3. Finding smarter ways to improve energy access through mobile technology

Since 2013, the GSMA M4D Utilities Innovation Fund has been instrumental in trialling a variety of business models to bridge the energy access gap in emerging markets. The most notable have been PAYG solar companies that have cumulatively sold nearly two million solar home systems by 2018, with the majority of the sales contributed by Innovation Fund recipients M-KOPA, Fenix, PEG and Lumos, to name a few. The PAYG model of using mobile phones to make clean energy accessible and affordable through mobile payments and M2M technology is also being replicated in other sectors, such as water (CityTaps), irrigation (SunCulture), clean cooking (KopaGas) and sanitation (Loowatt).[40]

Value chain disaggregation and the changing role of mobile operators

As the PAYG ecosystem has grown and matured in both scale and scope, PAYG companies are increasingly specialising in different activities along the PAYG value-chain. Companies such as d.Light, Angaza Design and Bboxx are now offering the PAYG hardware and software building blocks to enable new players with local knowledge to enter the market, but without the need to invest in recreating high-quality technology.

Figure 3 Source: FIBR

Distribution and consumer financing focused

Solar hardware focused	Omnivoltaic, renewit Solar solutions, AMPED INNOVATION, fosera
PAYGo software platform and/or remote lockout	angaza, Paygee, solaris offgrid, eseye, naefos
PAYGo solution for distributors and own B2C	BBOXX, d.light, greenlight planet, azuri
Distribution + Consumer Financing focused	Bright Life, OOLU, PEG, ECOENERGY
Vertically integrated	ZOLA, fenix intl, M-KOPA SOLAR
Value-added data solutions	fraym, Arifu, HARVESTING, EFL
Specialist solution / service providers	Catalyst., OPEN CAPITAL ADVISORS

This has also led mobile operators to rethink their role in the value chain and the opportunities for expanding partnerships and customer services.

- **Mobile operator-led models:** Some mobile operators are ambitiously launching their own PAYG solar businesses that provide retail as well as financing. With support of the GSMA M4D Utilities Innovation Fund in some markets, Orange Group has extended its PAYG solar home system (SHS) services from the Democratic Republic of Congo (DRC) and Madagascar[41] to Burkina Faso (through another M4D Utilities grant), Senegal, Mali, Guinea and Côte d'Ivoire. Another operator, Afghan

Wireless Communication Company, has partnered with d.light to provide PAYG SHS in Afghanistan with support from the GSMA M4D Utilities Innovation Fund. Of course, a mobile operator setting up a financial subsidiary could face its own regulatory and other challenges.[42]

- **Exclusive co-branding model:** Exclusive branding partnerships may become rarer, or not as long term, as mobile operators have a broader range of partners to choose from and solar becomes more well-known and trusted. However, in regions where PAYG solar still faces challenges like low-quality unbranded products, the market knowledge and branding anchor that mobile operators provide may be powerful.
- **Diversified model:** Specialisation in the value chain is creating an ecosystem that supports more life-enhancing devices, such as refrigerators, cooking gas, smartphones and solar water pumps. This is appealing to mobile operators, which can use these devices to target or grow specific customer segments. Pairing smartphones with PAYG solar systems has been a growing trend among companies in Africa, such as Mobisol, M-KOPA and Sunna. GSMA M4D Utilities Innovation Fund grantee, Vitalite, is also trialling a lease-to-own model that is aiming to deploy 1,500 smartphones and 500 cookstoves across rural Zambia, with mobile operators MTN and Airtel Zambia providing the mobile money payments service.

Understanding the sales and distribution gap: Challenges and opportunities

In their early days, a number of vertically integrated PAYG companies sought to leverage the last-mile sales and distribution networks of mobile operators to reach customers. This was a challenging model, due to the deep level of engagement it required between energy service providers and mobile operators. Nevertheless, some mobile operators are adopting this business model by launching their own services and tackling sales and distribution themselves. For many of the top PAYG solar companies, the unit economics of sales and distribution remain a challenge, so it will be interesting to see how mobile operators leverage their assets and experience.

In an era of value chain specialisation, a growing number of companies are choosing to focus on distribution, but many local distribution companies are finding smooth mobile money integration a challenge. Solutions like the GSMA IPN Hub (see page 11) can bridge the mobile money integration gap for energy service providers by providing a single platform for real-time notification of mobile money payments, essential for the prepaid service model. Through a single integration to the IPN Hub, energy service providers (and a range of other service providers) can receive payment notifications in real time from multiple mobile operators across multiple markets.

Off-grid moves from M2M to IoT

Some PAYG solar models rely on M2M connectivity to monitor systems remotely and halt usage if payments have not been made, enabling proactive maintenance. Others use a keypad technology to operate in areas with strong mobile network coverage. However, some companies are shifting their business models to leverage the Internet of Things (IoT) to improve device performance.[43] With the cost of sensors steadily declining, this technology, which allows devices to communicate with each other, is becoming more accessible to energy solution providers, even in emerging markets.

For example, SunCulture in Kenya, a GSMA M4D Utilities Innovation Fund grantee, sells solar-powered water pumps using M2M technology, and is now rolling out IoT-enabled systems that use soil and weather data to optimise pump activity. Another Innovation Fund recipient, SolarWorks in Mozambique, is using IoT technology and machine learning to combine weather forecasting data and user data to make solar home systems self-learning and to minimise system downtime.

Mobile operators experiment with smart metering for on-grid energy and mini-grids

On-grid urban utilities in emerging markets are shifting to smart metering to monitor energy use in near real time, which cuts costs and helps to balance supply and demand. Interestingly, a few mobile operators in Asia are taking the lead on trialling smart metering solutions for utilities. The largest mobile operator in Sri Lanka, Dialog Axiata, received a GSMA M4D Utilities Innovation Fund grant to develop and install GSM-enabled smart meters in partnership with The Lanka Electricity Company (LECO), an electricity distribution utility in Sri Lanka. This project led to the creation of a sophisticated low-voltage distribution network monitoring system that can monitor the network in real time at a very affordable price. Another Innovation Fund grantee, the Pakistani mobile operator, Jazz (Veon Group), has developed an electricity theft prevention and line-loss reduction solution for grids. It is testing smart metering systems that work at the box level on electricity distribution lines and will provide real-time monitoring and metering for the utility.

