at one of our solar micro-grids in Kericho, Kenya and shows the village, at night, new illuminated by security lighting powered by the micro-grid. Photo credit: Power Africa

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ABBREVIATIONS

Abbreviations	Definition
ACE	Africa Clean Energy
AECF	Africa Enterprise Challenge Fund
CRM	Customer relationship management
FCDO	Foreign Commonwealth and Development Office
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
IT	Information technology
OGE	Off-grid energy
OGS	Off-grid solar
PAYGo	Pay-as-you-go
PV	Photovoltaics
PVOC	Pre-export verification of conformity
REACT	Renewable Energy and Adaptation to Climate Technologies
REIAMA	Renewable Energy Industry Association of Malawi
SAS	Stand Alone Solar
SENDEA	SENDEA
SHS	Solar home systems
SSA	Sub-Saharan Africa
TATES	Total Access to Energy Solutions
TAF	Technical Assistance Facility
TVETT	Technical and vocational education and training (TVET)
USD	United States Dollar
USSD	Unstructured Supplementary Service Data
VAT	Value Added Tax



EXECUTIVE SUMMARY

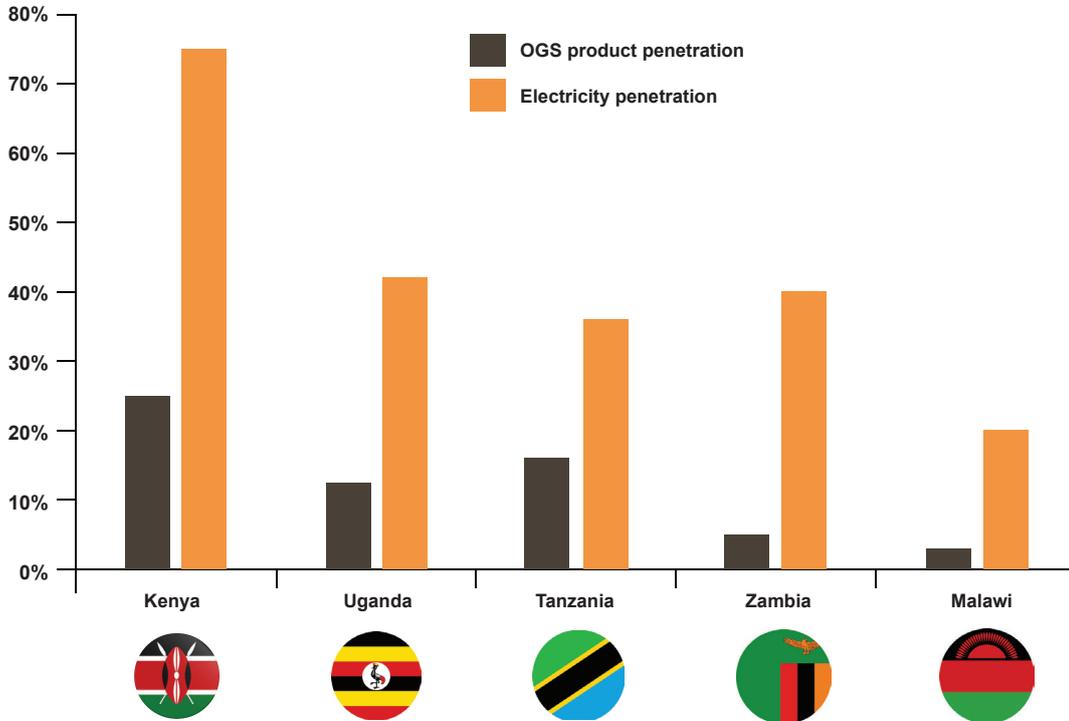


Figure 1: OGS product and on-grid electricity penetration as a % of the population in select SSA countries, %

Despite ambitious 2020 electrification targets, many Sub-Saharan African (SSA) countries still have relatively low electricity access, especially in rural areas representing close to 85 percent of the global energy access deficit.¹ Studies have shown that standalone off-grid solar (OGS) products such as solar home systems (SHS) and pico products, could potentially address this electrification challenge, especially as they are a more financially viable solution for serving off-grid households than grid extension. Unfortunately, penetration of off-grid solar products has been quite inconsistent, with countries such as Malawi and Zambia, lagging substantially at 3% and 5% penetration respectively, despite significant electrification needs.^{2,3}

Distribution costs and other distribution barriers are considered one of the key reasons for limited uptake of off-grid solar energy systems products in Sub-Saharan Africa. This is due to two assumptions, 1) that distribution costs have a significant impact on OGS price, therefore limiting affordability for OGS products' target market; and 2) that distribution barriers affect providers' ability to deliver necessary volumes of products directly to final consumers, therefore, limiting availability of OGS products. Further, landlocked countries such as Malawi and Zambia potentially have more significant

1 International Energy Agency (IEA) et al, *Tracking SDG 7: The Energy Progress Report 2019* (Washington DC: IEA, IRENA, UNSD, WB, WHO, 2019), 1, https://trackingsdg7.esmap.org/data/files/download-documents/2019-tracking_sdg7-execsumm-withoutembargoed.pdf

2 Overseas Development Institute (ODI), the Global Off-Grid Lighting Association (GOGLA) with SolarAid, and Practical Action, *Off-grid solar country briefings, Accelerating access to electricity in Africa with off-grid solar*, 2016, link

3 Sammy Mwititi, "Off-grid Solar Power Comes of Age in Kenya," *Business Daily*, 3 February, 2019, link

distribution costs and barriers due to the additional distribution steps between the port of entry into Africa, to the home country point of entry. These countries, therefore, are likely to have higher priced goods affecting the affordability of products and similarly creating limited availability of products because of the higher distribution costs and barriers. This report sought to understand the influence of distribution costs and other distribution barriers on the affordability and availability of OGS products with a particular focus on examining the differences between landlocked and non-landlocked countries, and the impact on price-sensitive, low-income earners in rural areas.

FINDINGS

On affordability, this report found that despite significant impact on overall cost to serves, distribution did not significantly impact variation in pricing across landlocked and non-landlocked countries. On average, distribution costs contributed ~47% to retail prices (as shown in figure 2) with limited variation across studied countries (Malawi, Zambia, Tanzania, Kenya, and Uganda). While some variation was observed among in-bound logistics costs and fiscal incentives, these differences were largely inconsequential as in-bound logistics costs accounted for only 3% to 6% of overall costs and the minor differences in various fiscal incentives among countries largely balanced out. Furthermore, an analysis of large and small OGS companies working across the studied countries showed no clear pattern in the difference in pricing between landlocked and coastal countries.

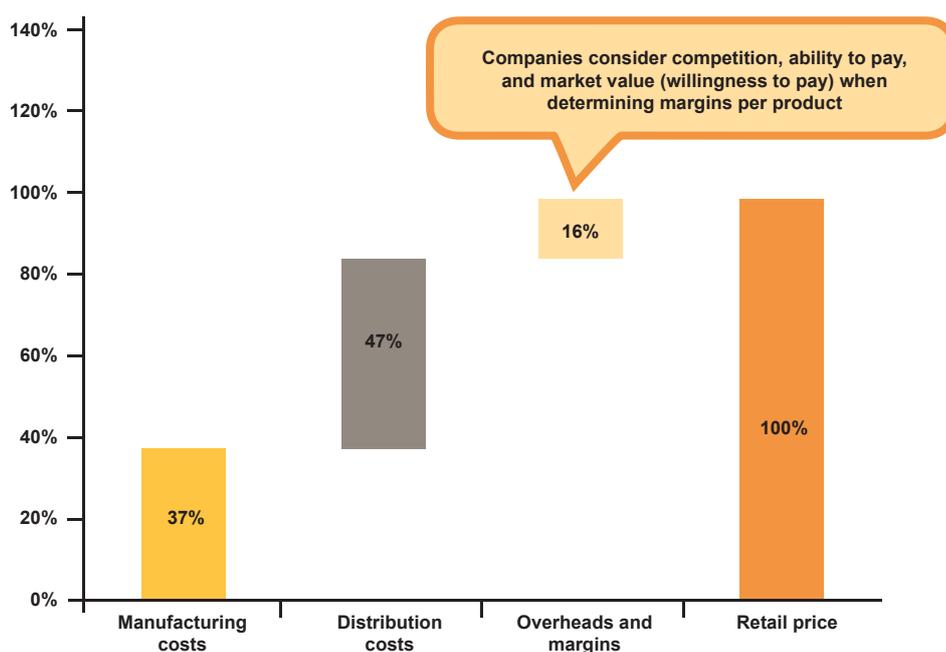


Figure 2: Average percentage cost contribution to retail price across countries, %

This indicated that OGS companies take different approaches to pricing and weigh pricing factors differently. The four price-setting factors that OGS companies prioritized include: overall costs (which constitutes distribution costs, manufacturing costs and overheads), competition, ability to pay, and market value (willingness to pay). As a result, this report found that distribution costs did not have an impact on retail price variations across study countries because despite having a significant impact on overall cost, overall costs are only one of the four factors OGS companies consider when setting retail prices.

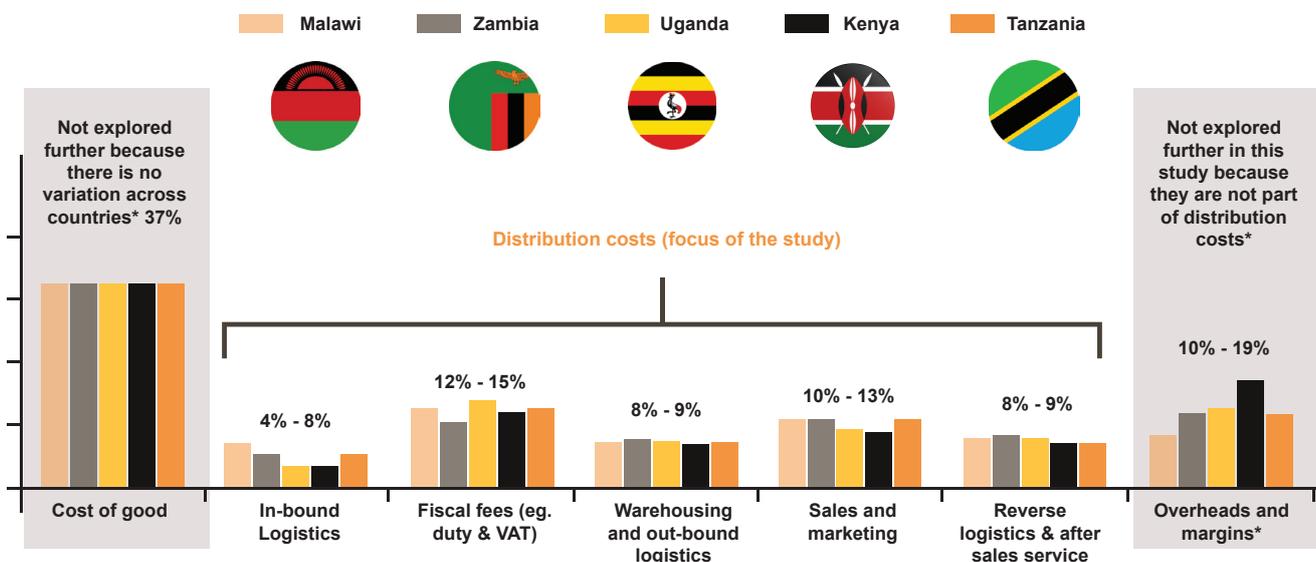


Figure 3: Average unit cost breakdown by country, USD

On availability, this study found other barriers in the distribution chain that limit availability of to OGS products for the final consumer. OGS companies face similar distribution barriers across landlocked and coastal countries that include access to finance - heavy working capital requirements from large import volumes with smaller companies sometimes incurring extra 40% for importing fewer goods in one consignment; and enabling environment - inconsistent tax application and weak enforcement of quality standards and complexity of middle and last mile distribution. OGS companies can address some of these challenges, however, others have wide-reaching implications that require support from broader OGS ecosystem players such as industry associations and governments. These barriers at a company level create cashflow constraints to the OGS operator while some of the macro challenges create significant delays in distribution chain that limit availability of products to the final consumer. While companies can leverage economies of scale and other innovative models to address the company level challenges, the macro challenges require concerted effort from different industry stakeholders over a longer period.

RECOMMENDATIONS

Stakeholders are implementing various innovative models to overcome challenges to reach more remote communities. These innovative models are based on the four most consistent and impactful factors that affect distribution: quantity of goods, geographical location, service offering and quality of goods. The most prominent innovative models include:

- Strategic partnerships:** OGS companies collaborate with partners in and out of the sector, to share costs and capitalize on the strengths of other ecosystem players. This is critical within the off-grid solar sector, where handling distribution logistics represents a substantial upfront cost and capacity requirements that most enterprises will struggle to cover.
- Use of specialized intermediaries:** OGS companies that are not vertically integrated recognize the value of engaging specialists in parts of the value chain so as not to reinvent the wheel. This enables operators to focus on improving their efficiency in one specific part of the value chain to maximize value.

- Integrating technology systems into operations: OGS companies have incorporated tech-enabled platforms across the value chain to increase efficiency and reduce operational costs.
- Decentralizing supply and distribution: OGS companies start with centralized supply and distribution but often decentralize these operations as they scale to maintain the quality of services and support to customers efficiently and cost-effectively.

Ecosystem players are best placed to create a conducive enabling environment for OGS companies to test and refine these models, and to address the large-scale distribution barriers that require solutions implemented at the ecosystem-level. Ecosystem players such as the government, associations, and financiers, are often relatively neutral, have considerable knowledge, industry-wide networks, and implementation capacity to implement initiatives that can reduce the implications of distribution costs and barriers on affordability and availability of off-grid solar products. Potential initiatives to be undertaken include:

- **Supporting the development and consistent implementation of favorable policy:** There is a broadly favorable enabling environment in Zambia and Malawi for OGS with solar energy policy integrated into electrification planning and tax exemptions in place on solar products. However, there is still limited capacity at customs and inconsistency in the way tax and other regulatory fees are applied. It is important for government and other public funders to bolster the capacity of the regulators to increase efficiency and transparency in the process given that these fees currently contribute ~11% to final price and address inconsistent enforcement that limits availability.
- **Supporting OGS companies to prepare for and access suitable financing:** The substantial financing needs and the incompatibility between OGS companies and traditional financiers, stifles the ability to scale their operations and increase the affordability of their products. Operators struggle to access financing to meet the high working capital requirements to build out outbound distribution channels and hold large quantities of inventory, in addition to high currency risk.
- **Improving access to last mile consumers:** Low-income, rural population is substantially complex to serve, due to the delicate balance between maximizing affordability and availability and ensuring the sustainability of OGS companies' business models. OGS companies have developed company level strategies to address this but there is need for broader ecosystem collaborations for example sector level initiatives and partnerships with the industry associations and government to leverage grassroots structures, create one-stop warehousing and clearing and enable other partnerships to enable scale and reduce the cost of reaching the last mile.

In conclusion, there is little variability in the impact of distribution costs and other distribution barriers between landlocked and coastal countries. While distribution costs and barriers have some influence on price, they do not affect pricing strategy exclusively and must be considered along with other factors such as competition, market value, and willingness to pay. These costs and barriers rather have a significant impact on the availability of products in country and how quickly they get to the last mile. There is an opportunity for OGS companies and other ecosystem players to come together and implement the strategies outlined above, that can address distribution challenges further reducing their impact on affordability and availability of OGS products. The rest of the report examines and presents in detail the findings of the analysis of the impact of distribution costs and other barriers on affordability and availability, reviews the innovative models OGS companies have leveraged to lower distribution costs and address other distribution barriers, and presents potential recommendations for various ecosystem players to support OGS companies to overcome affordability and availability challenges.

INTRODUCTION

1

Objective of the Report

This report therefore seeks to understand distribution costs and barriers for landlocked countries providing a valuable comparison with more developed markets and coastal countries. Specifically, the report examines Zambia and Malawi as focus countries with Kenya, Uganda and Tanzania as comparison countries, understanding the varying distribution models that have enabled uptake despite different access dynamics such as high-population density in peri-urban areas in Kenya, Uganda's landlocked nature, and Tanzania's large geographical scale. This report seeks to:

- Examine the impact of distribution costs and barriers on affordability and accessibility across landlocked and non-landlocked countries
- Highlight the different models that OGS companies are leveraging to lower distribution costs and limit distribution barriers
- Discuss interventions that ecosystem players such as the government, industry associations, financiers etc., can implement to support OGS companies' strategy and build the enabling environment

Varying costs for OGS companies influence their ability to serve rural markets and influence price strategy that inadvertently affects both affordability and availability to the consumer.

