



Mobile-enabled energy for humanitarian contexts

The case for pay-as-you-go
solar home systems in Kakuma
Refugee Camp

February 2019



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Executive Summary

Pay-as-you-go (PAYG) solar is a flagship example of how mobile technology can help make clean energy affordable for low-income populations, while also creating sustainable business models. It has proven to be successful and has seen impressive growth in Sub-Saharan Africa and Asia in the last five years, with over two million solar home systems (SHSs) sold on a PAYG basis by the end of 2018.

This widespread success has led humanitarian organisations and solar providers alike to consider whether PAYG solar could be a viable option for extending electricity to new untapped off-grid areas, such as refugee camps. Although the opportunity is big, as GSMA research highlights, replicating PAYG solar can be challenging in more complex market environments where providers need to adapt their payment collection methods, educate customers in the use of digital financial tools and rethink their last-mile distribution strategy.¹

Since 2016, PAYG SHSs have been piloted in Kakuma Refugee Camp in Kenya and its host community by a few providers, with the support of donors, international and local NGOs and local distributors. To date, just over 1,000 SHSs have been deployed, with the impact felt across many households and small businesses in the refugee camp and host community. Although the numbers are still small, this is a considerable accomplishment. It also reflects a shift in the humanitarian sector, which is increasingly considering energy access as a basic need and exploring new models of energy provision in humanitarian contexts. The PAYG model is particularly compelling given its ability to enable low-income populations to pay in small installments over time, lowering the barrier of high upfront costs.

To understand the reality better, the GSMA Mobile for Humanitarian Innovation (M4H) programme interviewed PAYG solar providers, their key partners and existing and potential SHS customers, on the opportunities and challenges of PAYG SHS in Kakuma Refugee Camp. **The verdict is that PAYG solar products can fill the energy access gap in the camp and perhaps in other humanitarian contexts, as well. However, it will not be easy and it is not always business as usual.** As one PAYG solar provider pointed out,

“The challenge is not technological anymore, but rather hinges on developing business models and structures that nurture financially sustainable companies.”

Working together with humanitarian organisations, PAYG solar providers can create a win-win scenario: SHS customers gain access to a reliable, sustainable and affordable energy solution that satisfies the mandate of humanitarian organisations working with refugees, while PAYG solar providers can reach new off-grid customers improving their socio-economic well-being.

This research study also considered the role of mobile network operators (MNOs), evaluating what would drive them to support energy access in refugee camps. The opportunity for MNOs to provide more than just platforms (for connectivity and mobile money) has not been fully realised, but in a favourable country context MNOs could gain new customers, revenues and brand visibility by supporting energy access to yet untapped off-grid areas, including refugee camps.

For PAYG SHSs to become a viable solution in humanitarian contexts, certain challenges need to be addressed, both before entering refugee camps and during implementation. Some of these challenges include unclear regulations,

misaligned mandates of PAYG solar providers and humanitarian organisations (e.g. requests for rapid scale with short timelines) and a value proposition that is still being tested for PAYG SHS agents and customers.

As customer testimonials in this report show, PAYG SHSs have already had a positive socio-economic impact on certain segments of the refugee population and host community, such as feeling safe at night, having the ability to study and feeling more at home. For these benefits to spread and become sustainable, our research found that humanitarian organisations, PAYG solar providers and MNOs can bear in mind the following considerations:

Key considerations

For PAYG solar providers



- Understand local regulations and the operating environment before rolling out a product;
- Balance humanitarian and private-sector approaches;
- Address the impermanent situation and unique economies of refugee camps through financing models;
- Invest in field agents familiar with the local context to educate refugees on SHSs;
- Offer agent incentives to build loyalty and increase sales;
- Do not underestimate the vast and difficult physical terrain; and
- Offer flexible payment options via a range of channels that suit the specific humanitarian context.

For humanitarian organisations



- Play a strong mediator and facilitator role for PAYG solar providers to successfully deploy in refugee camps;
- Consider extending financial support to PAYG solar providers to help them absorb some of the initial risks of developing products that address energy needs beyond basic lighting; and
- Help build a conducive market environment by encouraging fair competition.

For MNOs



- Consider the revenue and brand opportunities of partnering with PAYG solar providers, according to the country context; and
- In line with the opportunity, identify the right level of engagement to support these high socio-economic impact products.

1. GSMA M4D Utilities (2017), “Going greenfield with utility pay-as-you-go models: Enabling access to water, sanitation and energy in and beyond East Africa”, <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/12/Going-greenfield-with-utility-pay-as-you-go-models-Enabling-access-to-water-sanitation-and-energy-in-and-beyond-East-Africa.pdf>

Introduction

The number of people displaced as a result of natural or man-made crises grows year on year, and the need for high-quality, long-term energy provision for affected populations is rising in parallel.² PAYG solar is a flagship example of how mobile technology can help make off-grid clean energy affordable, and create sustainable business models.



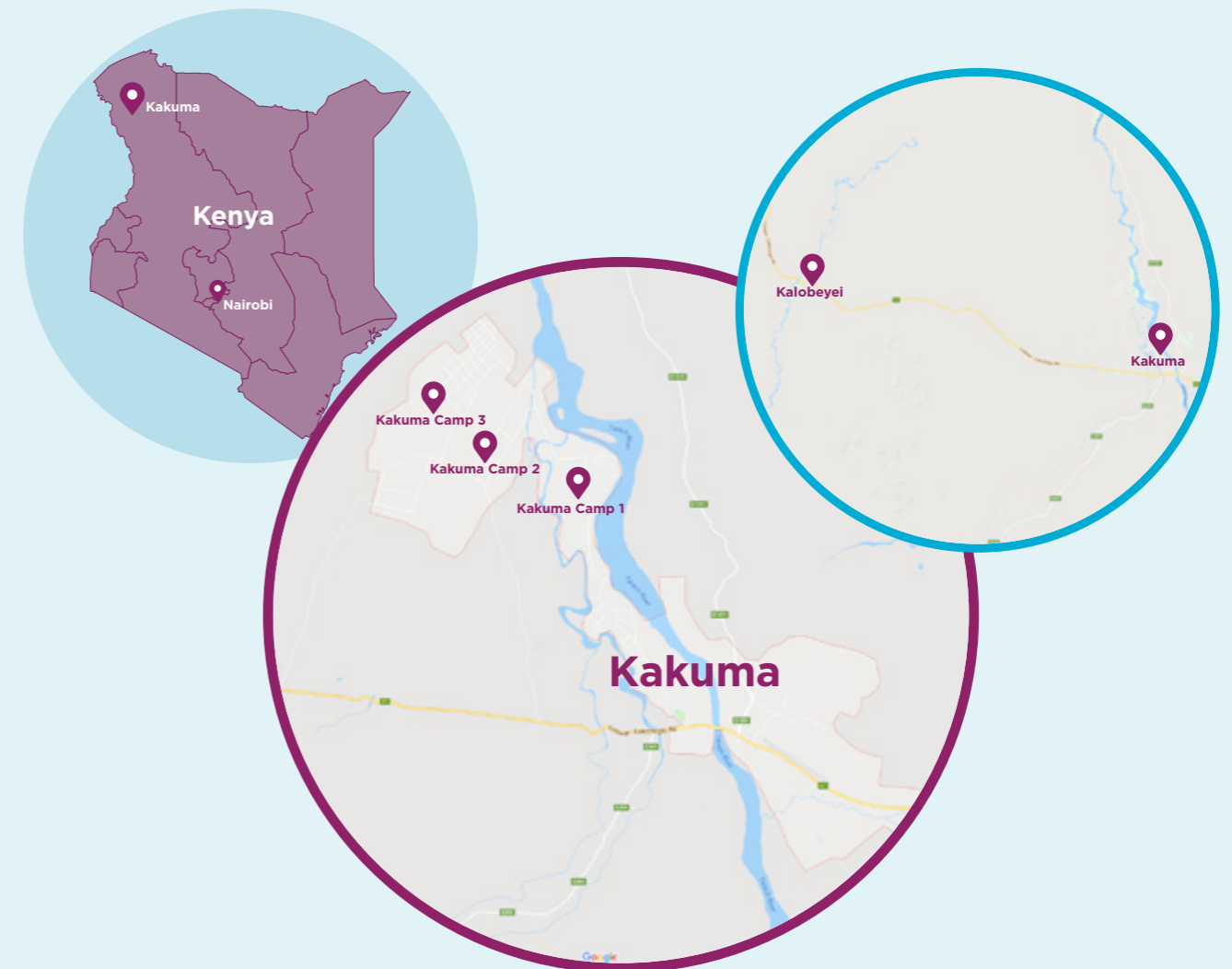
Although the potential for sustainable PAYG solar services in humanitarian contexts is largely unexplored, momentum is growing. Several new initiatives are coordinating the efforts of energy players, which are beginning to explore the feasibility of deploying their services in humanitarian contexts, including PAYG solar home systems (SHSs) for households and small businesses.

