



Credit: Christopher Wepukhulu/ Uganda 2018

# **PAYING FOR DARKNESS**

## **Strengthening Solar Markets for Refugees in Uganda**

NOVEMBER 2019



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Credit: Slavisa Trtic Trle for Mercy Corps, Uganda, 2014

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# Executive Summary

Like all of us, people living through humanitarian crises rely on energy to earn an income, connect with the world and provide their families with a healthy and comfortable living environment. Over the last decade, the humanitarian community has increasingly recognized the importance of addressing energy needs in emergencies, especially in cases of forced displacement. In Uganda, where 89% of 1.4 million refugees have unmet energy needs, bridging the energy access gap would transform lives and communities.<sup>1</sup> This research looks beyond in-kind distributions from aid agencies, which are failing to satisfy needs given the scale of need and scarcity of aid resources. We find that Ugandan refugees are spending portions of their scarce incomes on products like battery powered flashlights. These products are widely available, but are poor quality and short lasting - leaving refugee consumers living in darkness despite their investments. At the same time, we find that better quality products are widely available in the West Nile region, but are not reaching or being marketed towards refugee consumers. This research is motivated by the need to bridge that gap, and to ensure that refugee and humanitarian investments in lighting and power buy the best available products and solutions.

This research takes a close look at Pay-as-you-go (PAYGo) solar energy markets as a mechanism to improve energy access for refugees. PAYGo makes solar systems accessible to consumers who otherwise could not afford a large upfront payment, by distributing purchasing costs over time. And by pioneering new lending markets to underserved communities, it improves access to finance, similar to the way in which microfinance institutions pioneered low-income lending 30 years ago. Globally, Uganda has created one of the most successful markets for PAYGo solar energy. Yet, despite a flourishing national market, this research found **a near total absence of PAYGo products and services within West Nile refugee settlements**, where use of solar energy is limited to larger business owners and merchants. With a lack of solar products available in refugee settlement markets, refugees are currently spending their limited energy budgets on products and services with short-term benefits, including dry cell torches (flashlights) and batteries, and mobile charging facilities.

This research explores why PAYGo has not yet reached refugee markets and whether targeted interventions could address existing market barriers and improve choices for refugee energy consumers. It maps current access to PAYGo products and services in refugee settlements and explores local consumer, merchant and market actor attitudes towards PAYGo in refugee settlements. Merchants were carefully studied as both consumers of energy for productive purposes and potential sellers of PAYGo and other off-grid solar (OGS) products in the markets they serve.<sup>2</sup>

The market constraints identified in this research include:

- › **Product appropriateness and availability:** While lighting and power is a high priority across all consumer segments within the refugee settlements, there is a **mismatch between what energy products are currently on offer from PAYGo suppliers and what refugee and host community members want and can afford**. PAYGo products currently available are too expensive for most refugee customer segments (with the exception of small business owners), and require repayment periods that are too long for most refugee and host consumers. This is compounded by a lack of availability of lower priced OGS products and **low consumer awareness** of solar products in general, and practically no knowledge of PAYGo payment options nor OGS quality standards. As a result, consumers lack access to and awareness of OGS products

<sup>1</sup> UNHCR. [Figures at a Glance](#), and UNHCR and [Uganda Joint Multisectoral Needs Assessment](#), 2018

<sup>2</sup> In this report, merchants are defined as local kiosks or sales persons that are informal and independent and selling (or potential sellers of) energy and/or OGS products in small-scale businesses (likely alongside other products). Merchants may also be called Micro and small businesses (MSMEs).

that are both within reach financially, and that offer better long-term value compared with dry cell batteries and repeat payments for cellphone charging.

- › **Demand perception:** For the most part, PAYGo providers in West Nile demonstrated limited understanding of refugee community purchasing power. They reported not sending sales staff into Bidibidi settlement or Rhino Camp because of the perceived increased risk of lending to refugees, the increased cost of distributed operations and uncertainties about sustainable market demand.
- › **Market linkages and infrastructure:** Refugee settlements pose high costs to service due to dispersed communities, road quality and lack of storage facilities. While these factors pose concrete business challenges for retailers based in regional urban centers, **50% of merchants consulted within the settlements would be interested in offering OGS products, and humanitarian infrastructure could be tapped to reduce risk and operating costs.**
- › **Appropriate finance:** Most research participants demonstrated a willingness and ability to pay the cost of the lowest tier PAYGo deposits and smallest OGS lanterns. However, they would require three months' lead time to save the deposit or purchase amount, and shorter payment periods and flexibility to accommodate inconsistent income streams (particularly for farmers or businesses dependent on farmers' income due to seasonal harvest periods).
- › **Quality assurance and trust:** Consumers demonstrated a lack of awareness of OGS quality standards, and exposure to customer service that accompanies certified products.

With these constraints in mind, we see opportunities to cultivate functioning OGS markets that are accessible to refugee communities in the West Nile that leverage both PAYGo and lower priced, quality assured OGS products. We see value in leveraging PAYGo financing for small business owners and farmers, especially if adjustments can be made to accommodate specific constraints of refugee markets and seasonal income fluctuations, or capitalizing on alternative financing mechanisms such as Village Savings and Loan Associations (VSLAs).

We identify three major consumer segments: vulnerable households, farmers and small business owners. Each will require tailored approaches and products suited to their demand preferences and disposable income. The most vulnerable households can afford entry level, Lighting Global-certified solar lamps (\$8-20 USD) using either cash or financing support from VSLAs. Larger solar lamps with mobile charging capacity and solar home systems up to 6 watts (\$20-200) are accessible to farmers and business owners with PAYGo or alternative financing support.

This study has found that refugees are currently paying for substandard lighting and power products. OGS markets – including but not limited to PAYGo products – can meet the needs of refugee and host communities in the West Nile region. In order to succeed, markets will require investment and intervention from both the humanitarian and private sector. Refugee settlements and host communities in Uganda's West Nile region offer an important test case for PAYGo solar systems' ability to meet the energy needs of low-income and sparsely distributed rural populations. In the coming months and years, Mercy Corps, together with partners, will test the hypotheses presented in this study to identify the most appropriate and influential roles and investments for humanitarian, solar and local market and finance actors to close the energy access gap for refugees and host communities in Uganda.

# Introduction:

## Energy Access in Displacement Contexts

Individuals living through humanitarian crises rely on safe, reliable and affordable energy to earn income, connect with the world and provide their families with a healthy and comfortable living environment. In 2014, only 11% of forcibly displaced people (FDPs) in camps around the world had access to “reliable energy sources for lighting;” the annual energy expenditure of a displaced household of five people was approximately \$200.<sup>3</sup> These are refugee households with limited livelihood options to pay for goods and services. As a result, households use negative coping mechanisms (such as selling scarce food for fuel) to meet their energy needs.<sup>4</sup>

Over the last decade, the humanitarian community has increasingly recognized the importance of addressing energy needs in emergencies. In 2018, the leading global humanitarian standards handbook (Sphere) placed new emphasis on the responsibility to provide “access to a sufficient, safe and affordable energy supply to maintain thermal comfort, prepare food and provide lighting.”<sup>5</sup> However, there is not yet broad agreement on how best to increase energy access in crisis contexts. The energy options currently provided in camp settings for the vast majority of refugees globally meet only Tier 0-level cooking and lighting standards, leaving ample opportunity for improvement.<sup>6</sup>

In Uganda’s West Nile region, the South Sudanese refugee crisis has stabilized since the height of displacements in late 2017, and current residents of refugee settlements are building and investing in their homes and livelihoods. The government of Uganda and UNHCR are calling for approaches that build the self-reliance of refugees, and cash transfers are beginning to replace in-kind distributions of food and other items (including solar lanterns).<sup>7</sup> In this context, strengthening market systems that bring quality energy and financial services to the settlements is a necessary activity to make the most of limited aid dollars at this phase of Uganda’s refugee response.

Based on research conducted in Rhino Camp and Bidibidi settlements in the West Nile region, this report explores and identifies a number of opportunities to improve refugee access to safe, reliable and affordable lighting and power, while reducing reliance on aid agencies. Primarily, the research explores the appropriateness of PAYGo solar systems in a humanitarian context such as West Nile. We examine strategies that can be applied to support the companies’ distributing systems, retailers and last mile merchants selling them and FDP households that aspire to own them. The paper focuses on the most common OGS products sold in Uganda, which are pico and solar home systems (SHS).<sup>8</sup> Last, this paper analyzes opportunities and constraints of local energy markets as well as consumer (host and refugee populations) energy priorities, preferences, needs and willingness to pay.

The target audience for this paper is donors, humanitarian project managers and energy companies that are considering supporting the expansion of PAYGo solar in humanitarian contexts.

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3 <https://www.chathamhouse.org/sites/default/files/publications/research/2019-03-25-MEIWhitehouse.pdf>

4 *ibid*

5 The Sphere Association. (2018). *The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response*. 2018 Edition

6 The multi-tier framework for energy access classifies energy services from Tier 0 (no service) to Tier 5 (full service); Bhatia, M. and Angelou, N. (2015), Beyond Connections: Energy Access Redefined, Energy Sector Management Assistance Program, Washington, DC: World Bank, <https://openknowledge.worldbank.org/handle/10986/24368>

7 UNHCR (December 2018) *Uganda Refugee Response Monitoring Cash Based Interventions (CBI): June 2018*. UNHCR and WFP.

8 While there are larger commercial scale PAYG systems, they are not discussed. Further, there are emerging “Cook-as-You-Go” models for improved cookstoves being piloted, and productive assets like PAYG solar water pumps that have just been introduced to the market, but they are also not discussed. This allows for a deeper discussion of pico and SHS systems.