Companies have seen that last mile consumers in Sub-Saharan Africa (SSA) have low ability to pay due to limited disposable income and are thus more sensitive to risk and more demanding of value for money. Companies, development partners and financiers have focused interventions on innovations to provide more affordable products and flexible payment platforms that enable the companies to lower their costs to serve while still providing value to consumers.

Despite advancement in technology and product development, companies still incur several challenges in finding cost-effective routes to market considering distribution logistics from manufacturer to end-consumer especially since manufacturing largely happens outside of the continent. For landlocked countries in SSA like Malawi and Zambia, there is relatively low uptake of solar products in comparison to others with coastal access. It is therefore important to understand the barriers and costs across the distribution value chain to understand how that affects affordability and availability of products at the last mile.

Methodology

Insights in this study were gathered through a combination of secondary research and consultations with key local and regional stakeholders covering the focus and comparison countries enabling a thorough analysis of operator costs and pricing.



Photo credit www.lightingglobal.org

The secondary research focused on leveraging learnings from institutions such as GOGLA, Lighting Global, etc., who have prepared reports examining key trends in the energy sector, structure of the supply chain, drivers of distribution costs, and policy and regulatory trends. This was further supplemented by direct interviews with 30+ stakeholders, including local and international stand-alone OGS companies, industry associations, government regulators, and other ecosystem players. These consultations aimed to validate information gathered from desk research and gain more insights into the distribution channels of OGS companies, associated cost drivers and distribution challenges. Due to the sensitivity of financial or operational data, we have only included aggregated information rather than specific company details. The list of stakeholders consulted is in Annex I.

The Role of Off-Grid Energy

The secondary research focused on leveraging learnings from institutions such as GOGLA, Lighting Global, etc., who have prepared reports examining key trends in the energy sector, structure of the supply chain, drivers of distribution costs, and policy and regulatory trends. This was further supplemented by direct interviews with 30+ stakeholders, including local and international stand-alone OGS companies, industry associations, government regulators, and other ecosystem players. These consultations aimed to validate information gathered from desk research and gain more insights into the distribution channels of OGS companies, associated cost drivers and distribution challenges. Due to the sensitivity of financial or operational data, we have only included aggregated information rather than specific company details. The list of stakeholders consulted is in Annex I.

Despite ambitious 2030 electrification targets, SSA still has minimal electricity access, especially in rural areas where access stands at 31.5%,⁴ compared to the urban rate of 78.1%.⁵ This low access is often driven by high capital costs required to extend the grid, low ability to pay given 42%⁶ of

4 World Bank, Access to electricity (% of population), Poverty headcount at USD 1.90 a day (% of population), population density (people per sq. km of land area), <https://data.worldbank.org/>

5 020 Market Trends Report, the Global Off-Grid Lighting Association (GOGLA), 2020, https://www.lightingglobal.org/wp-content/uploads/2020/03/VIVID%20OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High.pdf

6 Hystra, Reaching Scale in Energy Access – Lessons from Practitioners, 2017, <https://www.adb.org/sites/default/files/publication/372436/access-energy-lessons.pdf>

people in SSA earn less than the international poverty line of USD 1.90 per day. There is a high cost of extending transmission and distribution to the more rural areas given the low probability of recovering distribution costs, and low population density in SSA at 50.1 people per sq. km.⁷

OGS energy has the potential to close the 55.4% gap in electricity access for SSA.⁸ OGS energy is a more cost-effective and reliable alternative to grid electricity due to the relatively lower installation and operational costs, and the energy generation capabilities of the African climate. OGS products' price points, which range from USD 3-140 for pico systems and USD 11-1,760 for SHS, are considerably lower than the cost of installing on-grid connections and appliances.⁹ Additionally, most SSA countries have significant hours of sunshine which can be used to power OGS products. For instance, Zambia and Malawi's current rates of 2000-3000 hours of sunshine per year can produce approximately 5.5 KWh/m² of solar power per day. These characteristics have resulted in significant uptake of standalone systems with 180 million sold worldwide in the last 10 years.

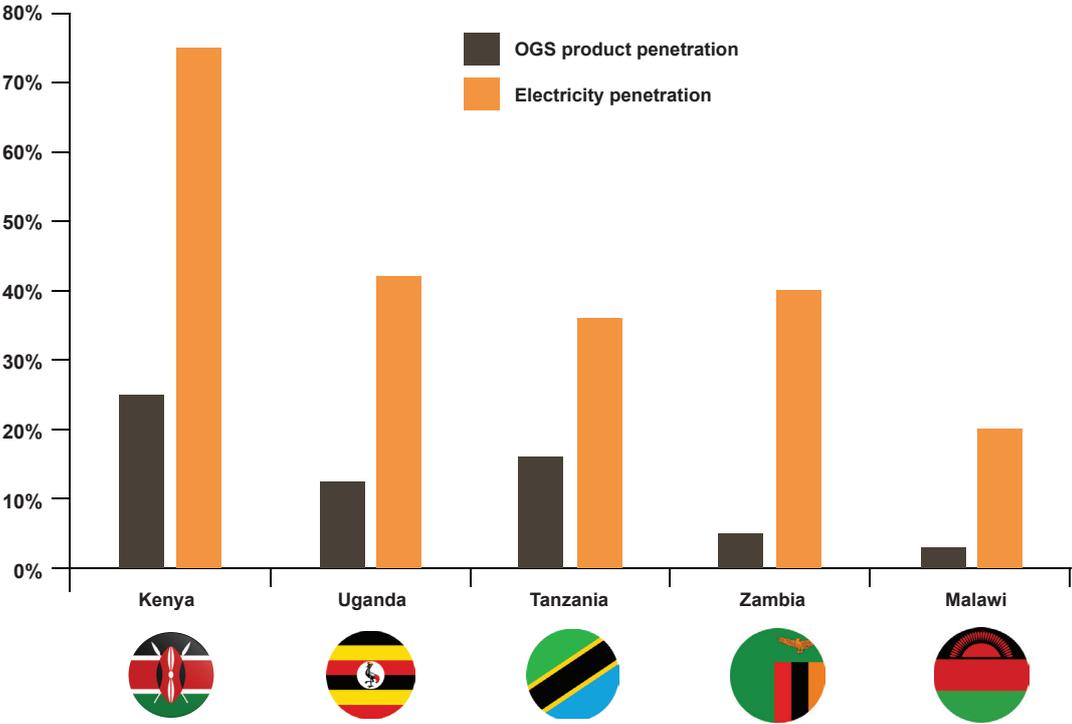
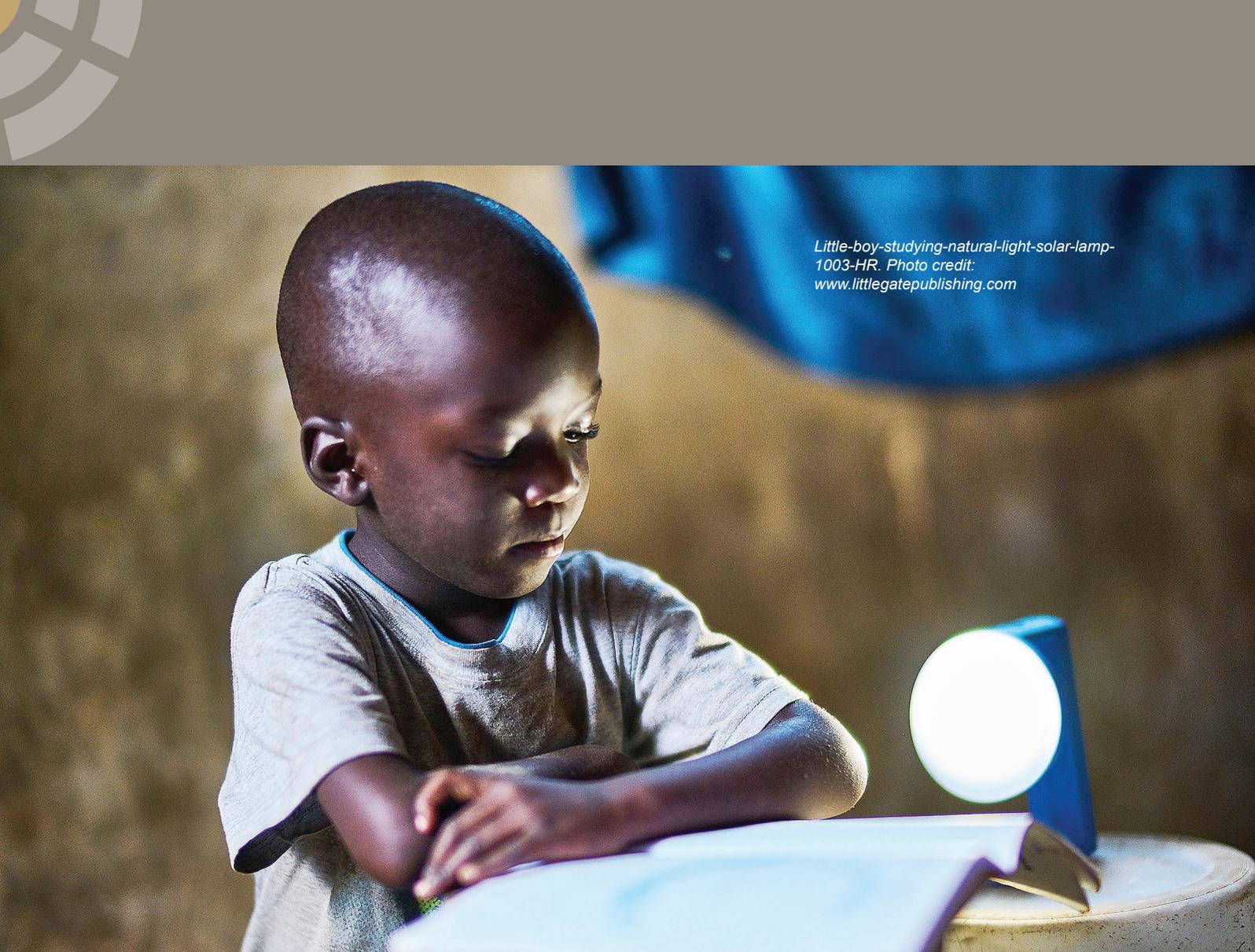


Figure 4: OGS product and on-grid electricity penetration as a % of the population in select SSA countries, %

7 Sammy Mwitii, "Off-grid Solar Power Comes of Age in Kenya," *Business Daily*, 3 February, 2019, <https://www.businessdailyafrica.com/analysis/columnists/Off-grid-solar-power-comes-of-age-in-Kenya/4259356-4964516-mi7ciaz/index.html>
 World Bank, *Access to electricity (% of population) - Sub-Saharan Africa*, (Washington, D.C., United States, 2017),
 8 World Bank, *Access to electricity (% of population) - Sub-Saharan Africa*, (Washington, D.C., United States, 2017), <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=ZG>
 9 Mayank Jain, Robin Gravesteijn, Arne Jacobson, Emily Gamble, Nicola Scarrone, *Digital Finance For Energy Access In Uganda*, (UN Capital Development Fund (UNCDF), 2019, <https://www.uncdf.org/Download/AdminFileWithFilename?id=9853&cultureId=127&fileName=big-data-paper20200206webpdf>



Little-boy-studying-natural-light-solar-lamp-1003-HR. Photo credit: www.littlegatepublishing.com

Despite the applicability of solar energy products, penetration rates have been quite low across countries, as seen in the graph, with countries such as Zambia and Malawi, lagging substantially at 3% and 5% respectively, despite significant electrification needs.

Affordability and availability are crucial aspects for uptake of standalone solar systems. Research and pilots have shown that it is important to address both the ability of consumers to pay for the products and the availability of these products to the end consumer.

Distribution costs and barriers are considered one of the key reasons for limited uptake of off-grid solar energy systems products in Sub-Saharan Africa. This is due to two assumptions, 1) that distribution costs have a significant impact on OGS price strategy, therefore limiting affordability for OGS products' target market; and 2) that distribution barriers affect providers' ability to deliver necessary volumes of products directly to final consumers, therefore, limiting availability of OGS products.

The following sections of this report therefore focus on understanding distribution costs and barriers across the OGS value chain and examining the significance of their impact on affordability and availability, across landlocked and non-landlocked countries to understand any variability.

UNDERSTANDING THE DISTRIBUTION VALUE CHAIN IN SSA

2

The distribution of OGS products in SSA is split into two main stages: in-bound and out-bound distribution, with different components and implications on affordability and availability. The remaining chapters of the report delve into costs and barriers across both stages and further examines the innovative models that companies have employed across the value chain.

Inbound Distribution

Inbound distribution covers movement of OGS products from the manufacturer, typically based outside of Africa in countries such as China and Germany, to an OGS company warehouse or head office which is typically located in the capital city of the country of final distribution. The subcomponents of in-bound distribution include:

- i. **In-bound logistics:** This covers transportation and storage of goods from the manufacturer (overseas) up until the warehouse/main distribution hub.
- ii. **Fiscal fees:** This includes VAT, import duty, infrastructure levy, and import declaration fees levied on OGS companies for importing solar home systems.
- iii. **Standards and other importation requirements:** These include cost of quality/standards certification, licenses to operate as a bona fide dealer in OGS products and additional documentation required to import solar home systems for example, import licenses.

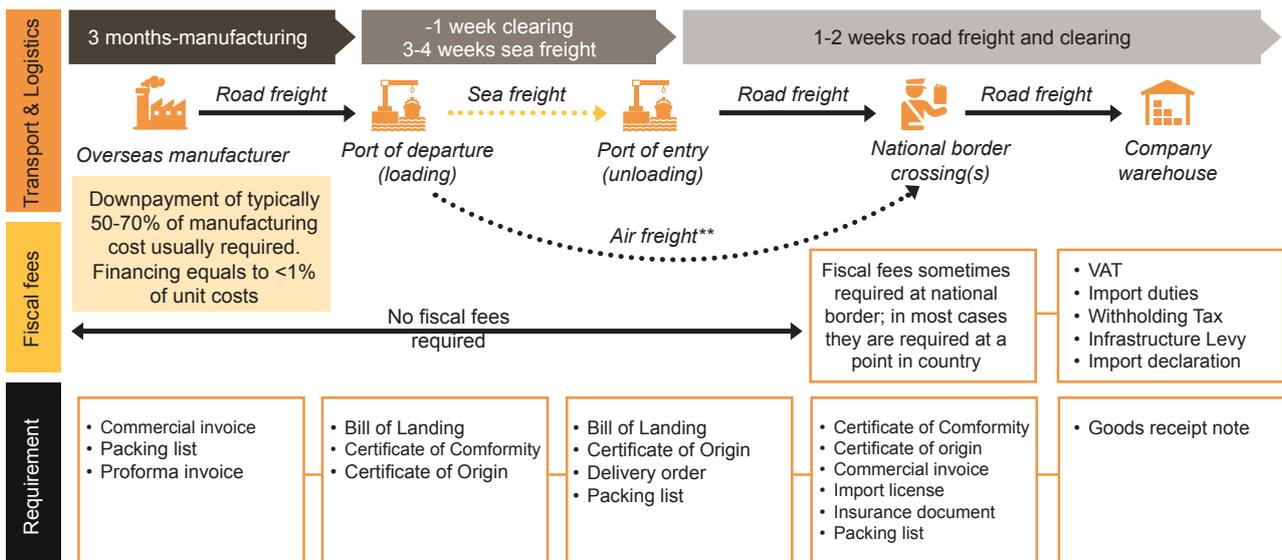


Figure 5: In-bound distribution

Outbound Distribution

Outbound distribution covers distribution of products specifically from storage at the OGS company warehouse or Head office to the end customer at the point of sale as well as reverse logistics to facilitate repairs and returns. The subcomponents of out-bound distribution include:

- **Warehousing and out-bound logistics:** These include storage of inventory and transportation to the customer who is typically in a rural area. Transportation typically consists of:
 - ◆ **Middle mile:** This refers to the transportation of goods from the main warehouse facility to the regional warehouses or local distribution points.
 - ◆ **Last mile:** This is the transportation of goods from regional or local distribution points to the customer's home. While middle mile typically requires trucks or other vehicles, last mile involves bicycles, motorcycles, or walk-in deliveries to the final consumer.
- **Sales and marketing costs:** This encompasses all operations that support the direct sale and marketing of goods, including sales agents, advertisement through radio, billboards, and roadshows.
- **Reverse logistics and after-sales-services:** OGS companies incur costs to service malfunctioning products on-site or remotely and to return faulty or repossessed goods to company service centers for repairs or refurbishing.