Some mobile operators are showing an increased interest in mini-grids. The use of smart meters in mini-grid power generation and consumption is enabling mini-grid operators to make decisions that will increase usage and reliability, including whether to connect new customers, to increase or decrease consumption at certain times of day or to add new generation or energy storage.[44]

Through a GSMA M4D Utilities Innovation Fund grant, Orange Burkina Faso is piloting prepaid smart metering on mini-grids in partnership with SINCO, a cooperative that manages electricity distribution through rural grids. Orange also has an online real-time dashboard synced with each meter to monitor fraud, alarms, disconnection and usage. Another grantee, Electricité de Madagascar, a Tower Company that works with the mobile operator Telma in Madagascar, is also constructing mini-grids that will be managed by GSM-enabled smart meters.

The data collected from these smart meters can be extremely useful in improving mini-grid operations. Platforms like Odyssey Energy Solutions are now able to process smart meter data from operating projects to track load, connections and financial performance in a standardised way, which we believe could be a major catalyst for scaling mini-grid models.[45]

As mobile IoT technology becomes more widely available, there is an opportunity for entrepreneurs to leverage the new cellular Low Power Wide Area (LPWA) network technology.[46] These networks are designed for lower cost IoT applications that use low data rates, need long battery life and are typically in remote locations. This is ideal for applications like smart-metering and decentralised utility service models.[47] Currently, there are very few mobile IoT networks in emerging markets in Africa and Asia. In 2016, mobile operators in the United States launched a series of new offerings and initiatives to spur innovation in IoT, including fixed annual data plans, a dedicated online programme for IoT developers, and starter kits with SIM cards, M2M modules and data plans. Applying the same type of ecosystem support in developing markets and working with local partners, such as incubators, could help to build momentum for IoT.[48]

There is no single solution to bridge the global energy access gap. Innovation in both off-grid and on-grid energy services is essential. As PAYG business models mature and replicate, and the costs of M2M sensors continue to fall, mobile-enabled energy solutions are expected to play a key role in achieving SDG 7.[49]

ENERGY

MOBISOL

PAYG SOLAR FOR ENTREPRENEURS IN RWANDA

LOCATION
Rwanda

MOBILE OPERATOR PARTNER
MTN Rwanda

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M Connectivity

FIND OUT MORE
Mobisol Pre-Paid Solar Energy

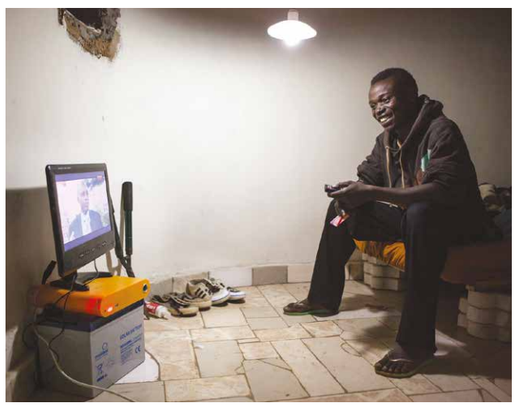
PROBLEM: 70 per cent of Rwandans still do not have access to reliable energy services.[50] The problem is particularly challenging in rural areas where only 18 per cent of the population has access to energy.[51]

SOLUTION: Mobisol is an international company founded in 2010 that engineers, develops and delivers rent-to-own solar home and business systems, appliances and services for emerging markets. Mobisol offers off-grid customers PAYG solar home systems (SHS), including customer support and maintenance.

GRANT SUMMARY: In November 2013, Mobisol received a grant from the GSMA M4D Utilities Innovation Fund to replicate its PAYG solar business in Rwanda through a partnership with MTN, with a focus on SHS for entrepreneurs to charge phones and rent lanterns.

IMPACT: Approximately 92 per cent of Mobisol customers using the small business kit system completely replaced kerosene, candles and/or batteries with their Mobisol system. Small business owners can earn approximately RWF 25,000 (£27) per month from the phone and lantern-charging business, which exceeds the monthly cost of Mobisol's 100 W system with the business kit, and allows it to increase its profit margins. Mobisol customers make 1.7 payments per month via MTN mobile money for their Mobisol systems — very active compared to the industry benchmark for active users (one transaction every 90 days). MTN is giving Mobisol a preferential transaction fee rate for Mobisol payments. In return, Mobisol increased MTN's long-term customer loyalty through the continued use of mobile money.

LOOKING AHEAD: Mobisol aims to provide sustainable and affordable energy solutions to 20 million people by 2023. In October 2018, Mobisol received a significant follow-on growth equity investment from its main shareholders to fund growth in its priority markets (Tanzania, Kenya and Rwanda) and expand both its product range and its recently expanded B2B distributor partner business in other geographies. Mobisol also partnered with MTN and phone manufacturer Tecno to increase connectivity in rural Rwanda by offering a smartphone on a PAYG basis. In October 2018, the company joined forces with the IFC to launch the PAYG business model in a new market, Ethiopia.