## Research Methods

Mercy Corps took an iterative, mixed methods approach to its research, starting with broad needs and market assessments in the West Nile, and then delving more deeply into specific questions based on the outcomes of the broader research. Three separate pieces of primary field research (in addition to extensive literature reviews) were conducted. The primary research methods are fully detailed in Annex 1.

## Market-based Approaches to Last Mile Energy Access

Traditionally, aid agencies have delivered energy goods and services directly through in-kind distributions or service provision. However, in some cases, refugees are able to meet energy needs through goods and services available in local markets. In a market-based approach, aid agencies identify and support opportunities to leverage these local markets in their programs. Market-based programming generally uses three primary approaches: work directly with suppliers to purchase goods and services; indirectly identify and help to address market constraints; or facilitate scalable change to make the market function more effectively.

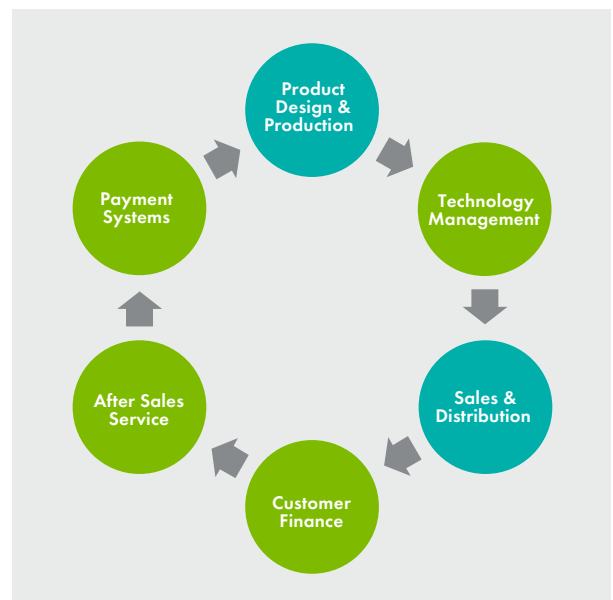
Working through local markets is particularly important in protracted crisis situations where displacement timeframes are unknown. Including local suppliers and service providers can offer more durable benefits to both host and refugee populations. In the West Nile context, robust and growing market economies and merchant networks exist within the refugee settlements and are connected to regional market hubs – yet these networks have largely been absent from aid agency programs.

However, working with local markets is challenging for the humanitarian sector given the fragility and ever-changing local context, vulnerability of beneficiaries, short program timelines and funding challenges. Thus, the practical delivery of market-based programming is being pioneered by only a limited number of agencies in conducive environments such as Uganda’s thriving off-grid solar energy market.

## PayGO Basics & Potential to Meet Refugee Needs

PAYGo makes OGS technology more financially accessible to those with lower incomes, and is of interest to humanitarian actors who want to address affordability barriers to energy access. PAYGo allows OGS companies to sell their products on credit to consumers who are unable to afford the upfront cost, or prefer to split the payments over a longer period. Although the overall cost of the technology increases due to applied interest rates, the upfront expense is decreased by spreading payments over a period of time with an affordable deposit and flexible installments. Through PAYGo, higher value, mobile-enabled OGS products serve as their own collateral, which reduces the risk of offering financing to customers that do not have traditional credit histories. Also, when customers do not make their expected payments, PAYGo technology has software which stops the flow of energy from the battery. Payments are generally made through mobile money, allowing the provider to regulate energy flow based on payments received (turning off units when needed).

Figure 1: Core Operations for PAYGo Companies



In places with robust mobile money systems, this technology allows PAYGo companies to extend consumer financing farther into rural areas than most lending institutions have managed to reach. Over time, companies using PAYGo financing can generate an alternative credit score for customers based on their energy use and repayment habits. Providers can act on this data to offer reliable customers additional energy or financial products. **Essentially, leading PAYGo companies are pioneering new lending markets in rural areas the same way microfinance institutions pioneered low-income lending in peri-urban areas 30 years ago.**

PAYGo systems rely on regular payments (usually digital) that offer convenience for customers and cost-effectiveness for companies. However, selling OGS products with embedded PAYGo technology is much more complicated than just selling OGS solar. In contrast to cash-based sales, PAYGo operations generally offer “life-long” after-sales service and relationship-building with customers managed through call centers and customer relations management systems. **Where digital payment systems are inexistent and weak, PAYGo may function (if clients or cash collection agents travel to pay bills, manage manual activation, etc.), but results in higher operational costs and may struggle to scale.**

The PAYGo approach has been particularly successful in countries where mobile money is prevalent. In Uganda, the technology has been primarily penetrating markets in urban and peri-urban areas where, relative to rural areas, household incomes are generally higher and more predictable; customers are easier to access and assess in terms of their financial history and risk; and mobile networks are strong and agent networks abundant.

In the first half of 2018, Uganda was the fifth-ranked country for OGS units sold globally and the second leading country for PAYGo unit sales. The confluence of a strong OGS market and mobile money sector makes Uganda one of the world’s leading PAYGo solar markets, with a very high potential for expansion into difficult operating environments. The settlements in northern Uganda’s West Nile region have entered a recovery phase. This relative stability has made it an ideal place to explore the potential for OGS technologies and PAYGo payment options to extend access to energy for FDPs. However, the difficult operating environments of humanitarian crises, particularly in rural locations, give rise to questions regarding the appropriateness and sustainability of PAYGo solutions for FDPs.

## Energy Markets Supply in Uganda’s West Nile Region

### Energy Product Availability & Pricing

In refugee settlements, energy product choice is limited to dry cell-powered torches sold in cash by small merchants in markets (though 50% of merchants consulted would be interested in offering OGS products). Outside the settlements in larger urban centers (including Arua and Yumbe), energy-specific merchants in markets sell uncertified solar power panels, and national retailers offer certified solar products, including PAYGo-enabled products – yet those markets are far from most refugees in the region and expensive to visit. Trust in energy product quality is poor and solar product maintenance opportunities missed despite a large supply of electricians in the region.<sup>9</sup>

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<sup>9</sup> Organizations such as Lighting Global offer global product certifications that set a baseline level of quality, durability, and truth in advertising to protect consumers. <https://www.lightingglobal.org/quality-assurance-program/our-standards/>



Research on energy usage in West Nile from the 2016/2017 Uganda National Household Survey<sup>10</sup> as well as 2018 research in two settlements in the West Nile region by GIZ/UKAID/Energizing Africa,<sup>11</sup> reveals that while both host community and refugees used dry cell torches and solar, kerosene (paraffin) was only used by Ugandans, while refugees were more likely to use disposable torches. USAID Power Africa (2018)<sup>12</sup> research in another settlement outside West Nile showed very similar energy usage to that in the settlements in West Nile.

TABLE 1: ENERGY SOLUTIONS USAGE IN UGANDA

Study	Findings
<b>UNHS 2016/2017</b>	In West Nile, 38% use paraffin, 39% use dry cell batteries, and 17% use solar.
<b>GIZ/UKAID/ Energizing Development 2018</b>	Surveys in Rhino and Imvepi settlements in West Nile region showed 49% of HH used disposable torches, 26% used solar lamps, and 25% used dry cell torches.
<b>USAID Power Africa 2018</b>	In the Rwamwanja settlement, HHs reported using disposable torches, solar home systems or solar kits (2 Wp to 150 Wp), dry cells, and to a lesser extent, solar lanterns and rented solar kits. Fewer than 1% of the HHs used large rechargeable batteries, electricity from neighbors, kerosene and candles. Energy is primarily used for lighting, phone charging and listening to the radio at the household level.

Primary research carried out by Mercy Corps reinforces findings from the literature. In Bidibidi, 67% of farmers and MSME owners reported using dry cell torches,<sup>13</sup> while only 15% reported using the light on their mobile phone (despite 50% of refugees in Bidibidi owning a phone<sup>14</sup>). A substantial percentage of respondents reported burning grass or just living in darkness at night. No one reported using paraffin nor was it sold in any of the markets. UNHCR confirmed they were not promoting its use in the settlements because they did not find it to be an appropriate fuel.

**Last mile availability and distribution of OGS products**

For OGS companies with offices in the West Nile region, there is a lot of overlap in the 10W space. Only one company, Green Light Planet, sells portable lanterns with PAYGo technology. Although these solar product companies operate in the West Nile region, they are based in the larger towns of Yumbe, Arua or Koboko, which are at least an hour of travel from refugee settlements. Non-PAYGo OGS wholesalers are also based in these larger towns.

Our study revealed that, although there are unmet energy needs in the West Nile region, PAYGo companies do not conduct regular operations there outside of urban hubs. For the most part, leading providers in West Nile reported not sending sales staff into Bidibidi or Rhino Camp due to: 1) the perceived increased risk of lending in these places; 2) the increased cost of distributed operations; and 3) uncertainties about sustainable market demand. One PAYGo company reported that they did conduct sales in Bidibidi until the beginning of 2018 and sold approximately 200 PAYGo systems. There also has been some limited distribution of PAYGo products from INGOs. Further, besides a GIZ-sponsored energy kiosk in Rhino Camp, none of the markets in the settlements were selling solar products using PAYGo financing.

10 Uganda Bureau of Statistics. Uganda National Household Survey 2016/2017 Report (UNHS). Uganda Bureau of Statistics.  
 11 Rohde, A. & Butele, B. (June 2018). [Energy Survey report: A survey of energy access in the refugee context in Uganda](#). GIZ.  
 12 USAID Power Africa (2018). Rwamwanja Refugee Settlement Market Assessment: USAID Power Africa Uganda Electricity Supply Accelerator. USAID Power Africa  
 13 Percentage of respondents from key informant interviews (KIIs) using dry cell torches  
 14 UNCDF and DanChurchAid (DCA). (May 2018). [Digital Financial Services Ecosystem in Bidi Bidi Refugee Settlement](#). UNCDF.