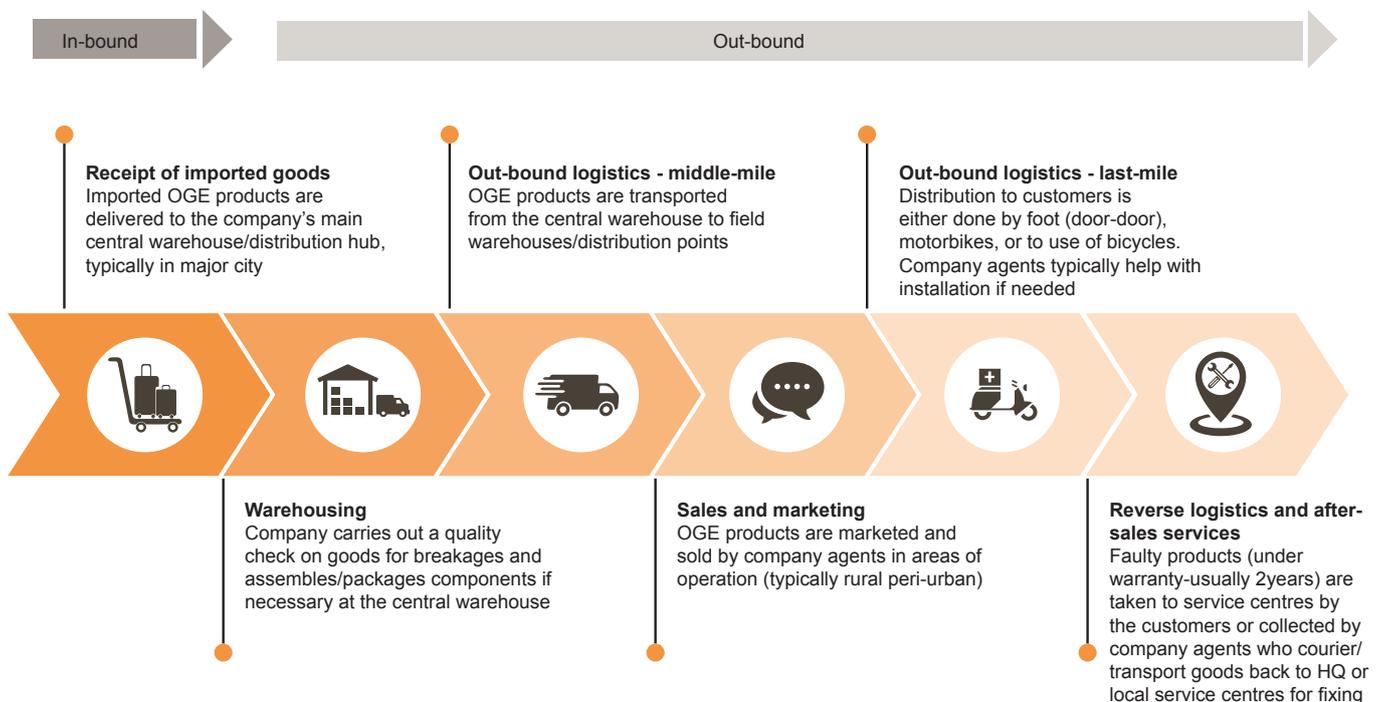


Figure 6: Out-bound distribution

IMPACT OF DISTRIBUTION ON AFFORDABILITY AND AVAILABILITY

3

Affordability and availability are crucial aspects that influence uptake of standalone solar systems. Research and pilots have shown that it is important to address both the ability of consumers to pay for the products and the availability of these products to the end consumer. This section explores the nature of distribution costs and barriers across focus and comparison countries and examines the impact on availability and affordability to the final consumer. Specifically diving into qualitatively evaluating the impact of distribution costs and barriers on affordability and examining the impact of these costs and barriers on consistent availability of products from OGS companies.

Summary Findings from Analysis

Building off the information collected, **an analysis tool was developed to compare the prices and distribution costs of solar products** received from OGS companies during consultations. The goal of the analysis was to understand the impact of distribution costs on affordability. Some of the key guiding assumptions for this analysis are listed below, however more comprehensive details are available in Annex 3:

- **OGS operator pricing and costs:** This analysis relied on pricing and cost data from OGS companies with presence in one or more of the focus (Malawi and Zambia) or comparison countries (Kenya, Uganda, and Tanzania)
- **Product selection:** When available, the analysis focused on Tier 1 plug and play solar home systems -- Tier 1 categorization is based on the Multi-Tier Framework developed for ESMAP under the SE4ALL initiative to define access as differentiated levels. According to this framework, Tier 1 systems have a minimum capacity of 3 W and a maximum of 12 W which typically support lighting, phone charge and a radio. The study excluded all component-based systems within Tier 1, plug and play and component-based solar home systems above 12 W (i.e. Tier 2 to 5) and productive use appliances such as TVs, refrigerators.
- **Mode of payment:** This study focused on the cash purchasing price rather than Pay-As-You-Go (PAYGo) models to exclude non-distribution variables that affect pricing related to PAYGo financing and default rates. The study focused on cost components that had direct impact on affordability and availability, had some correlation with distribution barriers, and were variable across the focus and comparison country

Distribution costs and barriers are a function of market differences and company operations. The main factors influencing distribution costs and barriers are quantity of goods ordered, various customer services, and quality of goods (all of which relate to the nature of company operations), and geographic location (relates to the market differences). This section presents research findings and analysis on the impact of distribution costs and barriers on availability and affordability given market differences and OGS company business models. **The analysis resulted in several key findings on next page:**

1 Retail prices across countries reveal no clear trend with the price differences seen between landlocked and coastal countries; pricing strategy is influenced by market maturity and other company specific dynamics versus geographical location

While costs are largely similar across countries, pricing varies by operator. Several companies offering identical products across multiple countries provided reliable pricing references for this study. An analysis of these companies shows no clear pattern with the difference in pricing between landlocked and coastal countries (as shown in figure 7).¹⁰ Some offer better prices in coastal, more developed markets like Kenya, while others offer better prices in landlocked, less-developed markets like Zambia. Further, prices of identical products sold by independent, smaller companies also give a similar conclusion. This indicates companies consider other factors when setting retail prices. The study found that OGS companies consider four factors when setting prices, namely:

- i. Costs:** Overall costs which constitutes distribution costs, manufacturing costs and overheads, often form a baseline from which OGS companies determine their desired gross margin based off other price-setting factors (shown below).
- ii. Competition:** Multiple companies cite competition as a major factor as they must keep their prices in line with the market to stay competitive. However, there are many non-quality-verified solar products in the OGS markets of the studied countries. These offer significant competition to quality-verified solar products, particularly pico lantern products.
- iii. Ability to pay:** Countries in this study have different living standards and average incomes. Research and analysis did not reveal any company that varied prices in different parts of the same country, however, some companies mentioned ability to pay as a factor of pricing between countries. This also factored in which types of products to offer in each country.

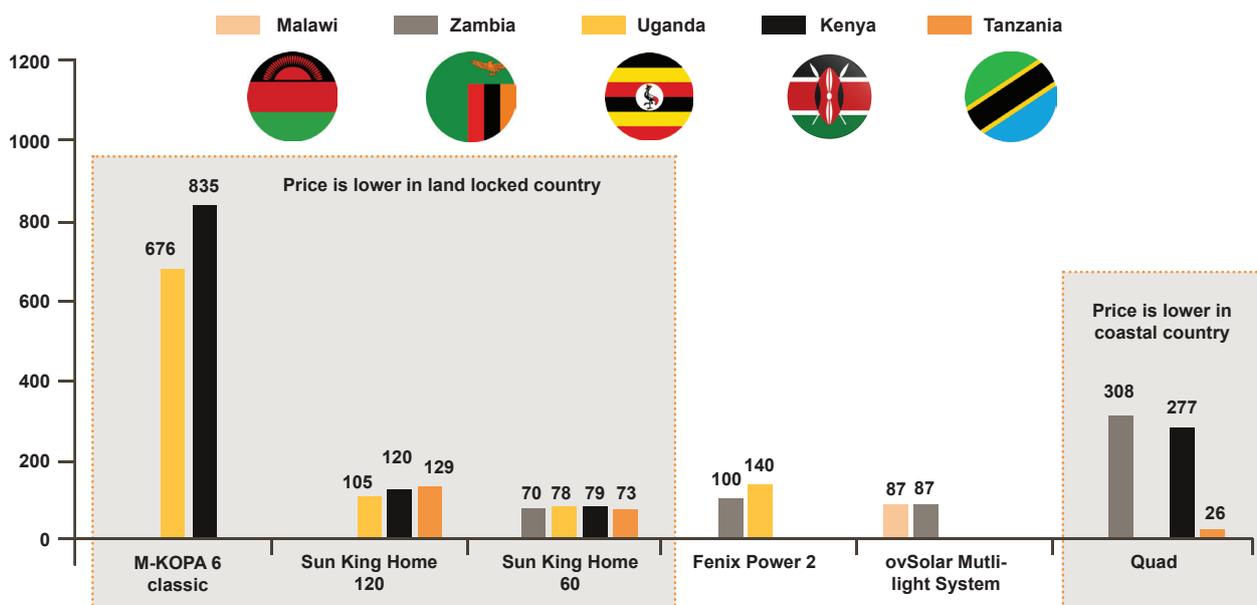


Figure 7: Retail prices of select solar home systems in landlocked vs non landlocked countries, USD

¹⁰ This report considered cash prices rather than PAYGo to eliminate variances caused by financing costs, default rates, etc.

- iv. **Market value:** Companies can adjust pricing based on market willingness to pay. In some cases, this could result in high prices with large margins, particularly in the face of little competition or for a highly regarded brand. In other cases, this could entail lowering prices if the product is not well known or the overall OGS market is not well developed.

The pricing variation across countries held true for both large vertically integrated companies and smaller local companies. Vertically integrated companies typically operate across multiple countries and engage across all stages of the value chain – from product design and manufacturing to distribution and financing activities.¹¹ Local OGS companies in contrast, operate in one country and typically do not focus on all stages of the value chain.

- **Vertically integrated OGS companies:** While they consider costs associated with operations in landlocked vs coastal countries, ultimately, they must consider additional factors such as ability to pay, market value and competition when setting prices. The study found that differences in pricing are a result of company specific pricing strategy. For example, Azuri's price is lower in Kenya (a coastal country) while M-KOPA has a lower price in Uganda (a landlocked country). Surprisingly, two of three companies with operations in both landlocked and coastal countries had better prices in the landlocked country.
- **Local OGS companies:** Smaller local OGS companies in different countries distributing identical products did not have similar prices. For example, among surveyed distributors, Sun King Home 60 is relatively cheap in Zambia and Tanzania, yet more expensive in Uganda and Kenya. This is driven by market factors that are product and operator specific such as willingness to pay in different regions, number of other players in the area and financing dynamics as some operate with NGO and government subsidy funding to serve hard to reach areas.

2 Distribution costs did not have significant impact on price variations across focus and comparison countries

Unit costs (manufacturing costs and distribution costs) across the five countries in this study are similar, ranging from 72% to 79% of the total retail price. The largest single cost component is the cost of goods. Many of the distributors in both the focus and comparison countries offered similar products indicating that there was no cost advantage in unit cost. **Distribution costs account for ~47% of retail price with limited variation across focus and comparison countries.** Given distance to the coast, the cost of in-bound logistics had the largest variations among distribution costs influenced especially by the overall market maturity. For example, Kenya, the most developed OGS market in this study, experiences lower costs for in-bound logistic, warehousing and out-bound logistics enabled by specialized intermediaries that lower operating costs. However, these differences were largely inconsequential and did not affect pricing as they were balanced out by variations in other distribution cost components. For example, fiscal fees were higher in Kenya, Uganda and Tanzania than in Zambia.

¹¹ Uganda Offgrid Energy Market Accelerator (UOMA), Accelerating access to local currency debt for SHS businesses, 2019 Link

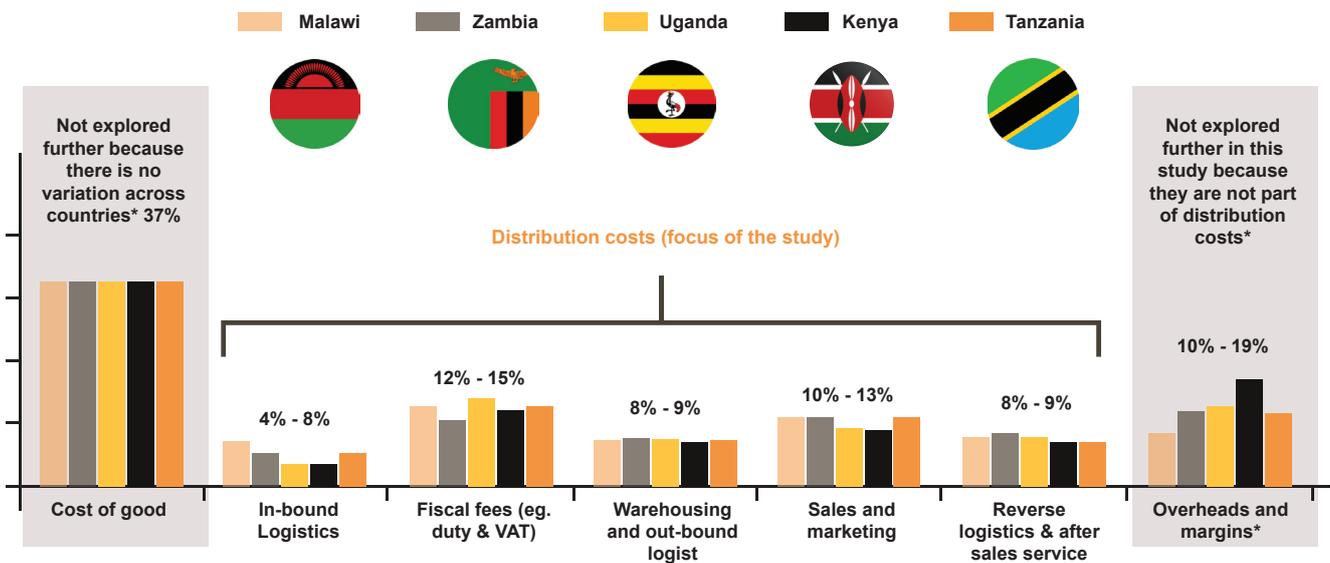


Figure 8: Average unit cost breakdown by country, USD

3 OGS companies face several distribution barriers that affect availability of products to consumers

Companies face other distribution barriers beside costs that significantly limit their ability to supply products consistently. They create cashflow constraints and significant delays in the supply chain, which limit availability of products to the final consumers. As is the case with distribution costs, these barriers relate to company operations and market differences.

These other distribution barriers relate to **access to finance; heavy working capital requirements from large import volumes, enabling environment; inconsistent tax application and weak enforcement of quality standards and complexity of middle and last mile distribution.**

The rest of this section further examines the different components of in-bound and out-bound distribution to better understand the influence market differences and OGS company operations have on distribution costs and barriers. The section details the typical routes, processes, and requirements of each component of the distribution value chain and highlights the impact on affordability and availability.

Review of In-Bound Distribution

► In-Bound Logistics

OGS companies interviewed for this report mostly source their products from China, Malaysia, India, and Germany. It typically takes 4-6 months between ordering products and receiving goods from these countries.

OGS companies that import from outside the continent typically outsource in-bound transportation to a single, well-known/global freight forwarding company.