The GSMA Mobile for Humanitarian Innovation (M4H)³ programme aims to accelerate the delivery and impact of digital humanitarian assistance by building a research agenda to inform the future of digital humanitarian response, catalysing partnerships and innovation for new digital humanitarian services, advocating for enabling policy environments, monitoring and evaluating performance, disseminating insights and profiling achievements.

A key focus of the M4H programme is access to mobile-enabled utility services in humanitarian contexts, building on the work of its GSMA sister programme, Mobile for Development (M4D) Utilities.⁴ More specifically, the M4H programme seeks to understand whether mobile-enabled energy services can be provided in a commercially sustainable way by the private sector in humanitarian settings by leveraging a network of humanitarian efforts already underway.

Kenya is the focus country of this study, given its relatively mature digital finance ecosystem and the number of PAYG SHS providers and partner companies piloting projects in Kakuma Refugee Camp. An estimated 180,000 registered refugees live in Kakuma Refugee Camp and Kalobeyei Settlement where just 11 per cent of refugees have access to reliable energy sources for lighting.⁵

2. UNHCR, "Energy", <http://www.unhcr.org/uk/energy.html>
 3. <https://www.gsma.com/mobilefordevelopment/mobile-for-humanitarian-innovation/> and <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/12/Landscaping-the-digital-humanitarian-ecosystem.pdf>
 4. <https://www.gsma.com/mobilefordevelopment/m4dutilities/>
 5. Chatham House (2015), "Heat, Light and Power for Refugees: Saving Lives, Reducing Costs", <https://www.chathamhouse.org/sites/default/files/publications/research/2015-11-17-heat-light-power-refugees-lahn-grafham-final.pdf>



Objectives

The aim of this research was to uncover evidence from the **field experiences** of service providers, MNOs, humanitarian organisations and end users, on the potential impact and deployment of mobile-enabled PAYG SHS in humanitarian contexts. This report:

- **Outlines the business case for PAYG solar providers deploying energy services in humanitarian contexts;**
- **Highlights lessons learned from early pilots in energy access in humanitarian contexts to share with the broader sector;**
- **Identifies the socio-economic benefits of access to clean energy for displaced populations; and**
- **Identifies existing and potential benefits to key stakeholders: humanitarian organisations and MNOs.**



Energy access: A new priority in humanitarian contexts

A shift to commercial models for off-grid energy access in humanitarian contexts

Encouraged by the growing number of off-grid energy companies providing sustainable energy solutions for vulnerable communities, several initiatives are underway to support off-grid energy access and commercially-led solutions in humanitarian settings.

Led by key humanitarian organisations, such as UNHCR, (The United Nations High Commissioner for Refugees) as well as the private sector, these initiatives represent a progressive shift in how the humanitarian sector is thinking about delivering services to beneficiaries. Energy access has not

been considered an emergency need by either the UN or non-UN sector since the development of the “Cluster Approach”⁶ in 2005, which focuses instead on areas such as shelter, water, sanitation, food security and education (Figure 1).

6. For more information on the Cluster Approach, see: <https://www.humanitarianresponse.info/en/about-clusters/what-is-the-cluster-approach>

Figure 1

Cluster Approach



Source: Humanitarian Response (HR), United Nations Office for the Coordination of Humanitarian Affairs (OCHA)

As Figure 2 illustrates, a variety of key actors have been leading this shift.

Figure 2

Ecosystem of actors working on off-grid energy in refugee camps

	Launch date	Members	Role
Safe Access to Fuel and Energy (SAFE)	2014	Consortium of UN agencies and NGOs Current chair: Global Alliance for Clean Cookstoves	Information sharing and advocacy
Moving Energy Initiative	2015	Energy 4 Impact, Practical Action, Chatham House, the United Kingdom Department for International Development (DFID), the Norwegian Refugee Council, the UN Refugee Agency (UNHCR)	Data collection and project management implementation
The global plan of action	2018	Moving Energy Initiative, Practical Action, Global Alliance for Clean Cookstoves, UNITAR, the UN Migration Agency (IOM), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), UNHCR, the United Nations Foundation	Advocacy
Smart Communities Coalition	2018	32 Members, 3 Collaborators Co-chairs: Power Africa, Mastercard	Coordination

UNHCR

In addition to giving out firewood (10 kg per person every two months), UNHCR Kakuma has been collaborating with the IKEA Foundation to distribute free solar lanterns to students and teachers at school.⁷ This initiative ended in December 2018 and will not be renewed, as UNHCR is conscious that untargeted giveaway energy products may distort the market⁸ and penalise commercially-driven models, such as PAYG SHSs. In Kakuma, UNHCR plans to support PAYG solar providers through market facilitation. By connecting them with relevant stakeholders on the ground, UNHCR will ensure these companies are informed of regulations and respect the UN mandate to “do no harm”.

Moving Energy Initiative (MEI)

The Moving Energy Initiative (MEI) is a three-year DFID-funded consortium led by Energy4Impact, and includes Chatham House, Practical Action, the Norwegian Refugee Council (NRC) and UNHCR.⁹ MEI, in collaboration with the private and public sectors, aims to prove the viability of off-grid energy solutions in refugee camps. To that end, MEI has provided financial support to test these solutions on the ground and produces reports on results and lessons learned from these pilots.

Smart Communities Coalition (SCC)

Complementary to the MEI, the Smart Communities Coalition (SCC) addresses broader technology access challenges faced by refugees and host communities, including internet connectivity and digital payment capabilities.¹⁰



7. The IKEA Foundation has been supporting UNHCR since 2011 and raised over 30 million euros in 2015 through the Brighter Lives for Refugees project to provide light and renewable energy sources for refugee families living in camps in Asia, Africa and the Middle East. Kakuma and Kalobeyi will benefit from this solar lighting project that will see 900 street lights and solar lanterns installed. More information at: <https://www.facebook.com/unhcrkenya/posts/the-unhcr-kakuma-sub-office-hosted-a-team-from-ikea-foundation-unhcr-private-sec/1014123441986013/>
 8. Interview with UNHCR Kenya, 2018
 9. More information at: <https://mei.chathamhouse.org/>
 10. More information at: <https://www.tent.org/smart-coalition/>

Players supporting mobile-enabled PAYG solar home systems in Kakuma Refugee Camp as a new energy product

MEI

In Kakuma, MEI has supported PAYG solar provider BBOXX in the deployment of SHSs in both the camp and host community. This has been part of a wider range of activities that have included feasibility studies into energy management models, market development activities and the demonstration of low carbon technologies. While activities in the camp ended in December 2018, publications will continue to be released in early 2019 to share results, notably on innovative financing and partnership models.

SNV

In line with the new focus on energy access in humanitarian settings, GIZ undertook an assessment to evaluate the potential of PAYG solar in Kakuma and to support this assessment with field evidence. In October 2017, SNV (a Dutch international development NGO specialising in energy, water, sanitation and hygiene) was selected to support the implementation of market-based energy solutions for cooking and lighting in Kakuma Refugee Camp and host community.¹¹

With the financial support of Energising Development (ENDEV), SNV called on PAYG solar providers to test out their model and share their results. In addition to financing, SNV provided training for agents, connections to suppliers in Kakuma and supported marketing activities through roadshows.