The majority of the target consumers living in the region, particularly the most vulnerable and refugee women with few means for travel, are limited to shopping at merchants in their local villages or nearby markets. In urban centers near Bidibidi, nine OGS retailers were found (all male owners from the host population), displaying the following brands: Solar Now, Fenix, Jinggong and Mira. The majority of OGS products were priced significantly lower than similar PAYGo solar models, suggesting a prevalence of low-quality or counterfeit products for larger solar models (although research into product quality or provenance was outside the scope of this study).

### Competing as a last mile OGS merchant

Although the current availability of stock in the refugee settlement markets for solar products is low, at least 50% of merchants (37% of them female owners of kiosks selling foodstuffs, household goods and clothing) interviewed not currently selling energy products were interested in expanding their inventory to include them. However, no one will exclusively sell solar products as there is a recognized demand for both non-solar and solar products in the area.

The low cost of torches and dry cell batteries allows for continued sales throughout the year. They were the most popular products sold by local merchants selling energy products (with average sales of 15 units per month). OGS suppliers, however, struggle to generate sales outside of harvest seasons when household income is more limited, due to the higher upfront prices of OGS. Merchants must diversify their sales to generate sustained income, and as such, all suppliers interviewed sell additional products such as household items, foodstuffs and charging facilities.

All merchants interviewed in Bidibidi prefer payments in cash up front. Some provide ‘tabs’ or ‘loans’ for one to two months maximum. They have neither the liquidity nor risk appetite to be able to manage larger and longer-term loan payments, nor the ability and secure storage to buy high-cost OGS products in bulk. This could be an additional reason why lower-quality products are prevalent in the market.

However, despite all the constraints, 50% of respondents were still interested in selling OGS once they were shown a potential demand opportunity to be activated with greater awareness-raising.

### Last mile pricing of OGS products

The table below provides price ranges of typical energy products found in the local market. The best-selling energy products were dry cell batteries and torches. The majority of the customers to these stalls are female while those buying high-priced energy products were typically male.

TABLE 2: ENERGY PRODUCTS & PRICES

<b>Model / Type</b>	<b>Cash Cost (Ugandan Shillings)</b>
<b>Mobile charge</b>	300 – 500
<b>Dry cell torch</b>	1500 - 3000
<b>Dry cell batteries</b>	500 – 2500
<b>Solar lantern (50 lumen)</b>	10,000-15,000
<b>Solar light and charger (220 lumen)</b>	15000 – 20000
<b>Solar 3 – 9W home system</b>	30000 – 50000
<b>Solar 10 W home system</b>	40000 – 200000

**Recent research by UNCDF concluded that lower-cost models of solar lanterns (at US\$10) or single solar lights with mobile chargers (US\$24.20) could realize a break-even point for consumers in four to ten months of purchase, respectively, if purchased up front.**<sup>15</sup> This is an additional incentive to low-income consumers should they be able to generate enough money to pay the upfront cost or repay it in a short time period.

**Higher-cost solar home systems would not realize a break-even point in the two-year payment period currently provided by PAYGo suppliers for these items.**<sup>16</sup> The incentive for purchase here is not the additional savings but the quality of life and aspirational benefits associated with the larger solar home system. As such, the business case for purchasing solar home systems exists in using it as a productive asset, and may be more attractive to business owners able to generate earnings from charging sales, extend opening hours and power additional services such as cinemas or computers.

Indeed, the same UNCDF report identified that consumers are more likely to ‘stack’ energy products to expand existing capacity and functionality (e.g., by adding more panels and batteries), rather than purchase larger power products to replace smaller ones. This finding also needs to be considered when targeting consumers with solar products.<sup>17</sup>

## Product Information and Marketing

Discussions with wholesalers and retailers in the towns of Yumbe, Arua or Koboko (as well as locally based retailers) suggest a limited understanding of their supply chains and market demand. This limited knowledge of products, prices and demand creates difficulties in procurement and trust in the supply chain. Credit is not extended to local energy suppliers, which reduces the availability of stock in the marketplace. Security is seen as a major obstacle to distribution and storage of high-value stock in the region.

Networks and marketing are conducted by word of mouth across the supply chain, as no other sources of information are available to suppliers or consumers. Most of the local retailers are fixed stalls serving villages only within their zone, and they rely on word of mouth or signposts to attract customers. Access to phones for communication and information is rare, with 48% of potential customers identifying the main challenges to using a phone as the lack of access to mobile charging facilities or the cost of charging.

When asked about marketing of energy products within the area, 67% of respondents said they had never received any information. Of those that had received information, 27% said they had been approached specifically by Solar Now agents and 10% had heard about MTN ReadyPay. Only one person had been converted to a customer.

## Quality Standards and Maintenance

The majority of the target market has no understanding of the quality assurances provided to them nor trust that such assurances will work. Only 13% of potential customers knew what the Lighting Global standard stood for, and only 22% of potential customers knew what a warranty was and what to do with it. This lack of understanding was also reflected in availability of such products locally. None of the local merchants interviewed currently selling energy products in the settlements had any products with Lighting Global certifications.

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<sup>15</sup> United Nations Capital Development Fund (UNCDF) – [https://www.slideshare.net/UNCDF\\_CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285](https://www.slideshare.net/UNCDF_CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285) (slide16)

<sup>16</sup> *ibid*

<sup>17</sup> [https://www.slideshare.net/UNCDF\\_CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285](https://www.slideshare.net/UNCDF_CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285)

Survey facilitators explained to respondents the function of Lighting Global and warranties before further discussion on willingness to pay for quality-assured products. This established a baseline understanding of these concepts to ensure a more informed response to questions. It is unsurprising that there was a mixed response as to whether potential customers would pay more for better quality solar products given a lack of knowledge (and proven trust) in the quality assurance systems used to justify the increased prices of these products. Consumers questioned the feasibility of warranty protection.

Another OGS market challenge – and common reality – in last mile distribution areas is that product quality assurance responsibility has shifted to the retailer rather than the manufacturer. Customers turn to those who sold them the product for quality issues, but most retailers have limited low-cost access to the manufacturer to guarantee a warranty is honored.

## Payments Infrastructure

Reliable and convenient digital payments are a critical component to the success of current PAYGo products in Uganda. They facilitate lower cost of payment collection for the supplier and increased convenience in payment options for the consumer. Investments and partnerships between Mobile Network Operators (MNOs) and humanitarian agencies have led to installation of temporary, then permanent, mobile network towers. This increased connectivity has served as a basis for expansion of related services, including mobile money. Over 70% of potential customers interviewed had access to mobile money, including both host and refugee populations. Use of mobile money, and satisfaction with quality of service within refugee settlements, however, is low. Most refugees interviewed had never used mobile money to pay for goods and services locally, only to occasionally convert mobile money to cash withdrawal.

The global association of mobile network operators, GSMA, reported that in 2018, agent availability remained a constraint to mobile money use in Bidibidi, with a reported 50 permanent agents available to serve over 250,000 refugees – approximately one agent per 5,400 individuals. Interviews and field visits in Bidibidi also revealed a high level of instability of agent networks. We found just one functioning mobile agent per zone visited. Turnover of agents is high (with several agents having recently shut down) and many agents were marginally operational. Several of the agents visited for interviews during the research were closed or out of business.<sup>18</sup> As one active MNO agent in Bidibidi's village five reported, "There are three Airtel agents, but only one is operating – me. There is supposed to be one in village 7 but he is probably not working."

**In addition to their availability, agent's quality and reliability surfaced as challenges to quality delivery of mobile money services.** Some agents were regarded as reliable and were sought out for service, while others were avoided even when that meant longer travel times. Focus group participants in zone 4, for example, noted that a mobile money agent was active in their village, but that his service was problematic. They preferred to walk 45 minutes to Kolekolina town to use mobile money agents there, which highlights a weak mobile money provider-client relationship.

This research identified a number of critical gaps around digital payment systems and agent effectiveness that will need to be addressed for PAYGo services, as currently designed, to become a reality for West Nile refugee populations. A number of factors contribute to agents' struggling to provide quality service provision to local host and refugee clients, including:

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<sup>18</sup> The balance of e-money, or physical cash, or money in a bank account that an agent can immediately access to meet customer demands to purchase (cash in) or sell (cash out) electronic money. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/06/mobilemoneydefinitionsnomarks56.pdf>

- › **Long distances to MNO service centers**, where critical tasks like rebalancing cash and e-float occur.<sup>19</sup>
- › **Lack of clear guidance on MNO policies around refugee consumers.** An interview with one MNO service center staff person revealed confusion about what documentation was acceptable to open a mobile money account for refugees.
- › **Unreliable network coverage** reducing demand amongst local consumers.
- › **Poor accounting skills and processes** of mobile agents finding it hard to manage the balancing of their complex mobile money and transfer accounts.
- › **Slow and costly resolution of customer issues**, wherein mobile agents lose frustrated customers who are referred to customer centers in nearby towns but find resolution of their issues too slow or complex.

## Access to Finance

PAYGo offers one form of financing for energy products, but it is not the only financing mechanism that could be leveraged to enhance energy access among refugees. Currently, no formal financial service providers (FSPs) exist who provide access to finance for refugee populations, but semi-formal VSLAs do operate in the area.