However, some smaller companies in countries without in-country wholesalers buy and import from neighboring countries, resulting in inflated in-bound logistics costs for example, companies in Malawi importing products via road freight from Zambia to their headquarters in Lilongwe and those in Tanzania importing products from a larger company’s regional hub in Nairobi. These usually face shorter time constraints but incur higher costs with purchase and logistics.



Figure 9: Road transit routes of goods to from ports of entry to destination cities

The two primary drivers of in-bound transportation costs are:

1. **Distance from origin to destination:** Road transport costs, especially transnational transportation, are a large factor of in-bound logistics. The cost of transport is largely dependent on the distance between the seaport and the final city/town where the goods are delivered. Third-party transporters factor in the cost of fuel, driver per diem, and truck maintenance, among others for the whole trip.
2. **Quantity of goods:** Per unit costs typically vary according to the quantity of products transported. For both road and sea freight, costs vary by number of containers and their respective size i.e. 20-foot or 40-foot. These costs are standardized irrespective of whether the goods fully or partially fill the shipping container. OGS companies incur lower costs per unit if they transport more units in each container.

Because of the standardized costs of importation per container and the length of time between ordering and receipt of goods, OGS companies have high working capital requirements. OGS companies typically raise external financing to meet these working capital needs. However, small local OGS companies who typically have fewer years of experience and less market traction, struggle to raise financing compared to larger regional players.

To lower working capital needs, OGS companies sometimes partner to import products in the same shipping container. However, this requires coordination as it can create significant delays when the container is held up at the border if one of the companies has not properly cleared their products or does not have the documentation to prove this. In addition, smaller companies opt to use air freight instead of sea freight because their required quantities are not enough goods to fill a 20 feet container – this leads to ~40% increase in in-bound logistics costs. In-bound logistics costs are highest for landlocked countries Malawi, Zambia, and Uganda (as shown in the table below) because of the high transportation costs from the port of entry to the destination city (i.e. Lilongwe, Lusaka and Kampala).

In-bound logistics cost as a percentage of the final price				
MW	ZM	UG	KE	TZ
6%	5%	5%	3%	3%

► Fiscal Fees

Imported solar home systems are subject to 5 main types of fiscal fees as shown in Figure 10. Value Added Tax (VAT) is the only fiscal fee charged on the solar home system retail price versus total cost of goods, insurance, and freight costs (CIF). Value Added Tax (VAT) and import duties are the highest fiscal fees and often OGS companies face challenges processing these payments due to the inconsistency in application of regulation in both focus and comparison countries. These inconsistencies are a result of ambiguous and sometimes dated definitions of solar home system components in the governing laws and regulators' limited capacity.

	MW	ZM	KE	TZ	UG
VAT	16.5%	16%	16%	18%	18%
Import duty	20%	20%	25%	25%	25%
Import declaration	1%	1%	3%	-	-
Infrastructure Levy	-	0.5%	2%	1.5%	1.5%
Withholding tax	-	-	-	-	6%

Figure 10: Select components of SHS are exempt of VAT and import duty fees in all focus countries

All countries in the study had VAT and import duty exemptions for some or all solar home system components. Components used to generate, or store electricity were commonly exempt, including solar panels, batteries, lights, and solar PV cables; components that consume energy, such as TVs and radios, are usually not exempt. **Despite these exemptions, the study found that tax authorities applied them inconsistently leading to higher and unpredictable costs for OGS companies.** For example, in Zambia solar batteries are exempt of taxes, however, companies reported paying import duties for li-on batteries because at the time of drafting the exemptions in 2008, solar home systems did not commonly use li-on batteries so they were not explicitly mentioned in the regulation.¹² Inconsistencies also arise when companies make slight adjustments to products that they had exemptions for in previous consignments. Another example comes from a Zambian OGS company who reported receiving an exemption for a 32-inch solar-compatible TV, but when they slightly increased the size of the TV, they lost their exemption. The study also found that different government institutions are responsible for exemptions associated with each duty type making the process to secure all exemptions arduous and time consuming. **Zambia had the lowest overall fiscal requirements as a percentage of the final price among focus and comparison countries as shown in the table below.** However, this marginal cost advantage was discounted by higher costs in other distribution components such as inbound logistics in comparison to other countries.

Estimated costs (direct/indirect) fiscal requirements as a percentage of final price				
MW	ZM	UG	KE	TZ
15%	12%	16%	14%	15%

¹² Energy Africa – Zambia, Technical assistance to model and analyze the economic effects of fiscal policy options for off-grid technologies in Zambia, 2018, link

► Standards And Other Importation Requirements

Standards and compliance of OGS products to national guidelines/requirements in focus and comparison countries have a very minimal effect on the overall price of an OGS product on a per unit basis. Figure 10 shows the various logistics and standard compliance documentation for importing solar home systems in focus and comparison countries.

Required documentation	
Standards	Logistics
<ul style="list-style-type: none"> • Import license – issued by the destination country allowing importation of specific good(s) into the country 	<ul style="list-style-type: none"> • Pro forma invoice – first invoice sent to purchasers before shipping goods • Commercial invoice – details value and quantity of imported goods • Packing list – details contents and weight of products being shipped • Bank draft – issued by bank detailing purchaser has sufficient funds to purchase products • Bill of Lading – details type, quantity, and destination of goods • Certificate of origin – details which country of origin of goods • Delivery order – document confirming delivery of goods to buyer • Insurance document – freight insurance for the goods being transported

Figure 11: Logistics and standards requirements

Costs of complying with importation and standard requirements are low when dealing in large volumes. The process, however, can be cumbersome, which is why companies usually hire a clearing agent (~USD 500 per container) to compile paperwork and coordinate customs clearing. Other costs include licensing paid to the regulator, usually <USD 1,000 for a 3 to 5-year license.

Standards Bureaus in focus countries are working closely with tax/regulatory bodies to explore ways to improve/quicken the processing of documentation for OGS products. For example, in Malawi, the standards body is exploring developing a unified I.T system to harmonize checks at the border. In Kenya, Tanzania and Uganda, a Pre-export Verification of Conformity (PVOC) system requires products to be tested in a lab in the country where they are manufactured, and the results/certificate must accompany the products and be presented to the relevant authorities to ensure conformity.

Despite efforts to improve processing of documentation, most regulators struggle to implement their mandate because of insufficient funding and limited technical capacity especially testing equipment required to verify the quality of products. As a result, there are many sub-standard and counterfeit products in focus and comparison countries that skew the perception of consumers about solar products. This has a negative impact on sales of quality products since they compete with significantly cheaper sub-standard products. Because of this state of the market, OGS companies that sell quality products often incur additional marketing costs to educate potential customers about their products and differentiate them from the counterfeits. Some of these advertising strategies include distributing flyers that contain summary product information or running awareness campaigns with sales agents on market days in rural areas.

Review of Out-Bound Distribution

► Warehousing And Out-Bound Logistics

OGS companies require significant capital to construct quality warehouses and develop a robust out-bound logistics network. Therefore, they often outsource specific components of this distribution stage

to avoid these upfront costs. **The study found that OGS companies in less developed markets have fewer options to outsource components of out-bound logistics, making market entry more difficult and requiring more bulky operations.** Other findings are discussed below:

- i. Warehousing:** Companies require warehousing for imported products at points of entry and for longer term storage at regional locations. Many companies in the study manage their own warehousing or regional hubs in key locations throughout their markets. Some companies outsource warehousing to a third-party with adequate facilities in the target market areas. For example, select local OGS companies in Malawi had regional warehouses to store OGS and serve their markets easily. Meanwhile, select international OGS companies in Kenya have the option of outsourcing warehousing to established couriers, who bundle warehousing, logistics, order processing and assembly into one package to streamline operations.
- ii. Out-bound middle mile logistics:** The study found that larger companies use logistics providers that may require long-term contracts or transport goods using their own trucks. Smaller companies tend to use public transportation or couriers that charge for each trip. Larger companies therefore incur lower logistics costs than smaller companies because they are able to negotiate for discounts on long-term contracts with higher volumes. For some of the markets, specialist platforms that handle logistics or crowdsource providers that help to make the process a lot more efficient and optimizes costs. For example, in Zambia, an international OGS company used a third-party logistics platform for in-country distribution.
- iii. Out-bound last mile logistics:** Most OGS companies deliver and install products at customers' homes through sales agents who use different modes of transportation including public transportation, motorbikes, bicycles, or on foot. OGS companies often provide an allowance to meet agents' transportation needs.
- iv. The complexity of middle and last mile logistics creates availability barriers for OGS companies:** The majority of solar customers are based in sparsely populated rural areas. However, population density varies across countries in the study. For example, over 70% of Zambia's population lives in extremely low density areas (less than 100 people/square kilometer) while in Kenya only 20% of the population live in extremely low density areas.¹³ OGS companies operating in countries with lower population densities require more capital expenditure to finance distribution structures to reach and service last mile customers. Where more specialized intermediaries are not available, especially in countries such as Zambia and Malawi, OGS companies must manage their entire value chain. In more developed OGS markets such as Kenya, however, product assembly, regional warehousing, order processing, and middle mile transportation can be outsourced to a single company, making the barrier to entry much lower for new entrants and shifting risk away from OGS companies. This is further discussed in Chapter 4 below exploring the various models used by companies for distribution.

OGS companies typically incur high costs on quality warehousing to ensure their products maintain maximum functionality. Battery capacity in solar home systems depreciates when stored at higher temperatures; OGS companies must therefore prioritize warehousing that has appropriate temperatures to store their solar home systems.

¹³ Vivid Economics and Open Capital, 2020 Off-grid solar Market Trends Report, the Global Off-Grid Lighting Association (GOGLA), 2020 Link

The study found that the key factors driving cost at this stage of out-bound distribution are distances between company stores and final customer, means of transportation used – own vs. third party – and the amount of inventory warehoused. The estimated costs on warehousing and out-bound logistics as a percentage of final price are shown in the table below.

Estimated costs on warehousing and out-bound logistics as a percentage of final price				
MW	ZM	UG	KE	TZ
9%	9%	9%	8%	9%

► **Sales and Marketing Costs**

The OGS sector in focus and comparison countries have varying levels of maturity and therefore final consumers in these countries have different levels of awareness about OGS products. Both affordability and availability of products are influenced by how awareness and access is achieved for end customers. Sales and marketing, therefore, play a critical role in distribution for OGS companies. Companies must establish a sales network (direct or indirect), often in rural areas where the final consumer resides. The study found that establishing direct distributions such as retail outlets owned by OGS companies helps build awareness and brand recognition, however, these are often cost-prohibitive in low density areas. Key components of sales and marketing include:

- **Sales agents:** Majority of OGS companies have their own agents who are paid a commission of 5-7% plus additional allowances for transportation. Independent sales partners or stores are another common sales channel. In some cases, partners will purchase the products directly from the company at discount of ~5%.
- **Direct marketing:** Some OGS companies give agents allowance for marketing activities to use for local promotional events. Other larger marketing efforts are not considered here as they are included in general overheads.
- **Retail outlets:** Some companies establish their own retail outlets to build brand loyalty and service faulty equipment. Companies reported that outlets are critical for sales and operations as the proximity to customers builds trust and relationship that is critical for sales and later repayment. OGS companies interviewed reported that retail outlets in MW, ZM and UG have a higher unit cost contribution because these countries typically have lower volumes per outlet.

Women make up more than half of sales teams for ~60% of companies interviewed. Interviewees reported that women tend to outperform men because they were engaged in sales activities fulltime unlike men who had multiple ventures. However, companies also reported some reluctance to use female agents for remote/ long-distance deliveries, particularly over-night, citing security concerns. Operators are increasingly focusing on distribution models for marginalized groups such as women, youth, disabled and refugees to achieve social and business impact. There is a business case in utilizing groups like women who are considered to be hidden influencers of purchase in communities—other studies, and our consultations for this report, show that women can sell up to twice as many households as men

Malawi and Zambia have the highest sales and marketing costs contributing 13% to the retail price (see table below). The study found that the key factors driving cost at this stage of out-bound distribution are agent compensation structure, including fixed rates and variable commissions, marketing spend on local promotions, and volumes sold per retail outlet compared to outlet costs (e.g. rent, store manager salary, etc.).

Estimated sales and marketing costs as a percentage of final price

MW	ZM	UG	KE	TZ
13%	13%	11%	10%	13%

► **Reverse Logistics and After-Sales Services**

Reverse logistics and after-sales services ensure that customers have a seamless customer experience and encourage repeat purchases. However, it is costly to set up these operations and therefore staff handling sales may also handle reverse logistics. The study found that reverse logistics and after-sales support costs are similar across countries, though OGS companies must set up training programs for technicians, particularly where national technical and vocational education and training systems are weak. The key components of reverse logistics and after-sales services are covered below:

- 1. Reverse logistics:** Most companies consulted provide a warranty (typically 2 years). Faulty products are repaired on-site or picked up by an agent and returned to the nearest service center or the company’s HQ, typically via public transport/ couriers. Some companies negotiate long-term (e.g. 2-year) deals with couriers for a fixed price for the services to mitigate against potential price increases.
- 2. Technicians:** Some companies have specialized technicians at service centers to handle after-sales support, while other companies train sales agents to double as technicians. In cases where poorly trained sales agents carry out installations of systems, customers are likely to face additional challenges with their solar home systems.
- 3. Call center:** Call centers are used to facilitate after-sales support to customers. Some companies have their own call centers while others outsource this service. Agents within these call centers are trained to troubleshoot customer challenges and when required, the customer is advised to return the system to the distribution center for further support.

Zambia and Uganda have the highest reverse logistics and after-sales service costs contributing 9% to final prices. The key factors driving cost at this stage of out-bound distribution are distance between company stores and service center, malfunction rates, which can be influenced by the level of training of the installer, salary of technicians and a portion of salaries for call center staff. Finding well-trained and affordable technicians can be difficult, particularly where national technical and vocational education and training (TVET) systems are weak. Even in countries where TVET is generally strong, many do not teach skills directly related to solar products. This has two main effects: 1. OGS companies must invest in comprehensive training programs for their technicians, and 2. Well-trained technicians can be scarce and must be paid a premium.

Estimated reverse logistics and after-sales service costs as a percentage of final price

MW	ZM	UG	KE	TZ
9%	9%	9%	8%	8%

As highlighted in the above section, the operations of OGS companies across in-bound and out-bound distribution vary according to the company financial capabilities, size and level of integration across the distribution chain. As a result, OGS companies face varying distribution barriers and incur different distribution costs. The next section of the report explores strategies OGS companies implement to reduce costs and overcome these barriers at different stages of in-bound and out-bound distributions.

MODELS TO ADDRESS DISTRIBUTION BARRIERS AND COSTS

4

As discussed in the previous section, companies face various costs such as fiscal fees and import costs, alongside other distribution barriers like the complexity of last mile distribution that cause cashflow constraints and significantly limit their ability to supply products consistently. While these distribution costs and barriers are not the biggest driver for pricing, research shows that effective distribution chains are key for the adoption of standalone solar especially in greenfield markets at the last mile. OGS companies are therefore employing different innovative models to optimize their supply chains and ensure consistency in supply especially to the last mile.

This section outlines the different innovative models that OGS companies are using to minimize the impact of distribution costs and barriers. The design of these models is largely influenced by the following operational factors:

- i. **Quantity of goods:** To manage their unit economics and achieve profitability, OGS companies need to meet minimum order requirements when importing and storing goods. With larger quantities they can negotiate lower charges with suppliers, transporters, and storage facilities, reducing per-unit costs.
- ii. **Geographical location:** The location of OGS companies' central operations is a key consideration as it impacts sourcing options and the ability to serve rural consumers. Operators incur additional costs to distribute products to more rural areas with poor infrastructure and low population density.
- iii. **Service offering:** Companies consider whether to vertically integrate their business across the value chain or focus on one part of their service offering considering the complexity and resources needed. Some of the larger regional OGS companies can take on the complexity of offering a full suite of services including consumer financing, training, and after-sales services. Given the resultant additional costs and limited access to finance for that level of scale, smaller local OGS companies are leveraging partnerships or specialist intermediaries to ensure their customer needs are met.
- iv. **Quality of goods:** Given the low ability to pay and limited access to finance, companies are often faced with choice on sourcing from cheaper non-quality verified manufacturers who typically supply low quality OGS products that are have not been certified by Lighting Global. While this may solve for cost in purchasing in bulk, it can be distortive to the market and often times excludes the companies from access to support for example donor funding given the products are not certified. Additionally, in some cases, companies face regulatory charges to clear their goods at the border if they do not meet certain standard requirements.