The pilot ended in December 2018 and it is not yet certain whether funding will be renewed. As SNV staff in charge of implementing an off-grid energy pilot project in Kakuma explained, "There is a strong need for energy products in Kakuma and for innovative products; we have tried to help PAYG solar companies get started. Our pilot ends at the end of 2018 and even if we do not come back next year, PAYG solar companies will be able to continue on their own, now." As stated in the last MEI case study, "BBOXX believes that a market for its products exists, and plans to continue selling in the area. The company also plans to expand its market in Turkana County, beyond Kakuma."¹²

PAYG solar companies piloting in Kakuma

Four PAYG solar providers have been leading the way in deploying PAYG SHSs, both in the Kakuma Refugee Camp and the host community, with financial, marketing and capacity building support from different bodies. The four actors are:



The following sections discuss their reasons for entering the market, and the opportunities and challenges they have encountered along the way.

11. More information at: <http://www.snv.org/project/market-based-energy-access-mbea-project-kakuma-turkana-county>

12. MEI (2018), "Market development activities - Supporting a solar retailer to test the market in a displacement setting", https://mei.chathamhouse.org/file/2474/download?token=cKjVcZC_



A role for MNOs?

Across Kakuma Refugee Camp and the host community, there is widespread mobile network coverage (2G, 3G), as well as airtime and mobile money agents, kiosks and shops. Safaricom is the leading provider in the area. UNHCR studies show that "In Kenya, over 72% of refugees have access to 3G connectivity, with much of the rest covered by 2G."¹³ A research study by humanitarian organisation, ELHRA, found that 62 per cent of refugees have internet access, mainly through their mobile phone.¹⁴

Without these mobile services in place, mobile-enabled PAYG SHSs would not have a viable payment mode, as payments are made via mobile money. While some MNOs have partnered with PAYG solar providers to provide off-grid customers with lighting and charging solutions in rural and off-grid settings (e.g. Safaricom and M-KOPA in Kenya,¹⁵ Fenix International and MTN in Uganda¹⁶), the opportunity for stronger partnerships in energy access solutions for refugee camps is still unclear. This report presents some of the potential drivers for MNOs to enter this market.

13. UNHCR (2016), "Connecting Refugees: How Internet and Mobile Connectivity can Improve Refugee Well-Being and Transform Humanitarian Action", <https://www.unhcr.org/5770d43c4.pdf>

14. ELRHA (2018), "Innovating mobile solutions for refugees in East Africa", http://www.elrha.org/wp-content/uploads/2018/02/Innovating_mobile_solutions_Report.pdf

15. GSMA, M-KOPA Grantee Details: <https://www.gsma.com/mobilefordevelopment/mgrantee/m-kopa/>

16. J. Caswell (14 December 2015), "What we learned from our grantees: Fenix International", GSMA Mobile for Development Utilities programme, <https://www.gsma.com/mobilefordevelopment/programme/m4dutilities/lessons-learned-from-our-grantees/>

What's driving PAYG solar in refugee camps: The case of Kakuma

The apparent shift in the humanitarian sector towards considering energy access a basic need in emergency situations and supporting commercially driven models, is a sign of the potential of PAYG SHSs to improve access to energy for refugees through a new, more sustainable, convenient and affordable solution.



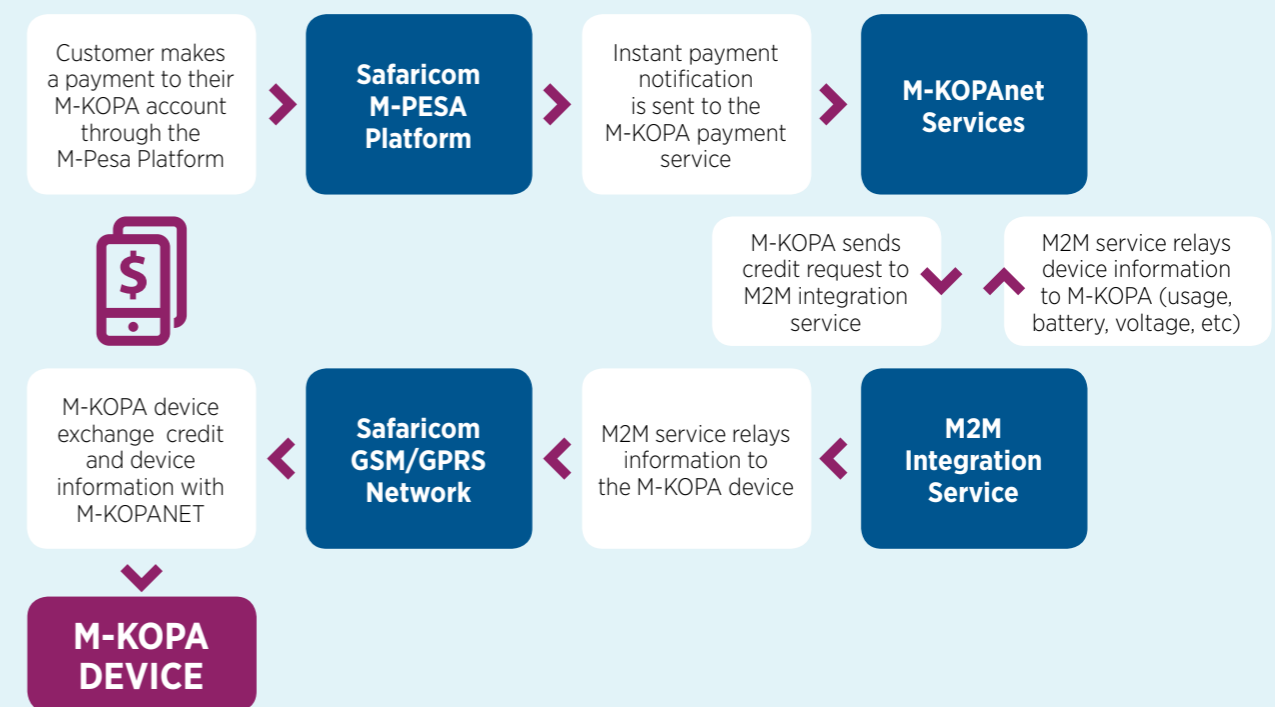
Mobile technologies underpin the PAYG solar model in three main ways (Figure 3):

- They enable payment collection through mobile money or other forms of **mobile payment**;
- They update and control PAYG-enabled assets, such as solar systems, or services through **machine-to-machine** (M2M) technology (long range, such as GSM, or shorter range, such as Zigbee) or keypad; and
- They enable communication between service providers, customers and local agents through mobile devices and services, such as **SMS or mobile apps**.

The mobile-enabled PAYG model meets important needs for both customers and providers. For customers, it is affordable and convenient for those with irregular incomes. PAYG expands addressable markets significantly and, in some cases, builds consumer trust by offering a low-risk, low-commitment trial (if customers cannot pay, they can give the SHS back). This is especially important in areas where low-quality solar products may have damaged user perceptions and trust in the service. For providers, PAYG enables more accurate awareness and real-time control of systems performance, efficient and secure payment collection (where customers can access mobile money) and gives customers an incentive to pay regularly since the service is suspended if they default (although service providers usually offer a grace period).¹⁷

Figure 3

M-KOPA's PAYG solar home system in Kenya



In Kenya, over half a million PAYG SHSs have been sold to date. An impressive number, but still a small proportion of the country's addressable energy market (about 32 million people).¹⁸

Source: GSMA Mobile for Development Utilities

17. GSMA Mobile for Development Utilities (2017), "Lessons from the use of mobile in utility pay-as-you-go models", <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/01/Lessons-from-the-use-of-mobile-in-utility-pay-as-you-go-models.pdf>
 18. The "energy addressable market" is the number of people covered by mobile networks but without access to electricity. More information at: <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/01/Lessons-from-the-use-of-mobile-in-utility-pay-as-you-go-models.pdf>

Can PAYG solar home systems fill the market gap for customers in Kakuma Refugee Camp?

Interviews with potential and existing PAYG solar customers in Kakuma Refugee Camp and the host community suggest that their essential energy needs are lighting, entertainment, productive use (for small businesses, such as shaving parlours or refrigeration for shops) and cooking. PAYG SHSs can respond to many of these needs.

