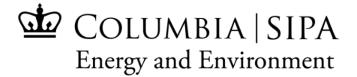# ALFAJIRI PROJECT

Assessment of market-driven solutions for energy access in refugee settlements in sub-Saharan Africa

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Acknowledgements

Purpose of Report

While significant progress has been made over the last few years to increase electricity access globally, in 2019, 771 million people still lacked access to this essential service (IEA, 2020). Many within that group include refugees and displaced persons, with approximately 80% of whom have little or no access to electricity services (Shell, 2020). Low electricity access has been shown to contribute to higher crime rates, lower levels of education, reduced income, adverse health outcomes, and increased fire hazards. However, connecting refugees to electricity grids can be expensive and often politically unfeasible as most camps and settlements are typically located in remote and sparsely populated areas. In recent years, various humanitarian organizations, non-governmental organizations (NGOs), public and private sector bodies have focused their efforts to finding solutions to address this widespread and urgent problem.

This report aims to assess past and current market-based interventions that target the provision or increase of electricity access in refugee camps and settlements. While some humanitarian organizations have historically provided direct funding or donations to attain this goal, the short-term and charitable nature of these capital injections often fail to provide the same degree of sustainability or infrastructure development that market-based solutions may offer. Organizations like the Smart Communities Coalition (SCC), Energizing Development (EnDev), Foundation of Netherlands Volunteers (SNV), Mercy Corps, and many others are increasingly opting to partner with private energy supply companies and developers to advance a sustainable market for clean, accessible energy resources within camps, settlements and host communities.

These interventions, along with increasing energy access, promote local employment, business growth opportunities, and skills and knowledge transfer through training. While these efforts are targeted towards a range of products and services, such as mini-grids, solar home systems (SHS), solar appliances, and clean cooking, our assessment will primarily focus on projects providing SHS and solar appliances, some of which have a clean cooking component.

Approach

This report summarizes findings from approximately 12 projects targeting the increase of energy access in refugee camps and settlements in Sub-Saharan Africa, achieved through partnerships between humanitarian organizations and the public and private sector. The projects chosen represent a diverse range with differences in geographic location, type of intervention deployed, duration of intervention, and enabling environment. A two-pronged approach was used for the analysis, which included extensive literature review as well as interviews with project sponsors and industry experts from energy service companies, donor organizations, and implementing agencies. Our analysis divides and assesses these projects based upon the type of intervention being deployed and further makes recommendations for the application of different interventions. The recommendations are based on the best practices and lessons learned from individual projects, existing literature, and the perspectives of project parties.

Due to the unavailability of raw data, we primarily focused on qualitative rather than quantitative analysis. Our ultimate goal was to analyze these projects across various parameters such as their funding approach, energy system type of usage, enabling environment, and make recommendations geared towards promoting the use of a holistic strategy in assessing energy interventions and in certain circumstances, promote the use of private sector driven solutions in order to ensure project sustainability.

Energy Access: Refugees

The United Nations (UN) Sustainable Development Goal 7 (SDG7) aspires to have everyone have access to affordable, reliable, sustainable, and modern energy by 2030. Africa has seen electrification rates increase in the recent past and it is now estimated that 52% of the population has access to electricity, although this remains below the global average (AfDB, 2019). With the majority of African governments recognizing that it is not economically feasible to provide on-grid electricity connection to all households and businesses, a hybrid approach has been widely adopted encompassing both grid and off-grid solutions in order to close the energy access gap. The off-grid approach provides a cost-competitive solution, especially in remote and sparsely populated areas where refugee camps and settlements are typically located. In some instances, national governments only extend grid coverage to its citizens, making refugee camps and settlements wholly reliant on decentralized off-grid solutions.

In 2019, the UN estimated that there were 79.5 million displaced persons globally with sub-Saharan Africa witnessing a tripling of growth over the last ten years to 6.3 million, from 2.2 million (UNHCR,2019), and with the number of internally displaced persons increasing from 6.3 million in 2009 to 17.7 million as at 2018 (UNHCR, 2018). The forcibly and internally displaced persons are mostly domiciled in camps and settlements in Uganda, Cameroon, Chad, Ethiopia, Kenya and the Democratic Republic of Congo (World Bank, 2017). Uganda hosts nearly 1.4 million refugees, making it the fourth-largest hosting country for refugees, with Ethiopia, Kenya, and Rwanda collectively hosting an additional 1.3 million refugees.

One of the main challenges that refugees in camps and settlements experience is access to clean, reliable, and sustainable energy, and this lack of access severely impacts their quality of life. One report estimates that 80% of refugees lack access to reliable electricity (Lahn & Grafham, 2015). The use of traditional biomass such as firewood and charcoal for cooking is prevalent in camps and settlements and often results in adverse health effects and premature deaths. An estimated 600,000 African fatalities occur each year due to indoor air pollution caused by cooking with firewood or charcoal (AfDB, 2019).

Collection of firewood may also exacerbate gender inequalities as women and children are often delegated this time-consuming role, taking time away from other useful activities and potentially exposing them to gender-based violence when they walk long distances to collect the firewood. For example, a study conducted in Nyarugusu camp in Kigoma, Tanzania in 2017 found that the average family spent 19 hours every week collecting firewood, and that 52 percent of the interviewees had experienced violence while collecting firewood the previous week (Moving Energy Initiative, 2019). Environmental impacts from the use of biomass include deforestation and loss of habitat and biodiversity. For household lighting, candles and kerosene lamps are typically used, but are wholly inadequate as they do not allow for free movement around the camp at night due to lighting insufficiency and pose a fire risk when handled improperly. Clean energy access, therefore, holds several benefits for the refugees, including providing adequate lighting for households that allows for children to study and for entertainment and income generating business activities to continue later into the night, enhanced safety due to public street lighting, safe and affordable cooking that leads to improved health outcomes, increased access to information, and the opportunity to engage in profitable activities through productive energy use.

Ultimately, many refugee camps are considered transitory, and many national governments aim to either resettle or repatriate the refugees back home after a period of time, with some notable exceptions such as Uganda which integrates and offers refugee citizenship pathways.

Role of Organizations in Humanitarian Settings

Humanitarian agencies have been instrumental in providing many required services to refugees, including food, water, shelter, and affordable energy access, and in some cases, multiple players such as donors and NGOs work alongside each other on the same issues. In addressing the energy needs of refugees, there is an increasing recognition of the need for a coordinated approach in the provision of energy products and services as disjointed disbursement may hamper the goals of increasing sustainable energy access.

Refugees in camps and settlements make up approximately 20% of energy demand with the other 80% utilized by humanitarian agencies' offices and public facilities, such as hospitals and schools, and host community members, with more than $1.6 billion spent per year on power and cooking (Shell, 2020). The energy products provided to the refugees rank from tier 0 to tier 1 (meeting basic electricity needs) to tier 5 (the highest level of access). The multi-tier framework approach considers energy connection beyond the access to electricity definition and considers capacity, duration, reliability, quality, affordability, legality and health and safety impacts as measurement criteria (World Bank Group, 2014). The products range from SHS for lighting needs, to briquettes and pellets which provide clean cooking solutions. One estimate shows that cooking takes up 74% of total energy spend for refugees with the host community spending 70%, with the reminder spent on basic lighting (Shell Report, 2020). Organizations deploy various interventions to increase product uptake, sales, and affordability. This is achieved by de-risking private sector investments through upfront or milestone-based grants and subsidies (both demand and supply side), and market development activities or technical assistance to promote consumptive, productive and/or public uses.

Attributes of energy supplye		Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Capacity	Household electricity	No electricity	Very lowe power	Low power	Medium power	High power	
	Household cooking	Inadequate capacity of the primary cooking solution				Adequate capacity of the primary cooking solution	
Duration and availability	Household electricity	<4 hours	4-8 hours		8-16 hours	16-22 hours	>22 hours
	Household cooking	Inadequate capacity of the primary cooking solution				Adequate capacity of the primary cooking solution	
Reliability	Household electricity	Unreliable energy supply				Reliable energy supply	
Quality	Household electricity / cooking	Poor quality of energy supply			Good quality of energy supply		
Afordability	Household electricity	Unafordable energy supply		Affordable energy supply			
	Household cooking	Unafordable energy supply				Affordable energy supply	
Legality	Household electricity	Illegal energy supply			Legal energy supply		
Convenience	Household cooking	Time and effor spent sourcing energy cause inconvenience			Time and effor spent sourcing energy do not cause inconvenience		
Health and safety	Household electricity	Unhealthy and unsafe energy system				Healthy and safe energy system	
	Household cooking	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5

Source: World Bank, ESMAP

Context for Energy Access

Uganda

Mapping the Energy Situation

Uganda enjoys a liberalized energy market and has a Feed-in-Tariff mechanism to promote the development of renewable energy. The country currently has 1,219 megawatts (MW) of installed

capacity and has a cost-reflective tariff structure. The Uganda Electricity Transmission Company Ltd. (UETCL) is mandated with supply of power and is the single buyer of electricity for the national grid. There is an independent Electricity Regulatory Authority responsible for sector regulation and oversight. Operating under a 20-year agreement, the largest and private distribution company is UMEME (UMEME, 2021). Approximately 60% of Uganda's electricity generation is provided by Independent power producers and the country is divided into 13 rural service territories in which six are powered by smaller distribution companies. The estimated renewable energy power generation potential is 5,300 MW, of which average solar energy is estimated to be 5.1 kWh/m² (UNREEEA, 2021).

Capital	Kampala
Region	Sub-Saharan Africa
Total Area (km²)	241,550
Total Population	44.3 million (World Bank, 2019)
Rural Population (% of total population)	76 (World Bank, 2019)
Current Electricity Access Rate (IEA, 2020)	Total: 75% Urban: 100% Rural: 65.7%
GDP (current US$)	35.2 million (World Bank, 2019)
GDP Per Capita (current US$)	794.34 (World Bank, 2019)
Current Electricity Access Rate (IEA, 2020)	Total: 23% Urban: 63% Rural: 11%
Installed Capacity (African Energy, 2020)	Total: 1,291 MW - Hydro: 1,006 MW - Solar: 59 MW - Bio: 97 MW - Other/Diesel/HFO: 129 MW
WB Ease of Doing Business Index (The World Bank, 2021)	116

Continent-Wide Energy Access

In 2015, the member Heads of State and Governments of the African Union released the Africa Case, built on the premise of "Agenda 2063" and in line with SDG 7, of accelerating Africa's economic development and universal access to electricity and clean cooking for the continent. To accomplish this, the governments would need to triple the average number of people with access to electricity from 20 million to 60 million by 2030. The Africa Case outlook predicts that Africa's economy will be four times as large in 2040 than it is today; yet total primary energy supply is expected to increase by only 50%. In a Stated Policies report, energy demand is expected to be lower than predicted by the Africa Case (IEA, 2019). The reasons for this decline in primary energy demand is phased out dependence on biomass coupled with improved energy efficiency and investments in renewable energy. The International Energy Agency (IEA) Sustainable Development Scenario estimates that an annual investment of $20 billion USD from 2021 to 2030 will be required to actualize these ambitions (IEA, 2020).