Confirmation from customer focus group discussions (FGDs), key informant interviews (KIIs), VSLA KIIs and recent financial inclusion research notes that rural hosts and refugees have more household income than perceived. However, income is seasonal and restricted to growth due to limited livelihood and financial inclusion opportunities in the area:

*Access to formal financial services is limited, primarily due to physical inaccessibility. FSPs are usually far from where refugees live and relatively hard to reach. Consequently, most refugees intensively rely on semi-formal and informal services, pointing to a situation of actual need. The use of savings groups and VSLAs is widespread and these groups and associations can serve as an important 'point of entry'. The availability of funds from informal sources is limited and the call for formal business loans is great. While the practice of borrowing is common, levels of current debts are relatively manageable for consulted households. Despite generally very low levels of income, three-quarters of respondents regularly save some money...FSPs should not create exclusive 'refugee' products, but rather seek to increase their physical accessibility and adapt already existing product features, methodologies, and processes.<sup>20</sup>*

According to the OPM, UNHCR is planning to open bank accounts for all refugee households, and are working with FSPs on this process and acquisition of relevant ID to facilitate this. In the meantime, VSLAs interviewed were optimistic about becoming suppliers or supporting services to solar energy products citing: local need; ability of their customers to generate the savings required for lower-cost solar models (e.g., 50 and 220 lumen); and their ability to generate increased revenues through low interest rates from loans for the products.

## West Nile Energy Consumer Preferences & Needs

This section examines energy access in the West Nile from two perspectives: the consumer and the supplier – with a focus on the last mile delivery through merchants. The majority of respondents rely on subsistence farming, with a handful of small business owners also represented.

<sup>19</sup> See above.

<sup>20</sup> UNHCR (2018) Assessing the Needs of Refugees for Financial and Non-Financial Services - Uganda

## Energy Consumer Priorities

For host and refugee subsistence farmers, energy is a high priority for quality of life and performing basic household tasks at night, facilitating children’s education and night time safety. Business owners see energy more as a productive asset providing access to power, information and communication.

The 2018 Ugandan Joint Multi-Sectoral Needs Assessment identified that the highest proportion of unmet needs were in the environment and energy sector (93% of host community and 89% of refugee households at the national level), with over 75% of refugees lacking any renewable source of energy. Our initial research, an open-ended participatory approach, revealed that refugees shared a strong desire for access to lighting and demonstrated various strategies to obtain it – with women frequently selling food rations to purchase torches. Men, by contrast, reported undertaking some casual labor to buy torches with their income. Adolescents have fewer opportunities, but similar to adults, girls reported sometimes selling rations for torches, and both boys and girls occasionally participated in casual labor or cash-for-work opportunities.

The three value propositions listed below are the most cited across occupations, genders, refugees and host groups (see Annex 1 for segmentation by occupation). All groups valued quality of life improvements associated with the ability to perform basic tasks at night. Safety for women and children ranked highly and was associated with reducing threats associated with traveling outside the home in darkness to reach schools, water points and other community destinations.

Value propositions include potential indicators to measure the impact of access to lighting and energy where other impact indicators, such as increased incomes for households due to increased energy access (noting that MSMEs are more likely to realize increased incomes than households), may be negligible or harder to measure.

TABLE 3: VALUE PROPOSITIONS

<b>Cross-cutting Benefit</b>	<b>Value Proposition (VP) of Energy Product</b>	<b>Description</b>	<b>Example Social Indicators</b>	<b>Example Income Generation Indicators</b>
Improved Quality of Life	VP1: Night time safety and improved quality of life	Provide light for traveling (i.e., to school or water points) and shopping at night (customers and sellers). Provide light at home for household tasks and leisure. Energy product must be mobile or able to charge a mobile light.	Ability to complete household tasks after dark  Reduced household tension and stress  Reduced fears of attack while performing tasks at night (by gender)	Increased number of MSMEs operating at night time  › Increased incomes for MSMEs

Cross-cutting Benefit	Value Proposition (VP) of Energy Product	Description	Example Social Indicators	Example Income Generation Indicators
Improved Quality of Life	VP2: Access to power, information and communication for small businesses	Provide charging power for mobile phones or radios (most trusted source of information) to allow access to information and communication. This featured as high priority for male MSME owners.	<ul style="list-style-type: none"> <li>› Improved access to friends/family</li> <li>› Improved and safer working environment (by gender)</li> </ul>	<ul style="list-style-type: none"> <li>› Increased incomes for MSMEs</li> <li>› Improved product knowledge</li> <li>› Improved customer satisfaction</li> <li>› Increased consumer bases of MSMEs</li> </ul>
	VP3: Facilitate children's education	Energy product provides light to children for schoolwork (with <b>added value</b> of providing more bulbs in other rooms to allow household activities to happen concurrently).	<ul style="list-style-type: none"> <li>› Improved school grades</li> <li>› Improved school attendance</li> <li>› Reduced tension within household</li> </ul>	<ul style="list-style-type: none"> <li>› Occupation/salary</li> <li>› Increasing numbers attending further education</li> </ul>

Relating these value attributes to a solar product is important. A solar home system will not provide a portable lighting source for tasks outside the home, but does provide 'enough bulbs' to satisfy lighting needs of various household members. A torch, lantern or mobile phone light is mobile for visits to water points, schools and shops. But a woman or child may not be given a mobile phone due to its value. The value propositions demonstrate that "one size fits all" solutions will not work well to accommodate the diversity of needs both between households and even within households. As such, a mix of products, including lower cost portable torches and lanterns, will likely be required to satisfy the diversity of needs and consumer preferences.

## Household Expenditures

Multiple studies in Uganda find the estimates of monthly household energy expenditures between US\$2.37 and US\$3.13 (see Figure 8). Refugee families report household incomes between US\$.37 to US\$.74 per day. The average potential monthly disposable household income<sup>21</sup> is US\$2.16 for farmers (both host and refugee communities of any gender) and up to US\$4.87 for MSME owners (although female MSME owners may have less, but this requires further fieldwork validation).<sup>22</sup> These income amounts were triangulated by local VSLAs who estimated farmers were depositing approximately 2,000 UGX (US\$.54) weekly into the VSLA.

21 Potential disposable income is leftover income that can be spent or saved once all basic household necessities have been accounted for.

22 See Annex for calculation methodology

In Uganda, OGS lights that cost from US\$20 to US\$140 can be purchased with down payments of US\$5 to US\$20 using PAYGo technologies (with cheaper options available on a cash purchase basis). Current monthly costs of PAYGo solar systems range from US\$4.86 to US\$15.27. At their current prices, **refugee farmers in the West Nile would have difficulty affording PAYGo solar systems. The lowest cost PAYGo SHS, however, is within reach for MSME owners**

TABLE 4: REFUGEE INCOMES AND CURRENT ENERGY EXPENDITURES IN UGANDA

Study	Findings
Ugandan Off Grid Energy Market Accelerator UOMA 2019 <sup>23</sup>	In Northern Uganda the average monthly spend on energy is US\$2.50. Market penetration without subsidies would be about 15% for the lowest cost solar home systems.
Development Pathways 2018 <sup>24</sup>	30% of refugee HHs say they have no source of cash income. 69% of refugees live on less than US\$1.68 per day in PPP terms (US\$.56 per day in actual dollars). 74% of refugees in West Nile live under the poverty line compared to 24% of host country nationals.
UNHCR 2017 <sup>25</sup>	54% of refugees live on US\$0.37 per day or less, and a further 23% live on US\$0.74 or less per day.
USAID Power Africa 2018 <sup>26</sup>	In the Rwamwanja settlement, the living cost per day per HH within the settlement averages US\$1.80. Ugandan family HHs report daily expenditures of US\$1.92, while Congolese families report daily expenditures of US\$1.78. Energy expenditures remain among the smallest expenditures of surveyed HHs, with a monthly average of US\$2.37, equal to 1.1% of HH expenditures, but 92% of households pay for energy services or phone charging.

However, actual household incomes do not necessarily indicate a lack of willingness and ability to pay. In Kenya, although there is generally no overall savings or productive income attributed to using solar energy compared to kerosene or batteries, people liked PAYGo systems so much they increased their monthly energy budgets to afford them – a strong endorsement of the value they hold for consumers.<sup>27</sup>

As such, our research focused on generating more data on consumer willingness to pay to understand whether similar energy demand existed in Uganda once people understood the potential added value of solar energy products.

## Willingness to Pay

**Farmers and businesses have sufficient disposable income to pay for lower cost OGS products either upfront or in installments that account for income fluctuations and risk appetite for long payment periods.**

During discussions with potential consumers of OGS products, we presented a series of OGS models currently on the market (see Annex 1). Each respondent identified their preferred product and was asked to provide a

23 Uganda Off-Grid Energy Market Accelerator (UOMA). (March 2019). [Reaching Unserved Populations: Insights and strategies to increase access in Northern Uganda](#). UOMA.

24 Development Pathways. (April 2018). [Analysis of Refugee Vulnerability in Uganda and Recommendations for Improved Targeting of Food Assistance](#). Development Pathways.

25 UNHCR. (2017). [Livelihoods Socio-Economic Assessment in the Refugee Hosting Districts](#). UNHCR.a

26 USAID Power Africa (2018). [Rwamwanja Refugee Settlement Market Assessment: USAID Power Africa Uganda Electricity Supply Accelerator](#). USAID Power Africa.

27 <https://www.gsma.com/mobilefordevelopment/program/mobile-for-humanitarian-innovation/electrifying-kakuma-refugee-camp-the-case-for-pay-as-you-go-solar-home-systems/>



price they would pay. The tables below show product preferences by occupation. If price were not a factor, the majority of respondents preferred the 10W SHS because it fulfilled all three value conditions indicated as priorities. When people chose the 6W and 220 lumen products, they generally said they selected these as they expected them to be more affordable and still meet their needs. Women were slightly more likely to prioritize smaller systems for this reason.

TABLE 5: WILLIGNESS TO PAY

OGS Model	Livelihoods Program Farmer	Subsistence Farmer	MSME	Total
10W solar home system	55%	54%	33%	53%
6W solar home system	15%	13%	33%	15%
220 lumen solar lamp with mobile charge	12%	25%	17%	20%
50 lumen solar lamp	9%	8%	0%	8%
No interest in any product	9%	0%	17%	4%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

The median price that respondents said they would pay for the product was 25,000 UGX or US\$6.77, which would not pay for any of the OGS models presented. However, it would easily cover the down-payment for the 50 lumen, 220 lumen and 6W SHS with deposits ranging from 5000 UGX to 20,000 UGX (US\$ 1.35 to US\$5.39).<sup>28</sup>

**The survey revealed 30% of people were willing to pay the price they offered in cash up-front.**<sup>29</sup> Sixty-six percent of those willing to pay in cash up-front estimated they would be able to pay the offered sum within three months of saving time.