> The children now have bright light to do homework. They do not use the kerosene lamp any more, the fumes made them cough at night. We feel more connected to the rest of the world through the radio and TV.
>
> MOBISOL CUSTOMER,
> RWANDA

ENERGY

M-KOPA

SCALING PAYG SOLAR HOME SYSTEMS IN KENYA

LOCATION
Kenya

MOBILE OPERATOR PARTNER
Safaricom

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

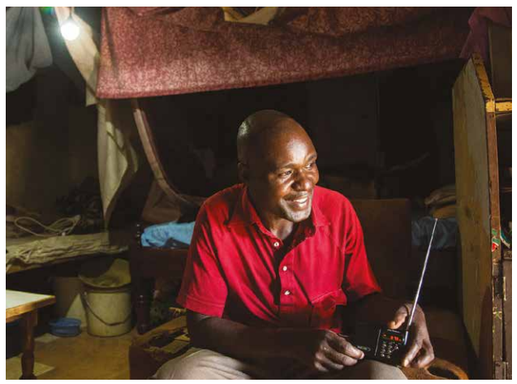
PROBLEM: Nearly 44 per cent of Kenya's population lacks access to electricity.[52] Kenyans typically spend 20 per cent of their income on kerosene and charging mobile phones.[53]

SOLUTION: M-KOPA pioneered and built PAYG solar home systems launched in 2012 to provide a more cost-effective energy solution to Kenyans. The solar home system consists of a base-station with a solar panel, three lamps and a charging kit for phones. Subscribers chose a payment plan starting from £0.40 and they can qualify for upgrades to more appliances, devices and financial services. Subscriptions are affordable and accessible for low-income homes, to pay at any time, from any place with a mobile signal.

GRANT SUMMARY: In December 2013, M-KOPA received a grant from the GSMA M4D Utilities Innovation Fund to expand its offering to include a low-power television. The grant tested whether the repayment behaviours of target customers were strong enough to support additional credit-based energy financing for SHS with televisions.

IMPACT: After the GSMA project, M-KOPA expanded its operations to Uganda and in November 2018 it surpassed 100,000 Ugandan connected homes and businesses. By January 2019 M-KOPA has connected over 700,000 homes across Africa, making it the biggest off-grid PAYG provider globally. M-KOPA has sold over 210,000 PAYG TV's[54] and it has recently launched a larger model with a 32 inch flat screen. According to M-KOPA, its current customer base is expected to make projected savings of over £400M by 2022, by replacing kerosene and accessing affordable appliances. In October 2018 it announced a pilot of Mastercard's Quick Response payment technology to enable more secure payments in markets without an established mobile money system.[55]

LOOKING AHEAD: In October 2017, M-KOPA secured £61 million in committed finance.[56] M-KOPA recently released a consumer finance product - Solapesa. Subscribers can use their M-KOPA device to access cash loans with tailored repayment plans.



> M-Kopa has actually changed my life because since I bought it...I started using it to light three rooms and even charging...even my neighbours benefit from charging their phones.
>
> M-KOPA CUSTOMER,
> KENYA

ENERGY

LUMOS

PAYG SOLAR USING AIRTIME PAYMENTS IN NIGERIA

LOCATION
Nigeria

MOBILE OPERATOR PARTNER
MTN

USE OF MOBILE CHANNELS
Airtime Payments / M2M Connectivity

FIND OUT MORE
Lumos: Pay-as-you-go solar in Nigeria with MTN

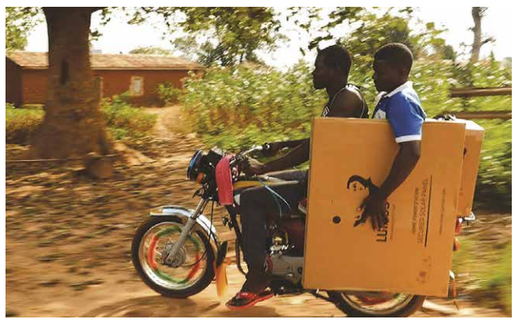
PROBLEM: 40 per cent of Nigeria does not have access to electricity,[57] and over 80 percent of all Nigerians (180 million) rely on petrol generators as a primary or back-up source of energy.[58] As a result, domestic and commercial consumers spend an estimated £11 billion annually to power 14 GW of small-scale diesel and petrol generators.[59]

SOLUTION: Lumos designs and manufactures mobile-enabled solar home systems and partners with mobile operators to make PAYG solar available in markets with a large addressable off-grid population.

GRANT SUMMARY: In December 2013, the GSMA M4D Utilities Innovation Fund awarded Lumos a grant to trial PAYG solar services with MTN Nigeria. MTN Mobile Electricity, an MTN and Lumos co-branded service, offers off-grid customers in Nigeria energy as a service via SHS. This PAYG model was enabled by the use of airtime credit and GSM-based M2M connectivity to remotely control and monitor the usage, billing and performance of an SHS.

IMPACT: As of June 2018, Lumos has sold over 88,000 SHS in Nigeria and Côte d'Ivoire, with over one million beneficiaries. The mobile airtime payment transactions generated by Lumos end users increased from 514,850 in 2016 to 1.2 million in 2017, and are expected to be above one million in 2018 in Nigeria alone. The Lumos SHS is now available in over 300 stores across Nigeria, up from 86 in 2016.[60]

LOOKING AHEAD: Lumos has expanded beyond Nigeria into Côte d'Ivoire, continuing its partnership with MTN. Over the next three years, Lumos is aiming to sell five million SHS in Nigeria and another million through expansion into other markets, including Côte d'Ivoire, Ethiopia and the Philippines.[61] Lumos also plans to add more services and adapt to a range of markets, such as SMEs and the rural poor.



> When we had a major blackout at Christmas, I was glad I had the solar because I didn't have to join everyone chasing around for fuel.
>
> SCHOLA ANDEM,
> LUMOS CUSTOMER, NIGERIA

ENERGY

PEG AFRICA

DISTRIBUTION OF SOLAR THROUGH LICENSING IN GHANA

LOCATION
Ghana

MOBILE OPERATOR PARTNER
Tigo / Airtel / MTN

USE OF MOBILE CHANNELS
SMS / Voice / M2M Connectivity

FIND OUT MORE
Lessons learned from our grantees: PEG Ghana

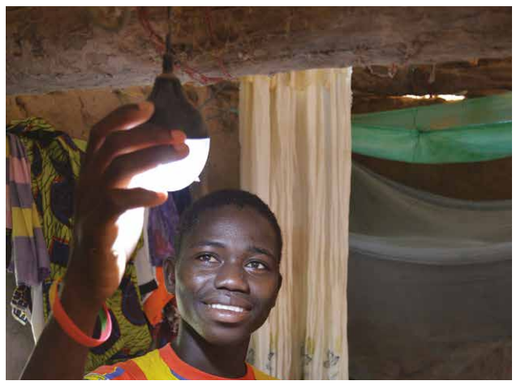
PROBLEM: While 45 per cent of people in Ghana live in rural areas, 34 per cent do not have access to grid electricity.[62] They can spend up to 30 per cent of their income on poor-quality, polluting fuels like kerosene, candles and batteries, and often have to travel many miles simply to charge their mobile phones.[63]

SOLUTION: PEG Africa was launched in 2013 to provide PAYG energy services in Ghana's off-grid market. PEG focuses on building value through distribution, financing and branding across the PAYG value chain.