In spite of the ambitious electrification plans and government commitments, continent-wide full energy access remains a challenging and critical task for policymakers. Electricity demand in Africa today is 700 terawatt-hours (TWh)

(IEA, 2020). Prior to the COVID-19 global pandemic, about 600 million African people lacked access to electricity and approximately 900 million lacked access to clean cooking (IEA, 2020). It is predicted that COVID-19 will push more than 30 million Africans back into energy poverty with the worst affected countries identified as Nigeria, Ethiopia, Kenya, Tanzania and Cote d'Ivoire (IEA, 2020). In countries with abundant renewable energy sources, their use and exploitation offer the most cost-effective solution to enable universal access, and investments in decentralized solutions will be critical to alleviating energy poverty. And while Africa has the most abundant solar resources in the world, the continent has only installed roughly five gigawatts (GW) of solar PVs, which equates to roughly one percent of the global total (EIA, 2019). Increasing off-grid connections in remote rural areas, driving down costs of small-scale solar photovoltaics systems, and encouraging the implementation of mini-grids will be key. While rural areas are more susceptible to energy poverty, favorable policies implemented by governments can address some of the challenges in the region and allow the exploitation of the natural resources available.

East Africa Energy Access

This report focuses primarily on countries and respective refugee camps situated in East Africa, and therefore a regional analysis of the

Kenya	
Mapping the Energy Situation	
Kenya's power sector is one of the most developed in the region having attracted Independent Power Producers (IPPs) to its energy market in the 1990s. Kenya has a Feed-in-Tariff policy for the procurement of renewable energy generation capacity. Kenya Power is the sole off-taker of energy and the Energy and Petroleum Regulatory Authority regulates the energy sector. Kenya has approximately 2,819 megawatts (MW) of generation capacity with the government seeking to add an additional 7,200 MW to the grid by 2030.	
Capital	Nairobi
Region	Sub-Saharan Africa
Total Area (km²)	580,370
Population (KNBS, 2019)	47.5 million (2019)
Rural Population (% of total population)	72 (World Bank, 2019) (KNBS, 2019)
GDP (current US$)	95.5 billion (World Bank, 2019)
GDP Per Capita (current US$)	1,816.55 (World Bank, 2019)
Current Electricity Access Rate (IEA, 2020)	Total: 75% Urban: 100% Rural: 65.7%
Installed Capacity (African Energy, 2020)	Total: 2,819 MW - Hydro: 826 MW - Geothermal: 828 MW - Thermal (MSD & GT): 749 MW - Wind: 331 MW - Solar: 51 MW - Biomass: 28 MW
WB Ease of Doing Business Index (The World Bank, 2021)	56

energy situation is warranted. The number of people who have gained access to electricity more than doubled from nine million between 2000 and 2013 to more than 20 million by the end of 2019. These results are part of a greater effort in the region to increase electrification using a combination of grid and off-grid connections. In East Africa, Kenya, Rwanda and Ethiopia, are partly responsible for this success. In Kenya, for example, energy access increased from 20% in 2013 to 85% by 2019 and together, Kenya, Tanzania and Ethiopia accounted for 50% of the five million people gaining access to electricity through new SHS pre-COVID19 (IEA, 2020).

Bridging the Energy and Humanitarian Sectors

The importance of energy access for affected populations in refugee camps and settlements cannot be overstated. Many refugees often turn to wood, coal, and biomass sources to meet their household needs for cooking, lighting and heating. These challenges are also faced by the host communities and households are forced to spend many hours a day walking to collect firewood, students are dependent on natural light to study, and unintentional health problems may arise from using and cooking with these primary sources.

Short Term vs. Long Term Planning
In a humanitarian crisis, satisfying immediate needs is often juxtaposed with the need for a long-term sustainable solution. This challenge has been exacerbated in recent years with the duration of stay at both camps and settlements increasing. Short-term budgeting cycles present a challenge in the long-term planning and deployment of investments for sustainable energy solutions, especially where financial break-even points may not appear until years after initial installation. Longer-term planning by donors, humanitarian actors, and host countries are necessary to ensure that energy access projects are sustainable.

Snapshot of countries- Refugee Policies

This report focuses on nine major camps located in six Sub-Saharan Africa countries. An overview of the refugee policies of the two main focus countries of the study, Uganda and Kenya, are provided below in addition to snap shots of refugee policies of the additional counties for comparative purpose.

There are additional qualifiers that may help distinguish the legal and practical differences between refugee camps and settlements, and we have identified three general parameters for energy suppliers to keep in mind (Schmidt, 1990).

1. *Freedom of movement:*
   Refugee camps tend to have stricter legal restrictions on freedom of movement compared to settlements. In the case of camps, movement outside the designated area and interaction with locals in the host community is limited or prohibited.

2. *Mode of assistance/economics:*
   A distinction can be made based on the ability of the refugees to engage in various economic activities. In camps, refugees may have greater requirements on *de facto* registrations in order to work, and these restrictions sometimes limit engagement in income-generating programs. Further, special approvals from the government may be required for businesses or partners to enter the camps. Conversely, refugees in settlements have greater freedom of movement, and are more integrated into the local community and, by extension, the economy. Therefore, their

income-generating activities require different, and sometimes more relaxed, government approvals.

3. *Designation as temporary locations/shelter (irrespective of their actual longevity):*
   Refugee camps tend to be viewed as temporary shelters while settlements are at times characterized as being more permanent in nature, with refugees staying for an average of 10 to 17 years (UNHCR, 2010). Nevertheless, and irrespective of the actual duration, the temporal versus more permanent nature of the environment inherently influences policy responses to refugees' social rights and economic freedom.

Uganda

Uganda is ranked as the third largest refugee-hosting state in the world (UNHCR, 2019). With a refugee population surpassing 1.4 million, many of whom hail from South Sudan, the Democratic Republic of Congo (DRC), and Burundi, Uganda has a global reputation of having one of the most progressive refugee policies (UNHCR, 2020). Uganda is a signatory to the main international legal commitments on refugee protection, which include the 1951 Refugee Convention, the 1967 Protocol, and the 1969 Organization of African Unity (OAU) Refugee Convention (BPB, 2020). As such, the country's refugee policies are emblematic of its famous, "Self-Reliance Strategy" (SRS), in which refugees enjoy the freedom of movement, right to work, access to basic governmental services, and live within the local communities and within government-designated settlements. The Ugandan government encourages community resilience and self-reliance by incorporating refugees into their long-term national development plans, as outlined in the United Nations (UN)'s supported 2016 Refugee and Host Population Empowerment (ReHoPE) strategic framework. The ReHoPE strategy has provided the Ugandan government access to international funding from humanitarian organizations, private donors, and predominantly western governments. There are however growing concerns over land disputes as the refugee population increases.

Kenya

Like Uganda, Kenya is a signatory to the 1951 UN Refugee Convention and its 1967 Protocol, and the 1969 OAU Refugee Convention. Kenya has a long history of hosting refugees and today, the country continues to be among the top refugee hosting countries in Africa. Beginning in the 1970s, Kenya, and Nairobi in particular, became home for many Ugandans fleeing from violence, many of whom were teachers and highly skilled workers. In the 1990s, Kenya experienced a surge of refugee arrivals from Ethiopia, Somalia, and Sudan, making case-by-case refugee status determinations increasingly difficult. Thus, the UNHCR assumed a predominant role in the tasks of providing refugees protection, assistance and solutions. Today, individuals from Somalia, Ethiopia, South Sudan, Sudan, and DRC Congo comprise the majority of those seeking refuge in Kenya.

Compared to Uganda, Kenya imposes encampment policies. Previously, Kenya allowed refugees to live in urban areas but in 2012, and again in 2014, citing national security concerns, the government announced an encampment policy and directed all refugees to move to the designated refugee camps (Goitom, 2016). Further, an amendment was made to the Refugees Act of 2006 in an effort to make permanent the encampment policy which required refugees to remain in the designated camps and to obtain authorization in order to leave the camp. Businesses, journalists, researchers, scholars and filmmakers intending to visit the camp are required to obtain a letter of approval from the government. It is estimated that roughly 80% of Somali refugees now present in Uganda relocated from Kenya as a result of the stricter policies (Betts A. , 2019). That said, despite legal restrictions, in reality, refugees have proven to be highly mobile in cases where UNHCR can facilitate transportation to areas where refugees need to access higher education or specialized medical care.

In 2017, Kenya adopted the Comprehensive Refugee Response Framework signaling its commitment to creating opportunities and seeking economic opportunities for refugees. Additionally, the government endorsed the global compact in order to strengthen the self-reliance and inclusion of refugees. These public commitments come at a time when the country faces the challenge of attracting donor funding and many humanitarian programs and international organizations have either cut or reduced funding (Siegfried, 2017).

Challenges of humanitarian and private sector interventions

In general, the productive potential in refugee settlements and camps depends on the ability of refugees to participate in economic activities. However, several barriers and social conditions don't allow for full participation, with education, sanitary conditions and access to energy presenting the main challenges at a macro level. From an analysis of existing literature and the interviews conducted with experts and NGOs representatives, the following challenges to both humanitarian and private sector interventions are identified:

- Education access difference between refugees and host communities. In Kakuma, more than 50% of refugees have no schooling in comparison with 33% of those in the host community.
- Limited access to markets due to poor road networks and lack of commercial access.
- Limited access to funding compounded by low financial literacy. This is correlated with low levels of savings and affordability of products and services.
- Lack of identification documents.
- Data collection is challenging in the camps. There are several biased considerations when surveys and studies are designed and administered.
- The main multilateral agencies historically haven't prioritized energy access.
- High costs of doing business. This includes lengthy and time-consuming requirements when hiring refugees within the camps and obtaining work permits for both refugees and foreign

staff working with the donors and NGOs, and infrastructure constraints and supply chain disruptions.

Analytical Framework

In analyzing various projects, we apply a multi-tiered framework that addresses the project focus, project design, challenges and risks and the type of intervention. We further break down each of these sections into various parameters which are used to comprehensively understand the projects as well as inform our recommendations.

Fig: Framework for Project Assessment

Project Focus	Product Use	Product Type	Target Population	
Project Design	Funding Type	Geography	Demography	Camp Maturity
	Local energy Market Maturity	Regulatory Environment	Cultural Dynamics	
Challenges[1]	Entry Requirements	Retention Rates	Logistical Issues	Underdeveloped Markets
	Data Quality	Monitoring Issues	Documentation requirements	Personnel Costs
	Market Distortion	Cultural Conflicts	Security Risks	
Type of Market Intervention	Direct Supplier Financing	Market Development Activities and Technical Assistance	Demand-side	

Project Focus

Our study reveals that in designing an intervention, one of the most critical things is to identify the kind of energy use being promoted. Organizations can focus on a certain type of usage such as consumptive to provide basic lighting or cooking energy access or productive use, which aims to increase income or productivity. Some of the projects provided energy systems purely for public or social use such as in hospitals or schools. Uniquely, one project is pursuing a Total Energy Access approach which aims to connect all the demand side aspects. The choice of the system therefore depends on the use and type. For example, higher power rating systems would typically be needed for productive use.