Table 1

Essential energy needs in Kakuma

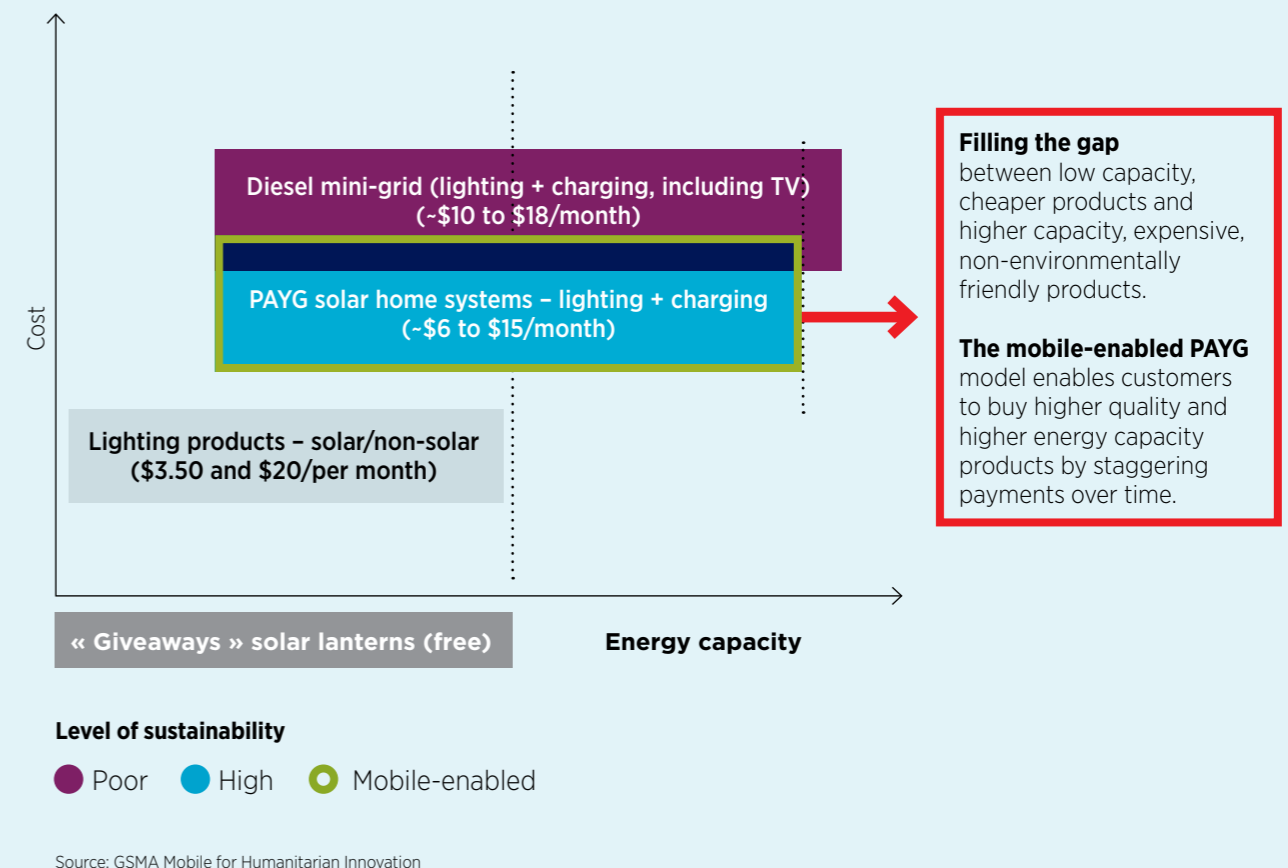
Energy need	Lighting for homes/outdoors	Entertainment	Productive appliances	Cooking
Beneficiary use	Mostly used for security at night and evening activities, e.g. studying, preparing meals.	Radio — and for higher income customers — TVs are in growing demand, although the ability to pay for larger appliances has not been confirmed.	Fridges and shaving devices for small business owners who currently use generators to power heavier loads.	Most homes use a mixture of firewood (provided by UNHCR or collected in the area) and charcoal. A few higher-income households use gas.
Potential for PAYG SHSs	PAYG SHSs can cater to these needs, especially given the range of lights that can be used in different rooms or outside.	Currently, most PAYG SHSs can power radios. For now, few of those sold in Kakuma power TVs.	Currently, PAYG SHSs sold in Kakuma Refugee Camp do not have the capacity to power heavier loads.	Not applicable to PAYG SHSs.

Filling the market gap between cheaper low-capacity energy products and expensive, unsustainable higher capacity products

Figure 4 compares the three main energy sources in Kakuma to illustrate how PAYG SHSs enable customers to buy higher quality products (longer lasting and more environmentally sustainable) with greater energy capacity to light and charge devices throughout the night (depending on the capacity of the SHS).

Figure 4

Comparing energy solutions in Kakuma Refugee Camp



While lanterns or torches are the cheapest product per unit on the market,¹⁹ some are more durable than others. Some low-quality torches do not last more than two weeks. The energy capacity (storage) of lanterns and torches is limited to a couple of hours a day, and even less for lanterns with a charging port. Depending on how regularly they are replaced,²⁰ these products can end up being more expensive than higher quality products with greater capacity.

On the other end of the cost spectrum are diesel mini-grids, which are the most expensive source of energy.²¹ These mini-grids can power an entire area of a camp, including higher load household and business appliances (such as fridges or TVs) for about five hours a day. Diesel mini-grid customers reported that they never have 24-hour access to electricity.

The mobile-enabled PAYG payment model therefore enables customers to access higher quality products by allowing payments to be staggered over time.

19. Costs vary; according to interviews, the cheapest is approximately \$3.50 while some are sold for \$10 or even \$20.

20. For the purposes of the graph, it is assumed that customers replace once a month.

21. Costs also vary depending on the load requirement of each household. On average, customers paid \$1,500 per month for five hours of lighting and charging.



Pricing structures of PAYG solar home systems

There are two main pricing models for PAYG SHSs: financed purchase and energy as a service.²² The financed purchase model is the only one currently available in Kakuma Refugee Camp and the surrounding host community.

PAYG business model	Pricing structure	Ownership	Service support
Financed purchase	<p>Various installment arrangements and possible down payment, with a payment schedule outlined in the customer contract.</p> <p>In some cases, once a customer has paid for the SHS in full or proven sufficient repayment, they may be able to buy additional products on credit.</p>	Customer owns asset at the end of the repayment period (between one and three years).	Service and support may be provided for a fixed term. Some offer extended service and support at the end of the fixed term.
Energy as a service	Continuous payments for the life of the service contract, with possible down payment.	Service provider always maintains ownership of the asset.	Service and support are key, offered over the life of the contract.

Comparison of PAYG solar home systems available in Kakuma:²³



PAYG solar agents working in Kakuma Refugee Camp and the host community mentioned that the deposit was a significant obstacle to selling more systems. However, a deposit is necessary for companies to limit credit risk and ensure customers are committed, highlighting the difficult but critical balance of keeping costs low while having a sustainable commercial model.