GRANT SUMMARY: In December 2013, the GSMA M4D Utilities Innovation Fund awarded PEG a grant, in partnership with Tigo, Airtel and MTN, to provide prepaid solar energy services to six villages in Ghana through both microgrid and solar home systems with one business. While both technologies had already been tested and were being used in Tanzania, the grant tested the potential to scale an energy service business in a new market that licensed existing third-party hardware and software rather than developing it themselves.

IMPACT: Although PEG changed suppliers and decided to focus only on SHS, the model proved successful and helped them raise £16 million in funding over several rounds over the last three years.[64] Following this project, PEG expanded its services to Côte d'Ivoire and Senegal, and now employs over 400 full-time staff and 550 commission-based sales agents. In January 2017, PEG announced a new nationwide partnership with BIMA, the global microinsurance and health pioneer, and Prudential Life, which would provide eligible PEG customers with free insurance cover as a reward for loyalty and timely loan repayment.[65] By 2017, it had reached 11,000 families with its hospital insurance scheme.[66]

LOOKING AHEAD: PEG Africa aims to electrify 500,000 households in West Africa by 2020.[67]



> PEG Ghana helps by helping me to sell things even when electricity is not available. Having light at all times has made my store more attractive to customers.
>
> FEMALE SHOPOWNER
> AND USER OF PEG, GHANA

ENERGY

FENIX INTERNATIONAL

CALING PAYG SOLAR IN UGANDA

LOCATION
Uganda

MOBILE OPERATOR PARTNER
MTN Uganda

USE OF MOBILE CHANNELS
SMS / Mobile Payments

FIND OUT MORE
The power of mobile to improve access to energy: Fenix and MTN Uganda's story

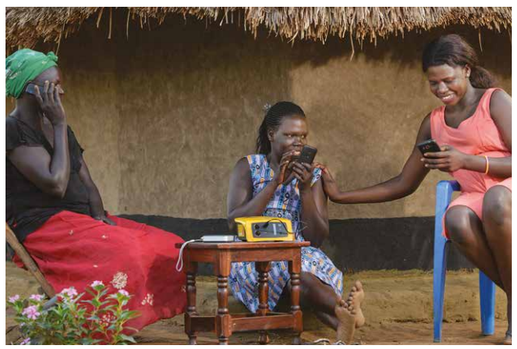
PROBLEM: Only 27 per cent of Ugandans have access to reliable and affordable energy.[68] The World Bank's 2018 *Doing Business* report identifies the cost of electricity as a particular impediment to private sector development in Uganda, with the country ranking significantly below regional counterparts, such as Kenya and Rwanda, in the "getting electricity" category.[69]

SOLUTION: Fenix International, headquartered in Kampala, was founded in 2009. Fenix designs, manufactures and distributes ReadyPay Solar, a mobile payment-enabled solar panel and smart power system that empowers off-grid residents with convenient, affordable access to clean electricity.

GRANT SUMMARY: In February 2014, Fenix received a grant from the GSMA M4D Utilities Innovation Fund to scale its new PAYG system, ReadyPay Power, to enable solar-powered lighting and phone charging. It also tested the introduction of ReadyPay home and business products through joint marketing and distribution with MTN.

IMPACT: In 2014 alone, Fenix's 13,000 customers made over 100,000 mobile money transactions. Thirteen per cent of ReadyPay Solar customers were not previously MTN Mobile Money customers, and 70 per cent of those surveyed said their impression of MTN had improved significantly with its association with ReadyPay Solar. As of November 2018, following its acquisition by ENGIE in April 2018,[70] Fenix has grown into a pan-African energy provider serving over 350,000 households across three markets (Uganda, Zambia and Côte d'Ivoire), still in close partnership with MTN.

LOOKING AHEAD: In late 2018, Fenix launched its PAYG solar service in Nigeria and Benin, and is planning to expand to other African markets in 2019.



> In my shop, I sell drinks, and food. With ReadyPay solar, I can operate my shop for longer hours and generate money from letting people charge their phones.
>
> ROBINAH NAMIREMBE,
> SHOPKEEPER, UGANDA

ENERGY

ECOENERGY

PAYG SOLAR IN PAKISTAN

LOCATION
Pakistan

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M

FIND OUT MORE
EcoEnergyFinance: Distribution of solar pay-as-you-go in Pakistan

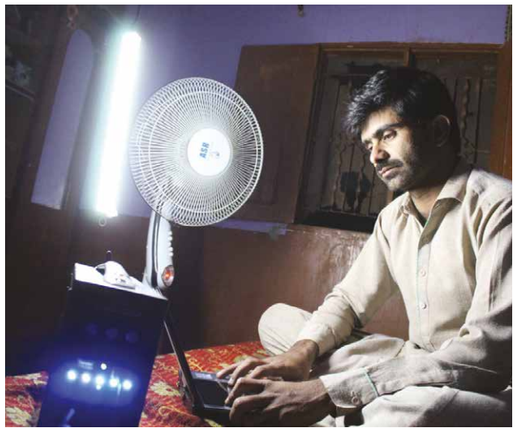
PROBLEM: In 2012, Pakistan had an electrification rate of 69 per cent, with 57 per cent access in rural areas and 88 per cent access in urban areas.[71] Meanwhile, about 85 per cent of the country's 182 million people have access to GSM networks.[72] Thus, Pakistan's addressable energy market, defined as the number of people with access to GSM networks but not to electricity, is estimated at 29 million people, or 16 per cent of the population.