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[1] These challenges are being faced by the humanitarian organizations looking to implement market-based interventions as well as the energy service providers.

Many interventions, including the ones discussed in this report, aim to distribute or increase the uptake of SHS and related appliances. Others might include clean cooking appliances and fuels and mini grids. Finally, the intervention's scope may target a specific population, which will consist of the refugee and/or host community as well as any gender-specific targets.

Project Design

The scope of an intervention will consider both structural design, such as whether funding is through grants, traditional loans, or a form of equity investment, and the project's intended target. As we are examining humanitarian market-based interventions in this report, most of the analyzed projects are financed through grants to private organizations either in the form of seed funding or results-based financing (RBF).

The project's external environment and ecosystem are also key in understanding the interventions and strategies deployed. The primary external considerations incorporated into our assessment include:
- **Geography:** country, town, settlement or camp; proximity to urban centers
- **Demography:** age and economic profile of the refugee population
- **Camp or Settlement Maturity**: age of the settlement or camp
- **Local Energy Market Maturity:** current energy products used in the area; average expenditure on energy services; whether products have been provided through local markets, and government support, or humanitarian assistance
- **Regulatory and Enabling Environment:** host government policies on the integration of refugee populations; and permitting and entry requirements for new projects
- **Cultural Dynamics** Settlements and camps are unique in their cultural composition. This factor considers any internal cultural dynamics and/or relationships with the host community and existing language barriers

Refer to Appendix B for brief market profiles of major refugee camps/settlements.

Challenges and Risks

Humanitarian settings and protracted crisis situations present unique challenges for the private sector and consequently for market-based interventions. Each product inherently carries risks and other considerations unique to that technology. For example, initiatives to increase the uptake of cleaner cooking technologies using alternative fuels will potentially face the challenge of securing long-term fuel supply. Mini-grid projects generally necessitate a tariff-setting process that can be legally onerous. Selling SHS and solar appliances requires navigating individuals' ability to pay, in addition to risks on the local product supply chain.

Based on our landscape study, we have come up with a map of common challenges observed across projects. While this is not an exhaustive list of potential risks that new or existing interventions may face, it represents some of the largest and most common factors that projects should consider and

incorporate into their planning. The risks have been further mapped into project design considerations. Certain exacerbating factors have also been highlighted. For example, a broken supply chain can be related to both the maturity of the current energy market and its ability to supply these products, as well as the camp's geographic location (i.e., the ease of access).

Challenges	Consideration Bucket	Exacerbating Factors
Onerous Entry Requirements	Regulatory Environment Government permits for entering the camp	Uncertainty in Government's policy direction
Retention rates	Demographics Camp Maturity Geography Target Population	High population turnover Violence-afflicted regions
Logistical Issues	Energy Market Maturity Geography	Remote location of camps affects supply chain particularly for non-local players
Underdeveloped Market	Demographics Camp Maturity Energy Market Maturity	Newer camp or settlement Low-income refugees Comparatively lower energy access (lack of existing products in the market) Existence of low-quality products disincentivizing relatively expensive products
Low Quality Data	Geography Camp Maturity Energy Market Maturity	Limited data on demographics, specifically income brackets Limited data on existing products or energy access Inability to collect data due to low data connectivity
Monitoring Difficulties	Geography Camp Maturity	Low access to internet or phone service for communication and mobile payments High population turnover
Documentation Requirements	Regulatory Environment	No Government supported identification process for refugees contributing to problems in credit checks
High Personnel Costs	Energy Market Maturity Camp Maturity	Strong presence of humanitarian organizations leading to above-average wages
Market Distortion	Energy Market Maturity Camp Maturity	Strong presence of humanitarian organizations leading to large number of free or subsidized products
Cultural Conflicts	Cultural Dynamics Target Population	Existing tension between host and refugee communities

		Focusing on solely the refugee settlement or camp Insufficient focus on the diverse languages spoken in the camps/settlements
Security Risks	Geography	Camps are often located in remote and/or violence-affected regions

Project Groupings

Projects have been classified into three categories based on the type of funding provided and the purpose of the intervention - direct grant financing to suppliers, market development activities and technical assistance, and demand-side interventions. They have been further cross-classified into productive, consumptive, and public use based on the type of systems being promoted. In the following sections, each of the categories is defined and illustrated through a project that serves as a model for the type of intervention.

Direct supplier grant financing interventions refer to direct funding provided by humanitarian or public sector organizations to suppliers in order to set up last mile distribution and operations, purchase inventory, or establish systems. The projects identified in this category focus on setup of operations, rather than directly reducing the product prices for consumers, though there may be indirect price benefits from reducing the initial installation costs.

Project Highlight: De-Risking Pay-As-You-Go (PAYGO) Solar Home Systems in Uganda Refugee Settlements Project[2]

Use type: Consumptive, Productive; **Timeline:** October 2018 to August 2020; **Settlement:** Kiryandongo and Rwamwanja; **Country:** Uganda; **Implementing Agency:** Smart Communities Coalition/ USAID Power Africa, Green Powered Technology and Energy 4 Impact; **Funding:** $460,000 by USAID; **SHS units sold:** 4,137

The main objective of this project was to encourage private PAYGO SHS companies to consider refugee communities as a viable market. Three grant awards totaling to $460,000 were awarded to PAYGO SHS companies BrightLife, Fenix International, and SolarNow (SN) to stimulate initial market activity and increase participation in the refugee settlements and host communities. The grant awardees were able to establish infrastructure and operating systems in order to conduct sales at physical centers; marketing, recruitment, and training programs; and customer service operations. The product prices were not subsidized. All three grantees are looking to continue operating in the area

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[2] Source(s): Based on Final Report on "De-Risking Pay-As-You-Go Solar Home Systems in Uganda Settlements Project" prepared in July 2020 by Green Powered Technology

encouraged by the repayment rates. Two of the three grantees have seen "acceptable" repayment rates while one is looking to scale back to cash operations.

What worked? Potential for a sustainable market in both communities; Engagement with local leaders to enhance access to settlements; Collaboration with local Non-governmental organizations (NGOs) and training centers to recruit local talent; Integration of the host and refugee markets; Customers who were using SHS for business purposes emerged as more consistent payers; Mix of various marketing strategies including use of radio for sales and to attract new customers, multiple market 'activation' events per week, door-to-door sales and customer referrals; Early repayment rates were considered favorable

Challenges: Lack of points of service infrastructure in refugee settlements, which may be tackled by exploring satellite presence; Language barriers in recruitment and training; Wage inflation in the region due to presence of humanitarian organizations requires formulation of more attractive payment or incentive structures; Lack of mobile money penetration impedes repayment; Identification issues and lack of data made assessing credit history difficult.

Market development activities and technical assistance leverage the public or humanitarian sectors' experience working in refugee or similar humanitarian settings and may consist of a combination of marketing and awareness campaigns, employee training, technical assistance, or mediation between suppliers and government or other humanitarian organizations, among others.

Project Highlight: Market Based Energy Access (MBEA) I Project [3]

Use type: Consumptive; **Timeline:** 2017-2019; **Settlements:** Kakuma and Kalobeyei; **Country:** Kenya; **Implementing Agency:** SNV under EnDev ; **Funding Agency:** EnDev**; SHS units sold:** 4,322

The project sought to create market demand for stoves, fuels, SHS, and solar lighting products by connecting refugee and host communities with private sector companies. Specifically, the project aimed to increase the use of improved cookstoves and alternative fuels such as ethanol and enhance last mile distribution of solar energy products. Technical assistance and broader market development were deployed, and project activities included carrying out awareness campaigns, supply chain development, setting up of linkages with local traders, and training local residents on cookstoves

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[3] Source(s): Based on the reports "Promoting Market Based Energy Access for Cooking and Lighting in Kakuma Refugee Camp published in July 2020 by Deutsche Gesellschaft für Energising Development Internationale Zusammenarbeit (GIZ) GmbH and SNV Netherlands Development Organisation, and "Humanitarian Energy: Energy for micro-enterprises in displacement settings" published in December 2020 by Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH

production. Product affordability through innovative financing models such as PAYGO was also explored.

What worked? Local presence and strong network with different parties in the camps including community leaders and public and private sector organizations; Use of local capacity for awareness campaigns, community engagement, and regular soliciting of feedback from end-users and distributors; Awareness campaigns had a positive effect on purchases, especially in middle and high-income groups; Solar suppliers were quick to engage in the market; Decentralizing operating and maintenance processes improved customer service.

Challenges: Behavioral change resistance from refugees towards paying for energy services; Awareness campaigns were not as effective with lower income residents who have lower purchasing power, and they continue to rely on UNHCR; Insufficient product availability for SHS and solar appliances, as local sellers are not able to pay upfront costs for stock; Logistical challenges due to the remote location of the camp; While people were aware of and willing to use the mobile money platform, refugee IDs only allow for registration and use the platform for three months at a time, resulting in difficulties tracking customers and high risk of default on payments.

Demand-side interventions seek to increase the affordability of consumer products through customer-side interventions. These may take the form of direct subsidies either by providing funds to suppliers to specifically reduce product prices or directly improving customers' and businesses' access to financing.

Project Highlight: Access to Modern Energy in Humanitarian Setting (AMPERE)[4]

Use type: Consumptive, Productive; **Time:** July 2019 to July 2020; **Settlements:** BidiBidi ; **Country:** Uganda; **Implementing Agency:** Mercy Corps Netherlands (Mercy Corps), in partnership with SNV and Response Innovation Lab (hosted at Save the Children); **Funding Agency:** Netherlands Enterprise Agency (RVO) under the AME (Access to Modern Energy) partnership with the Dutch Coalition for Humanitarian Innovation (DCHI); **SHS units sold:** 3,639.

Market-based interventions were employed to enhance long-term investments in BidiBidi, ensuring access to high-quality, reliable, and clean energy products. Mercy Corps partnered with two private solar energy providers—Village Power and d.light—to implement the AMPERE pilot project. Village Power and d.light were tasked with managing all sales operations in the settlement. The funding was used to provide a 60% subsidy for the 306 participants buying Village Power and d.light's products through a results-based financing (RBF) mechanism. The project sought to test how market systems

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[4] Source(s): Based on reports "Paying for darkness: Strengthening Solar Markets for refugees in Uganda" published in 2019 by Mercy Corps, "One Year on: Paying for darkness: Strengthening Solar Markets for refugees in Uganda" published in Jan 2021 by Mercy Corps, and "Assessing the scalability of the Pay-As-You-Go model in refugee settlements" published in May 2020 by students at Columbia SIPA

can be strengthened by targeting the constraint of appropriate finance, i.e., interventions targeted towards creating more flexible financing options to accommodate inconsistent income streams in order to increase ability to pay for solar products and reduce credit risk to Off-Grid Solar (OGS) suppliers. Phase I focused on small lanterns and SHS paid through upfront cash payment or PAYGO. The subsidy aimed to prove that consumers are able to repay loans at a certain monthly price. Repayment rates by the refugees were found to be similar to the ones experienced in the host community across companies' portfolio. As such, the two OGS suppliers involved in the pilot expressed the intention to remain in the area to continue assessing market demand.