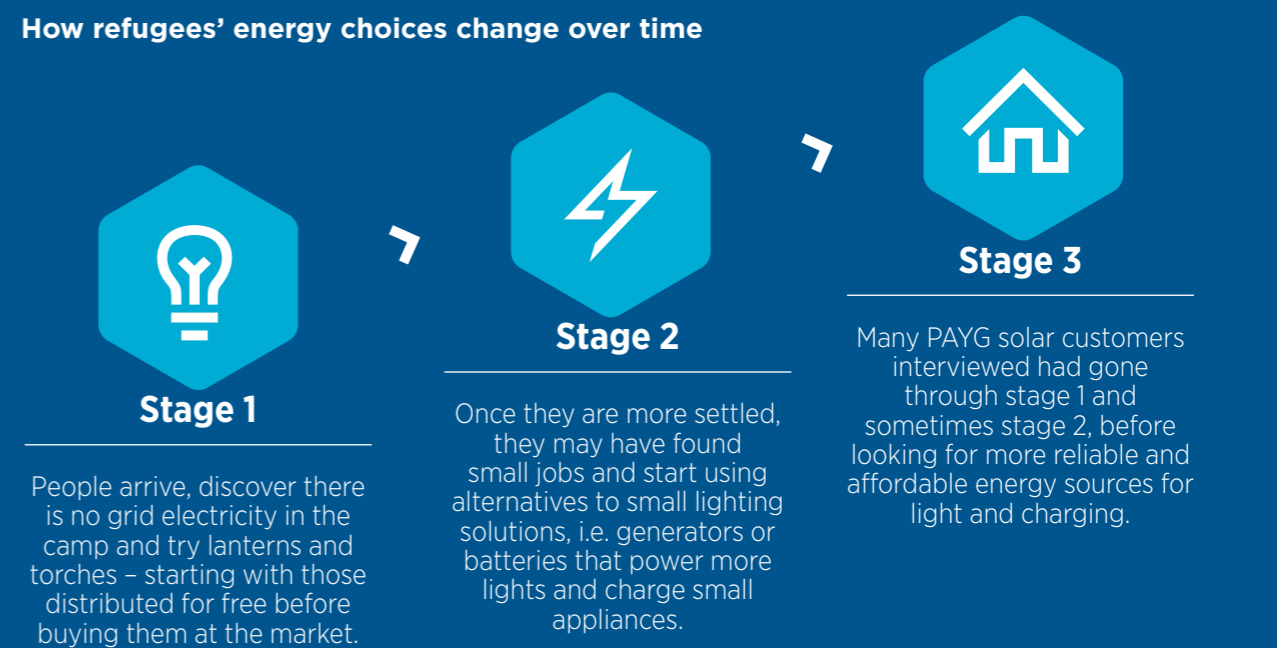
This is a particular challenge in hard-to-reach areas such as refugee camps where the logistics of transporting equipment without proper roads or infrastructure increases the cost of products. One PAYG solar provider reported that they had to increase the price of its SHS by a few dollars to compensate for those additional costs.

Enabling refugees to move up the energy ladder

Our research findings suggest that refugees go through three stages of energy choices and sources (Figure 5). Over time, most refugees upgrade from simple torches to multiple lighting solutions and, if possible, charging solutions offered by diesel mini-grids and PAYG SHSs. This evolution is consistent with UNCDF's "energy ladder hypothesis".

Figure 5

How refugees' energy choices change over time



22. GSMA M4D Utilities (2016), "Feasibility study: Assessing the opportunity for pay-as-you-go solar in Pakistan", <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/M4D-Utilities-Feasibility-Study---Assessing-the-opportunity-for-PAYG-solar-in-Pakistan.pdf>

23. For BBOXX pricing, see: https://mei.chathamhouse.org/file/2474/download?token=cKjVcZC_

PAYG solar providers: Key drivers for entering refugee camps

While this report has highlighted the motivations for humanitarian organisations to support new and sustainable energy solutions such as PAYG SHSs, our research also explored the key drivers for PAYG solar providers, with a specific focus on the business case.

PAYG solar providers piloting SHSs in Kakuma Refugee Camp highlighted some of their main reasons for entering the market. In general, all saw an opportunity to expand their services and/or technology to untapped, harder to reach off-grid areas.

Market Opportunity

“We were looking for density of population in the difficult area of Turkana that has mobile coverage.”
PAYG solar provider #1

“Going to a refugee camp was a differentiator in Kenya, which already has a mature PAYG solar market.”
PAYG solar provider #2

“We knew of a potential demand, we had seen some of our SHSs make their way informally to refugee camps. We thought of how to make this formal.”
PAYG solar provider #2

Financing (Grants)

“We were beckoned by donors interested in providing energy access in refugee camps; so we are trying.”
PAYG solar provider #3

Social Impact

“Refugees are fundamentally our target customer groups, as they are off-grid/unreliable grid and have low economic opportunity.”
PAYG solar provider #4

The business case is reportedly stronger for newer companies than more mature ones. For newer companies, the need to differentiate themselves, particularly in a market like Kenya where the PAYG SHS market is relatively mature, and the ability to receive grant funding to test and develop a model for humanitarian settings, are some of the reasons why newer companies may have a stronger incentive to experiment and validate the business model for PAYG solar in refugee contexts.

Drivers for MNOs to partner with PAYG solar providers in refugee camps

Mobile connectivity and mobile money are key to the deployment of PAYG SHSs. In Kakuma Refugee Camp and host community, these services are already in place, provided by Safaricom. However, there are some limits on mobile money use due to refugees' lack of identification, which will be

discussed later.

For MNOs already engaged in off-grid energy access, comparing common drivers to potential drivers²⁴ in refugee camps can help to evaluate the opportunity for MNOs.

Table 2

Drivers for MNOs to engage in energy access in rural off-grid vs. refugee camp settings

	New revenue streams				Innovation and partnerships	Social impact
	Customer acquisition	Reduced churn	Mobile airtime/data increase (ARPU uplift)	Increased mobile money adoption	Brand visibility	Providing services to vulnerable communities
Rural off-grid scenario	✗	✗	✗	✗ (especially in a new market)	✗	✗
Refugee camp scenario	✗ High population density in camps offers higher potential for customer acquisition	✗ Less certain due to mobility of refugee ²⁵	✗	✗ (depending on maturity of agent network)	✗	✗

Although the rural off-grid scenario differs, sometimes greatly, from the refugee camp setting, examples from existing deployments in rural/off-grid areas illustrate some of the drivers presented in Table 2.

- In 2016, PAYG solar provider, Mobisol, generated \$0.58 in monthly transaction fee revenues per SHS for MTN Rwanda. SHS owners made an average of 5.1 mobile money payments every 90 days, and 20 per cent were new mobile money users.²⁶
- In Nigeria, MTN is co-branding its service with PAYG solar provider Lumos, and is helping to build the customer-facing relationship. The partnership allows Lumos to use MTN's distribution, sales and after-sales support and keep service costs to a minimum.²⁷ In turn, MTN Nigeria values the innovation and social impact this partnership brings to their brand and product portfolio.

Entering refugee camps is likely to increase customer acquisition, mobile airtime and data, especially when provided with new charging solutions. Other drivers are less certain, such as reduced churn and mobile money revenues, but the potential positive impact on an MNO's brand is an argument for stronger engagement with PAYG solar providers beyond simply leveraging existing mobile platforms.

24. GSMA Mobile for Development Utilities 2018 Annual Report: <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/01/Achieving-SDGs-6-and-7-The-promise-and-impact-of-mobile-technology.pdf>
 25. However, as per UNHCR data, refugees stay in exile for an average 10.3 years.
 26. GSMA Mobile for Development Utilities 2017 Annual Report: <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/07/Mobile-for-Development-Utilities-Annual-Report.pdf>
 27. GSMA Mobile for Development Utilities (2017), "Lessons from the use of pay-as-you-go models", <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/01/Lessons-from-the-use-of-mobile-in-utility-pay-as-you-go-models.pdf>

Challenges to deploying PAYG solar in refugee camps

Given the market gap in affordable higher capacity energy solutions, the opportunity for PAYG solar in refugee camps is clear, especially for customers, humanitarian organisations and PAYG solar providers. However, to fully validate the business case, the challenges of entering and implementing these solutions in refugee camps through public-private sector collaboration must be considered.

Contrary to popular belief, refugees' ability to access and pay for mobile technology is not always a barrier to the successful deployment of PAYG solar products.



Common misconceptions of refugees

Are PAYG solar solutions viable in refugee camps? Testimonials from the field debunk some common misconceptions about refugees' access to mobile technology and their ability to pay.

Misconception #1: Refugees do not have access to mobile phones and there is no connectivity in the camp

"I am the one to have a phone in this house, if the kids want to use it, they ask me. It's like that in our community. Sometimes, older children get a phone too. We have mobile signal here and across all camps of Kakuma. It only gets worse in the last and newest part, Kalobeyei."

Nnema, Sudanese, mother of four children, refugee in Kakuma since 1993²⁸

Misconception #2: Refugees have low technological literacy

"The kids love to play with the phone but we have to limit the usage. Only the elders who don't have any children to help have issues using the phone, most people manage."