To address these, OGS companies have developed innovative models highlighted below to source products and drive uptake. Given the limited sourcing options for OGS products, companies have innovated to reduce distribution costs and barriers across middle and last mile distribution. These models include:



Partnerships: Operators are coming together to either leverage existing on the ground networks or, for many of the local OGS companies, to enjoy economies of scale. This is the most pronounced strategy on a macro-level with industry associations and the micro-level with companies utilizing existing networks like community groups, savings groups, and local government structures.



Specialized intermediaries: Operators that are not vertically integrated recognize the value of engaging specialists in parts of the value chain so as not to reinvent the wheel and leverage the benefits of having experience dedicated to specific parts of the value chain. This enables many of the local OGS companies to focus on product development or customer experience with their distribution channel.



Integrated technology systems: To improve the unit economics of their businesses, companies must minimize inventory and optimize distribution based on cost and quality. Many have incorporated tech-enabled platforms across the value chain to increase efficiency and performance, using software to reduce information asymmetry and make data backed decisions.



Decentralized supply chains: Several companies recognize the inefficiencies in centralized supply and are setting up or leveraging existing community hubs to store and market products.

Aside from their ability to address relevant distribution costs and barriers, operators must consider several external and internal factors to select an optimal distribution strategy as laid out below.

- **Inclusion and impact:** There is opportunity for operators to test new models and markets with the focus on serving marginalized groups such as women, youth, disabled and refugees to achieve social and business impact. Although there is potential for significant impact, there is significant need to constantly innovate to change mindsets, improve payment performance and provide training to intentionally incorporate inclusive strategies.
- **Consumer awareness and culture:** For operators to drive uptake, it is important to understand factors that influence consumer behavior to improve perceptions in the market. Operators focus on models that enable effective communication and incorporates a concrete understanding of the cultures and norms that influence purchase and ambitions around energy, community influencers and decision makers and, what value and benefits are most appealing to specific regions and groups.
- **Management complexity:** Operators review the implications of different models against their organizational structure, processes, internal capacity, and relationship with different stakeholders. This includes level of technical expertise and time that will be required to implement, monitor, and evaluate different distribution strategies, available within the organization and options outside of the organization. Most of the small operators in Zambia and Malawi do not have large teams and must consider leveraging specialists.

- d. Potential to scale:** Operators must assess the ability of different strategies to hit company growth targets especially as the company's supply needs grow in quantity and variety of products required. Many operators also consider the ability to replicate the distribution model across varying target markets and locations.

The rest of this section of the report examines the different distribution models that OGS operators can implement, reviewing how these are implemented at different levels of the distribution chain, the key success factors for these models, and concludes with the current applicability of these models in the focus countries.

Partnerships

Partnerships allow businesses within and outside of the off-grid solar energy sector to work together across the entire value chain to reduce distribution costs and limit the impact of distribution barriers. This is critical within the off-grid solar sector, where organizing supply, handling distribution logistics and cultivating market demand represents a substantial upfront cost that most enterprises will struggle to cover, especially at the early-stages of growth.¹⁴ OGS companies have taken to collaborations within and outside the sector, to share costs and capitalize on the strengths of other ecosystem players.

Partnerships within the Zambia and Malawi off-grid solar markets have been limited in nature. The nascent nature of these markets limits partnership opportunities because of the similarities in offering and business models among the few players in the market. For example, the Solar Association of Zambia highlighted that only 5 out of their 40 members were focused on solar home systems. There still is substantial opportunity for partnerships, especially for smaller players to consolidate, increase their negotiating power and decrease the unit costs. Larger operators in Zambia and Malawi still do leverage partnerships, but less because of economies of scale, and more to leverage local expertise, especially in existing value chains outside the sector.¹⁵

Partnerships Across Inbound and Outbound Distribution

► Inbound distribution:

Partnerships increase purchasing power and allow them to meet inflexible shipping standards therefore addressing the factors of quantity of goods mainly through:

- i. Centralized purchasing:** OGS companies struggle engaging with international suppliers to negotiate prices and terms whilst importing small volumes of products. To address this, OGS

¹⁴ Richard Gomes and Meera Shah, *Last Mile Solutions for Low-Income Customers*, (Shell Foundation, October 2018), https://shellfoundation.org/app/uploads/2018/10/Shell-Foundation_Last-Mile-Distribution-Report.pdf

¹⁵ *Consultations with Solar Association of Zambia, 2020*

companies have come together for centralized purchasing to increase their negotiating power and therefore reduce the per unit cost of purchasing products.¹⁶

- ii. **Consolidated shipping:** OGS companies struggle with shipping costs that are priced according to the volume of goods that one is transporting. Due to the small volumes transported, smaller OGS companies who use sea freight often incur 40% higher per unit costs than large transporters who can fill up a full container.¹⁷ To address this, OGS companies either bundle their shipping orders to fewer times per year to increase the volumes transported or partner with other OGS companies to secure dedicated shipping containers, allowing them to reduce per unit shipping costs.

For example, to minimize purchasing and shipping costs, SENDEA, a member organization in Uganda, has developed a **centralized purchasing and consolidated shipping system**. Member OGS companies submit their product needs to the network which then builds relationships with suppliers and makes group orders, increasing their ability to minimize per unit purchasing and shipping price due to large volumes. These products are delivered to a central local location for storage that can be accessed by the member operators at flexible payment terms.¹⁸

► **Outbound distribution:**

Partnerships provide access to other organizations' distribution infrastructure and expertise, therefore addressing the factors of quality, quantity and service offering mainly through:

- **Marketing and distribution partnerships:** There are significant costs associated with creating awareness, and, developing and maintaining local distribution models, especially to the target population of OGS companies who are typically based in the sparsely populated rural areas. OGS companies have developed partnerships with OGS and non-OGS players who have extensive networks, regional knowledge, and existing infrastructure to utilize co-marketing and co-advertising across various channels to increase sales and brand recognition, therefore reducing the operational and financial investment in building out their own networks. For example, to minimize their marketing and distribution costs, while still creating and sustaining market demand, Fenix partnered with MTN in Uganda and Zambia. Leveraging MTN's existing market presence and distribution network, Fenix was able to scale their pay-as-you go system through the co-branding and distribution partnership. Fenix has since emerged as one of the fastest growing solar company in Uganda and Zambia distributing >300,000 systems across the country.¹⁹
- **Financing partnerships:** Access to finance is important for unlocking economic security and increasing access to non-financial goods such as clean energy. Unfortunately, access to finance is also one of the key challenges that affect OGS companies and limits their ability to provide their products to low-income communities. Some OGS companies have partnered with financiers to provide consumer financing, reducing technical capacity and working capital needs of operators.

16 SENDEA (Solar Entrepreneur Network for Decentralized Energy Access), *Services for Members*, 2020, <https://www.sendea.org/what-we-offer/services-for-fellows>

17 *Consultations with Muhanya Solar*, 2020

18 SENDEA (Solar Entrepreneur Network for Decentralized Energy Access), *Services for Members*, 2020, <https://www.sendea.org/what-we-offer/services-for-fellows>

19 GOGLA, "Fenix International", <https://www.gogla.org/about-us/members/fenix-international>



*For two Kenyan farmers, solar lamps benefit every part of life
Photo credit: Hailey Tucker 2014*

For example, to minimize financing costs while providing pay-as-you-go solar services to their end consumers, BrightLife, a social enterprise that distributes solar products partnered with FINCA Uganda, the local branch of a global microfinance network. Through this relationship, FINCA Uganda developed a product called “Flexipay”, which involved provision of credit for purchase of BrightLife products, and access to broader set of financial products and services. In doing so, BrightLife customers are able to enjoy a range of financing and energy products, with minimal strain on the working capital needs of Brightlife.^{20, 21}

Potential Success Factors

Partnerships help operators leverage other companies’ strengths, but they can also come with their own sets of challenges that can minimize the positive impact of these connections, especially increased interactions between multiple organizations with individual motivations, capacities, and growth strategies. Below we have aligned 3 key factors to consider during partnerships to maximize the potential for success:

Robust partner coordination: Partnerships include collaboration across multiple stakeholders who have individual motivations, that can be competing at times. To minimize any conflicts of interest and ensure benefits to all parties involved, clear designation of roles, responsibilities and rules of engagement need to be clearly stipulated. For example, SENDEA involves partnerships between multiple OGS companies who compete to sell and distribute their products. To minimize negative competition and ensure the value of the partnership, SENDEA’s members are segregated to sell in specific regions in Uganda and frequently communicate on any expansionary plans that they have in mind.

²⁰ “BrightLife: A social enterprise by FINCA International, link <https://finca.org/our-work/social-enterprise/brightlife/>

²¹ Daniel Waldron, “Solar Energy: A New Frontier for Microfinance”, Consultative Group to Assist the Poor (CGAP), 17 April 2017, link

Periodic performance evaluation: Partnerships are typically instituted to serve a specific need/purpose, but as seen from our interviews, this requires frequent reviews to ensure that initial goals are being met, and ensure the persistency of the goal that necessitated this in the first place. For example, Fenix mentioned that they had to review the value of their partnership with MTN as they scaled their operations and had larger distribution needs. This is because in early stages of their expansion, the lack of brand awareness and limited financing to invest in distribution networks, necessitated partnerships with MTN but as they scaled and had larger distribution requirements, they had to establish their own distribution hubs in addition to those utilized through MTN.

Substantial technical and local partner knowledge: Partners need to have good knowledge of their clients/partners and key challenges to facilitate valuable sales and after-sales support. For example, FINCA was able to increase the value provided to BrightLife's clientele beyond access to solar products, to provide banking products to them that they needed such as savings accounts and development of credit histories that would improve their ability to service their repayments to BrightLife.

Specialized Intermediaries

Many operators engage specialist intermediaries with technical expertise and resources for innovation at various parts of the distribution chain. This enables operators to focus on improving their efficiency in one specific part of the value chain to maximize value. Some specialist intermediaries have been developed within the solar sector, from previously vertically integrated players who decided to build their expertise in a specific area. Alternatively, when markets are more developed, they often become attractive to intermediaries in other sectors.

There are limited specialist intermediaries in Zambia and Malawi's off-grid solar space due to the early stage of the market. For this reason, OGS companies who can afford to, will vertically integrate their operations. Smaller players who cannot build end-to-end value chains rely on these services from larger operators and focus their operations on a specific piece of operations. For example, most local players source their products locally from larger players who are vertically integrated, focusing more on establishing their own outbound – middle and last mile distribution chains. However, the use of specialized intermediaries can still take place especially if solar companies tap into specialists in other sectors, or subsidiary companies leverage the specialists' value chains of their operations in other countries.

Specialized Intermediaries Across Inbound and Outbound Distribution

► Inbound distribution:

Specialized intermediaries provide technical expertise and resources around shipping, regulatory processing, and inbound logistics, therefore addressing the factors of geographical location and resource investment through:

- i. **Outsourced shipping and port processing** to minimize exposure to the complexity and costs of the shipping industry, which is mostly foreign operated, and regulatory processes that can be inconsistent. For example, to minimize managerial complexity and costs, majority of OGS companies outsource the infrastructure and personnel required to ship products and process them at the relevant ports. Outsourcing infrastructure is mostly driven by the large upfront investment

required, while outsourcing personnel is driven by the technical experience, knowledge, and networks to navigate the unique, and volatile shipping and regulatory processing steps. Outsourcing these functions saves OGS companies' substantial amount of time and financial resources, allowing them to focus more on improving the efficiency of their outbound services.²²

- ii. **Outsourced inbound distribution** from the port of entry to the central distribution hub to minimize the per unit cost due to consolidation of orders and leveraging of existing networks and infrastructure. For example, to minimize managerial complexity and costs, M-KOPA outsources warehousing and logistics in Kenya to Fargo Courier Limited. As of 2018, Fargo courier managed four warehouses with a product assembly line and 52 retail outlets for distribution of M-KOPA products. This strategy has enabled M-KOPA maintain a lean organization structure while increasing access to over 600,000 homes in East Africa.^{23, 24}

► **Outbound distribution:**

Specialized intermediaries provide access to technical expertise of high quality, at affordable rates due to their ability to scale their offering across many players within the sector, therefore addressing the factor of service offering through:

- i. **Outsourcing training:** Customer experience is important to increase uptake, right from initial contact to after-sales communication. It is important to provide adequate training to sales agents and customer support teams, however, this is quite costly especially with high attrition rates. Companies are leveraging external training firms to provide high-quality training to sales agents and customer support teams, at reduced costs through leveraging the economies of scale enjoyed by dedicated training firms. For example, to ensure high quality consumer awareness of solar energy and its products in a cost-effective way, Greenlight outsourced training to Shortlist. Shortlist, a dedicated training organization, provided high quality sales and leadership coaching to their Greenlight staff, with local context framing based on their experience in those geographies. This strategy has enabled Greenlight to rapidly scale their operations across 11 countries in Africa.²⁵
- ii. Outsourcing after-sales support to optimize the customer experience at reduced costs by engaging dedicated support agents. For example, to reduce the management complexity and upfront cost of establishing distribution networks, Azuri outsources its last mile distribution network, including aftersales support to Raj Ushanga. Raj Ushanga has a 3rd party distributor agreement with Azuri, where it collects products from Azuri's inland warehouses and leverages its own networks of +500 agents across 47 counties to serve Azuri's customers. This has allowed Azuri to maintain a lean organization structure and sell more than 200,000 units across SSA since 2012.^{26, 27}

22 Consultations, 2020

23 M-kopa Solar, Impact report 2019, <http://www.m-kopa.com/wp-content/uploads/2019/09/M-KOPA-IMPACT-REPORT-2019.pdf>

24 Consultations, 2020

25 Richard Gomes and Meera Shah, Last Mile Solutions for Low-Income Customers, (Shell Foundation, October 2018), https://shellfoundation.org/app/uploads/2018/10/Shell-Foundation_Last-Mile-Distribution-Report.pdf

26 "About us", Raj Ushanga House Ltd, <https://www.rajushanga.com/>

27 "Azuri Technologies ranked 370th fastest growing company in Europe", Azuri, <https://www.azuri-group.com/azuri-technologies-ranked-370th-fastest-growing-company-in-europe/>

Potential Success Factors

The use of specialized intermediaries allows OGS companies to focus on core aspects of their business, while allowing them to benefit from the experience, knowledge and networks of technical experts. However, releasing control over a vital part of your business can be challenging, especially in terms of sourcing and managing these experts with the right set of skills. Below we have laid out 3 key factors to consider when using specialized intermediaries to maximize the potential for success:

Presence of a mature market: Specialist intermediaries require mature markets with multiple players requiring similar products or services. This will ensure their ability to scale operations and drive profitability due to the presence of established operators who are willing to outsource parts of their operations and increase their effectiveness, and/or new entrants who want to achieve scale rapidly with minimal upfront costs.²⁸

Creative structuring of intermediary incentives: Collaborations should ensure aligned incentives to maximize the value of the specialist intermediaries. Aligning incentives ensures that the specialized intermediary has “skin in the game”. For example, Azuri incentivizes Raj Ushanga by structuring their fees around the quality of sales i.e. based on repayment revenues generated, rather than only upfront sales fees to ensure that both parties are working towards the same call.²⁹

Establishment of clear operational agreements: To govern the relationship between specialists and solar operators, service level agreements must be put in place, highlighting service expectations, conflict resolution processes and the extent of risk exposure to different parties in event of client challenges e.g. responsibility of fixing faulty products. Research has shown that efforts to collaborate with intermediaries has failed due to mismatched expectations when parties have not clearly understood the capacity or appetite of the intermediaries to take up certain responsibilities.³⁰

Integrated Technology Systems

The largest technological advancement in the off-grid solar energy space has been largely focused on the PAY-GO invention that facilitates consumer repayments for solar equipment. However, as the efficiency needs in the solar market have increased, it has become even more imperative for OGS companies to leverage technology to reduce operational costs.