What worked? Emphasis on cash payment options, and cheap and portable products increased the sales; Detailed consumer segmentation in the area allowed the sector to determine the needs that may be met through supported local energy markets and revealed more clearly who may be excluded; Co-designing of proposed interventions allow for market actors to suggest potential design iterations derived from their knowledge and experience; Community-level market activation events such as the "Mercy Corps campaign" and "walking sales agent" worked to improve awareness among customers; Product quality tests done during the demonstrations led to higher trust and product credibility; Setting up service centers that covered warranties, customer education, and after sales services were also useful for consumers.

Challenges: Dependence on subsidy levels was observed. Once the subsidy was reduced to 50% in phase II of the project, there was a decrease in purchases; There was low brand recognition of the private companies. A survey found that most pilot participants believed that the products were being sold by Mercy Corps and did not identify the names of the private companies; Penetration of mobile money is low in the Bidibidi camp, so refugees have to travel longer distances to access mobile payment points; Language barriers impacted consumer trust of products.

Analysis and Recommendations

For Project-implementing Agencies and Donors

<u>**Comprehensive Market Surveys**</u> - The social, political, and economic landscape of camps and settlements can differ greatly, as well as customers' specific energy needs and attitudes toward different products. Projects should endeavor to gather as much of this contextual information as possible before structuring an intervention. Practical Action's Renewable Energy for Refugees (RE4R) project in Jordan and Rwanda, for example, uses a "total energy access (TEA)" approach that involves surveys and stakeholder assessments to determine the needs of all levels of the community (households, businesses, and community facilities) (Practical Action, 2020). The TEA assessment has yielded valuable data about household and business fuel consumption, cooking behaviors, and community-wide priorities for energy access, essential for understanding the energy system as a whole. Such an understanding can help organizations mitigate several challenges including on affordability by providing insights on pricing and payment structures.

Inter-agency collaboration and information sharing - Collaboration between the different stakeholders - government, public, and private - working in the energy access space in humanitarian settings is critical to the success of these interventions and removal of redundancies in the implementation of projects. A platform for engagement between the diverse group of donors and investors interested in the subject would help identify the gaps in various settings, enhance data and information sharing, and identify impact areas to be prioritized. A collaborative approach will enhance the effectiveness of the project reach while avoiding duplication in the implementation of projects.

> **In summary, open communication between various stakeholders, information sharing on best practices and lessons learned, data repositories, and common key performance indicators for the industry will be highly beneficial to building a sustainable market system going forward.**

Further, public sector or government partners offer a unique benefit to private suppliers through their experience of working with other private sector entities and/or the local communities. Platforms such as SAFE Humanitarian Working Group (SAFE Fuel and Energy, 2021) are already working toward this goal. Lastly, there is need to implement a common language of measuring success in the interventions.

Use of Results-Based Financing: Results-based financing (RBF) is commonly used to link funding to pre-determined, verified results. The use of RBF is more suitable in mature market settings, particularly when applied to simpler technologies. RBF can stifle the development of newer or less-developed technologies and may be ineffective in locations where the upfront costs for investment for suppliers is too high to activate the market.

Based on type of intervention -

Direct Supplier Financing - Direct funds given to suppliers to set up operations, purchase inventory, or build systems can stimulate market development. Depending on how they are deployed, these funds can be less risky than demand-side interventions. Reducing the initial investment costs may allow for conditions that

> **Direct Supplier Financing is best utilized for projects focused on productive uses, as these projects have associated revenue streams that support the ongoing project operations after the funding is phased out for the supplier. Market conditions for consumptive use projects do not generally support direct supplier financing for sustainable operations, particularly in case of markets with low-income refugees as market saturation may be observed after a certain point. Strong market development activities would be useful for mitigating some of the challenges, with the benefits of high-quality products being visibly demonstrated.**

stimulate early demand by improving availability of the services without resulting in dependence on aid or subsidy, as capital and operating expenditures often decline after setup is completed. Multiple projects have demonstrated the existence of market demand in these conditions and the expectation is that with time the projects will be able to operate in an economically viable manner. However, some companies provided with this type of financing such as BBOXX in the MEI project in Kakuma, have consequently asked for more funds which raises concerns about the commercial viability of operations without future funding support and if replication of such models will have distortive effects due to continued support by external actors (Moving Energy Initiative, 2019).

Supply side interventions can be particularly useful in productive and public projects as upfront capital investment is a large barrier. The MEI implemented a Solar Powered ICT and Learning Hub in Kakuma with grant funding of about $125,500 where refugees can access a variety of digital services

> **Productive and public use projects offer the additional benefit of accessibility for both the host community and refugees, which can create improved community relations and broaden the scope of impact.**

as well as technical, financial, and literacy training and printing, internet, and mobile charging services. A few months after the hub opened, it was noted that only 18% of the energy available was being used. However, this was converted to an opportunity as the implementing agency found that there was significant interest from local businesses in connecting to the hub to access additional energy services, which would generate additional income for the hub.

A different MEI project deployed a grant of approximately $200,000 towards the capital costs for purchase and installation of solar systems at healthcare clinics run by the International Rescue Committee (IRC) in Kakuma. In addition to resulting in significant monthly energy savings by replacing existing diesel generators, the project was able to facilitate the electrification of another clinic where the IRC intended to install another diesel generator. As of December 2018, the solar energy systems were supplying 100% of the clinics' needs and, consequently, the IRC reduced its fuel consumption at the clinics by 100% (Moving Energy Initative, 2018). Such improvement in public infrastructure can have ripple effects.

Similar to demand-side interventions, supplier financing is unlikely to yield sustainable sales when used to artificially or temporarily lower the price of products for individual consumers if it does not result in lower prices in the long term, particularly in markets with low energy expenditure and ability to pay.

Market Development Activities - These types of interventions leverage the public sector's experience working with displaced and rural communities, other aid organizations, and local governments without necessitating a long-term financial commitment.

Awareness campaigns - Some markets, such as Kakuma and Kalobeyei where the MBEA I project pilot was implemented, have high relative energy expenditure (with firewood alone costing around 20% of per capita income) as well as high utilization of inefficient or expensive fuels such as firewood or diesel generators (SNV, 2020). In these environments, there is a demonstrated willingness to pay for fuel but often a lack of awareness and/or availability of cleaner, more efficient technologies. The MBEA I project revealed a willingness to pay for solar appliances and alternative cooking fuels even among lower-income households. Awareness campaigns require sustained efforts of at least 6-12 months to be truly effective (SNV, 2020), as there is often a lag between the campaign reaching consumers and those consumers being able and willing to purchase services. In the AMPERE pilot project, for example, parties found that it takes 1-3 months after a campaign for the demand to materialize.[5]

> **Market development activities are successful in markets that have overall high energy expenditure or willingness to pay but lack knowledge and have limited availability of targeted products. In markets with less ability to purchase products, they should supplement subsidies or other financing to solve issues such as lack of information or trust in certain products.**

Supply chain assistance - The complexity and number of supply chain elements is unique to each project's geography, energy market maturity, and technology. Markets that are good for supply chain assistance are those where the demand can sustain operations after the initial project implementation period has elapsed.

Demand-Side Interventions - Despite initial success, demand-side interventions generally carry more long-term risk as they do not fundamentally alter the economic landscape or income of refugees, and therefore may result in reversion to prior spending behaviors when the program ends.

> **Demand-side interventions are best utilized in markets with low ability to pay, as they are a useful funding application for increasing energy expenditure in areas with a high need but low use or availability of energy resources. These interventions should be paired with interventions to address market disruptions or failures outside of low ability to pay and can be used to stimulate initial demand but will not result in sustained sales on their own. Other non-subsidy interventions that can alter longer-term market conditions would stop demand from plummeting once subsidies are phased out.**

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[5] Feedback in SCC annual meeting

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Projects that utilize demand-side interventions often demonstrate success during the pilot stage and particularly in settings where there is low-paying capacity. For example, the AMPERE pilot successfully deployed demand-side subsidies using RBF in the Bidibidi Camp in Uganda and found repayment rates to be high. However, demand-side interventions are unlikely to yield sustainable sales when used to artificially or temporarily lower the price of products for individual consumers if it does not result in lower prices in the long term. This can lead to behavioral resistance from consumers towards paid products thus hampering efforts of pure market-based function of service providers.

For Suppliers:

> **Suppliers should ensure that individuals and businesses have access to finance for the upfront cost of products in order to maximize market penetration and mitigate risk of supply chain disruptions. When possible, they should work with local businesses to obtain small loans or engage in payment plans directly so as to prioritize obtaining initial product stock.**

Facilitating Financing - While not generally a standalone intervention, facilitating customers' and businesses' access to finance is crucial in establishing projects and ensuring their long-term success after the pilot phase.

Individual Customers - Many projects that provide SHS attempt to utilize mobile payment methods for customers to meet their payment obligations. However, because refugees often experience issues accessing SIM cards, mobile money accounts and other digital tools, other financing options for individuals are worth considering. One option is the establishment of revolving community funds in which members of the community contribute to a pool of funds, which is then used to pay for products. Community funds can increase accountability and encourage more consistent repayment across the area. This is particularly useful in areas with a large concentration of low-earning refugees.

Alternatively, arrangements such as work exchange programs or programs that require small, highly subsidized payments from refugees can promote a sense of ownership crucial to reducing the distortive effects of a freely distributed product.

Local Businesses - A major challenge for local businesses selling products is obtaining the funds required for initial inventory, as it requires a certain amount of cash on hand (Practical Action, 2020). However, a lack of inventory can be detrimental to projects' long-term success as disruptions in the supply chain and customers' ability to efficiently obtain products and services can deter future purchases and make residents less inclined to switch from their current inefficient lighting or cooking methods. Small loans to businesses can prevent these initial constraints.

Supply Chain Development - Supply chain elements located as close to the customer base as possible can benefit less mature markets lacking initial uptake in the product.

Employing refugees within the camp to distribute informational material contributes to overall awareness and education of a newly introduced product- enhancing the company's value chain. Additionally, engaging refugees to sell the product as representatives for the company generates employment, increases local household income, and may decrease operational costs for the company.

Specifically, suppliers should ensure spare parts, repair centers, and other emergency product services are available on site and decentralize their maintenance and storage operations. In more mature markets with existing penetration of renewable energy products, the suppliers' ties to the local community may have less of an impact because the products are already well known and used.

Product Warranties - **Suppliers should provide product warranties and after-sale services to incentivize uptake of products.** Coordination and agreement of minimum product standards will encourage the deployment of lasting and sustainable products and decrease the prevalence of counterfeit or substandard products.