SOLUTION: EcoEnergy delivers solar home systems (SHS) on a PAYG basis to remote and off-grid customers in Pakistan through its integrated sales and service network.

GRANT SUMMARY: In February 2014, EcoEnergy (formerly EcoEnergy Finance) received a grant from the GSMA M4D Utilities Innovation Fund to sell 50 SHS with GSM-based M2M connectivity and 750 solar lanterns on a PAYG basis in partnership with mobile wallet provider, UBL OMNI in Sindh, Pakistan.

IMPACT: EcoEnergy has been selling lanterns without PAYG technology on cash or credit since 2013. Sixty-four per cent of EcoEnergy customers cited time savings as the major benefit of its services. Other perceived benefits of the service were improved health (40 per cent), entertainment (39 per cent) and money savings (29 per cent). Following the grant, EcoEnergy entered a partnership with BBOXX, which enabled it to expand, respond to technological difficulties and attract financing. In November 2017, EcoEnergy acquired Brighterlite Pakistan's customer portfolio. Since the two companies have targeted slightly different markets, and Brighterlite Pakistan produces smaller 12 W to 40 W products compared to EcoEnergy's 50 W and 100 W BBOXX systems, EcoEnergy can upgrade customers to more powerful systems as their energy needs grow.

LOOKING AHEAD: After receiving a £460,000 debt financing deal in March 2018 from Social Investment Managers and Advisors (SIMA), a social investment firm backed by Dutch and Belgian government development banks, EcoEnergy aims to reach 10,000 households by the end of 2019.



> Ever since I installed solar energy, I save some money, and it is quiet and peaceful. My clients used to be disappointed because they would come here to watch films and the generators wouldn't start sometimes. This is better for my restaurant.
>
> OBHAYO KHASKHELI, ECOENERGY
> CUSTOMER, SINDH, PAKISTAN

ENERGY

GHAM POWER

TELECOM TOWERS AS ANCHORS OF GRID POWER IN RURAL NEPAL

LOCATION
Nepal

MOBILE OPERATOR PARTNER
NCell (Axiata)

USE OF MOBILE CHANNELS
Mobile Infrastructure / Mobile Payments / M2M

FIND OUT MORE
Finding a replicable model for mobile-enabled micro-grids with NCell in Nepal

PROBLEM: Despite considerable hydropower resources, only 76 per cent of Nepal's population has access to electricity. There is also a wide urban-rural gap, with about 94 per cent of city dwellers benefitting from energy access compared to just 61 per cent of the rural population.[73]

SOLUTION: Founded in 2010, Gham Power develops solar microgrids and commercial off-grid systems in developing countries. It focuses on developing projects that are good fits with PAYG models, including rural microgrids, commercial and industrial systems and productive end-use systems.

GRANT SUMMARY: In May 2015, Gham Power received a grant from the GSMA M4D Utilities Innovation Fund to expand the capacity of two microgrids in Nepal, improving energy access for two rural villages and providing energy to two NCell telecom towers. Mobile money was used for bill payment and smart meters were deployed to monitor individual consumption.

IMPACT: Following the grant-funded project, Gham Power customers reported an across-the-board increase in appliance ownership 10 months after connecting to the microgrid. About 22.5 per cent of SMEs using Gham Power's service reported higher profit (including small hotels or roadside eateries that added refrigerators or cold storage to improve business), with most attributing the change to the addition of new appliances. Increased access to any type of energy, coupled with better mobile service, also increased mobile use. For mobile operator NCell, airtime expenditure from Gham Power users increased by 17 per cent, mobile internet usage increased by 32 per cent and smartphone ownership rose by 44 per cent. Following the GSMA grant, Gham Power deployed two more 15 kW microgrids reaching 128 households in rural Nepal. As of November 2018, the company has delivered over 2.5 MW of installed energy capacity across 2,000 projects, impacting over 10,000 people.

LOOKING AHEAD: Gham Power is seeking to establish itself as a market leader in Nepal's solar market, while placing an even greater importance on productive end-use systems, such as solar pumps. Given that only five per cent of Nepalese farmers use electric/diesel pumps, this represents a significant opportunity for expansion.

> Before connecting to the microgrid, we could only work for six hours. Now we are able to operate for longer hours and have introduced computer classes. Access to reliable energy helped expand the business; our income has almost doubled since.
>
> GHAM POWER CUSTOMER AND BUSINESS OWNER, CHAYASMITAR, NEPAL

ENERGY

KOPAGAS

PAYG CLEAN COOKING SERVICE IN TANZANIA

LOCATION
Tanzania

MOBILE OPERATOR PARTNER
Vodacom, Airtel

USE OF MOBILE CHANNELS
Mobile Payments / M2M

FIND OUT MORE
Mobile-enabled Pay-as-you-Cook service in Tanzania

PROBLEM: In Tanzania, over 90 per cent[74] of the country's 57 million people use solid fuels, such as charcoal and wood, as their main source of energy for cooking. This has detrimental effects on the safety and respiratory health of families and the country's environment.

SOLUTION: KopaGas, founded in 2014, makes clean, efficient liquid petroleum gas (LPG) affordable and available to low-income households through its pioneering PAYG smart metering technology, in partnership with Tanzania's leading LPG importer.

GRANT SUMMARY: In September 2015, KopaGas received a grant from the GSMA M4D Utilities Innovation Fund to design a low-cost meter for LPG canisters and test a PAYG cooking gas service with 150 households in Tanzania. In May 2018, KopaGas received another GSMA grant to validate fundamental market and operational assumptions to strengthen the PAYG business model for scale. KopaGas also partnered with Airtel to roll out a cashback programme that seeks to promote positive customer behaviour and increase stickiness for Airtel and KopaGas services.