Technological systems are easy to scale but can be costly to develop, limiting their spread in Zambia and Malawi. In-built PAY-GO technologies are common among larger producers and distributors such as GreenLight Planet and Dlight. These technologies are typically developed by inhouse experts. In addition, there are innovative alternative third-party providers such as Angaza (with operations in Kenya and Malawi) that have developed PAY-GO technologies for companies without the in-house

28 *Last Mile Solutions for Low-Income Customers, 2018*, https://shellfoundation.org/app/uploads/2018/10/Shell-Foundation_Last-Mile-Distribution-Report.pdf

29 *Consultations*

30 *Last Mile Distribution: State of the Sector*, <https://static1.squarespace.com/static/5bc20b07d7819e67da2a5364/t/5df7e131b3325a6bba38032b/1576526214061/State+of+the+Sector+GDC+report+.pdf>

expertise or resources to develop PAY-GO technologies on their own. However, not all OGS companies have inhouse experts to develop this key technology or have the financial resources to pay third-party providers like Angaza. As result, there is limited spread of these technologies in Zambia and Malawi particularly because majority of the companies operating in these markets are still at the early to growth stage and have limited financial resources .

Integrated Technology Systems Across Inbound And Outbound Distribution

► Inbound distribution:

Technology has been used to address the management complexity, supply, and logistics cost, that OGS companies face as they sell a variety of products across a large geographic areas.. On the supply side, ~84% of operators are supplier agnostic to minimize risk of stockouts and access a variety of products.³¹ Technology is used to address this through:

- i. **Use of tracking applications:** Off-grid solar companies often sell a variety of products, across a large geographic area to maximize revenues. Unfortunately, this increases management complexity, supply, and logistic costs especially when inventory requirements are not consolidated. To address this, off-grid technology has been developed to include tracking applications for outbound last mile distributors to facilitate more efficient sourcing and distribution processes, by tracking products and sales across different regions. For example, to manage inventory efficiently from a central location, Solar Sister began using an **offline mobile CRM application**. This allowed Solar Sister to track sales transactions in the field and analyze results in Salesforce.com. The mobile data platform allowed Solar Siter to enhance data collection, monitoring, and inventory management both from suppliers and sales agents in the field. This helped Solar Sister smoothen their supply and ordering processes to minimize any inventory gaps, therefore supporting the productivity of their sales agents.³²
- ii. **Use of online order web portals** to easily connect manufacturers of solar products to distributors on the ground in a cost-efficient manner. For example, to improve the ease of ordering inventory, OGS product manufacturers have developed online web portals that OGS companies can log into to order products and track their progress. This provides robust record of the order type and quantities for easy reference, and minimizes the cost and complexity of communication, especially since OGS manufacturers and operators are often based on different continents and speak different languages.³³

► Outbound distribution:

Technology platforms help consolidate the variety of support services required to enable regional staff optimize and standardize the customer experience despite geographical spread. These platforms create

31 "Pricing Quality: Cost drivers and value add in the off-grid solar sector", 2019, https://www.gogla.org/sites/default/files/resource_docs/pricing_quality.pdf

32 "Solar Sister Case Studies", Taroworks, <https://taroworks.org/solar-sister-case-studies/>

33 Consultations, 2020

centralized hubs of data that enable real-time decision making, therefore, addressing the factors of service offering and geographical location through:

- i. **Tech-enabled remote training:** Training is a core part of the off-grid solar energy business model because it is required for sales agents and clients. Sales agents need to be trained on product specification and sales strategies, while consumers need to be trained in the proper use of products to reduce after-sales support needs. Unfortunately, this is often expensive, time-consuming, and complex to implement across the various stakeholders, spread over a vast geographical area, with varying timelines. To address this, phone applications have been developed to deliver training, motivational messages, and product specifications to agents and clients, therefore minimizing costs and increasing access to this information in a timely fashion. For example, to minimize training costs, OGS companies make use of text messages to widely disburse information to customers and their remote teams especially around product updates or promotional offers. This allows quick dissemination of information at low cost, to a wide variety of key stakeholders who can reach through the call centers or local offices to inquire about additional information.³⁴
- ii. **Tech-enabled support:** After-sales services for OGS companies mainly revolve around addressing ad-hoc technical difficulties or faulty products. OGS companies try to reduce the costs through upfront training of consumers to minimize improper use of products and robust quality assurance practices. Unfortunately, ad hoc challenges do persist that are difficult to predict and therefore plan for in terms of staff resources. To mitigate this, OGS companies have developed technician-hailing platforms that limit the need for dedicated resources, and instead tap into the existing community expertise. For example, to minimize after-sales costs, Zonful set up a centralized, 24/7 call center connected to a technician hailing application. Customers call to register issues, which are then linked to a network of over 6,000 freelance technicians through the application, which directs the first available and nearby technician to the customer's house. Through this automatized aftersales system, Zonful managed to deliver quality service to >20,000 while keeping aftersales costs low, at just 2% of the end-consumer price.³⁵

Potential Success Factors

To enable accessibility of products to clients and employees, embedded technology requires a variety of enabling factors to be successful. This is especially true in the off-grid solar space where most of the target clients are low-income earners who are based in the rural areas and therefore have minimum exposure to technological advancements. Key factors to consider include:

Connectivity infrastructure: OGS companies are often operating in low-income and rural markets that are often “off-grid” in terms of not only electricity grid access but also telecommunication grid access. This access is key to collecting and communicating information in real time which is one of the key benefits of technology. Operators, therefore, have to keep this in mind and shy away from platforms that require internet connectivity and instead consider USSD platforms that require basic connectivity which is widespread.

³⁴ *Consultations, 2020*

³⁵ “Pricing Quality: Cost drivers and value add in the off-grid solar sector”, 2019, https://www.gogla.org/sites/default/files/resource_docs/pricing_quality.pdf

Affordability: Technology introduced should have minimal financial implications on the employees and clients who are often significantly price sensitive. This necessitates the use of platforms or applications that are easily integrated into even the simplest of appliances at little or no additional cost.

Usability: Platforms or applications need to be user friendly to staff and clients, paying attention to factors of language and digital access. For example, Solar Sister's CRM platform is available offline for use even on feature phones, at a cost that can be traced back to the company, not the field agents.

However, technology should be complimented by dedicated resources on hand to support on technical difficulties, and to address complex issues that could be beyond the functionality or the programming of the technology. For example, Zonful's application tracks back to call center personnel who can monitor the performance of technicians ordered through their platform to maintain accountability.

Decentralized Supply

OGS companies often start out with centralized supply and distribution networks to minimize management complexity and the cost of establishing a network. As OGS companies scale their operations, maintaining a centralized supply and distribution network while maintaining the quality of services and support provided to your customers and team becomes less efficient and cost-effective. To address this, OGS companies have decentralized supply and distribution as laid out in the section below.

Zambia and Malawi solar space has substantial decentralization within outbound distribution, and minimal decentralization in the supply chain. This is because the market does not have substantial market demand to necessitate localizing supply. Instead OGS companies make orders from manufacturers overseas, or engage intermediaries such as the TOTAS program, who can import products for them. OGS companies have decentralized their outbound distribution, especially in Zambia, due to the wide geographical scope, and the low-density rural areas where the target customers are located.

Decentralized Supply Across Inbound And Outbound Distribution

► Inbound distribution:

OGS companies in Africa often struggle with sourcing products from countries like China due to the long delivery and shipping time, the high minimum order requirements and the robust inventory management required. This dissuades local OGS companies from purchasing such products, turning them towards the products available locally even if they are not the required quality.

- 1. Establishing local assembly hubs** brings down import costs significantly especially across countries with regional hubs that bring down logistical costs like import duty. For example, to make their products more affordable and accessible to its East African clientele, M-KOPA has established a local assembly hub in Kenya. M-KOPA manufactures components of its products in Asia, distributes this to Kenya, where these are assembled into final products before disbursement across East Africa. This has enabled M-KOPA to significantly reduce its sourcing and importing costs.³⁶

³⁶ M-KOPA local assembly, <http://www.m-kopa.com/m-kopa-local-assembly/>

2. Partnering with distribution intermediaries who can purchase products for local distribution. For example, to minimize its working capital needs, Vitalite partners with Total, through its affiliate Total Access to Energy Solutions (TATES) program, to source and ship its products to Zambia. TATES provides an end-to-end importation service to large PAYGo distributors in sub-Saharan Africa. These services include product sourcing from the supplier, possible provision of credit, freight, customs clearance, and, on occasion, warehousing. TATES purchases products directly from suppliers, ships it and stores it at their warehouses in Zambia for 60-90 days, where Vitalite can draw down on the stock as needed. This has enabled Vitalite to minimize its financing costs, enabling it to source high quality products, and distribute them across Zambia.³⁷

► **Outbound distribution:**

Last mile customer experience is the crux of solar operators' business model due to the need to ensure longevity and continuity of repayments, and to leverage their experience to bring in more sales. Therefore, OGS companies need to have substantial presence on the ground, in a cost-effective way, to engage consumers and provide support when needed, through:

- 1. Establishing local wholesaler hubs** in the countries of distribution, where local distributors can quickly make orders from local stock. For example, to make their products more accessible to their distributors, Greenlight Planet decentralized their sourcing point from Asia, and has now established product distribution hubs in more than 40 countries acting as a local wholesaler in those countries to local companies i.e., One Acre Fund, SunnyMoney and Zonful. This has enabled Greenlight Planet to gain economies of scale by manufacturing and shipping their products in bulk, and therefore provide their products at a lower cost to its distributors.³⁸
- 2. Establishing standalone or leveraging existing regional distribution hubs** where they can establish a base for their staff and clientele. For example, to cost-effectively support its field agents, Solar Sister leverages the houses or shops of its agents to hold stock and hold regular meetings to understand sales progress and challenges. Using its agents' premises builds a sense of community amongst them developing opportunities for peer learning and collaboration, minimizing the managerial oversight required from Solar Sister.³⁹

Potential Success Factors

Decentralizing supply is an effective way to meet the needs of customers who have a significant geographical spread, however, this is mostly limited by the potentially large upfront costs required. Below we lay out key success factors that can help OGS companies to validate the use of this model, while minimizing costs.

Robust evaluation of market need: It is important to test the market to prove the presence of sufficient demand for investment in local operations and understand the market requirements for this localized support. This prevents over investment in regional hubs that will be underutilized. For example, before

³⁷ Consultations, 2020

³⁸ Company, Greenlight planet, <https://www.greenlightplanet.com/sun-king-greenlight-planet/>

³⁹ Consultations, 2020

Dlight opened a regional warehouse in Tanzania, it was already selling products to various local distributors from their other locations in Kenya and China. The company therefore understood the local demand and understood the potential scale of operations required.

Flexibility in regional hub structure: Companies with decentralized supply and distribution should still operate cohesively as a network. Therefore, OGS companies should develop regional structures that address the local needs but also allow for the flexibility to leverage each other's resources.. For example, M-KOPA has developed a tiered structure of its offices, ranging from Tier 1-3 with different functionality so that every regional hub doesn't have to be a one-stop shop, and each tier within a strategic radius, has its own purpose.

Leverage local infrastructure and resources: To maximize ease of integration of these regional hubs, OGS companies should consider leveraging existing areas and people that are central to the community. For example, in Tanzania, Solar Sister uses the homes of its agents as a base for small training programs or distribution of products. This limits the need for Solar Sister to invest in a regional office, while also building the Solar Sister model into the existing community, instead of standing out as a commercial entity.



Earth Hour Solar Light Challenge - Earth Hour 2020 Photo credit: Nico Keenan / WWF-Aus



INTERVENTIONS TO SUPPORT THE MARKET

While OGS companies have developed multiple innovations to improve their efficiency and lower their costs, other challenges highlighted in the report require interventions from ecosystem players such as the government, solar associations, and financiers.

Due to their relative neutrality, consolidated knowledge, industry-wide networks, and implementation capacity, we believe ecosystem players are best placed to; create a conducive enabling environment for OGS companies to test out and refine the models to improve affordability and availability at the company-level, and address the large-scale distribution barriers that require solutions implemented at the ecosystem-level.

Several ecosystem players in Zambia and Malawi have already made initial strides towards implementing support initiatives to improve the affordability and availability of OGS products.

These existing initiatives include developing public bodies to address policy issues such as Zambia's Off-Grid Energy Task Force within the energy government ministries in Zambia and Malawi. These task forces aim to drive policy development and ensure that off-grid solar is a priority for the central governments i.e. lobbying for it to be included in long-term electrification plans, to increase the intentionality around off-grid solar by developing specific activities and targets to drive its growth.⁴⁰ Additionally, there have also been initiatives to address the access to finance challenges, mainly driven by development partners who are less risk-averse and want to catalyze the market and private operators who recognize the viability of the off-grid solar sector. Initiatives include the establishment of innovative financing programs tailored to OGS companies such as Power Africa's Beyond the Grid Fund for Zambia that is a EUR 20M results-based "social impact procurement" fund that under its first round of financing, incentivized off-grid operators such as Fenix and Vitalite to deliver 300,000 connections by 2021.⁴¹ There has also been an increase in investor forums such as the Zambia Off-Grid Investor Forum in 2018,⁴² to increase the dialogue between investors and off-grid operators and facilitate investment. Lastly, there have also been initiatives to support the OGS companies' services, especially through increasing coordination efforts between OGS companies. For example, in Malawi, the government through UNDP support established the Renewable Energy Industry Association of Malawi (REIAMA) in 2000 and made it a requirement for OGS companies to be part of the association. This was supposed to bring them together and establish a body that could effectively represent and advocate for the private sector.

Due to the nascent nature of the OGS sector in Zambia and Malawi, the initiatives are quite early-stage and have had limited impact so far.

⁴⁰ Consultations

⁴¹ "Power Africa: Beyond the Grid Fund for Africa", REEEP, <https://www.reeep.org/bgfz>

⁴² Renewable Energy Industry Association of Malawi (REIAMA), GOGLA, <https://www.gogla.org/renewable-energy-industries-association-of-malawi-reiama>

Euince Wegulo prepares a meal for her family with the help of a Greenlight Planet solar lamp she purchased from One Acre Fund on credit.

Photo credit: www.oneacrefund.org



Supporting on Fiscal Policy and the Enabling Environment

The policy environment in Zambia and Malawi for OGS companies has been favorable as solar energy policy has been integrated into electrification planning. However, it is important to continue to address fiscal policy given taxation and regulatory fees contribute ~11% to the final price and inconsistent application had significant impact on availability given the delays in the supply chain. In addition to on-going initiatives, the report proposes the following initiatives to improve the policy environment for OGS companies:

i. Strengthen the capacity of the local tax authorities and create clarity on the taxation policy:

There is a need to strengthen the capacity of regulatory bodies to lay the groundwork for more effective enforcement in the future. This will involve investment in more customs personnel and technology to help with screening and training of customs officials. In addition to strengthening regulatory capacity, the government can consider more direct interventions for the smaller local operators to incentivize growth such as corporate tax holidays, incentives for market entry, reductions in withholding tax, and other taxes related to business operations especially given the adverse effects of COVID – 19.

ii. Develop and provide training on “handbooks” that outline guidelines for solar operators:

A clear and detailed handbook on taxes and other regulations for OGS companies will create more clarity and minimize delays at the country entry points. There is an opportunity here for government regulators and the industry associations to collaborate on training for the handlers and OGS companies to ensure there is awareness and clarity. There has been success with this in Uganda, where the Uganda Solar Energy Association (USEA) in collaboration with the government developed a handbook on solar taxation to streamline and guide tax application and provided training to its members on compliance.

iii. Improve the capacity of the bureau of standards for continued vigilance:

To curb distortion in the market from cheaper low-quality goods, the government through both bureaus of standards should ensure that there is a comprehensive up-to-date framework of standards relevant to the market amidst the rapid technology advancement of the solar energy sector. The bureau of standards need to review and stay abreast with new IEC standards and adapt relevant standards to the needs of their local markets.

iv. Develop innovative structures to enable for piloting new technologies:

To encourage local innovation, governments need to develop conducive environment for local manufacturers and innovators of solar technologies. This could include instituting a “regulatory sandbox”, where OGS companies could pilot new technologies in the market, under the supervision of regulatory bodies but without the typical regulations that can be constricting. This would allow the operators to test out new products on the market at subsidized costs, while the regulators would consistently learn about market innovations and therefore be able to develop the corresponding policies and procedures.

v. Develop one-stop-shop regulatory centers:

To address the time delays resulting from the multiple regulatory checkpoints and processes, Zambia and Malawi can explore OGS specific regulatory hubs with the various agencies together, equipped with relevant quality assessment equipment and the legal mandate to review solar products. This could streamline the process and allow the government to closely monitor and support the OGS companies without them incurring extra warehousing and regulatory costs.