Challenges and Limitations

As previously highlighted, our initial approach was to quantitatively analyze the effectiveness of market-based interventions in refugee camps and settlements and to construct a framework to measure their success and sustainability. However, we encountered challenges with the availability or confidential nature of the raw data for many of the projects. Commonly cited reasons for missing or unavailable data were that some projects are ongoing or experiencing disrupted timelines due to COVID-19. Some project participants were willing to provide us with raw data to help inform our analysis of the sustainability and effectiveness of the project for our final recommendations, premised on the condition that they would solely be used for analysis and would not be published. Future iterations of market-based intervention assessments may consider requesting more detailed raw data given that many of the projects analyzed will be completed in a few years.

Our readers ought to be aware of the limitations that led us to generalize our findings, analysis, and recommendations. We were conscious throughout our analysis to consider contextual information of region, countries, camps, and settlements. For instance, and as discussed in our report, access to refugee communities in Uganda and Kenya differ significantly, despite being geographical neighbors. These contextual considerations must be kept in mind while reading this report.

Conclusion

Market-based interventions have enormous potential for providing more sustainable solutions to low energy access in refugee camps and settlements and creating new job opportunities. The existing market demand provides an opportunity for energy-product providers to step in and create a business model which meets the needs of the population. However, considering that these populations are highly vulnerable, there needs to be adjustments to the business-as-usual approaches for making them economically viable in the long-term. As this space continues to develop with the support of humanitarian organizations and donors, it will be crucial for project implementers and suppliers to leverage the lessons learned from prior interventions and continuously assess how to mitigate risks. A mix of supply and demand side support may be required for markets depending on the customer segmentation. It is important that all stakeholders in this space share information and pursue a collaborative approach to enhance effectiveness and reach. Furthermore, not all settlements and populations are suitable for market-oriented approaches due to their risk levels. In which case, humanitarian interventions need to focus on meeting the basic energy needs of the population and developing an ecosystem which could support market development at a later stage.

It is our hope that this report provides insight into those lessons and challenges and direction towards overcoming the challenges faced by these interventions.

Appendix A: List of Projects Analyzed

1. De-Risking Pay-As-You-Go Solar Home Systems in Uganda Refugee Settlements Project

2. Supporting a solar retailer to test the market in a displacement setting

3. Solar Powered ICT and Learning Hub for Kakuma

4. Renewable Energy for Refugees (RE4R)

5. Installing Solar Systems in Healthcare Clinics Run by IRC

6. Access to Modern Energy in Humanitarian Setting (AMPERE)

7. Access to Energy for Refugees and Host Communities II

8. Market based Energy Access (MBEA) I

9. Market based Energy Access (MBEA) II

10. Digital Agents for Energy+

11. Sustainable Use of Natural Resources and Energy in the Refugee Context in Uganda

12. Building a market system for clean energy in Burkina Faso

Appendix B: Brief market Profiles of major refugee settlements/camps

Markets of settlements and host communities

In the past, criticism was levelled against the long-term status of some refugee camps and settlements. During the first decade of 2000, long-term settlements were thought to produce radicalization and political instability in the long run if no solutions were found (Helton, 2002) For example, Kenya in 2016, and more recently in March 2021, threatened to close both Kakuma and Dadaab camps, stating that the terrorist attacks in 2013 and 2015, in addition to other subsequent unsuccessful plots, had received organizational support from elements within these camps (Pravicini, 2021). Similarly, the UNHCR (UNHCR, 2004) reported that camps were heavily criticized for promoting dependency and affecting resource distribution in host communities. This view has changed in the past few years on the back of a higher awareness of humanitarian aid and a better understanding of the social dynamics in both settlements and host communities.

Arguably, the clearest explanation for considering market development in refugee settlements is given by Grafham (Grafham, 2020). He states, "...perhaps more fundamentally, refugees often lack the legal freedom to work, especially outside of informal, barter and 'cash for work' camp economies. This can limit their ability to purchase energy products and services and may be a barrier to successfully deploying improved electricity supply to generate income".

Kenya

As per Kenya's Refugee Response Plan (RRP) for South Sudanese 2019-20 (UNHCR, 2019), the Government of Kenya maintains an open-door asylum policy for new arrivals including from non-neighboring countries such as Eritrea, Burundi, the Central African Republic and others. The RRP further goes on to state that the refugee response partners in close collaboration with the government and the private sector are targeting to increase access to sustainable energy from 20% to 60% by 2020. Non-wood-based fuels such as briquettes, biogas, Liquefied Petroleum Gas and Bioethanol are being targeted to replace wood. In addition, private sector engagement is being explored to support capital investments in energy in Kakuma and Kalobeyei. It may be noted here that at the time of publishing the report, the Kenyan Government has ordered the closure of the Dadaab and Kakuma refugee camps due to security concerns (Reuters, 2021).

Kakuma, Kenya

Kakuma camp is the second largest camp in Kenya and hosts the majority of the projects examined in this report. The camp was first established to receive refugees fleeing the second Sudanese civil war (1983-2005) (UNHCR, 2018) and later others from Somalia, Ethiopia, Uganda, Sudan, Rwanda, DR Congo, Burundi and Eritrea (UNHCR, 2018).The camp is located on the outskirts of Kakuma town in Turkana county, in the north-western region of Kenya.

According to a 2018 study undertaken by the IFC (IFC, 2018), the camp has a thriving informal economy with more than 2,000 businesses and 14 wholesalers which tend to meet daily needs for Kakuma's residents, providing food, cosmetics, mobile phones and other miscellanies. In the same study, the IFC found that in spite of the legal and practical limitations that refugees face (the inability to gain formal employment, move or own property, amongst others), about 12% identify as business owners or as self-employed. They also found that refugees employed by NGOs are hired as volunteers who are paid relatively low incentives due to legal restrictions on employment.

Kalobeyei, Kenya

The Kalobeyei settlement was established in 2015 (UNHCR, 2021) and is a joint initiative of the national government, the county government of Turkana and UNHCR, and is located just 3.5 kilometers from the Kakuma camp, within Turkana county. The settlement was meant to decongest Kakuma camp, following a continuous influx of South Sudanese refugees after renewed conflict broke out in South Sudan in December 2013. The settlement opened its doors to refugees in 2016 with an initial designated capacity of 70,000. According to Betts, Omata and Sterck (Betts, Omata, & Sterck, 2020), the settlement's initial objective was to serve as an experiment on how to transition refugee assistance from an aid-based model to a self-reliance model and for the first time, a refugee settlement was especially designed to enable refugees and the host community to live side by side, sharing markets, schools and hospitals. This unique model is based by the Kalobeyei Integrated Social and Economic Development Programme (KISEDP) which aims to provide integrated, market-based opportunities to the refugees and the host community. Consequently, many of the regulatory constraints imposed on refugees in Kakuma camp are not applied in the Kalobeyei settlement (Betts, Omata, & Sterck, 2020). In a study conducted by Betts et al. implementing agencies note that the host communities are frustrated by the benefits extended to refugees, which are perceived to give the refugees a better quality of life than the host nomadic community. Similarly, refugees have a negative view of the host communities as they perceive them to be hostile.

Camp/refugee settlement	Kalobeyei Settlement	Kakuma
Year established	2015	1992
Refugee Population (UNHCR, 2020) **(December 2020)**	40,085	158,365
Monthly Income for refugees	KES 3900	KES 5,597

Energy Products	-Solar panel ownership is 20% among the more established sections of the population. -Energy access in the range of 0 to 4% -Privately run diesel mini-grids established by community members serve around 100 customers.	UNHCR donated solar lanterns Solar lanterns USD 1 million on stand-alone diesel spent per year by NGOs 1700 customers served by independent diesel mini-grids
Monthly Average refugee household energy expenditure		
Batteries	KES 100	
Lighting		KES 372
Phone Charging	KES 150	KES 35
Cooking	KES 1500	KES 499
Kerosene	KES 50	

Data on Monthly Income and Household Energy Expenditure derived from SCC Market Profiles on Kalobeyei[6] and Kakuma[7] published in 2019

Uganda

As per Uganda's revised 2019-20 CRP (UNHCR, 2019) Uganda's favorable protection environment for refugees is based in the 2006 Refugees Act and the 2010 Refugee Regulations. The report further states that refugees are allowed freedom of movement, the right to work, establish a business, own property and access national services, including primary and secondary education and health care. Access to sustainable energy for efficient and clean cooking, lighting and power remain a major challenge for refugee settlements and the Government is seeking to mainstream energy efficiency and climate change mitigation across sectors, especially in solar power and sustainable cooking energy.

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[6]https://origin-www.mastercard.us/content/dam/mccom/en-us/Governments/Documents/kalobeyei-scc-profile-jan2019.pdf
[7]https://www.mastercard.us/content/dam/mccom/en-us/Governments/Documents/kakuma-scc-profile-jan2019.pdf

BidiBidi, Kiryandongo, Rwamwanja, Imvepi and Rhino, Uganda

The BidiBidi refugee settlement was created in 2016 (UNHCR, 2018) by the Government of Uganda and different NGOs and multilateral agencies in order to host refugees from the South Sudan conflict. The settlement is located in north-western Uganda and is currently home to approximately 230,000 refugees.

The Kiryandongo refugee camp was first established in 1954 in Bweyale, Kiryandongo district and hosts refugees from Rwanda, Kenya and the Democratic Republic of Congo. However, it was only in 1990 that the Ugandan government designated the land as an official refugee camp.

The Rwamwanja settlement initially ran from 1964 to 1995 and was then re-opened by the Ugandan Office of the Prime Minister in 2012 to accommodate the constant inflow of refugees from the Democratic Republic of Congo (UNHCR, 2018).

The Imvepi refugee settlement is located in Terego District in northwestern Uganda. It opened in February 2017 (UNHCR, 2019) and can host a maximum of 110,000 refugees. It mostly accommodates South Sudanese asylum seekers.

Finally, the Rhino camp refugee settlement in northwestern Uganda was first established in 1980 (UNHCR, 2019) but has been expanding in the wake of the South Sudanese civil war. The settlement currently hosts more than 100,000 refugees.

Different from other African countries, Uganda is well known for its progressive refugee policies. The refugee management policy in the country is characterized by a non-encampment, settlement approach, which is widely regarded as an example of a best practice in the region. The Uganda refugee management policy also promotes the integration of life-saving social services into national government systems with a special focus on community integration (Food and Agriculture Organization of the UN, 2017).