Esperance, Burundian, refugee in Kakuma since 2009

Misconception #3: Refugees cannot pay for energy

"I spend KES 1,500 (USD 5) a month on this generator and only get 5 hours electricity a day, but I pay, I need it. Paying monthly is ok, as I get my incentive revenue every end of month. I get KES 10,000, so in the end I spend a lot on energy."

Rebecca, Sudanese, refugee in Kakuma since 1995

"I use torches for lighting my home. Once the UNHCR one got spoilt because my kids kept playing with it in the dust, I started getting torches on the market. The price varies — between KES 350 and 1,000 (\$3.50 and \$10). Some last a month, others last 2 weeks."

Cecilia, Somali, refugee in Kakuma since 2013

"A mobile phone charge is 20 bob (\$0.20) at the market and I may charge once, twice or three times a day. In total I spend KES 600 or 800 (\$6–8) on charging per month."²⁹

Jean Claude, Burundian, refugee in Kakuma since 2009

Misconception #4: Refugees and host community members do not invest in owning assets

"I earn KES 4,000 (\$40) a month in incentive³⁰ and mostly charge my phone at my friend's place for free. We have some torches at home. If I were to invest in a solar system, I would need to know it will bring me money."

Joseph, Kenyan, lives in Kakuma town

"As a PAYG solar agent, I am self-employed. I get paid on a commission basis and don't have limits to how much I can earn in a month."

PAYG solar sales agent

28. This point is confirmed by MEI's report: "Nearly all families own at least one phone, the average being 1.6 phones per family." <https://www.chathamhouse.org/sites/default/files/publications/research/2018-01-30-meeting-refugees-energy-needs-burkina-faso-kenya-mei-corbyn-vianello-final.pdf>

29. Refugees who are employed by humanitarian organisations in the camp receive incentive revenues rather than a salary.

30. A 2018 MEI report found that in Kakuma, refugees spend on average \$3.72 on lighting and \$0.35 on phone charging per month. The different prices reported in our interviews may be due to the fact that most respondents were potential or current PAYG solar customers, with higher purchasing power. <https://www.chathamhouse.org/sites/default/files/publications/research/2018-01-30-meeting-refugees-energy-needs-burkina-faso-kenya-mei-corbyn-vianello-final.pdf>

Upfront challenges for PAYG solar providers: The complex environment of refugee camps

For PAYG solar providers, entering a refugee camp is not the same as entering an off-grid or rural area. Refugee camps are a complex and unique context due to:

- **Governmental regulations** (entry into the camp, identity requirements for SIM registration and mobile money);
- **Balancing humanitarian and private-sector approaches;**
- **The impermanent situation for refugees;** and
- **Limited robust data on refugee income and willingness to pay.**

Governmental regulations

- **Entry into the camp**
 - Getting the right authorisations to enter a refugee camp can be complex, even without an intention to deploy a commercial product.

“We tried to do a consumer survey in a refugee camp to evaluate the potential for us to provide our service. Without the right contacts in the field, we didn’t know how to proceed. In the end, we weren’t able to go in.”
PAYG solar provider

- **Grey zone of accessing mobile money services**
 - Opening a mobile money account requires a recognised identification document. The Refugee ID (i.e. UNHCR manifest) is not accepted, which suggests that unless the refugee has a formal passport from their country of origin or an Alien ID issued by the Kenyan government, they will not be able to open a mobile money account in their own name.³¹

Balancing humanitarian and private-sector approaches

- **Risk of market distortion due to giveaway energy products and grants**
 - Due to giveaways of small and often low-quality solar products, PAYG solar providers believe that refugees are less willing to pay for energy products. However, this is changing as UNHCR moves away from giveaways.
 - Similarly, while grants are necessary to encourage PAYG providers to enter the market, caution must be taken to avoid distorting the market by reducing the prices of SHSs to unsustainable levels without subsidies.
- **Risk of short-term vision: focusing on customer numbers rather than customer quality**
 - Grants and target beneficiary numbers requested by donors may reduce the focus on acquiring long-term customers with a good repayment record, and instead prompt providers to sign up high numbers of customers fast without considering the risk of higher default rates.
- **Unrealistic demands due to different mandates**
 - NGOs may support the implementation of PAYG solutions, but often cannot handle cash collection. PAYG solar providers need to either develop their own network of agents or find other partners to do it, which increases the complex logistics of working with multiple partners.
 - An NGO may ask a PAYG solar provider to deploy at large scale (e.g. 10,000+ units), and while delivering this quantity may not be an issue, if an NGO cannot guarantee the credit provision, the risks will be too high for the PAYG solar company to deliver at this scale.



The impermanent situation in refugee camps is reflected in customer mindsets

- **Refugees pay for energy and often live in camps for several years.** However, their situation remains — at least in their mind — impermanent, which has an impact on commercial models that involve contracts and long-term commitments.

Limited robust data on refugee income and willingness to pay

- **A large segment of refugees relies on incentive revenues, informal jobs within the camp (e.g. “householding”), assistance from humanitarian organisations and remittances.** Collecting reliable data on a refugee’s ability and willingness to pay for energy access is challenging via surveys, and until SHSs are deployed on a larger scale the demand for energy access cannot be validated. The GSMA M4H programme recently conducted surveys with refugees and host communities in Jordan, Uganda and Rwanda to explore ability and willingness to pay for mobile-enabled services (such as mobile financial and energy services). The findings of this survey will be released in the second quarter of 2019.

31. “In most refugee-hosting countries, MNOs are now subject to mandatory SIM registration obligations which require customers to present an approved identity document before a SIM card or mobile money service can be activated. Displaced populations may, especially at the outset of their displacement, lack the identity documents required to pass KYC criteria; this means that in markets where humanitarian-issued IDs are not accepted for KYC purposes, asylum seekers and refugees face challenges or delays obtaining a government-issued ID.” <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/06/Refugees-and-Identity.pdf>

Operational challenges

In light of the complex environment and impermanence of the refugee camp setting, the value proposition for PAYG solar agents and customers can be more difficult for PAYG solar providers. Some of the main challenges providers face in implementing their solutions in refugee camps include:

- **Refugees’ perceptions of their temporary status;**
- **Customers “lost in translation” due to the diversity of languages;**
- **Logistics and distances;**
- **Lack of incentives for agents;** and
- **Payment limitations.**

Refugees’ perceptions of their temporary status

- **This is an operational challenge for two reasons:**
 - The risk of customers leaving the camp before they have repaid the provider in full and cannot make payments from their new location outside the country where the system was purchased (e.g. Kenya).
 - “Loyalty” and building a credit history to access additional services are less tangible and appealing to customers who are not planning to stay in one place or one country.

Lack of incentives for agents

- **Due to the difficult environment and low customer acquisition,** refugee agents can lose motivation.
- **They also often consider leaving the camp,** resulting in less engaged agents who may mis-sell the product or make false promises to customers (e.g. “your system will power your TV or your fridge”).

Customers “lost in translation” due to the diversity of languages

- **In Kakuma, 19 nationalities cohabitate, speaking multiple languages.** This affects understanding of contracts, the benefits of SHSs and other important information that is not available in their language.
- **The multiplicity of languages can easily lead to approximate translations between agents and customers, resulting in potential misunderstanding and mistrust of the product and service.**

The example of a customer defaulting because he had not understood that he was under a contract is illustrated below:

“With my generator, I pay when I use it but it’s not the same with my SHS. When I left for 3 months and got back, I didn’t understand why I didn’t have light after paying 600 shilling to top up. It is only now that you come to explain that I understand that it is a contract, I need to pay the 3 months I didn’t use. It’s ok but the solar system needs to work and agents need to explain better.”

Hassan, Sudanese, refugee in Kakuma refugee camp since 2010

“Our agents, some leave the camp or [are] repatriated, some get less motivated because of different priorities and the work is hard. Many have several small jobs too. Right now, with the peace agreement in Sudan, many Sudanese went back without even informing UNHCR.”