When provided the actual cost of the product, **75% of respondents said they would accept a PAYGo payment plan for their preferred solar product.** However, **the majority required different monthly installments than what is currently offered by PAYGo providers and shorter overall payment periods.** These preferences are related to fears of inconsistent income to pay long-term loans, particularly for farmers or businesses dependent on farmers’ income due to seasonal harvest periods.

Overall, the surveys helped identify where people may extend their willingness to pay from the initial prices they offered for OGS products to what they would be willing to pay for the actual loan price given (see Annex 1 for details). **On average, farmers and MSMEs owners increased their willingness to pay by 75% once the price was known.** Similar to the Kenyan case study mentioned earlier, people may be willing to use more of their limited disposable income to purchase items of value.

Sixty-eight percent of respondents (both farmers and MSME owners) preferred **a three-month lead time to save and to pay for PAYGo deposits,** across all product types. The optimum times to pay for high-priced items

<sup>28</sup> For the purposes of the research we designed willingness to pay questions that included a potential PAYGo loan scheme with revised deposit and monthly installments for the 50 and 220 lumen solar lamp to test their market potential. These financing options are not currently available on the market. The pricing options provided for the 6W and 10W SHS represented current market pricing.

<sup>29</sup> The median was used given the large range of prices offered for different product preferences.

were in the harvest months of June to July and October to December. During the lowest income periods, people, on average, have a total monthly household income of 5500 UGX (US\$ 1.49) and no disposable income. The key is to design a payment plan that offers flexible monthly payments that align with their varying income streams in the course of a year.

TABLE 6: PROPOSED LOAN STRUCTURES

Potential PAYGo / loan structure      Rationale

Lead time to secure higher deposit of 3 months	This is the average time people need to plan and save for expenditures, so the timing of product marketing needs to be done with this lead time in mind. Higher deposits could result and reduce size of monthly instalments and payment period.
Pay deposits in high income period	Timing of deposit should be designed to be paid in high-income periods with consumers given sufficient lead time (with timely marketing) to save the deposit.
Maximum 9-12-month loan period	Although longer than the 3 months people want for a loan period, this is significantly shorter than most loans on offer and still adequate for time periods refugees may spend in host countries. This would result in faster payback for lenders de-risking their investment but without compromising on interest.
Ability to pay monthly instalments even during lowest income periods	By timing the loan start at the right time of the year the supplier could 'reward' timely full payments to the loan with a subsidised payment/ incentive at low income periods (e.g., "get this month half price or free!")

**Energy Consumer Segmentation**

**Demand data collated from the surveys indicate that consumer segmentation in the area (at a high-level) is fairly simple. This is beneficial because it allows a straightforward initial market entry strategy to the area, reducing the complexities of differentiated consumer product and service design.**

Each consumer has unique needs and characteristics. However, common trends allow us to group people into different energy consumer segments based on knowledge, attitudes, perceptions, needs and income. Simple segmentation means that targeting, for instance, vulnerable refugee women for a pilot, allows outcomes to be extrapolated to a larger potential market in the area rather than being restricted solely to vulnerable refugee women.<sup>30</sup>

The below table shows initial segmentation data that should be iterated upon as market demand and assumptions are tested.

<sup>30</sup> Consumer segmentation for MSME owners is, due to logistical constraints, based on only a small number of interviews compared to farmers and vulnerable groups. As such the assumptions generated on MSME owner segments should be validated and updated as market interventions are implemented.

TABLE 7: CONSUMER SEGMENTATION

Segment	Vulnerable Groups	Farmers	Female MSME Owner	Male MSME Owner
<b>Profile</b>	Hosts & Refugees Male & Female Disabled / Caregivers / Elderly	Hosts & Refugees Male & Female	Hosts & Refugees Female only	Hosts & Refugees Male only
<b>Prioritized value of energy product</b>	Children’s education  Night time safety for travel/water collection / shopping  Single lights (easy to hold and for single households)	› Children’s education  › More bulbs for more rooms  › Night time safety for travel/ shopping  › Phone charging	› Children’s education  › Night time safety for self and business facilities  › Phone charging	› Access to information and communication for business purposes  › Large power source
<b>Calculated disposable income</b>	8000 UGX per month (no significant segmentation trend in results)		MSME at 18,000 UGX (average though male MSMEs may be higher)	
<b>Energy product matches</b>	Wind up / dry cell torch Mobile phone charging 50 lumen solar	Wind up / dry cell torch Mobile phone charging 220 lumen solar	Wind up / dry cell torch Mobile phone charging 220 lumen solar 6W SHS	
<b>Payment requirements</b>	Cash Payment up front	Cash Loan up to 9 months	Cash / Mobile money Loan up to 12 months <sup>31</sup>	
<b>Potential market size in Bidibidi (conservative estimates)</b>	<b>97,341 people (19,468 households)<sup>32</sup></b> 12% total Bidibidi population		<b>34,132 business owners<sup>33</sup></b> 5% total Bidibidi population	

31 As MSMEs are additionally using OGS as a productive asset they may generate increased revenues from their OGS purchase and be more comfortable paying higher-priced loans over longer time periods and potentially using mobile money given the higher cost of monthly installments

32 Assuming 70% of local population are farmers and 75% are willing to pay for solar products (field data) with only 22% converting intention to pay into a purchase (UNCDF) assuming five people per household.

33 Assuming 30% of local population are MSME owners and 75% are willing to pay for solar products (field data) with only 18% converting intention to pay into a purchase (UNCDF)

# Addressing Market Constraints to Energy Access in the West Nile Region

Major market constraints in the West Nile energy market are reducing both host and refugee communities' access to continuous, good quality and affordable energy products. Mercy Corps research has boiled down these barriers to five major market constraints impeding development of a functional OGS market in West Nile. The table below identifies these constraints and Mercy Corps-proposed strategies to address them.

TABLE 8: MAJOR MARKET CONSTRAINTS

		Strategies to Address Market Constraints
Product Appropriateness and Availability	<ul style="list-style-type: none"> <li>› Available energy options do not fully deliver upon the customer value proposition (and are often counterfeit/poor quality or unaffordable)</li> <li>› Lack of consumer and supplier knowledge of better solar options that could deliver on the value proposition.</li> <li>› Lack of information on OGS options due to scarce marketing (in addition to limited supplier knowledge)</li> </ul>	<ul style="list-style-type: none"> <li>› <b>Information campaign to consumers to raise awareness</b> of the value and choice of more applicable OGS products, prices and payment options</li> <li>› <b>Education and outreach to local market actors on product choice and the ability of consumers to pay</b> (with goal of increasing availability of lower cost solar products)</li> </ul>
Demand Perception	<ul style="list-style-type: none"> <li>› Suppliers' lack of understanding of customer demand and segmentation in the area and resulting inability to market product or project stock</li> <li>› Supplier perceptions of host and particularly refugee populations assume limited willingness to pay for solar products</li> <li>› Inability to demand forecast supply due to fluctuating incomes and in-kind distributions</li> </ul>	<ul style="list-style-type: none"> <li>› <b>Address perceptions</b> of OGS demand in the region and creditworthiness of consumers through sharing research with suppliers</li> <li>› <b>Build acumen among suppliers to forecast demand</b> and how to use partners and data to do that</li> </ul>

## Strategies to Address Market Constraints

<p>Market Linkages and Infrastructure</p>	<ul style="list-style-type: none"> <li>› Customers rely on word of mouth to find energy suppliers and maintenance services</li> <li>› Market actors have ad-hoc relationships and limited knowledge and trust of their supply chain and market networks</li> <li>› Poor or no warehousing security, roads and other infrastructure to transport and store products in the area</li> </ul>	<ul style="list-style-type: none"> <li>› <b>Networking and information sharing events and systems</b> to build relationships between last mile distributors and OGS suppliers</li> <li>› <b>Hired use of innovation centers or other secure facilities</b> as warehousing for suppliers to test movement and storage of stock</li> <li>› <b>Increase efficiency of last mile transportation</b></li> </ul>
<p>Appropriate Finance</p>	<ul style="list-style-type: none"> <li>› Few credit options for solar products that are suitable to meet local needs</li> <li>› Local suppliers are not provided lines of credit to purchase and bring to market more expensive solar energy products</li> <li>› Mobile money as a payment option is constrained by poor quality of service, low availability of agents to serve a dispersed population and increased transaction costs.</li> <li>› VSLAs – as a proposed solar financing strategy – may lack the up-front liquidity to purchase OGS in bulk</li> </ul>	<ul style="list-style-type: none"> <li>› <b>Increase supplier awareness and preparedness to accommodate the consumer 3-month savings period</b></li> <li>› <b>Semi-formal mechanism, such as VSLAs, as a financing intermediary</b>, between OGS distributors and PAYGo suppliers</li> <li>› <b>Build capacity of VSLAs act as last mile distributors</b>, purchasing OGS in bulk and selling directly to members</li> <li>› <b>VSLAs vouch for members</b> – provide credit credentials of consumers, validate security deposits or cash payments prior to asset distribution enabling better demand forecasting; and act as intermediary to provide mobile payments from consumers to suppliers</li> <li>› <b>Smart subsidies to support demand creation and seasonal promotions</b> paid to the OGS supplier or VSLA to incentivize continued payments through low-income periods for households</li> </ul>

## Strategies to Address Market Constraints

### Quality Assurance / Trust

- › Almost no consumer and local trader awareness of solar product options, standards and warranties
- › Consumers and suppliers do not trust product quality, given prevalence of low-quality products in the market
- › No clear processes for returns, warranty fulfilment or consumer protection for last mile consumers
- › **Incentivizing certification bodies and PAYGo suppliers to advertise** quality standards to generate demand for products
- › **Information campaign to raise awareness of Lighting Global brands and warranties**
- › **VSLAs provide 'escrow' accounts for PAYGo consumers** – PAYGo consumers continue payments for their products without reaching the OGS supplier until warranty agreements are fulfilled
- › **Transparent warranty process** to be agreed between PAYGo suppliers, electricians and VSLAs

Although both host and refugee population see meeting their unmet energy gaps as a priority, **the current PAYGo solar business model and products do not match the needs** of the majority of the West Nile refugee and host community market. **Solar home systems are attractive to all consumers; the reality is they are too expensive for the majority of the local market** and only financially attainable for profitable MSME owners. From a humanitarian perspective, these PAYGo solar home systems may therefore exclude the majority of the target group (vulnerable refugees with low household incomes) or create an ongoing dependency on subsidized products. From a markets perspective, this means that the only potential customers would be MSME owners who would use solar home systems as both household and productive assets. Conservatively, the potential market size is currently 34,000 business owners within the region (see table 7), just 5% of the Bidibidi population.