To incentivize the uptake and distribution of solar products, ecosystem partners need to frequently update, and ensure the proper implementation of policies. While implementing these changes in the policy framework, ecosystem players should ensure coordination given inter-related roles within the government and with other stakeholders. This will ensure consistent application of policies thus enabling operators to manage distribution costs.

Supporting OGS Companies to Prepare for and Access Suitable Financing

The substantial financing needs and the incompatibility between OGS companies and traditional financiers stifles the ability to scale their operations and increase the affordability of their products. Companies struggle to access financing to meet the high working capital requirements to build out outbound distribution channels and hold large quantities of inventory, in addition to high currency risk.

43 *Lighting Global, GOGLA, ESMAP, Off-Grid Solar Market Trends Report 2020*, <https://www.lightingglobal.org/resource/2020markettrendsreport/>

According to the GOGLA Market Trends Report, public funding for the OGS sector has grown rapidly, with over US\$ 800 million for OGS and energy access related technical assistance globally approved by World Bank in 2018 and 2019.⁴³ However, Zambia and Malawi have largely focused their investment on large scale solar mini-grid projects. There is a need to develop more targeted support to financing challenges for small operators, leveraging lessons from more advanced markets in SSA:

Improving Access to Last Mile Consumers

- 1. Address foreign exchange risk by increasing access to local currency financing:** One of the key barriers to local currency debt financing for solar home systems businesses is the limited knowledge about the unique operational model of businesses in the sector. Increased and embedded support to local financiers could significantly increase the utilization of existing facilities in the short to medium term. For example, The Development Bank of Ethiopia, funded by the World Bank, has developed a financing scheme of \$40 million, which is partly used to offer a pool of priority FOREX working capital to import products meeting LG Quality Standards.
- 2. Pilot facilities and partnerships which enable DFIs to invest in small OGS companies at smaller ticket sizes:** Many of the operators in Zambia and Malawi are still in the early to the growth stage of development and therefore require smaller capital injections. However, this can be a challenge for financiers given the lower returns and operational challenges associated. DFIs will need to be creative about establishing facilities that can deploy debt in smaller tranches, i.e. utilizing financial intermediaries, establishing innovative partnerships, or creating stand-alone facilities with lower financial return mandates.
- 3. Increase visibility and transparency of industry data used to assess sector growth:** Financiers have cited a lack of industry benchmarks around financial and operational performance for SHS operators. Technical assistance to train credit teams in utilizing standardized industry KPIs when evaluating solar home system businesses will enable them to more effectively assess actual rather than perceived risks in the sector. Data transparency drives more targeted funding, for example, SIMA Funds teamed up with Angaza to access Angaza's wealth of reliable data on last mile distributors' performance and therefore evaluate and monitor investments into solar operators, based on their operational data. In 2020, SIMA and Angaza will launch a dedicated debt facility, which will offer a range of products including inventory financing and quasi-equity loans to last mile distributors in the clean energy sector in all in emerging markets.⁴⁴
- 4. Provide supply-side subsidies that incentivize businesses to serve hard to reach rural areas:** Unserved populations are heterogeneous and require unique solutions to serve. However, today, these segments are not clearly defined, preventing public and private sector actors from understanding how to reach them. To successfully implement subsidies for operators in Zambia and Malawi, it is important to align mechanisms and partner with implementors relevant to the type of communities and affordability of consumers. Based on learnings from experiences in advanced markets in East Africa like Kenya and Tanzania, the key for the proper implementation

⁴⁴ "Angaza and SIMA Announce Investment Fund for Distributors," November 19, 2019, <https://www.angaza.com/2019/11/19/distributor-finance-fund/>

of subsidies is ensuring there is an appropriate monitoring process to ensure operators are effective and incentivized, including checks for quality and energy efficiency. Across the different models, the Sustainable Solar Market Packages (SSMP) scheme and Results-Based Financing (RBF) sales model have been effective and should be explored to support businesses targeting varying groups. There are some programs such as USAID's Solar Home System (SHS) Kick-Starter Program (USD 5 million) in partnership with local and international financiers in Malawi offering results-based finance, operational support, and access to working capital financiers to OGS companies.

- 5. Provide investment readiness training, tailored to solar operators:** Ecosystem players should provide technical assistance for investment readiness to OGS companies. This can be implemented by providing training to improve their existing operational processes, and to understand the financing landscape, to better prepare them to successfully seek financing and to efficiently absorb this financing. Zambia and Malawi have accelerator programs such as BongoHive that could partner with associations to tailor their investment readiness training to early-stage businesses.

Provision of innovative financing mechanisms such as foreign exchange mechanisms and supply-side subsidies, and capacity building will enable OGS companies to increase availability and affordability of products. Particularly, increased access to finance will enable OGS companies address working capital challenges and scale up their operations. In addition, OGS companies will be better placed to develop new technologies and business models that will increase affordability and the availability of products in the last mile.

As earlier mentioned, there are considerable challenges in terms of last mile distribution. While there are different strategies implemented by OGS companies to reduce the cost of operations at the last mile, there is room for further support:

- 1. Increase coordination between OGS companies:** To help small OGS companies to enjoy economies of scale at the early stage of their growth, associations or other networks could bring them together to address the various challenges identified across the distribution chain. This could include investing in and consolidating supply orders, sharing facilities, or logistical chains such as warehouses or trucks. During our consultations Renewable Energy Industries Association of Malawi highlighted that this is something they were hoping to pilot, once they attain the right financing and partnerships.
- 2. Develop innovative products that can consolidate last mile distribution needs:** To reduce last mile distribution costs, and maximize potential earnings, ecosystem players could support research into products such as one-stop charging ports, or more productive use technology. Shared products would require customers to come to a central point, therefore, limiting resources required for last mile distribution, while productive use technology provides a direct path for consumers to increase their income, and therefore could be priced higher, transferring more distribution costs.
- 3. Incorporate OGS-related training in local technical facilities:** The OGS sector is relatively new to Zambia and Malawi's market, yet it has grown rapidly over the last couple of years, creating multiple employment opportunities for the residents. To better prepare the population to take up these roles and improve the quality of services in the OGS sector, local technical and

vocational education training (TVET) centers need to include courses on the OGS sector into their curriculum with support from the government and development organizations. This will, as a result, reduce the cost of building in-house maintenance functions by solar providers.

- 4. Establish regional maintenance support initiatives:** Consumers require maintenance and after-sales support, but there is limited affordable local expertise to address these issues. As the industry scales, there could be an opportunity to establish a regional standalone maintenance facility that absorbs local technicians and streamlines the regional maintenance systems. The success of such a service would, however, be dependent on the industry reaching a substantial number of consumers.

These interventions to increase coordination and enable the development of innovative solar products and support mechanisms will help improve the availability of products to last mile consumers. They will also enable operators to manage distribution costs and optimize operations even in remote areas with limited infrastructure, and limited local talent resources.



Alice Wafula's family eats dinner together under the light provided by a Greenlight Planet solar lamp. Photo credit: www.oneacrefund.org



CONCLUSION

As highlighted **despite significant impact on costs, distribution did not significantly impact variation in pricing across landlocked and non-landlocked countries.** However, OGS companies are faced with other distribution barriers discussed in this report as well as other challenges that limit overall accessibility of OGS products to final consumers.

Across the distribution chain, operators have identified innovative models to address these distribution barriers, however, there is more opportunity for ecosystem players to also support the implementation of these models and create a robust enabling environment. It, therefore, will take a collective effort between private and public stakeholders in the OGS market to refine and implement strategies to minimize the influence of distribution costs and barriers, and therefore help these countries to meet their electrification goals. Specifically:

- i. Supporting further innovation on last mile distribution
- ii. Supporting OGS companies to access financing especially working capital
- iii. Supporting fiscal policy to improve the enabling environment

ACE TAF is supporting several of these initiatives in Zambia, Malawi, and other focus countries to promote affordability and availability of OGS products. For example, ACE TAF is:

- Conducting a multi-country study on **alternative consumer finance models for marginalized populations** which will be targeted towards and widely disseminated to policy makers to inform them of the importance and viability of alternative consumer financing models, in addition to PAYGO models, and any policies and regulations that might be able to support such models. The assessment will provide information for policy makers as well as guidance for off-grid companies and organizations that they might partner with, such as MFIs/SACCOs etc., on the development of new alternative consumer financing partnerships. This will help policy makers and SAS companies and their partners better solve the challenge of the accessibility and affordability of SAS in achieving universal energy access.
- Supporting an **assessment on the feasibility of setting up local manufacturing and/or assembly** of solar products for various reasons – economic development, job creation, increasing access to renewable energy to name a few. This analytical study will weigh the pros and cons of local manufacturing or assembly and make recommendations on policy aimed at supporting and promoting the establishment of local manufacturing and/or assembly with the associated costs/investment requirements. The study will examine the possible potential impact on price and the availability and quality of products.
- Conducting a **multi-country study on responsible taxation in Malawi, Sierra Leone, and**

Rwanda. The objective of this assignment is to develop a robust framework to assess the interactions between tax policy and implementation, and off-grid solar market development, and apply the framework to three pilot countries to develop a policy brief that will include recommendations for OGS tax policy design and implementation (with a focus on VAT and import duty) based on qualitative and quantitative results.

- Supporting on **implementation of tax policy by working with regulators to prepare handbooks** to ensure consistent application of exemptions and taxes on off-grid solar products across countries like Kenya, Malawi, Zambia, and Senegal. ACE TAF conducted an initiative in Nigeria to help improve the importation process for stand-alone solar companies in the country through the development of a detailed importation guidebook. This guide was produced after liaising with all relevant organisations, including the Ministry of Energy, the REA, the Nigerian Revenue Authority and the Customs Department to gain clarity on the current processes and develop a detailed report on how the process can be improved for solar companies.

ANNEX

ANNEX 1: KEY COUNTRY STATISTICS CONSIDERED IN THE STUDY FOR BOTH FOCUS AND COMPARISON COUNTRIES

Economic statistics	Zambia	Malawi	Uganda	Kenya	Tanzania
Current GDP (Constant 2010 USD, billions) ⁴⁵	29.62	9.75	42.36	65.06	55.48
Annual GDP growth ⁴⁶	1.71%	4.37%	6.51%	5.37%	5.79%
Annual inflation ⁴⁷	9.15%	12.42%	2.87%	4.69%	3.46%
Currency depreciation rate ⁴⁸	-15.32%	-1.23%	0.81%	0.62%	0.07%
Demographics					
Population density (people per sq. km) ⁴⁹	23.34	192.44	213.06	90.30	63.58
Minimum wage (USD) ⁵⁰	1,252.00	294.00	432.00	745.00	215.00
Finance					
Mobile penetration (Mobile cellular subscriptions (per 100 people) ⁵¹	89.16%	39.00%	57.27%	96.32%	77.24%
Mobile money usage ⁵²	28.00%	20.00%	51.00%	73.00%	39.00%
Energy					
Total energy production (Billion kWh) ⁵³	11.55	1.42	3.46	9.63	6.70
Total energy consumption (Billion kWh) ⁵³	11.04	1.32	3.11	7.86	5.68
Electrification rate ⁵⁴	39.81%	18.02%	42.65%	75.00%	35.56%
Solar energy penetration ^{55,56,57,58}	5%	3%	12%	25%	16%

45 World Bank, GDP (constant 2010 US\$), 2019, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?locations=ZM-KE-TZ-UG>

46 World Bank, GDP growth (annual %), 2019, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=ZM-KE-TZ-UG-MW>

47 World Bank, Inflation, consumer prices (annual %), 2019, <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=ZM-KE-TZ-UG-MW>

48 OCA Analysis

49 World Bank, Population density (people per sq. km of land area), 2018, <https://data.worldbank.org/indicator/EN.POP.DNST?locations=ZM-KE-MW-TZ-UG>

50 "List of minimum wages by country.", Wikipedia, July 2020, https://en.wikipedia.org/wiki/List_of_minimum_wages_by_country

51 World Bank, Mobile cellular subscriptions (per 100 people), 2018, <https://data.worldbank.org/indicator/IT.CEL.SETS.P2?locations=ZM-MW-KE-UG-TZ>

52 World Bank, The Global Findex Database, Mobile money usage, 2017, <https://globalfindex.worldbank.org/>

53 Central Intelligence Agency, The World Factbook, 2016, <https://www.cia.gov/library/publications/resources/the-world-factbook/>

54 World Bank, Access to electricity (% of population), 2018 link

55 Overseas Development Institute (ODI), the Global Off-Grid Lighting Association (GOGLA) with SolarAid, and Practical Action, Off-grid solar country briefings, Accelerating access to electricity in Africa with off-grid solar, 2016, <https://www.odi.org/publications/10200-accelerating-access-electricity-africa-grid-solar>

56 Sammy Mwititi, "Off-grid Solar Power Comes of Age in Kenya," Business Daily, 3 February, 2019, <https://www.businessdailyafrica.com/analysis/columnists/Off-grid-solar-power-comes-of-age-in-Kenya/4259356-4964516-mi7ciaz/index.html>

57 Mayank Jain, Robin Gravestijn, Arne Jacobson, Emily Gamble, Nicola Scarrone, Digital Finance For Energy Access In Uganda, (UN Capital Development Fund (UNCDF), 2019, <https://www.uncdf.org/Download/AdminFileWithFilename?id=9853&cultureId=127&filename=big-data-paper20200206webpdf>

58 Ipsos Tanzania, Solar Off Grid Market Research In Tanzania, (World Bank and Lighting Africa), 2017, <https://www.lightingafrica.org/wp-content/uploads/2018/04/Lighting-Tanzania-Deep-dive-market-report-Dec2017-4-Circulation-.pdf>

ANNEX 2: CASE STUDIES ON THE MODELS TO ADDRESS DISTRIBUTION BARRIERS AND COSTS

► PARTNERSHIPS

SunnyMoney manages marketing and distribution costs while entering new markets by partnering with the Ministry of Education in Malawi for distribution



- SunnyMoney is a social enterprise owned by the international UK based charity, SolarAid, that distributes solar products from manufacturers such as Greenlight Planet, across Uganda, Malawi, and Zambia. To build consumer buy-in as they entered Malawi, SunnyMoney sought to tap into the local leaders within each community.
- Identifying teachers as respected members of the community, SunnyMoney partners with the Ministry of Education in Malawi to use local schools, “Teacher Development Centers” and headteachers to penetrate new markets in rural areas before setting up local shops and independent agents. SunnyMoney brings teachers together, educates them on the use of their products, and sells these at a full, and fair price. The teachers then act as ambassadors in the community, tapping into the large network of students and parents that they interact with.

By first selling solar products to teachers to get their buy-in, and using them as agents in the community, SunnyMoney minimized marketing and distribution costs, while still developing consumer awareness. To date, SunnyMoney has sold over 1.7 million solar lights across Africa.⁵⁹

Vitalite minimizes its financing costs by partnering with Total to source and ship its products to Zambia



- Vitalite is a clean energy company that sources and distributes solar home systems in Zambia. Vitalite imports its solar home systems from China, which requires them to pay a 50% down payment once the order is made, and the other 50% a month later before it is shipped to Zambia. Thereafter it takes another ~60days for it to arrive in Zambia. This requires Vitalite to have robust inventory planning and access to financing to support these substantial working capital needs to facilitate this long supply period.

59 Education, SunnyMoney, <http://www.sunnymoney.org/index.php/about/education/>

- To mitigate this, Vitalite partners with TOTAL, through its affiliate Total Access to Energy Solutions (TATES) program. TATES purchases products directly from suppliers, ships it, and stores it at their warehouses in Zambia for 60-90 days, where Vitalite can draw down on the stock as needed.