PAYG solar field manager, Kenyan working in Kakuma refugee camp since 2017



Logistics

Kakuma has a particularly harsh climate — it is extremely hot most of the time, and dusty and windy, making it a less attractive and more difficult place to do sales. Field managers reported that many people faint while doing this work.

- **Transportation:** Kakuma is very spread out in some areas (between camps) and dense and winding in others (in between houses, etc.). Having the right transportation — motorcycles and bicycles — is critical for mobility.
- **Logistics and storage:** SHSs are mainly stored in Nairobi (the headquarters for a number of SHS providers). Delivering new or replacement pieces to Kakuma can take up to four months.

“I think the number one challenge for us as agents is the availability of equipment in the camp. Once a customer needs a replacement piece, it can take weeks or months to bring from the HQ to Kakuma. People get tired. And they have to go back to their old ways even with the PAYG solar system in their home.”

PAYG solar agent, Somali refugee working since 2016 in Kakuma refugee

Payment limitations for lower income segments

“I would say one of the biggest challenges for us is the payment. About 50% of refugees are from the Bottom of the Pyramid and have very little revenue. We need to reach these people, there is a need for products for all the tranches of the population but right now, PAYG solar solutions are still for higher income refugees, such as those who have small shops.”

PAYG solar agent

“It is the end of month now and people get their incentives, so we run around to remind people to pay for their systems. Door to door and through phone calls. But we need to be there, every agent has an allocated perimeter for people to know him/ her. That is crucial.”

PAYG solar field manager, Kenyan working in Kakuma Refugee Camp since 2017

The socio-economic impact to date

Despite these challenges, since 2016, over 1,000 PAYG solar home systems have been leased or sold³² in Kakuma Refugee Camp and the host community, thanks to the efforts of several PAYG solar providers and the support of humanitarian organisations.

Main benefits of PAYG solar home systems

The following testimonials summarise the main socio-economic benefits of SHSs for customers in both the camp and the host community. While customers in both areas reported the same broad benefits, refugees in the camp appeared to have

more immediate needs (e.g. to use their mobile phone, to be safe), while for members of the host community, it appears that the SHS adds comfort to their lives (they feel more at home and save more money).

Main benefits of using PAYG solar home systems for refugees and the host community

 <p>Comfort To feel at home</p>	 <p>Savings To save money</p>
 <p>Phone use To use my phone more</p>	 <p>Security For the security of my shop</p>
 <p>Safety To be safe at night</p>	 <p>Education For children to study at night</p>
 <p>Business For business outlets to be open later</p>	

32. This conservative estimate is based on interviews of three PAYG SHS providers piloting their products in Kakuma Refugee Camp.



To save money for my business

"The generator is KES 1,500, instead the PAYG solar system I have is KES 1,250. I can do things with the savings. The system has potential to give me more, like if I could charge 4 or 5 phones at a time — that would be good. Only issue is our curfew, even if we have light at night, we have to close shop at 7 or 8 pm, latest."

Jamal, Sudanese, refugee in Kakuma since 2009



To use my phone more

"I used to have to go to town to charge my phone, now I can do it at home and I can use my phone more often. I also use my phone to pay via M-Pesa for the system. It's practical. I would say this is the biggest service I use my M-Pesa for."

I also charge neighbours' phones for a small fee, so helps me pay back my solar system."

Joseph, Kenyan, living in Kakuma town



To be safe at night

"One evening, I got bitten by an insect, it was 2am, I had no clue what it was and if it would bite me again. I went out and screamed for help."

This is when I decided I needed a proper light at home and we got a solar system, for security. I feel safer now."

Khaltoum, Sudanese, refugee in Kakuma since 1995



For children to study at night

"I was born here, I am 24 and I have two children. I want them to be able to do their homework and maybe have a better future. So I bought a solar home system. One light is in the children's room and one is in the main room."

Hiba, Sudanese refugee



To feel at home

"The solar system makes the house comfortable, we have light and music. I can charge my speaker too. My wife and children stay at home instead of going out to the neighbours."

John, Kenyan, living in Kakuma town since 2010



For the security of my shop and to be open later

"In the host community, there is lots happening so it makes us feel secure to have lights at night — we have three outside and one inside the shop. It also tells our customers we are open in the evening. We usually close at 9pm now, instead of 6."

Diane, Kenyan, living in Kakuma

Considerations for the future: The roles of key players

PAYG solar providers: It isn't all business as usual

The PAYG solar providers we interviewed did not suggest a differentiated marketing approach for refugee camps, other than costing.³³ However, there are some specific considerations that could help address the challenges mentioned earlier.

Tackling upfront challenges

• Understand local regulations and operating environments

- Work with humanitarian organisations to understand the local context, including regulations and suppliers (e.g. local distributors and storage companies), before going business on the ground.
- Consider piloting in countries where the regulatory environment in refugee camps is more open to commercial solutions. For example, in Uganda and Rwanda, refugees can work legally and move more freely.

• Balance humanitarian and private-sector approaches

- Key resources and market intelligence, such as the GSMA M4H programme, the SCC and MEI, can help in understanding the mandates and priorities of humanitarian organisations, and how to deliver a commercially viable product that suits the humanitarian context.
 - Know how to present the value proposition of SHSs to humanitarian organisations: what impact does an SHS have on beneficiaries' lives and in turn, how can these commercial models help cut costs for humanitarian organisations?
- In line with UNHCR's 70/30 policy (70 per cent of support to refugee camps and 30 per cent to the host community), it would be prudent to address the energy needs of the host community, as well as those of refugees.

"In Kakuma, our partners were crucial for us to understand the demand within the camp and gave us confidence in the stability and potential of the local market."

PAYG solar provider

• Address the impermanent situation and unique economies of refugee camps through financing models

- Have a better understanding of potential customers' payment behaviours to adapt the business model, pricing structure and payment timeline accordingly. Beyond surveys, PAYG solar providers need to pilot their models on the ground to better tailor their products to customers' needs.
- Look for funding to de-risk initial credit for systems. Given the uncertainty around refugee customers' ability and willingness to pay (due to the nascency of commercial offerings in humanitarian contexts), seek the support of innovation funds and grants.

Operational challenges to address when rolling out

• Invest in field agents familiar with the local context to educate refugees on SHSs

- Field research indicates that customers prefer interacting with field agents than call centres. It is crucial to invest time and money in field agent training to ensure customers are sufficiently educated in SHSs, the benefits they offer and how repayment works over time.
- Work with agents that speak several of the languages spoken in the local context, as conveying certain nuances may be crucial.

• Offer agent incentives to build loyalty and increase sales

While costs need to be controlled, incentivising agents in camps is critical given their important role as the face of the SHS product and service. Suggestions for improving agent performance include:

- Incentive schemes for agents, especially high-performing agents (e.g. receiving airtime bonus, advance credit);
- Providing a helpline for agents;
- Conducting regular refresher training for agents; and
- Considering monitoring visits by field representatives.

• Consider the vast and difficult physical terrain, particularly for the supply chain

- Set up or leverage an existing stock shop closer to the camp. In the long run, it will lead to economies of scale and avoid long waiting times for replacement parts, which can disincentivise existing SHS customers.

• Offer flexible payment options

- Offer a range of pricing structures and repayment schedules to cater to refugees' differing abilities to pay.
- PAYG SHS payments are made via mobile money. If access to mobile money is limited in the short term, PAYG solar providers will need to use alternative methods, such as leveraging their agent network to make payments in the place of customers, although this is costly and could limit scale.
- Partnering with local distributors for payments and cash collection should be considered, although working with multiple partners introduces complexity of its own.

A better opportunity for new players?

"As long as the necessary time, effort and money is invested in navigating and understanding the peculiarities and diversity of the place, even refugee camps can be vibrant, high-impact markets."

PAYG solar company in Kakuma since July 2016

Interviews with more mature PAYG solar providers appeared to show that the opportunity in refugee camps was not as strong in the immediate future. Given their shareholders' and investors' current priorities, they do not have the time or resources to dedicate to new and untested business opportunities.

This leaves the door open for newer players to invest in deploying PAYG SHS in refugee camps, to further define the business opportunity and, in the case of Kakuma Refugee Camp and to tackle misconceptions that it is impossible to operate in these contexts.