The need for better OGS solutions and potential impact of expanded access is clear. The “business as usual” approach has not yet worked to expand PAYGo use in the settlements and is unlikely to take off in the future without strategic support. Expansion of PAYGo solar products into the region is not currently feasible for high-cost solar home products and using current PAYGo product and payment packages. As an executive for a leading PAYGo provider in Uganda noted, “refugee markets are different.”

## Appropriate OGS Energy Products

**According to the market data, the greatest segments of the Bidibidi population are able and willing to pay for three types of OGS products on the Ugandan market.**

Although the 10W solar home system was the preferred product at the onset of the willingness to pay discussions, this product is too expensive for the vast majority of the local population. The OGS products listed below could meet both the value preferences of consumers and fall within potential disposable income levels with a three-month saving period for cash in full payments or loan deposits. In addition, given that consumers are more likely to ‘stack’ energy products to expand existing capacity and functionality (e.g., by adding more

panels and batteries) rather than purchase larger power products, the focus on these OGS product options capitalizes on this trend.<sup>34</sup>

Although this will need to be validated in future market activation activities, it is assumed, based on the majority preference for a short saving period of three months, that the tipping point on payment options (between cash upfront and loans/PAYGo) and product choice (between higher and lower priced OGS) will be when a three-month saving period cannot generate a sufficient upfront cash payment or deposit down payment.

TABLE 9: PRODUCT OPPORTUNITIES

OGS Type	Typical Price Range <sup>35</sup>	Consumer Segment	Payment Option	Supplier
Single solar lamp (50 lumen)	\$8 - \$10	Vulnerable Groups	Cash in full	VSLAs Local merchants
Single solar lamp with mobile charging (220 lumen)	\$20 - \$60	Farmers MSME (Female) MSME (Male)	Cash in full PAYGo / loan	VSLAs Local merchants PAYGo companies
6W solar home system	\$100 - \$200	MSME (Female) MSME (Male)	Cash in full PAYGo / loan	VSLAs Local merchants PAYGo companies

### OGS Merchant Sales Channels

Sale of OGS goods (both PAYGo and non-) could conceivably happen through merchants consulted in this research who expressed interest in adding OGS to their existing product lines – but only if the identified market constraints are addressed.

The market constraints previously presented highlight some of the reasons local merchants are not already distributing OGS, and why refugee settlements offer an unfavorable environment for the “normal” regional sales agent model that prevails in more urbanized areas of Uganda.

However, within the settlements, local merchants, VSLAs and electricians could potentially provide the last mile distribution, financing and maintenance services required to facilitate successful OGS sales in the area. All these market actors in and around refugee settlements have direct contact with significant portions of a population currently out of reach of established OGS retailers.

## Conclusion

This research examined the energy needs of low-income and sparsely distributed rural refugee and host community populations in Uganda’s West Nile region, and the capacity of energy markets, including PAYGo actors, to better meet those needs. Our research has underscored the fact that refugees are currently paying for

<sup>34</sup> [https://www.slideshare.net/UNCDF\\_CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285](https://www.slideshare.net/UNCDF_CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285)

<sup>35</sup> Providing price range for certified products only.

–and are willing to pay more - for lighting and power. However, their limited access to quality solar products means that these investments go towards short-term, substandard solutions including dry cell batteries and charging stations. This research explored why solar products and PAYGo solutions in particular have not yet reached refugee markets and identified the following market constraints:

- › **Product appropriateness and availability**, with a mismatch between what energy products are currently on offer from PAYGo suppliers and what refugee and host community members want and can afford.
- › **Demand perception and limited understanding** of refugee community purchasing power among energy market actors.
- › **Market linkages and infrastructure constraints**, which lead to higher operating costs, but which could be offset through partnerships with humanitarian actors.
- › **Appropriate finance** with flexibility to accommodate inconsistent income streams (particularly for farmers or businesses dependent on farmers' income due to seasonal harvest periods).
- › **Quality assurance and trust**: Consumers demonstrated a lack of awareness of OGS quality standards, and exposure to customer service that accompanies certified products.

These constraints highlight why PAYGo solar will require different strategies for refugee settlements than the urban and peri-urban markets where they have had the most success. Yet we see real opportunity to cultivate both PAYGo and non-PAYGo off-grid solar markets that will result in better options for refugee energy consumers with limited incomes to meet lighting and power needs. We identified three major consumer segments: vulnerable households, farmers and small business owners. Each will require tailored approaches and products suited to their demand preferences and disposable income. The most vulnerable households can afford entry-level, Lighting Global-certified solar lamps (\$8-20 USD) using either cash or financing support from VSLAs. Larger solar lamps with mobile charging capacity and solar home systems up to 6 watts (\$20-200) are accessible to farmers and business owners with PAYGo or alternative financing support.

Strengthening market systems that bring quality energy and financial services to the settlements is a key activity to make the most of limited aid dollars at this stabilization phase of Uganda's South Sudanese refugee response. A strategy of facilitation and indirect support will minimize unsustainable, blanket aid distributions. Aid agencies need to invest in areas that can generate the most interest to incentivize further adoption by local market actors without further external intervention. The co-creation of strategies and buy-in of local market actors into the interventions is critical for the long-term success of the action and the market itself. Any planned intervention should be given support just long enough that market actors realize the benefits and scale the interventions independently. Successful business models will foster an environment for both non-PAYGo and lower costs of PAYGo OGS products, leading to the shared goal of sustainable, high-quality and affordable solar energy products for households and businesses in humanitarian crises.

Refugee settlements and host communities in Uganda's West Nile region offer an important test case for PAYGo solar systems' ability to meet the energy needs of low-income and sparsely distributed rural populations. In the coming months and years, Mercy Corps, together with partners, will test the hypotheses presented in this study to identify the most appropriate and influential roles and investments for humanitarian, solar and local market and finance actors to close the energy access gap for refugees and host communities in Uganda.



# Annex 1: Research Methodology

The research used mixed methods of both demand and supply side focus group discussions, key informant interviews and desk research. Surveys were administered using mobile data collection (Kobo forms) to scale the research and allow for more detailed analysis of demand and supply side data. Survey tools were carefully designed to gather both qualitative and quantitative data points where needed. Convenience sampling was used to meet the sampling requirements as much as possible.

Research Objective(s)	Timeframe	Sampling and Methods
<p><b>Gain a broad overview of the PAYGo OGS market in Uganda and the West Nile Region to identify potential feasibility as an energy option for FDPs.</b></p> <p><b>The outputs pinpointed areas for more granular data points to guide future primary research.</b></p>	<b>Feb. 2019</b>	<ul style="list-style-type: none"> <li>› Twelve remote interviews with industry experts</li> <li>› In-person interviews with major renewable energy donors and meetings with seven PAYGo solar providers working in Kampala</li> <li>› Field research in West Nile in Arua, Rhino Camp, Bidibidi and Yumbe—three FGDs, six interviews with refugee solar users (four PAYGo system users and two offering phone charging services commercially)</li> <li>› Interviews with two mobile money agents, two MNO service center staff and six PAYGo retail location staff</li> </ul>
<p><b>Identify energy needs and priorities in productive, consumptive and public realms, focusing on specific needs of women and girls and risks and fears of violence.</b></p>	<b>Mar. 2019 – EEMRG</b>	<ul style="list-style-type: none"> <li>› FGDs and interviews with 73 refugees and 21 host community members in Bidibidi and Rhino camps</li> <li>› Interviews with 11 humanitarian energy practitioners</li> </ul>
<p><b>More defined research on:</b></p> <p><b>-Consumer segmentation (HHs and merchants) including priorities, current sources, mobile access, preferences and willingness to pay for energy products</b></p> <p><b>-Identify merchants' networks as suppliers of OGS products, customer profiles; preferences for selling energy products, (cont.)</b></p>	<b>Jun. -Jul. 2019</b>	<ul style="list-style-type: none"> <li>› Demand side survey research (through a mix of FGDs and KIIs) in Zones 3 and 4 of Bidibidi</li> <li>› Sampling gathered segmentation data with emphasis on vulnerable groups (weighting given to low-income occupations, women and inclusivity criteria); sampling was 50:50 host vs. refugee criteria to understand the host energy market and to reduce conflict between host and refugee communities</li> <li>› Occupation = subsistence farmers, subsistence farmers in livelihood programs, MSME owners</li> <li>› Gender = 70% women / 30% men</li> <li>› Inclusion = 70% 18-54 y.o. / 30% inclusion (elderly, LGBTI, disabled, care-giver)</li> </ul>

## Research Objective(s)

## Timeframe Sampling and Methods

prices, quality standards and sales/product issues; and opportunities for improving energy sales

-Deep-dive on feasibility constraints identified in previous research of non-PAYGo and PAYGo OGS

-Understand local humanitarian programming and potential market distortion effects, refugee migration patterns to verify supplier perceptions on flight risk and credit-worthiness

Jun. -Jul. 2019

› Citizenship Status = 50% host / 50% refugee

› Mix of FGDs to trend results and KIIs to validate FGD outputs and provide more granular data. Actual FGDs/KIIs vs. intended varied due to logistical constraints

› 10 FGDs total (65 people in total)

- Subsistence farmers (2FGD male refugee; 3FGD female refugee; 3FGD female host)

- Livelihood program farmers (1FGD female host and 1FGD female refugee)

### 82 KIIs

- Subsistence host farmers (15F/12M)

- Subsistence refugee farmers (8F / 10M)

- Livelihood program host farmers (6F/6M)

- Livelihood program refugee farmers (12F/12M)

- MSME owners (host) (1F / 5M)

- MSME owners (refugees) (1F)

› Supply side surveys (30 KIIs) were conducted in Zones 3 and 4 of Bidibidi and Bidibidi market.