Camp/Refugee Settlement	Kiryandongo	Bidi Bidi	Rwamwanja	Rhino	Imvepi
Year established	1954	2016	1964-1995 Reopened in 2012	1980	2017
Refugee Population (March 2021)	71,554	236,718	76,303	123,371	68,800
Income for refugees	55% of households annually earn less than UGX 500 K	48% of households annually earn less than this amount UGX 500K	59% live on less than UGX 2,000 per day	Annual Average income of UGX 200K[2]	
Energy Products	-Presence of national grid in base camp and 2-4 km in the camp -MKOPA and Solar Now are active - Kerosene and torches ford lighting - Diesel generation for businesses	Uganda's Rural Electrification Agency (REA) undertaking grid extension into the northern part of Bidi Bidi Potential Mini-grid sites identified by Power Africa	Uganda's Rural Electrification Agency (REA) undertaking grid extension into the northwestern part of Rwamwanja Potential Mini-grid sites identified by Power Africa Small solar systems for lighting, from around 10 – 100 W, found throughout the settlement PV components and solar lanterns sold through retail shops	Firewood-based stoves are used by 81% household, 49% used solar lamps, mostly	
Monthly Average refugee household energy expenditure					
Batteries					
Lighting					
Phone Charging	UGX 500		UGX 500		
Cooking		UGX 32,500			
Kerosene	UGX 4000				

Data on Monthly Income and Household Energy Expenditure derived from SCC Market Profiles on Kiryandongo[8], Bidi Bidi[9] and Rwamwanja[10] published in 2019.

Data on Energy Products for Rhino and Imvepi camp derived from the report "The State of Sustainable Household Energy Access in Refugee Settings in Uganda Survey Findings in Rhino Camp Settlement and Imvepi Settlement, Arua District, West Nile Region"[11] published by GiZ in 2019.

Burkina Faso

As per Burkina Faso's Crisis Response Plan 2021 (Crisis Response IOM, 2021),the Government of Burkina Faso adopted the expanded emergency program for the Sahel Region (PUS), that covers the five most impacted regions (Nord, Boucle du Mouhoun, Est, Centre-Est and Centre-Nord). The Government's priorities, as defined in the Expanded PUS, are the following: i) optimizing the management of humanitarian and social emergencies; ii) strengthening the presence of the state; iii) building the populations' resilience (preservation of human rights, promotion of social cohesion, prevention of extremism and radicalization); and iv) creating the conditions for the return of displaced persons. According to the report, in late 2020, humanitarian needs remain largely unaddressed in certain areas, notably given restricted humanitarian access and an overall lack of resources.

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[8]https://www.mastercard.us/content/dam/mccom/en-us/Governments/Documents/kiryandongo-scc-profile-jan2019.pdf

[9]https://www.mastercard.us/content/dam/mccom/en-us/Governments/Documents/bidi-bidi-scc-profile-jan2019.pdf

[10]https://www.mastercard.us/content/dam/mccom/en-us/Governments/Documents/rwamwanja-scc-profile-jan2019.pdf

[11] https://data2.unhcr.org/en/documents/details/69808

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Goudoubo, Burkina Faso

Goudoubo refugee camp was established in 2012 (UNHCR, 2021) as a result of the political and military unrest that began in Mali in January earlier that year which led to a mass exodus of asylum seekers to Burkina Faso (Chatham House, 2016). Overall, the UNHCR is responsible for all matters of humanitarian aid, including energy, in the refugee camp. However, it works with other partners, such as IEDA Relief, who are responsible for camp management. The camp has faced significant challenges during the past years due to escalating violence in Burkina Faso driving thousands of refugees to leave the camp (Schlein, 2020).

According to a Chatham House report (Chatham House, 2016), the average monthly income per household in the camp is $US120, which is higher than the average $US95 monthly income of host community households. The difference is mostly explained by the fact that 40% of refugees' income consists of aid from the UNHCR and other humanitarian organizations.

Camp/Settlement	Goudoubo
Year established	2012
Refugee Population	9,269
Monthly Income for refugees	USD $120
Energy Products	Three three diesel generator sets operating in the camp 89% of refugee households use firewood for cooking 59% of households use Solar lamps for lighting, mostly donated 2.3% use SHS, out of which 70% were bought on credit
Average monthly household Energy Expenditure	USD $7 - $10

Data on Annual Income, Energy Products and Average Monthly household Energy expenditure derived from MEI report on The Energy Situation in Goudoubo Refugee Camp, Burkina Faso [12]published in 2016

Ethiopia

According to Ethiopia 2020-2021 Country Refugee Response Plan (UNHCR, 2020), the country maintains an open-door policy for refugee inflows and allows humanitarian access and protection to those seeking asylum on its territory. The report further highlights that in 2019, its parliament adopted revisions to the existing national refugee law which gives refugees the right to work and reside out of camps, access social and financial services, and register life events, such as births and marriages. Some operational priorities stated in the plan include the issuance of individual identification to all refugees over the age of 14, and proof of registration to every refugee household. This will facilitate issuance of SIM cards and access to bank accounts. Cash-based Interventions directed towards meeting basic needs such as fuel for cooking are also being piloted in certain refugee areas in the Afar, Benishangul-Gumuz Somali and Tigray regional states. Further, access to sustainable energy including the

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[12]https://www.chathamhouse.org/sites/default/files/publications/research/2016-05-19-mei-energy-situation-goudoubo-refugee-camp-vianello.pdf

provision of energy saving stoves and the expansion of briquette production as an alternative source of household energy are a priority within refugee camps.

Adi-Harush, Ethiopia

The Adi-Harush refugee camp was established in 2010 (UNHCR, 2018) to host mostly Eritrean refugees. As of March 2021, the camp had a population of around 32,000 refugees (UNHCR, 2021). In November 2020, thousands of refugees were forced to leave the camp as violence between the Ethiopian Federal Forces and the Amhara militia escalated. All UN and NGO staff were withdrawn. However, since February 2021, UNHCR has been regaining gradual access to the camp (Plaut, 2020).

Camp/Settlement	Adi-Harush	Hitsats	Mai-Aini	Shimelba
Year established	2010	2013	2008	2004
Refugee Population	32,167	25,248	21,682	8,702

Rwanda

Some of the major highlights from the 2021 Country Refugee Response Plan for Rwanda (UNHCR, 2020) are: expansion of cash-based interventions to gain efficiency and effectiveness; promotion of refugees' financial inclusion and contribution to the local economy; pursuing the rollout of alternative cooking energy solutions in all camps in line with the national policy; banning the use of firewood; and supporting the economic inclusion of refugees and food security to foster refugees' self-reliance and their progressive graduation out of humanitarian assistance. The report highlights that in an effort to find a long-lasting solution, local integration and a non-encampment policy is being promoted based on the refugees' right to work, start a business, and continue with education.

Kigeme and Nyabiheke, Rwanda

The Kigeme refugee camp is situated in Nyamagabe District, in the southern province of Rwanda. It formerly hosted Burundian refugees who were repatriated in May 2009. It was reopened in 2012 following clashes between the Congolese army and the M23 rebel group and now hosts the largest number of Congolese refugees in Rwanda (Iyakaremye & Makagature, 2016). It is operated by UNHCR and MIDIMAR and hosts around 20,000 refugees (UNHCR, 2016).

The Nyabiheke camp was established in 2005 and is located in Gatsibo District in the eastern province (UNHCR, 2016). It is home to nearly 15,000 refugees who are primarily from the North Kivu and South Kivu provinces of the Democratic Republic of Congo. Originally hosting Congolese refugees who fled to Rwanda in the early 2000s, Nyabiheke was expanded in 2013 in order to accommodate several thousand additional Congolese refugees, who arrived in 2012-2013 following renewed fighting in eastern DRC which caused a large-scale refugee influx (UNHCR, 2016).

Camp/Settlement	Gihembe	Kigeme	Nyabiheke
Year established	1997	2012	2005
Refugee Population[2] (March 2021)	12,302	18,654	14,484
Annual Income for refugees	RWF 56,000 (Cash transfers remittances) RWF 43,200 (Salaried Jobs + Cash Transfers) RWF 39,000 (Salaried Jobs) RWF 25,000 (Cash transfers only)		
Energy Products	Majority of households rely on basic sources such as candles and torches for lighting Small proportions rely on solar lanterns (21%) and SHS(16%) More than 75% households rely primarily on basic stoves and firewood		
Monthly median refugee household energy expenditure[5]			
Batteries and Candles	RWF 480		
Charging	RWF 50 to RWF 100		

*Note that these are overall statistics for refugees in Rwanda and not specific to the mentioned camps

Appendix C: Mapping of Projects

Note: Many of the projects have multiple phases and activities and thus may fall into cross-cutting categories. We decided to map this breakdown in order to show the commonalities in the impact areas and intervention mechanisms of the projects being implemented in refugee settings. For the purpose of analysis, projects have been broadly classified based on the major activities and the stage that the project is in with priority being given to the SHS elements.

Categorizations	Productive Use	Consumptive Use	Public Use
Direct Supplier Grant Financing	De-Risking Pay-As-You-Go Solar Home Systems in Uganda Refugee Settlements Project Supporting a solar retailer to test the market in a displacement setting Solar Powered ICT and Learning Hub for Kakuma	De-Risking Pay-As-You-Go Solar Home Systems in Uganda Refugee Settlements Project Supporting a solar retailer to test the market in a displacement setting	Installing Solar Systems in Healthcare Clinics Run by IRC Solar Powered ICT and Learning Hub for Kakuma
Demand-Side Intervention	Access to Modern Energy in Humanitarian Setting (AMPERE) Access to Energy for Refugees and Host Communities II Renewable Energy for Refugees	Access to Modern Energy in Humanitarian Setting (AMPERE) Access to Energy for Refugees and Host Communities II Renewable Energy for Refugees	Access to Energy for Refugees and Host Communities II Renewable Energy for Refugees
Market Development Activities and Technical Assistance	Market based Energy Access (MBEA) II Digital Agents for Energy+	Market based Energy Access (MBEA) I Market based Energy Access (MBEA) II Sustainable Use of Natural Resources and Energy in the Refugee Context in Uganda Building a market system for clean energy in Burkina Faso	

Appendix D: Detailed Project Analysis

Please note that the major sources for the information on the projects have been cited with the Project Name. Additional sources on specific pieces of information may also have been cited further along in the body of the analysis.