This has enabled Vitalite to minimize its financing costs, enabling it to source high-quality products, and distribute them across Zambia.⁶⁰

SENDEA reduces supply and financing costs for its members' in Uganda through a centralized purchasing system and provision of flexible payment terms^{61, 62}



- SENDEA (Solar Entrepreneur Network for Decentralized Energy Access) is a local network of five OGS companies in Uganda aimed at supporting local entrepreneurs in the off-grid solar energy space. The member operators (Access to Solar Technologies Ltd., Anuel Energy Ltd, New Cares Ltd, Sostap Ltd., and SunTap Ltd), source and distribute small quantities of products, which has inflated the per-unit costs.
- To minimize their supply costs, SENDEA has developed a centralized purchasing system where the operators submit their product needs to the network, which then builds relationships with suppliers and makes the group orders, increasing their ability to minimize the per-unit cost of the products due to the large volumes purchased. These products are delivered to a central local location for storage that can be accessed by the member operators at flexible payment terms.

Fenix minimized marketing and distribution costs during its expansion through a marketing and distribution partnership with MTN in Uganda and Zambia^{63, 64}



- Fenix International is a vertically integrated energy and financial services company that designs and manufactures renewable energy equipment in Uganda, Zambia, Mozambique, Cote D'Ivoire, and Nigeria. Low consumer awareness on the concept of solar power, products, and benefits in some areas requires Fenix to invest substantial resources in gaining consumer buy-in.
- To minimize their marketing and distribution costs, while still creating and sustaining market demand, Fenix partnered with MTN Uganda and Zambia to scale their pay-as-you-go system through co-branding and distribution partnerships.

60 Malawi Country Report 2014, <https://www.sunnymoney.org/assets/Uploads/PDFs/Malawi-report-2014-1.pdf?>

61 Sendea, "Services for Members", 2020, <https://www.sendea.org/what-we-offer/services-for-fellows>

62 Consultations with SENDEA members

63 GOGLA, "Fenix International", <https://www.gogla.org/about-us/members/fenix-international>

64 Consultations with FENIX employees

Leveraging MTN's existing market presence and distribution network, Fenix has emerged as one of the fastest-growing solar companies in Uganda and Zambia distributing >300,000 systems across the country.

Azuri minimizes management complexity and upfront investment in storage and distribution networks by partnering with Raj Ushanga in Kenya



- Azuri is a PAYGo solar company operating in East/West/South Africa with key offices in Kenya, Zambia, Nigeria, Tanzania and Uganda that offer a variety of solutions including home lighting and satellite TV. Azuri continues to leverage existing local networks for distribution, as it focuses on product innovation.
- Therefore, Azuri has developed a lean organization structure that designs products in the UK, manufactures them in China before delivering them to their markets in Africa where they partner with 3rd party distributors on the ground such as Raj Ushanga, with whom they have an exclusivity agreement in Kenya. Raj Ushanga collects the products from Azuri's warehouse and then leverages its distribution and warehousing network of +500 agents across all 47 counties in Kenya to transport, store and distribute Azuri's products.⁶⁵

This reduces the management complexity and upfront cost of establishing distribution networks, allowing Azuri to cost-effectively sell more than 200,000 units across sub-Saharan Africa since 2012.⁶⁶

BrightLife minimizes its financing costs by partnering with FINCA to facilitate their pay-as-you-go solar services to their end consumers



- Access to finance is important for unlocking economic security and increasing access to non-financial goods such as clean energy. Unfortunately, access to finance is also one of the key challenges that affect OGS companies and limits their ability to provide their products to low-income communities.
- To test out the hypothesis and provide clean energy to low-income communities, FINCA global microfinance network, set up BrightLife in Uganda, a social enterprise that distributes solar products, through a partnership with FINCA Uganda, the local microfinance institution.⁶⁷

65 "About us", Raj Ushanga House Ltd, <https://www.rajushanga.com/>

66 "Azuri Technologies ranked 370th fastest growing company in Europe", Azuri, <https://www.azuri-group.com/azuri-technologies-ranked-370th-fastest-growing-company-in-europe/>

67 "BrightLife: A social enterprise by FINCA International, link <https://finca.org/our-work/social-enterprise/brightlife/>

Through this relationship, FINCA Uganda developed a product called “Flexipay”, which involved the provision of credit for the purchase of BrightLife products, and access to a broader set of financial products and services. In doing so, BrightLife customers can enjoy a range of financing and energy products, with minimal strain on the working capital needs of Brightlife.⁶⁸

► SPECIALIZED INTERMEDIARIES

M-KOPA in East Africa minimizes investments in assets and overhead costs by outsourcing its warehousing and logistics to Fargo Courier^{69, 70}



- M-KOPA solar is one of the leading distributors of solar-powered systems in Kenya, Nigeria, and Uganda. The scale of their operations required it to have regional hubs and robust distribution channels to meet their client’s needs in a timely and efficient manner. However, this resulted in high capital requirements to acquire assets, hire staff, and service other overhead costs.
- M-KOPA, therefore, outsources warehousing and logistics in Kenya to Fargo Courier Limited. Fargo Courier is a logistics and warehousing service provider with over 1000 employees and a large network of over 100 branches, depots, and drop off points countrywide. As of 2018, Fargo courier managed four warehouses with a product assembly line and 52 retail outlets for distribution of M-KOPA products. Both M-KOPA and Fargo courier staff work at the retail outlets while M-KOPA sales agents manage marketing and distribution to consumers.

This strategy has enabled M-KOPA to maintain a lean organizational structure while increasing access to over 600,000 homes in East Africa.

Greenlight Planet in East Africa minimizes its sales training costs through using Shortlist’s dedicated training service instead of developing one in-house⁷¹



- Greenlight Planet designs, distributes, and finances solar home systems across 60 countries across the world, with a presence in 11 countries in Africa. To increase the scale

68 Daniel Waldron, “Solar Energy: A New Frontier for Microfinance”, Consultative Group to Assist the Poor (CGAP), 17 April 2017, <https://www.cgap.org/blog/solar-energy-new-frontier-microfinance>

69 M-kopa Solar, Impact report 2019, <http://www.m-kopa.com/wp-content/uploads/2019/09/M-KOPA-IMPACT-REPORT-2019.pdf>

70 Consultations with M-kopa and Fargo employees

71 Richard Gomes and Meera Shah, Last Mile Solutions for Low-Income Customers, (Shell Foundation, October 2018), https://shellfoundation.org/app/uploads/2018/10/Shell-Foundation_Last-Mile-Distribution-Report.pdf

Shortlist

of its operations, Greenlight had to ensure high-quality consumer awareness of solar energy and its products. Unfortunately, to do that effectively, Greenlight had to ensure that it was providing high-quality sales training with local context framing to its salesforces spread across the world.

Fenix reduces its distribution cost while maintaining efficient deliveries by outsourcing its last mile logistics to a tech-driven logistics entity

 fenix intl

 MUSANGA

- Fenix International aims to reach off-grid households across Africa with affordable, solar home systems.⁷² Zambia represented an interesting challenge due to its widespread population, that required Fenix to make a large upfront investment in regional distribution hubs and logistical network.
- To limit the requirement for this large initial cost, Fenix outsourced some of its outbound, middle mile distribution to Musanga Logistics. Musanga provides a technology-driven distribution network where individual shippers and couriers are connected to commercial entities to provide deliveries of their products. Musanga Logistics platform tracks and collects data to enhance communication and make order time shorter by getting to know the location of the driver and track deliveries quickly.

By outsourcing logistics, Fenix has been able to save the cost of the initial fleet and overhead costs, make faster delivery across the country while increasing transparency for more informed decision-making, enabling Fenix to reach more than 30,000 Zambian households.^{73,74}

► INTEGRATED TECHNOLOGY SYSTEMS

Zonful in Zimbabwe minimizes the need for dedicated after-sales resources by developing a technician hailing application to address ad hoc customer support needs.

 ZONFUL ENERGY
SOLAR POWER TO THE PEOPLE

- Zonful is an off-grid solar company in Zambia offering PV systems on a Pay-As-You-Go business model. The pay as you go business model required substantial investment in ensuring customer support throughout the repayment period to maximize repayments while providing value to the clients. This proved particularly expensive due to the need to recruit, train, and retain an effective network of outbound, last mile agents and technicians.

72 "About", Fenix International, link <https://www.fenixintl.com/>

73 Consultations with Fenix Zambia and Musanga employees

74 Musanga Logistics unfortunately stopped its operations in early 2019

- To address this, Zonful set up a centralized, 24/7 call center where customers call to register issues, which then links to a network of over 6,000 freelance technicians via an in-house, 'Uber-like' application, which directs the first available and nearby technician to the customer's house.

Through this automatized aftersales system, Zonful managed to deliver quality service to >20,000 while keeping aftersales costs low, at just 2% of the end-consumer price.⁷⁵

Solar Sister in Tanzania minimizes management complexity and inventory losses by leveraging TaroWorks' offline mobile application to enhance data collection.



- Solar Sister is a distributor of solar products through a network of over 4,000 entrepreneurs while leveraging women-to-women networks to achieve last mile distribution for solar devices in Nigeria, Tanzania, and Uganda. Solar Sister struggled to manage the different stakeholders involved in their outbound, last mile distribution networks and used manual paper records, that were then logged into a database resulting in inventory losses and substantial investment in management resources.
- To address this, Solar Sister began using TaroWorks' offline mobile CRM app to manage last mile distribution by tracking sales transactions in the field and analyzing results in Salesforce.com. The mobile data platform allowed Solar Siter to enhance data collection, monitoring, sales, and inventory management in the field.

This helped Solar Sister improve the productivity of the business development associates who sign up Solar Sister entrepreneurs, sell products to them for resale, and train the entrepreneurs to manage their own small business.⁷⁶

Angaza technology enables distributors to make products accessible and affordable to individuals in emerging markets through PAYGo technology.⁷⁷



- RDG is a multinational company that designs, manufactures, and distributes solar products in off-grid communities in Zambia. Unfortunately, it proved difficult to assess the credit risk of these individuals especially since they had limited sources of consistent income or financial history, therefore increasing the risk of providing goods on credit to them.
- To address this, RDG, outsourced the development of an embedded metering technology within the solar home systems, to Anagaza, a software company that offers platforms to pair with hardware products. This metering

⁷⁵ "Pricing Quality: Cost drivers and value add in the off-grid solar sector", 2019, https://www.gogla.org/sites/default/files/resource_docs/pricing_quality.pdf

⁷⁶ "Solar Sister Case Studies", Taroworks, <https://taroworks.org/solar-sister-case-studies/>

⁷⁷ "We the Future" TED Talk Shines Light on PAYGo Technology, <https://www.angaza.com/2019/02/07/we-the-future-ted-talk-payg-technology/>

technology, enabling the product to turn on and off based on the payment status, allows RDG to extend credit to the consumers while building a credit history for them.

Angaza has partnered with >150 distribution partners in over 50 countries, to apply this metering technology, and extend financing to low-income communities

► DECENTRALIZED SUPPLY CHAIN

Greenlight Planet helps reduce distribution costs by supplying products to other distributors on wholesale as well as setting distribution hubs across the country.⁷⁸



- Greenlight Planet, works with a vast international network of distribution partners, from large micro-finance institutions to local micro-entrepreneurs, expanding the reach of solar energy products.
- To make their products more accessible to their distributors, Greenlight Planet decentralized their sourcing point from Asia and has now established product distribution hubs in more than 40 countries in Asia, Sub-Saharan Africa, and Central America acting as a local wholesaler in those countries to local companies such as One Acre Fund, SunnyMoney, and Zonful. This has enabled Greenlight Planet to gain economies of scale by manufacturing and shipping their products in bulk, and therefore provide their products at a lower cost to its distributors.

M-KOPA has developed regional hubs with staggered service levels, therefore minimizing the duplication services and serving its customers and agents efficiently.



- M-KOPA distributes its products across multiple regions in Kenya, requiring substantial resources to serve its customers.
- To do this effectively, M-KOPA decentralized its operations and established regional hubs in the rural areas, with 3 key tiers of services offered. The centers have decreasing functionality. For example, Tier 1 centers have the full range of services including storage of products for agents and technicians to attend to product challenges that come up, while the Tier 3 facility just has storage facilities where agents can pick up products.

This staggering of service centers and the strategic locations of these facilities, allows M-KOPA to minimize duplication of services, therefore, minimizing their costs, while providing high-quality services to its customers.⁷⁹

⁷⁸ Company, Greenlight planet, <https://www.greenlightplanet.com/sun-king-greenlight-planet/>

⁷⁹ Consultations with M-kopa employees

ANNEX 3: DETAILED ASSUMPTIONS USED IN CONDUCTING ANALYSIS ON OPERATOR COSTS AND PRICING

Assumptions in this report are informed by literature review, data derived from in-depth consultations with OGS and Non-OGS companies, as well as insights from key sector stakeholders, across the Focus and Comparison countries. It is important to note that assumptions in this report are based on aggregate data and do not reflect any OGS company and takes into consideration the wide range in product quality and pricing within all countries. Nevertheless, our assumptions provide sound insights into the impact of distribution on the availability and affordability of OGS products.

- **Product type** – products costs and pricing data are based on a 10W SHS that includes a radio and flashlight and 2 lights; This was selected because of their general popularity in the region and because they include relatively standard appliances (i.e. unlike TVs which come in various sizes and with various channel bouquet packages).
- **Product pricing** – based on the cash retail price to the consumer on a per-unit basis.
- **Cost of goods** – (i.e. cost of manufacturing) a flat percentage rate was assumed for all countries because all companies had access to the same manufacturing locations, as was supported by the research and OGS company consultations.
- **Overheads and margins** – by definition, companies cover their overheads from their gross margins; Overheads and Margins were therefore derived from the difference between the price and total unit costs. Any individual company's overhead structure will, therefore, determine profitability.
- **In-bound freight** – derived an aggregate cost of in-bound freight from data provided by OGS companies on the cost of international shipping from manufacturers overseas up until delivery to the company HQ, as well as secondary research to sense check our findings.
- **Regulatory fees and taxes** – based off actual data of Import Duty, Infrastructure levy, and Withholding/Import declaration charged on Cost, Insurance, and Freight (CIF) for products imported by OGS companies, as well as VAT (charged on the retail price) levied by tax authorities in each focus and comparative countries in the report.
- **Warehousing and out-bound logistics** – take into account both data derived from research and OGS company consultations in each country and factors in warehousing rentals, transportation costs per unit from HQ to regional/field warehouses/offices, and last mile distribution costs.
- **Sales and marketing** – based on average data derived from research and OGS company consultations in each country and is factored by sales agent commissions per unit, rental fees in retail outlets per unit, and marketing costs per unit.
- **Reverse logistics and after-sales services** – average data attained from research and OGS company consultations in each country and factors the unit cost of reverse logistics (product returns) to service centers, engineer fees/wages per unit, and call center service costs for OGS companies.

ANNEX 4: LIST OF CONSULTATIONS IN THE FOCUS AND COMPARISON COUNTRIES

Zambia

1. Fenix Zambia – OGS operator
2. Muhanya Solar – OGS operator
3. WidEnergy Africa – OGS operator
4. Vitalite Zambia – OGS operator
5. Solar Industry Association – OGS industry association
6. Musanga Logistics – Logistics provider

Malawi

1. Sonlite – OGS operator
2. SunnyMoney – OGS operator
3. Global Solar Association – OGS operator
4. Malawi Fertilizer Company – OGS operator
5. Renewable Energy Industries Association of Malawi – OGS industry association
6. FinCoop – Distributor

Kenya

1. M-KOPA Kenya – OGS operator
2. Azuri Technologies – OGS operator
3. Mwangaza Light – OGS operator
4. Raj Ushanga – OGS operator
5. Kenya Renewable Energy Association (KEREAA) – OGS industry association

Uganda

1. Fargo Courier – Logistics provider
2. Fenix Uganda – OGS operator
3. Newscares – OGS operator
4. Sostap Ltd – OGS operator
5. SENDEA – OGS member network
6. Uganda Off-grid Market Accelerator (UOMA) – OGS industry coordinator
7. Uganda Solar Energy Association – OGS industry association

Tanzania

1. Solar Sister - OGS operator
2. Sunking/Greenlight Planet – OGS operator

Regional organizations

1. Global Distributors Collective (GDC) – Distribution association
2. GOGLA – OGS industry association
3. Hystra Consulting – Consulting firm with experience in OGS





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