- 9 KII (energy product stockists)

- 16 KII (non-energy product stockists)

- 3 KII (mobile agents)

- 2 KII (VSLAs)

› Wider market interviews in nearby towns of Yumbe, Arua and Koboko (9 KIIs):

- Aid practitioners and government (3 KIIs)

- BRAC (1 KII) to study 'Living Goods' last mile distribution model and its sustainability

- OGS wholesalers (1 KII) for supply side opportunities and constraints to supply non-PAYGo technologies into the area

- MNOs (2 KII) for strategic intent on growing network in the region and operational challenges

- Electrical training institutes (2 KII) for opportunities for improving maintenance and quality of OGS

## Energy Priorities & Preferences

The survey tool asked for respondents in FGDs and KIIs to provide the two most important values of energy. In some cases, the enumerator entered more than two answers and, as such, we have a greater number of entries in this table than the number surveyed. However, the additional entries do not skew the data and show priority commonalities among various occupations.

Values	Livelihoods Program Farmer	Subsistence Farmer	MSME owner	Grand Total
Sum of Safety for women	10	16	1	27
Sum of Heating/warmth	2	4	0	6
Sum of Other	3	0	0	3
Sum of Children's Education	14	36	3	53
Sum of Safety at night	24	34	4	62
Sum of Communication and information	14	13	3	30
Sum of Safety for children	9	14	1	24
Sum of Entertainment	0	2	0	2
Sum of Improving business income	0	1	4	5

## Willingness to Pay Product References

The first two sets of primary research assessed local demand for energy products with only a verbal description of the product/service that the vast majority of potential consumers had never seen or used before. This would make it very difficult to gather genuine insight into what the consumer is willing to pay. For the third set of primary research, Mercy Corps conducted the willingness to pay discussions with 82 KIIs and 9 FGDs<sup>36</sup> by either physically (for FGDs) or pictorially (for KIIs) providing a selection of solar products currently on the market with a diverse range of prices and functions.

All enumerators were trained prior to the survey on the product descriptions, including the value that the quality standards and warranties applied to the products. There was only one brand used for this work for ease of procurement and consumer comparison of product types. The exercise was not a marketing action for this brand but an effort to compare willingness to pay for similar types of solar products on the market.

Some of the prices offered are different to those currently in the market in order to test willingness to pay of loan products for small solar products.

<sup>36</sup> Due to technical issues one FGD did not complete the willingness to pay questions



### 50 lumen lamp

Single integrated panel lamp with Lighting Global certification



### 220 lumen lamp

Single lamp and mobile phone charger with separate solar charging panel



### 6W and 10W Solar Home System

Similar in presentation but smaller power size, these systems provide three hanging lights that can be split into different areas, a solar charging panel and mobile phone charger

## PRODUCT SPECIFICATIONS

## Approx. PAYGo PRICES CASH ONLY

PRODUCT SPECIFICATIONS	Approx. PAYGo PRICES	CASH ONLY
<b>10W PAYGo SHS</b> <ul style="list-style-type: none"> <li>› 10W Solar Panel</li> <li>› 22Wh Battery</li> <li>› 2 Ultra Bright LED Lights</li> <li>› Independent Switches</li> <li>› Phone Charging Cable with multiple tips</li> <li>› 3-year warrant on battery and panel</li> <li>› 2-year warranty on accessories</li> </ul>	<b>Deposit 70,000</b> Daily, Ugx 2,500 Weekly, 16,500 <b>Monthly, Ugx 65,000</b>  <b>12 MONTHS</b> Total= Ugx 920,000	<b>UGX – 475,000</b>
<b>6W PAYGo SHS</b> <ul style="list-style-type: none"> <li>› 6W Solar Panel</li> <li>› 6 Ah Battery</li> <li>› 3 ceiling-mounted fixed lamps with wall mount switches</li> <li>› Charging kit with USB cable and adapters</li> <li>› 2-year warranty on accessories</li> </ul>	<b>Deposit 20,000</b> Daily, Ugx 1,500 Weekly, Ugx 10,000 <b>Monthly, Ugx 40,000</b>  <b>12 MONTHS</b> Total, ugx 550,000	<b>UGX – 385,000</b> <b>(saving 155,000)</b>

## PRODUCT SPECIFICATIONS

## Approx. PAYGo PRICES CASH ONLY

<b>220 LUMENS SOLAR LIGHT</b> <ul style="list-style-type: none"><li>› LEDs with 220 lumens total flux</li><li>› Three light modes</li><li>› 360 degree ambient wide-angle spread</li><li>› 2,200 mAh, 3.7 volt, Lithium-NMC battery</li><li>› 2.35W solar panel</li><li>› Device Charging capability and cables</li><li>› 2-year warranty</li></ul>	<b>Deposit – 8,000</b> <b>Monthly – 9,300</b> <b>12 MONTHS</b> <b>TOTAL = 120,000</b>	<b>UGX 80,000</b>
<b>50 LUMENS SOLAR LAMP</b> <ul style="list-style-type: none"><li>› LEDs with 50 lumens total flux</li><li>› Three light modes</li><li>› 360 degree ambient wide-angle spread</li><li>› 425mAh, 3.3 volt, lithium ferro-phosphate (LiFePO4) battery</li><li>› 0.35 watt, integrated polycrystalline solar panel</li><li>› 2-year warranty</li></ul>	<b>Deposit – 5,000</b> <b>Monthly – 7,500</b> <b>6 MONTHS</b> <b>TOTAL = 50,000</b>	<b>UGX 35,000</b>

## Willingness to Pay Calculations

### Monthly disposable income potential

Surveys did not ask respondents directly about their monthly disposable income due to the sensitive nature of discussing income and the fact that this is often a subjective opinion challenging to validate. The survey was therefore designed to collect data that would allow us to estimate and triangulate monthly disposable income potential using two methods from the same respondents:

- › Method A – calculating monthly disposable income by dividing price offered for their preferred solar product by months required to save to purchase that product at that price
- › Method B – calculating monthly disposable income using monthly loan instalments offered for paying the actual product price

Method A uses data provided by the respondent on paying for their offered prices. Method B uses data provided by the respondent on paying for actual prices. These offer a potential monthly disposable income from the respondent and allow us to see whether there is a difference between monthly disposable income between paying for the offered price versus the actual price. If a respondent can pay the actual price (and it is the same or higher than the offered price), it is possible the respondent was initially undervaluing their monthly disposable income. It should be noted, however, that true willingness to pay can only be established if a purchase is made. As such, the UNCDF work that shows conversion rates from intention to purchase to actual purchase is important to estimate market potential.<sup>37</sup>

<sup>37</sup> <https://www.slideshare.net/UNCDF/CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285>

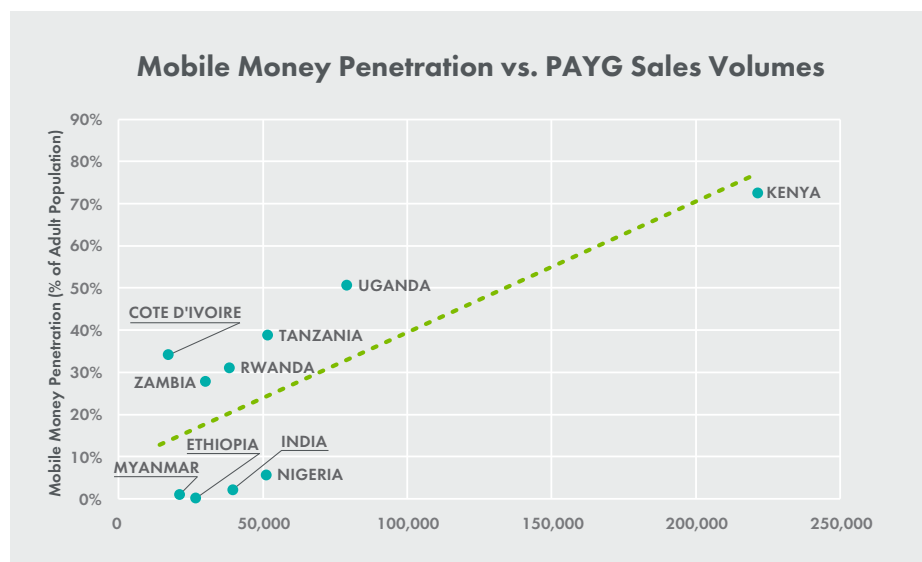
# Annex 2: PAYGo Overview

In the first half of 2018, 50% of OGS PAYGo units were sold in East Africa, accounting for 79% of global OGS PAYGo revenues.<sup>38</sup> The strong mobile money penetration in East Africa is often cited as the reason for the relative success of the region (e.g., Kenya, Uganda). Further, the lack of mobile money systems in countries with high OGS sales but low PAYGo sales (e.g., India) is cited as the constraint to PAYGo penetration.<sup>39</sup>

Graphing the top ten PAYGo countries' sales volumes versus their national mobile money penetration shows that there is a strong positive correlation between mobile money penetration and PAYGo sales volumes. **Therefore, while mobile money penetration in East Africa has likely enabled the growth of PAYGo there, and its absence may impede the spread of PAYGo technologies elsewhere.**

PAYGo adds complexity to existing OGS operations, while also adding new operational elements that a company must manage. This means that large companies that can invest in and manage sophisticated technology and operations are the best suited for distributing PAYGo technologies. PAYGo sales require maintaining a relationship with the customer while they continue to make payments for it, and the business model benefits from building stronger relationships with good paying customers. Donors and investors understand this and have concentrated 67% of their sector investments into four market leaders globally.<sup>40</sup>

MOBILE MONEY AND OGS PAYGo COUNTRIES H1 2018



Sources: GOGLA 2018, and World Bank Findex 2017.