Intervention Category	Direct Supplier Grant Financing	Direct Supplier Grant Financing	Direct Supplier Grant Financing
Project Type	Productive, Public	Public	Consumptive, Productive
Project Name	Solar Powered ICT and Learning Hub for Kakuma (Chatham House, 2021)	Installing Solar Systems in Healthcare Clinics Run by IRC (Chatham House, 2021) (Moving Energy Initative, December)	De-Risking Pay-As-You-Go Solar Home Systems in Uganda Refugee Settlements Project (USAID, 2018)
Timeline	2017-2019	2018	2018-2020
Project Implementer/Lead	Moving Energy Initiative[13]	Moving Energy Initiative	Smart Communities Coalition/USAID Power Africa, Green Powered Technology, and Energy 4 Impact
Country	Kenya	Kenya	Uganda
Settlement/Host Community	Kakuma	Kakuma	Kiryandongo and Rwamwanja
Overview	Moving Energy Initiative funded a project implemented by Crown Agents to construct the solar-powered ICT Nuru Access Center in Kakuma refugee camp. It was set up at the end of 2017 and took two weeks to construct. The personal	The International Rescue Committee (IRC) runs a number of health clinics and hospitals in Kakuma refugee camp in Kenya. The Moving Energy Initiative worked with IRC and Kube Energy to install new solar systems in Clinics 5 and 6.	Green Powered Technology and Energy 4 Impact engaged with three SHS companies BrightLife, Fenix International, and SolarNow to establish the infrastructure and operating systems required to initiate SHS sales; conduct marketing, recruitment, and

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[13] A collaboration of Energy 4 Impact, Chatham House, Practical Action, the Norwegian Refugee Council (NRC), the Office of the United Nations High Commissioner for Refugees (UNHCR) and the UK Department for International Development (DFID)

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	computers in the center require only 7 watts to power, compared to 250 watts required by most personal laptops.	A 36-KW system was installed at Clinic 6, and a 3-KW system was installed at Clinic 5. Both systems include battery storage and were completed in 2018.	training programs; and provide customer service operations. All three grantees are looking to continue operating in the area encouraged by the repayment rates. Two of the three grantees have seen "acceptable" repayment rates while one is looking to scale back to cash operations.
Target/purpose of project	The project aimed to offer a place where refugees can access a variety of digital services as well as technical, financial, and literacy training and printing, internet, and mobile charging services. Partners also use the hub as an outreach center for youth education and empowerment and target a 50:50 male to female utilization ratio. Additionally, the hub offers workshops on entrepreneurship, commercial services like a cyber cafe, and a potential sales point for pay-as-you-go SHS for local residents.	The project was intended to help the IRC reduce diesel power consumption at its clinics by 54,000 liters annually so that it could invest savings in other healthcare facilities. Additionally, it sought to train hospital staff in installation and maintenance of the system and connect local businesses to the power grid.	The project sought to de-risk the entry requirements for pay-as-you-go SHS providers in the settlements in order to incentivize companies to establish or expand operations. The primary goal was to deliver more access to SHS in both the refugee and host communities through market development. Product prices were not subsidized directly.
Funding source	Moving Energy Initiative	Moving Energy Initiative	United States Agency for International Development (USAID)
Funding amount*	Grant of approximately $125,502 (AidStream, 2017)	Grant of approximately $200,000	Grant of approximately $460,000
What worked?	Results showed that just over half of all hub users had their very first experience of accessing digital media at the center.	The project successfully replaced the Clinic 6 diesel generator and electrified Clinic 5, which previously had no electricity access.	Potential for a sustainable market in both communities; Engagement with local leaders to enhance access in settlements; Collaboration with local Non-governmental

	The hub can also foster good relations between the camps and the host community because host community members can also use the hub.	Fuel consumption and operating and maintenance expenses were reduced at the clinics.	organizations (NGOs) and training centers to recruit local talent; Integration of the host and refugee markets; Customers who were using SHS for business purposes emerged as more consistent payers; Mix of various marketing strategies including use of radio for sales and to attract new customers, multiple market 'activation' events per week, door-to-door sales and customer referrals; Early repayment rates were considered favorable
What did not work?	A few months after the hub opened, it was noted that only 18% of the energy available was being used. However, this was converted to an opportunity as the implementing agency found that there was significant interest from local businesses in connecting to the hub to supply additional energy services, which would generate additional income for the hub (Crown Agents , 2019).	O&M partner for the project, Power Gen, highlighted that finding qualified technicians in the local population can be challenging (Energy4Impact, 2019)	Lack of points of service infrastructure in refugee settlements, which may be tackled by exploring satellite presence; Language barriers in recruitment and training; High turnover of staff and wage inflation in the region due to humanitarian organizations requires formulation of more attractive payment or incentive structures; Lack of mobile money penetration impedes repayment; Identification issues and lack of data made assessing credit history difficult High turnover of staff and wage inflation; Identification issues and lack of data made assessing credit history difficult.
Analysis	24% of hub users were utilizing the ICT facilities for educational purposes	Clinic 6 previously spent $2,334 per month on diesel, and Clinic 5 had no electricity but was planning on installing a diesel generator that would have cost $10,000 to build and $675 per month to run. The project	**Units Sold:** 4,137 **Units Target:** 10,000 **Jobs Created:** 285 **Jobs Target:** 15

59% were using email and social media to connect with loved ones and advise them of their whereabouts	reduced total energy costs, including maintenance and depreciation of the system, to $500 per month.

IRC reduced its fuel consumption by 100% (72,000 liters of diesel annually).

As of December 2018 (about 6 months after installation) the solar systems were still supplying 100% of the clinics' power needs. | Refugees accounted for 22% of sales, and women accounted for 31%.

Repossession Statistics:
BrightLight: Repossessed 190 units (lower than the absolute target of 260)
Fenix: Repossessed 114 systems
SolarNow: information unavailable |

*for consistency, any grant amounts have been converted to USD and are therefore approximate and subject to differences in exchange rates over time

Intervention Category	Direct Supplier Grant Financing	Demand-Side Intervention	Demand-Side Intervention
Project Type	**Consumptive, Productive**	**Consumptive, Productive, Public**	**Consumptive, Productive**
Project Name	Supporting a solar retailer to test the market in a displacement setting (BBOXX) (Moving Energy Initative, 2018) (Whitehouse, 2019)	Renewable Energy for Refugees (Practical Action, 2020) (EnDev, 2020)	Access to Modern Energy in Humanitarian Setting (AMPERE) (Mercy Corps, 2021) (Mercy Corps, 2019) (Columbia SIPA Energy and Environment, 2020)
Timeline	2018	2017-2022	2019 to 2020
Project Implementer/Lead	Moving Energy Initiative	Practical Action, in partnership with UNHCR	Mercy Corps Netherlands (Mercy Corps), in partnership with SNV and Response Innovation Lab (hosted at Save the Children)
Country	Kenya	Rwanda	Uganda
Settlement/Host Community	Kakuma	Kigeme, Nyabiheke, and Gihembe	Bidibidi
Overview	The Moving Energy Initiative provided funding to BBOXX Capital to establish retail outlets for its pay-as-you-go SHS. The grant covered the acquisition of an initial 75 units, rent and staff costs for an initial six-month period, associated training costs, and co-funding of marketing materials for the company. Customers were required to pay a KES 1,780 (~USD 17.5) deposit and a monthly fee of KES 900 (~USD 8) until the balance had been repaid in full (approximately 3 years). The customer then has to pay KES 450 (~USD 4.15) per month to continue receiving support for the system. Further, marketing support was provided to BBOXX by MEI including the conducting of roadshows for raising awareness and running advertisements.	The Renewable Energy for Refugees project focuses on helping refugees and their host communities access finance, training, technology and expertise to facilitate renewable energy powering homes, schools, health clinics and businesses. It targets the provision of solar-powered electricity for households, small enterprises, institutions and community facilities (Energy4Impact, 2021). Practical Action is promoting four interventions to address this: i) SHS for households and enterprises	Mercy Corps conducted this pilot to evaluate solutions to energy needs in humanitarian settings through market interventions. The program utilized demand-side product subsidies as well as some market activation activities to enhance long-term investments in BidiBidi, addressing the access to high-quality, reliable, and clean energy sources. Mercy Corps partnered with two private solar energy providers—Village Power and d.light—to initiate the AMPERE pilot project. Mercy Corps played a coordinating role, while Village Power and d.light were tasked with managing all sales operations in the settlement.

		ii) biomass and advanced cooking technologies iii) solar powered community street lighting iv) solar power for institutions, community facilities, and enterprises They have taken a "Total Energy Access" approach in assessing levels of energy access that involves extensive surveys and interviews in the community to identify the most crucial challenges in energy access in the camps. The project is ongoing.	
Target/purpose of project	The project sought to de-risk the entry requirements for pay-as-you-go SHS providers in the settlements in order to incentivize companies to establish or expand operations. The primary goal was to test the market for camp occupants and businesses and deliver high-quality solar products to the community. Product prices were not subsidized directly.	The target is to help refugees to move from aid dependence to economic independence. The project is supporting about 150 refugee and host community entrepreneurs with business mentoring, access to electricity and appliances, technical training and access to finance. Businesses are supported to procure enterprise solar kits, construct a nano-grid or connect to the national grid.	The project aimed to test how market systems can be strengthened by creating more flexible financing, increasing ability to pay for products, and reducing credit risk.
Funding source	Moving Energy Initiative	IKEA Foundation	SNV Netherlands Development Organisation, Save the Children, and the Dutch Coalition of Humanitarian Activities (DCHI).
Funding amount*	Grant of approximately $41,000	Not available	Not available

What worked?	Previous assessments that identified market potential for SHS proved correct. Demand for the systems was found to be even higher than what the initial acquisition anticipated, particularly in the refugee community.	Tailored one on one package of support and business mentorship Vocational training to entrepreneurs A PUE (Productive Use of Energy) clinic was constructed in each camp to create awareness of the potential of productive use of energy for livelihood development among the refugees.	Repayment rates by the refugees were found to be similar to the ones observed in the host community across companies' portfolios. As such, the two OGS suppliers involved in the pilot expressed the intention to remain in the area to continue assessing market demand. Emphasis on cash payment options, and cheap and portable products increased the sales. Detailed consumer segmentation in the area allowed the sector to determine the needs that may be met through supported local energy markets and revealed more clearly who may be excluded. Co-designing of proposed interventions allow for market actors to suggest potential design iterations derived from their knowledge and experience. Community-level market activation events such as the "Mercy Corps campaign" and "walking sales agents" worked to improve awareness among customers. Product quality tests done during the demonstrations led to higher trust and product credibility. Setting up service centers that covered warranties, customer education, and after sales services were also useful for consumers.