33. A PAYG solar provider explained that the logistics and transportation costs to Kakuma are so high that they increased the price of the system to compensate.

Humanitarian organisations: Facilitators, gatekeepers and funders

Humanitarian organisations can play a strong mediation role in the deployment of PAYG solar home systems in refugee camps and should consider the following:

Familiarise PAYG solar providers with local humanitarian contexts

Introducing PAYG solar providers to the local context (e.g. specific regulations, field actors) is a critical success factor for PAYG solar providers and ensures they are aligned with the humanitarian mandate to “do no harm”.

Briefing PAYG providers on the local context can also include important regulatory requirements for mobile money account registration. In some countries, this regulation can be vague, particularly for refugees. In other countries, regulation may allow refugees to register for mobile money services with their UN-issued ID card, but they may not have timely access to these forms of ID or they may only be valid for short periods, effectively cutting off access to mobile-enabled services.³⁴

Consider short-term financing support

To fill the “larger than lighting” needs of the refugee population, humanitarian organisations could consider extending financial support for PAYG solar solutions to help providers avoid some of the upfront risks. For example, this financial support could help providers with their initial capital expenditure for units while customers pay their regular installments.

Support a conducive market environment by encouraging fair competition

As has been experienced in various refugee contexts, the distribution of free and often low-quality energy products to beneficiaries distorts the market and reduces willingness to pay. In the future, humanitarian organisations should consider removing these products or providing “giveaways” (typically basic, short lifespan lanterns) to only the most vulnerable refugees.

MNOs: Platform providers with the potential for greater engagement

Field research showed increased use of mobile phones by PAYG solar customers in both Kakuma Refugee Camp and the host community. A 2018 Chatham House study indicates that 73 per cent of refugees would use their phones more if they could charge them more easily.³⁵

However, there are potential unlocked revenues as refugees have limited access to mobile money services due to current identity restrictions. Research by the GSMA M4D Utilities programme highlights the revenue opportunity of PAYG solar for MNOs; for example, in 2016,³⁶ over 1.6 million

mobile money transactions were recorded every month to top up PAYG solar products and, in Ghana, PAYG solar provider PEG demonstrated that its customers generated 122 per cent more revenue per active user for Tigo Cash than non-PEG customers.³⁷

Depending on the local context, the drivers for MNOs to partner with PAYG solar providers in humanitarian contexts will vary. Accordingly, there are different levels of engagement MNOs could consider:

Figure 6

MNOs: Different levels of engagement are possible

Depending on the local context, the drivers to partner with PAYG solar companies (listed above) will have more or less appeal for each MNO. Below are different engagement levels MNOs should consider:

Low to High	Medium	High – Partnership
<ul style="list-style-type: none"> • Ensuring mobile connectivity (including data) in both refugee settings and the host community. • If connectivity is already in place, engagement between MNOs and PAYG solar providers can be minimal. MNOs will directly benefit from PAYG SHS deployments in terms of more service use (airtime, data and mobile money). • If connectivity is not in place, a high level of engagement will be required. Given the costs of deploying a tower, the value proposition will need to be strong. The PAYG solar proposition may need to be coupled with other incentives. For example, in addition to the ability to pay for mobile-enabled solar home systems, the ability to provide mobile money-enabled humanitarian cash transfers would also be necessary. 	<ul style="list-style-type: none"> • Ensuring mobile services (including mobile money) and MNO agents are accessible to the refugee population and host community, i.e. in close proximity/within the camp. • Depending on the mobile ecosystem and regulations in place, leveraging MNOs’ services and agent networks may be a low to medium level of engagement. MNOs would benefit from expanding their services and networks to new untapped areas. • In the case of Kenya, there is a lost opportunity for MNOs and PAYG solar providers. As regulations around mobile money use for refugees are unclear, PAYG providers often have to process mobile money payments themselves, which limits scale and makes it difficult to control costs. It also limits revenues for MNOs. 	<ul style="list-style-type: none"> • Partnering directly with a PAYG solar provider, e.g. giving visibility to their products by leveraging the MNO’s marketing channels and their mobile services and networks; providing reduced prices or bonuses for PAYG solar clients. • This will be a high level of engagement as both partners will be involved in product sales and possibly service provision, combining their respective competencies. • In addition to expanding services to new areas and increasing revenues, strong partnerships will attract MNOs interested in enhancing their brand reputation with a strong social mission in the country, and which may have already guaranteed connectivity in these areas.

While the opportunity for MNOs to engage in the deployment of PAYG solar products in rural settings is strong, in refugee camps, additional evidence and data on use (ARPU)³⁸ and increased use of mobile services (airtime, data, mobile money) are needed to understand which type of engagement MNOs should consider.

34. UNHCR (February 2019), “Displaced & Disconnected: Addressing Legal Barriers to Accessing Mobile Connectivity & Financial Services”, [ADD LINK ONCE REPORT IS LIVE]

35. MEI (2018), “Prices, Products and Priorities: Meeting Refugees’ Energy Needs in Burkina Faso and Kenya”, <https://www.chathamhouse.org/sites/default/files/publications/research/2018-01-30-meeting-refugees-energy-needs-burkina-faso-kenya-mei-corbyn-vianello-final.pdf>

36. GSMA Mobile for Development Utilities 2018 Annual Report: <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/01/Achieving-SDGs-6-and-7-The-promise-and-impact-of-mobile-technology.pdf>

37. Daniel Waldron and Michiel Wolvers, CGAP (27 February 2017), “Daily Energy Payments Powering Digital Finance in Ghana”, <https://www.cgap.org/blog/daily-energy-payments-powering-digital-finance-ghana>

38. Average revenue per user

Conclusion

A PAYG solar provider recently noted, *“Nothing is for sure, we need to have faith and pilot the model.”* However, pilot funding to PAYG solar providers in refugee camps came to an end in December 2018, and while some providers may continue to test the model, particularly newer ones, the future is uncertain without strong support from humanitarian organisations as facilitators and/or funders.

After piloting on a small scale and proving the demand for new or alternative energy solutions to torches and generators in refugee camps and host communities, providers need to achieve higher volumes, i.e. reach as many customers as possible — not just small business customers with higher incomes — without compromising the quality and sustainability of the products.

Prices also need to be kept low to ensure high repayment rates and loyal customers, and timelines need to be adjusted to the local context. However, low prices and extended repayment timelines may make the credit risks too high for PAYG solar providers to move forward on their own. It also increases the risk of customers leaving the country without paying for their system in full. Therefore, at least in the short term, subsidies from grant assistance are important to “absorb operation costs before breakeven is reached.”³⁹

PAYG companies may also consider exploring new partnerships to offer more value-added services to customers. For example, partnering with microfinance institutions could help offer new financial services to refugees, provided an enabling regulatory environment is in place. Although more partners can bring complexity to the offering, it may also give customers more incentive to pay.

The alternative will be selling solar home systems at a higher cost, filling the energy access gap for higher income segments of the population in the short term. Maybe that is where it will start — as it did for PAYG solar in other parts of Kenya or M-Pesa — to trickle down and ultimately reach all segments of the population in Kakuma Refugee Camp and the surrounding host community.

39. MEI (2018), “Market development activities – Supporting a solar retailer to test the market in a displacement setting”, https://mei.chathamhouse.org/file/2474/download?token=cKjVcZC_

Appendix

Research methodology

This study combined desk research on energy access and qualitative field research (see Annex for research questions).

Desk research (interviews over the phone/in Nairobi)

Type of company	Company
PAYG solar providers (with Nairobi HQs)	BBOXX, Azuri, Pawame
NGOs and energy experts	World Vision, Energy for Impact (Moving Energy Initiative), Practical Action, Power Africa (Smart Communities Coalition)
MNOs	Safaricom

Field research (interviews and focus group discussions, with the support of Pawame in Kakuma)

Type	Total
End-user interviews and focus group discussions (household and small business customers in both Kakuma Refugee Camp and the host community)	FGD: 4 Interviews: 10
Interviews with frontline workers (PAYG solar agents, MNO agents)	4
Interviews with humanitarian and energy experts (UNHCR and SNV)	2

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