IMPACT: The "Pay-as-you-Cook" pilot improved access to clean cooking fuel for 148 households and two small-scale food stands, reaching a total of 870 people (90 per cent of whom were women and 48 per cent were living below the poverty line). As of June 2018, the company has reached over 500 households with its pay-as-you-cook model and its gas distribution business, which accounts for seven percent of LPG distributed in Tanzania.

LOOKING AHEAD: KopaGas aims to reach 2000 households by March 2019. It has recently received additional support from impact investor Acumen, which it seeks to leverage to become the largest distributor of LPG in Tanzania. KopaGas also recently unveiled the KopaMeter 4.0, a more sophisticated IoT-enabled smart meter, which will allow it to serve more customers more efficiently.

> I'm convincing other women to also buy gas. Using it has been much better for my health and my children's health than charcoal, it also helps keep the environment clean.
>
> KOPAGAS VENDOR, TANZANIA

ENERGY

SUNCULTURE

MAKING IRRIGATION ACCESSIBLE TO KENYAN FARMERS WITH SOLAR POWER

LOCATION
Kenya

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M

FIND OUT MORE
Changing lives through mobile-enabled solar irrigation

PROBLEM: Improving agricultural output is critical to reducing poverty in Kenya. Irrigation is key to increasing farmers' productivity and output, but just four per cent of irrigable land in Kenya is currently under irrigation.[75] Many traditional diesel-powered irrigation pumps have proven to be too costly and carbon-intensive.

SOLUTION: SunCulture, founded in 2012, designs and sells solar-powered irrigation systems that make it cheaper and easier for farmers in Kenya to grow high-value fresh fruits and vegetables.

GRANT SUMMARY: In September 2015, SunCulture received a grant from the GSMA M4D Utilities Innovation Fund to develop, trial and set up Rain Maker, an affordable PAYG solar-powered irrigation solution that extends access to water pumping solutions to underserved smallholder farmers and communities in the developing world (starting with Kenya).

IMPACT: Over 26 per cent of SunCulture's customers switched from diesel-generated water pumps to using the solar pump as their main source of irrigation, while 70 per cent of customers use the pump to get their household water supply. About 70 per cent of customers pay for the product using PAYG. Most importantly, SunCulture farmers have reported an average increase in crop yield of 300 per cent per year.

LOOKING AHEAD: In August 2018, SunCulture secured funding from EDF, one of the world's largest electric utility companies and a global leader in low-carbon energy. SunCulture is opening the East African market for EDF to expand its off-grid solutions across the continent, while EDF will share its experience selling and installing off-grid solutions for residential customers and its knowledge of Central and West African markets. Sunculture is also rolling out its new RainMaker2 with ClimateSmart™, an IoT-enabled device, which uses soil weather data to optimise pumping activity.

> I decided to buy the SunCulture pump to make life easier and not constantly deal with the challenge of getting water from the well, using a bucket all the time. Now I am at least able to use the irrigation method for my plants.
>
> SUNCULTURE USER, KENYA

ENERGY

D.LIGHT

DRIVING MOBILE MONEY ADOPTION IN A GREENFIELD MARKET WITH A PAYG SOLAR SERVICE

LOCATION
Haiti

MOBILE OPERATOR PARTNER
Digicel

USE OF MOBILE CHANNELS
Mobile Money / M2M

FIND OUT MORE
d.light and RE-VOLT: Pay-as-you-go solar service driving mobile money adoption in Haiti

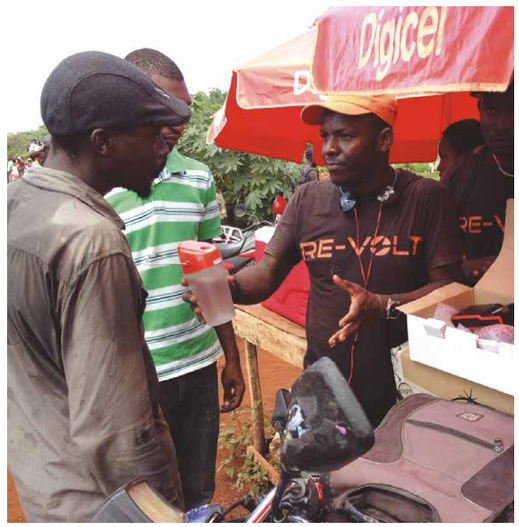
PROBLEM: 60 per cent of Haiti is still unelectrified, with rural areas much worse off than urban areas.[76] Haiti has also experienced frequent earthquakes and floods, which disrupt grid electricity where it is available.

SOLUTION: d.light provides affordable distributed solar energy solutions for households and small businesses, with a focus on designing and supplying a variety of SHS hardware products. In Haiti, d.light has developed a business model designed to simultaneously drive mobile money adoption and expand energy access.

GRANT SUMMARY: In December 2015, the GSMA M4D Utilities Innovation Fund awarded d.light a grant in partnership with RE-VOLT and Digicel to scale up a lease-to-own energy model in Haiti through the distribution of PAYG SHS and to test the impact of PAYG solar on the adoption of Digicel's Mon Cash mobile money service.

IMPACT: At the time of the grant, Haiti was still a nascent mobile money market, with seven per cent of the population subscribing to mobile money and three per cent actively using mobile money accounts (December 2015). By the end of the grant (December 2017), this had risen to 16 per cent and eight per cent, respectively.[77] According to Digicel data, 43 per cent of RE-VOLT customers were new mobile money users. Moreover, the introduction of a PAYG SHS increased Digicel's ARPU for its RE-VOLT customers by 20 per cent, from HTG 759 (£9) to 913 (£10), indicating that these systems can boost mobile revenues.