What did not work?	High logistics and transportation costs, especially compared to other BBOXX locations, require a large customer base to be economically viable, which is challenging given the frequent customer relocation and low sales volume relative to the market size. The sales rates observed in the pilot stage are not viable. Training, marketing and credit-provision activities are dependent on aid agencies.	Behavioral resistance due to resettlement plans of refugees Refugees are hesitant to operate businesses in the host community due to taxes and other operating costs. Low purchasing power among refugees undermining growth projections Dependence on aid and support– the RE4R program has covered 70% of the cost of the technology	Dependence on subsidy levels was observed. Once the subsidy was reduced to 50% in phase II of the project, there was a decrease in purchases. There was low brand recognition of the private companies. A survey found that most pilot participants believed that the products were being sold by Mercy Corps and did not identify the names of the private companies. Penetration of mobile money is low in the Bidibidi camp, so refugees have to travel longer distances to access mobile payment points. Language barriers impacted consumer trust of products
Analysis	**Units Sold**: 105 The first 75 were Financed by the grant, and 40 more were later financed by BBOXX as demand exceeded supply. **Jobs Created:**13 0% default rate in the first two months	**Appliances Acquired** - 51 business owners **People Trained:** 145 entrepreneurs and stakeholders trained on the potential of PUE **Suppliers of Appliances:** 6, linked to 51 enterprises **PUE Appliances Acquired:** 80	**Products Sold:** 3,639 **Households Benefited:** 2,270 **PAYGO Systems:** 324 **On-time Payments (pre-COVID):** 75% **On-time Payments (post-COVID):** 68%

*for consistency, any grant amounts have been converted to USD and are therefore approximate and subject to differences in exchange rates over time

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Intervention Category	Demand-Side Intervention	Market Development	Market Development
Project Type	**Consumptive, Productive and Public**	Consumptive	**Productive and Consumptive**
Project Name	Access to Energy for Refugees and Host Communities II. (Alianza Shire, 2021) (Moreno-Serna, et al., 2019)	Market based Energy Access (MBEA) I (SNV, 2020) (EnDev, 2020)	MBEA II (SNV, 2021)
Timeline	2018-Ongoing	2017-2019	2019-2021 (estimated 2023)
Project Implementer/Lead	Alianza Shire[14]	SNV Netherlands Development Organisation under EnDev	SNV Netherlands Development Organisation under EnDev
Country	Ethiopia	Kenya	Kenya
Settlement/Host Community	Shire (Adi-Harush, Hitsats, Mai-Aini, and Shimelba)	Kakuma and Kalobeyei	Kakuma and Kalobeyei
Overview	The first phase of the project was aimed at the improvement and extension of the electricity grid and connecting to communal services including a primary school, communal kitchens, or markets hosting small businesses. Further, street lighting covering over 4 KM was installed, and training was given to refugees to become the technicians in charge of maintaining the infrastructure. The second phase of the project scaled up these targets and added the provision of 1700 3G Solar Home Systems on prepayment basis (Alianza Shire, 2021)to pre-identified beneficiaries as one of the	SNV and EnDev collaborated with several private sector organizations to deliver efficient cookstoves, SHS, and solar appliances to the two refugee camps and surrounding communities. Project activities included awareness campaigns, supply chain development, setting up linkages with local traders, and training local residents in stove production.	MBEA II is an ongoing project that builds upon the MBEA I pilot and has expanded its targets to micro-enterprises and social institutions, as well as to individual households. In addition to the continued activities from MBEA I, SNV is facilitating access to finance for micro businesses and households by partnering with financial intermediaries and the development of a cash-based intervention (CBI).

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[14] Spanish Agency for International Development Cooperation (AECID), Iberdrola, Signify and Acciona.org, the Humanitarian Action Office of the and the Innovation and Technology Centre at the Universidad Politécnica de Madrid (itdUPM), UNHCR

	components. Alianza Shire is holding workshops with potential users and the community to reach an agreement for the rates to be applied which will achieve long-term sustainability of solar home systems (Alianza Shire, 2020). This phase also aims to support the creation of 6 micro-businesses owned by refugees and host communities which will be in charge of the operation and maintenance of the SHS.		
Target/purpose of project	The project is intended to improve the living conditions in the host and refugee communities by creating livelihood opportunities, enhancing local capacity building and improving access to energy services.	The project sought to increase access to cleaner cooking alternatives and solar lighting through creating a market for private sector suppliers in the communities.	The project aims to further increase clean cooking and solar energy access for individuals in the camps, as well as provide clean cooking and lighting products for businesses and institutions.
Funding source	European Union's Emergency Trust Fund for Africa	SNV, EnDev	SNV, EnDev
Funding Approach*	$5,507,225	Not available	Not available
What worked?	Results not available yet as the project is ongoing. Major Considerations include focus on refugee-host integration, high quality products, economic sustainability, and training of locally diverse stakeholders.	Local presence and strong network with different parties in the camps including community leaders and public and private sector organizations Use of local capacity for awareness campaigns, community engagement, and regular soliciting of feedback from end-users and distributors	Not applicable - ongoing

| | | Awareness campaigns had a positive effect on purchases, especially in middle and high-income groups.

Solar suppliers were quick to engage in the market.

Decentralizing operating and maintenance processes can improve customer service - for example, spare parts and repair centers can be set up locally to avoid delays that disincentivize future purchases.

This approach appeared to be more effective in promoting lighting solutions and higher quality cookstoves. The higher uptake of energy access products among host community households shows the importance of higher disposable income and ability to pay among the target market in driving uptake. Nevertheless, the steady uptake for lighting solutions among refugees demonstrates a willingness to pay even among lower-income households. | |
|---|---|---|---|
| **What did not work?** | Major challenges highlighted by implementing agency include lack of key information about the operating environment such as income and population distribution; resistance of beneficiaries towards paying for a service; lack of coordination amongst multiple local stakeholders, humanitarian vs development mindset, and lack of consolidation of previous learnings (Alianza Shire, 2020). | Lack of steady bioethanol supply made people reluctant to fuel switch and acquire new stoves. Suppliers were not adequately prepared to provide a steady stream of bioethanol after new stoves were sold.

The small businesses and local sellers distributing efficient stoves, lighting, and SHS struggled to cover the upfront costs of stock, introducing uncertainty about the reliability of the market.

Awareness campaigns were not as effective with lower-income residents with lower purchasing power, and they continue to rely on UNHCR. | Not applicable - ongoing |

		Many in the communities still use firewood, as fuel switching will require deeper behavioral changes, and the scope of the marketing campaign is limited despite being demonstrably effective.	
Analysis	Results not available	**Solar Products Sold:** 2,556 solar lanterns and 4,322 SHS **Stoves Sold:** 2,005 industrial stoves and 277 locally made stoves Bioethanol, briquettes, and pellets were successfully introduced in the communities. Solar appliance uptake was higher in the host community.	Not applicable - ongoing

*for consistency, any grant amounts have been converted to USD and are therefore approximate and subject to differences in exchange rates over time

Intervention Category	Market Development	Market Development	Market Development
Project Type	Productive	Consumptive	Consumptive
Project Name	Digital Agents for Energy+ (Smart Communities Coalition, 2020) (Norwegian Refugee Council, 2021)	Sustainable Use of Natural Resources and Energy in the Refugee Context in Uganda (EnDev, 2018) (EnDev, 2020)	Building a Market System for Clean Energy (Moving Energy Initiative, 2018) (Moving Energy Initiative, 2021)
Timeline	Ongoing	2017-2018	2017-2018
Project Implementer/Lead	Norwegian Refugee Council, International Trade Centre, and Mastercard.	GIZ, EnDev Uganda	MEI
Country	Kenya	Uganda	Burkina Faso
Settlement/Host Community	Kakuma and Kalobeyei	Imvepi and Rhino	Goudoubo
Overview	The project seeks to create job opportunities for the refugees and host community youth and train small businesses and individual entrepreneurs to sell clean energy products in Kakuma and Kalobeyei.	The project consisted of a series of interventions to increase energy access in the refugee and host communities, including awareness raising activities, training local stove artisans, supporting local vendors for energy products, and setting up energy kiosks.	MEI worked with the local private sector to develop market systems for solar products, including SHS. MEI took a systems approach for energy access by improving information flow, market channels, customer financing, and after-sales technical support.
Target/purpose of project	The pilot is targeting twenty-five refugee and host community youths to become agents and five SMEs as the wholesalers of the energy products supplied by Total in Kakuma and Kalobeyei. The Project aims to test a model that would allow different product lines to	The project sought to create an integrated approach to sustainable energy access and cooking solutions, in addition to other ecosystem goods and services. Additionally, it sought to create a market-based system to deliver cookstoves and energy products, specifically Pico PV, to the communities (UNHCR, 2017).	MEI targeted the development of a market systems project around the systemic constraints affecting the functioning of the market. The project aimed to demonstrate that even in highly underdeveloped markets, there is an opportunity to catalyze the growth and development of the market system. The project focused on:

	reach the bottom of the pyramid customers, while offering employment opportunities and market development.		- Market perceptions: changing the perception of the energy system by demonstrating the products' market potential - Marketing and retail: facilitating direct marketing interactions between energy companies and energy users - Financing: challenging the idea that aid agencies must deliver credits or loans, which displace local finance mechanisms - After-sales engagement: willingness to invest in energy is dependent on customer satisfaction, therefore after-sales support improves the customer experience and promotes the creation of future demand
Funding source	TRANSFORM, a joint initiative of DFID and Unilever	DFID	MEI
Funding approach*	Not available	Grant of approximately $330,000	Not available
What worked?	A market assessment was conducted in the first stage of the project. Training and mentorship were provided to the energy product agents and wholesalers. A collaborative training approach was used with Total providing product training, Mastercard providing online platform and application training, and	Kiosk managers reinvested revenues in restocking products Awareness-raising activities, especially allowing people to try out solar products and stoves, increased their confidence in these products. Included roadshows and billboards	MEI identified 2 companies that were fully committed to carrying out self-directed marketing activities in the region. MEI encouraged ideas from the market and supported the process to bring them to fruition while also facilitating the right conditions for firms to take action.

	ITC conducting entrepreneurship and business development training.	The two kiosks are run under two different models with one being run as a business by a South Sudanese refugee group while the other is with an NGO. The business model has emerged as more successful Energy related services such as cafe, printing, photoshops requiring no awareness raising have emerged as most successful	The local curriculum of the training and employment institute (ANPE) in Dori was adapted to include a module on solar products and systems. Visual materials (such as cartoon-based posters) were developed to be engaging for the private sector
What did not work?	Product delivery was delayed due to additional documentation and verification requirements which increased transportation and processing costs. Access to finance for the product wholesalers was a challenge with local banks having cumbersome collateral and documentation processes and a high interest rate on loans. Delays in the production and distribution of marketing materials was experienced which affected the branding and marketing plan. A high level of competition and saturation of the solar energy market was observed in parts of Kakuma 1 and Kalobeyei. Recognition that a collaborative approach should have been used early on with agents, wholesalers, and the supplier so as	The original implementation time of roughly half a year was insufficient for supporting the up-take of energy businesses, and developing viable business models Kiosk managers need continuous support Road infrastructure is poor which impacts logistic Challenges in incentivizing solar product providers to sell their products in the kiosks Lack of formal micro-financing schemes for customers to access energy products Low purchasing power and willingness to pay Kiosk established in more recent settlement which had experiences of in-kind	MEI found that information and marketing, after-sales support, and finance were not all trickling through to marginalized communities, including to the refugees. Insufficient engagement with aid agencies such as UNHCR More information is needed on the market distortions caused by the free distribution of energy products.

	to establish a price range that would provide for break-even points and different profit margin levels giving agents flexibility to adjust price points. Covid-19 restrictions have affected proposed market campaign activities resulting in fewer sales than expected.	distribution recently faced more challenges in sales	
Analysis	60 sales of the Total products had been made as of 15th February 2021. The project provided training to five small businesses to become wholesalers and 25 youth entrepreneurs to become agents of the energy products supplied by Total.	2 solar energy kiosks in adapted portable containers that sell quality solar products, improved cookstoves, cold drinks and energy-related services were set up Kiosk management teams were provided with training Income generation for 8-10 members of a South Sudanese youth group	Fifty-five energy agents trained and recruited by firms available for sales, marketing, repairs and maintenance in Dori, and Goudoubo camp. Brought together over 75 organizations – UNHCR, other aid agencies, NGOs and development organizations, the private sector, and the government – during networking sessions, workshops and conferences for discussion on market systems

*for consistency, any grant amounts have been converted to USD and are therefore approximate and subject to differences in exchange rates over time

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