Minimally, it is important to understand the fundamentals of global PAYGo operations outlined in Figure 4, below.

### IMPORTANT PAYGO STRATEGIC OPERATIONS

Strategic Operation	Description	Characteristics in West Nile Settlements
Sales	Identifying a viable target market and communicating the value of the product to them.	Scarce data on potential market size and customer density; customers located far from sales centers, and expensive and unreliable transportation in settlements; FDPs speak multiple non-local languages.

38 GOGLA. (October 2018). [Global Off-Grid Solar Market Report: Semi-Annual Sales and Impact Data: January to June 2018](#). GOGLA, Lighting Global, Berenschot.

39 Gupta, G. & Bhattacharya, K. (January 2018). [Off-Grid Solar Market Trends 2018](#). Lighting Global. The International Financial Corporation (IFC).

40 Gupta, G. & Bhattacharya, K. (January 2018). [Off-Grid Solar Market Trends 2018](#). Lighting Global. The International Financial Corporation (IFC).

Strategic Operation	Description	Characteristics in West Nile Settlements
<b>Distribution</b>	Logistics which ensure products effectively reach the target market as they are sold.	Inventory storage is mostly limited to Arua (large regional town); safe storage nearer to the market needs to be identified for cost effective distribution.
<b>Registration and Credit Scoring</b>	Collecting customer data and evaluating it to determine their willingness and ability to pay.	Most FDPs do not have government ID cards or permanent homes, which is a common requirement from PAYGo companies.
<b>Loan Structure</b>	The terms of conditions of the future payments for the product.	Loan terms ranged from 12-35 months, required initial deposits ranging from US\$5-US\$20, and monthly payments from US\$5-US\$15 with differing policies on leveraging penalties for late payments.
<b>Payments System</b>	The mechanism customers have to use to make the future payments.	Payments are made through mobile money, but most FDPs are not registered for mobile money, and do not have reliable access to an agent where they can make regular payments.
<b>After Sales Service</b>	Dealing with questions on the product and repairs	Service centers are located in Arua, and it is not cost-effective to send a technician into most places in the settlements or to have customers travel to the service center. Some companies have large call centers to support remotely though.
<b>Data Collection and Cross-Selling</b>	The type of data that is collected on customers, and how it is used.	Companies collect customer data at registration and track their payments. One company also tracks energy usage patterns of clients twice a day. Good payers are offered loans for larger systems or further components (i.e. television), and in some cases financial products like school fee loans or a savings account.
<b>Solar Waste Collection</b>	The system a company has for recovering toxic components after their usable life.	No companies were recovering used systems, even though batteries, electronic components and solar panels often contain hazardous materials.

PAYGo technologies are generally embedded in mid- to large-size OGS products, because the small or pico systems are already affordable – embedding PAYGo technology in them would mean they would not be cost competitive, especially with generic solar products.

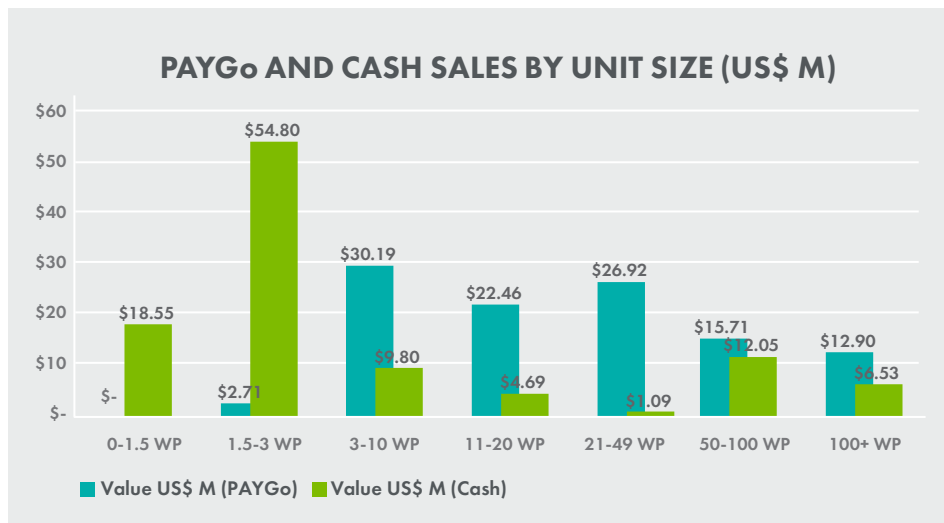
In 2018 GOGLA reported its global affiliate sales by cash and PAYGo products. It shows that the smallest systems of 3 Wp or less are almost all sold for cash, and most PAYGo providers are making sales in the 3 Wp to 100 Wp range.

As such, PAYGo solar is not currently targeted at helping people afford the smallest solar systems. **Instead, the value of PAYGo technology is to allow low-income people that would have bought a small OGS**

system to buy larger ones (e.g., increasing from pico-level solar to lighting for an entire household), as opposed to extending energy access to those that could not have afforded solar at all.

The figure below compares the most commonly cited impacts of solar lighting in industry literature with the context of the settlements in the West Nile. In the settlements of the West Nile region, solar technologies can make relevant affordable. Customers that make their payments regularly often have the potential to upgrade their systems or add other elements to them like radios or televisions, deepening the access to energy they have and the impacts it brings to the quality of the life in the household.<sup>41</sup>

PAYGo VS. CASH SALES FOR GOGLA AFFILIATES H1 2018



Source: GOGLA Market Trends 2018

IMPACT OF RENEWABLE ENERGY IN THE WEST NILE

Impact Category	Noted Benefits (from literature)	Application to Settlements in West Nile
<b>Quality of Life</b>	More time at night for family activities, reading, doing school work; ability to charge phone and connect with relatives; ability to connect with the world through radio and/or TV.	This has a high level of relevance in the settlements as solar light is a much more reliable energy source for these activities than torches or mobile phone lights. It also provides charging capabilities that dry cells generally do not.
<b>Environmental</b>	A slight reduction in GHG emissions that were produced from kerosene as well as fewer dry cell batteries being discarded in the environment.	For some host nationals in the West Nile that were using kerosene there would be a reduction in GHG, but this would not apply to the vast majority of refugees. A reduction in discarded dry cell batteries is likely as long as the solar is able to reduce their usage.
<b>Health</b>	Less inhalation of kerosene fumes.	Limited relevance to host nationals using kerosene, but generally not relevant to the settlements.

41 This has the potential to elevate customers from SEforALL Tier 1 to Tier 2 access to energy.



Impact Category	Noted Benefits (from literature)	Application to Settlements in West Nile
<b>Safety</b>	Less risk of fires in the house, or of children accidentally ingesting kerosene.	People in the settlements are living in mud huts with thatched roofs, so this may be an important impact for those burning grass for light, or in the rare instances of kerosene usage.
<b>Cost Savings</b>	Regular savings from not buying kerosene, batteries for a radio and/or paying others to charge a phone.	Recent research by UNCDF showed that saving using solar in Uganda is only realized with low-cost solar models – 50 or 220 lumen type products.  For solar home systems there is no net saving to the consumer from a household perspective. If the product is being used as a productive asset, however, it may generate some revenue to justify the cost of purchase. In addition, the use of OGS may have an indirect financial benefit in other impact areas.
<b>Income Generation</b>	Ability to charge others to charge a phone, or for business owners, to keep a shop open longer or sell more goods like cold soda.	This is certainly a benefit, but it would only be for a very limited portion of the population that could afford a larger system – generally MSME owners. In the West Nile settlements, solar is generally locked in the house during the day so it will not be stolen. Therefore, it is rare that it will have enough power to charge mobile phones of those outside the HH (as a business).

In addition, PAYGo payment options have opened up credit to lower income households in Uganda, with good paying customers of leading PAYGo companies upgrading to larger solar systems, buying additional components like televisions, or borrowing more cash. Fenix International has developed a school fees loan for its PAYGo customers. Fenix wants their customers to feel like they are developing a long-term relationship with the company, and as long as customers remain in good standing they have continual access to products that the company offers. BrightLife in Uganda is using a similar philosophy to allow customers to contribute to a savings account when they make their installment payments.<sup>42</sup>

42 UNCDF – Energy ladder slide 16 - <https://www.slideshare.net/UNCDF/CleanStart/insights-from-the-energy-ladder-research-in-uganda-97075285>

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### About Mercy Corps

Mercy Corps is a leading global organization powered by the belief that a better world is possible. In disaster, in hardship, in more than 40 countries around the world, we partner to put bold solutions into action — helping people triumph over adversity and build stronger communities from within. Now, and for the future.



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