LOOKING AHEAD: Through its four hubs in Africa, China, South Asia and the United States, d.light has sold over 20 million solar light and power products in 65 countries, improving the lives of over 85 million people. d.light aims to reach 100 million people by 2020. In the last two years, d.light has raised over £75 million in funding, with the most recent £31 million equity investment coming from a consortium led by Inspired Evolution, an Africa-focused investment advisory firm that specialises in the energy sector.[78]



> I really appreciate the SHS because it took me out of darkness. Now I just have to press a button and I have light. I am afraid of the dark. It has changed my life. You hear about candles falling on tables, on tablecloths; candles are disgusting. I do not like them. Candles dirty your house, they can even start a fire. I am able to save money on the two to three candles a day that I used to buy. The RE-VOLT system is easier, it has class.
>
> CARLO SAINT-HILLAIRE, D.LIGHT CUSTOMER, HAITI

ENERGY

DEVERGY

SOLAR PV-BASED MICROGRIDS IN TANZANIA

LOCATION
Tanzania

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M

FIND OUT MORE
Devergy: Leveraging a mobile services bonus to encourage the use of mobile money wallets for smart solar mini-grids in Mbeya, Tanzania

PROBLEM: Only 33 per cent of Tanzanians have access to energy.[79] Particularly low energy access in rural areas (17 per cent) is a severe constraint on average household consumption and productivity.

SOLUTION: Devergy is a Tanzania-based energy services company that provides affordable and reliable energy to low-income households in rural villages through smart mini-grids that allow customers to prepay using mobile money.

GRANT SUMMARY: In May 2015, Devergy received a grant from the GSMA M4D Utilities Innovation Fund to expand its smart mini-grids in Tanzania's Mbeya region.

IMPACT: Devergy customers, 60 per cent of which live below the poverty line, reported spending 20 per cent less on lighting and phone charging after becoming Devergy customers.[80] Seventeen per cent did not have a mobile money account prior to the Devergy service offering and opened one in order to use it. Sixty-four per cent of users reported using mobile money more since becoming Devergy customers. In March 2017, Tigo Tanzania launched Tigo Bonus, an extra airtime, data and SMS offering unique to Devergy customers to drive higher average purchase amounts by customers using their own Tigo Pesa wallet.

LOOKING AHEAD: As of October 2017, with support from Development Innovation Venture (DIV) and in partnership with the Power Africa Initiative, Devergy has tested various productive use models to encourage customers to use its power connections for income-generating purposes, helping to move its customers up the energy ladder. Devergy grids will cover the needs of both residential and business customers, up to and including refrigeration and freezing for businesses.[81]

> Previously I was using my own solar panels, which would stop working at 20:00 or 21:00. Now I can work as late as I like.
>
> D. SKAMANGA, DEVERGY CUSTOMER, TANZANIA

KAMWORKS

INTRODUCING PAYG SOLAR IN A GREENFIELD ASIAN MARKET

LOCATION
Cambodia

USE OF MOBILE CHANNELS
Mobile Payments / M2M

FIND OUT MORE
Kamworks: Introducing GSM-enabled PAYG solar in Cambodia

PROBLEM: Although energy access in Cambodia is nearly universal in urban areas (99 per cent), it is still very low in rural areas (36 per cent).[82] In contrast, about 99 per cent of Cambodia's population has access to GSM networks, which can be leveraged to extend rural energy access.

SOLUTION: Kamworks, established in Cambodia in 2006, provides a range of solar technologies, from PAYG SHS to rooftop solar systems for schools and large buildings. After initially selling SHS on a cash basis and experimenting with microfinance partnerships, Kamworks launched a programme to scale up credit sales in 2013. In parallel, Kamworks designed its own GSM-enabled SHS technology to collect payments using mobile money.

GRANT SUMMARY: In November 2013, Kamworks received a grant from the GSMA M4D Utilities Innovation Fund to develop and sell/rent PAYG SHS with M2M connectivity in rural Cambodia and integrate them with mobile money for payment collection.

IMPACT: Ninety-eight per cent of Kamworks' customers appreciated the convenience of paying using Cellcard's WING mobile money service. Kamworks sold or rented the 300 GSM-enabled SHS by May 2015 under the grant-funded project. Over 500 GSM-enabled systems were sold by November 2015 and, as of November 2018, Kamworks has sold over 14,000 SHS throughout Cambodia and has 98 per cent market share of Cambodia's PAYG marketplace.

LOOKING AHEAD: Kamworks has diversified its SHS portfolio to include multiple customer segments with different energy requirements and payment capabilities. It has also started to offer its clients add-on products for productive use, such as solar water pumps.

> Our life is much better. We have four LED lamps; we find it easy to charge our devices; we know when the system has discharged. And every six months we get a free maintenance visit by Kamworks' technicians.
>
> THEA, KAMWORKS CUSTOMER, CAMBODIA

ENERGY

AFRICAN SOLAR DESIGNS (ASD)

TELECOM TOWERS AS ANCHORS OF COMMUNITY-BASED POWER PROVISION

LOCATION
Kenya

USE OF MOBILE CHANNELS
Mobile Infrastructure

PROBLEM

Although energy access in rural Kenya has increased, 44% of rural residents still do not have access to energy.[83]

SOLUTION / PROJECT

African Solar Designs (ASD) was founded in 2008 as a clean energy advisory and engineering solutions company in Kenya. It provides bespoke off-grid solar solutions to companies across East Africa and consulting for government and international development agencies. In February 2014, ASD received a grant from the GSMA M4D Utilities Innovation Fund to trial a solar-diesel hybrid energy system for powering an off-grid telecom tower as the anchor load, as well as surrounding businesses and communities.

The project was not successful due to delays in negotiations in the power purchase agreement with Airtel and later Africa Towers, which overlapped with a sale of the towers to Eaton Towers.

LOOKING AHEAD

Drawing on the lessons of this project, ASD is seeking to take advantage of renewed interest in telecom towers as anchors of community-based power provision, and trial more anchor-based models throughout East Africa.[84]

PRODUCT HEALTH SERVICE

MOBILE-ENABLED B2B SERVICES FOR SOLAR HOME SYSTEM PROVIDERS

LOCATION
Tanzania, Bangladesh, Kenya

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

Across emerging markets, SHS providers are investing in remote control and monitoring hardware and software. Reducing these costs through economies of scale could unlock vital funds that could be used to scale and reach more customers.

SOLUTION / PROJECT

Product Health Service offers data analytics solutions to energy providers by analysing raw data from connected hardware (e.g. a connected battery) using an embedded GSM module or WI-FI connection. In May 2015, Product Health received a grant from the GSMA M4D Utilities Innovation Fund to provide remote battery monitoring to three SHS manufacturers and distributors in Tanzania (NIWA), Bangladesh (BGEF) and Kenya (Barefoot Power).

Product Health closed operations in 2016 due to issues related to product pricing and intense market competition.

LOOKING AHEAD

There are now many more B2B providers in the SHS sector providing some pieces of the value chain, but Product Health has closed its operations.

EMERGENCE BIOENERGY

LEVERAGING BIOMASS POWER FOR TELECOM TOWERS AND COMMUNITIES IN BANGLADESH

LOCATION
Bangladesh

USE OF MOBILE CHANNELS
Mobile Services / Mobile Payments / Mobile Infrastructure

PROBLEM

Although nationwide access to energy in Bangladesh increased from 9% in 1990 to over 75% in 2016, rural energy access remains below 70%, with more than 89% of the off-grid population concentrated in rural areas.[85]

SOLUTION / PROJECT

Emergence BioEnergy, Inc. (EBI) was founded in 2008 and opened its first branch office in Bangladesh in 2013. The company aimed to deploy small-scale, farm waste-to-energy, distributed power generation systems in remote locations. In May 2015, EBI received a grant from the GSMA M4D Utilities Innovation Fund to trial an innovative, small-scale, biomass-fuelled Stirling engine in Bangladesh as the generation technology for telecom towers, and for businesses and households in the vicinity of the towers.

EBI faced significant logistical and technical challenges and the biomass engine solutions did not succeed. EBI closed in 2015.

LOOKING AHEAD

While there is still interest in business models that use renewable energy to power an off-grid tower and nearby businesses and communities, these models have faced challenges (see our 2016 annual report), including assurance of reliable energy supply.

ENERGY

SNV

PAYG SOLAR LANTERNS IN BENIN

LOCATION
Benin

USE OF MOBILE CHANNELS
Mobile Payments

PROBLEM

In Benin, 82% of the population in rural areas is not connected to the electricity grid and relies on lanterns that run on dirty and costly kerosene.[86] Many people spend a significant amount of money on charging their phones at local kiosks (FCFA 550 or around £0.77 a week, according to SNV's research).

SOLUTION / PROJECT

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to **SNV**, an international NGO, and ARESS, a local solar distributor, to trial the sale of solar lanterns with PAYG technology to make these lower-cost lighting products even more affordable for the poorest customers. ARESS and SNV partnered with MTN to use MTN agents for lantern sales and distribution and MTN Mobile Money for payments.

LOOKING AHEAD

ARESS is now selling SHS in Benin and has about 10,000 PAYG solar customers. 50% of its sales agents are MTN agents, while about 30% are ARESS agents and 20% are from other channels.

VILLAGE INFRASTRUCTURE

SOLAR-POWERED PAYG AGRO-PROCESSING MILLS

LOCATION
Vanuatu

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

In the South Pacific island of Vanuatu, approximately 50% to 60% of its 250,000 people live in off-grid villages outside of the main towns with no access to electricity.[87]

SOLUTION / PROJECT

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to **Village Infrastructure Angels** (VIA), an angel investment group, to provide PAYG SHS and solar agro-processing mills monitored remotely through M2M technology. In the absence of mobile money in Vanuatu, VIA used SMS to send unlock codes to customers once they had made payments. At the end of the pilot, VIA had provided an SHS to about 1,250 households and installed 25 M2M sensors on agro-processing mills.

LOOKING AHEAD

Despite the challenge of operating PAYG without mobile money, VIA has continued to grow in Vanuatu, with over 2,500 PAYG SHS customers and 500 solar mills. It has also expanded to Indonesia where it has about 5,000 PAYG SHS customers, and another 5,000 are being shipped to Vanuatu and Honduras.

SOLSHARE

SMART NANOGRIDS FOR RURAL ELECTRIFICATION

LOCATION
Bangladesh

USE OF MOBILE CHANNELS
Mobile Services / Mobile Payments / M2M Connectivity

PROBLEM

By May 2017, 4.12 million solar home systems had been installed in off-grid areas of Bangladesh.[88] Although these systems have been very successful in Bangladesh, an estimated 600,000 kWh energy produced through SHS is wasted every day due to lack of energy storage infrastructure.[89]

SOLUTION / PROJECT

ME SOLshare has developed a peer-to-peer solar electricity trading platform (SOLgrid) that leverages existing SHS in an off-grid context. SOLgrid is enabled by a smart meter (SOLBox) and a software backend, including a data collection and analysis platform that is integrated with mobile money providers, such as bKash, DBBL and IFIC, and a mobile app to support field agents.

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to ME Solshare to trial its innovative bottom-up approach to building DC nanogrids by connecting distributed solar home systems in Bangladesh.

LOOKING AHEAD

ME SOLshare and Grameen Shakti have recently received an £0.7 million UN DESA grant to deploy 100 microgrids to reach at least 15,000 beneficiaries.[90] ME SOlshare also intends to expand its presence in Bangladesh and India to the rest of Asia.

ENERGY

DIALOG AXIATA

MOBILE OPERATOR-LED SMART METERING IN PARTNERSHIP WITH AN ELECTRIC UTILITY

LOCATION
Sri Lanka

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

In urban Sri Lanka, the Lanka Electricity Company (LECO) faced challenges providing consumers with consumption and billing information to reduce consumption and control costs, particularly for low-income customers.

SOLUTION / PROJECT

Dialog Axiata is the largest mobile operator in Sri Lanka with a mobile subscriber base of over 13 million as of the end of 2018.[91] In September 2015, Dialog Axiata (in partnership with LECO) received a grant from the GSMA M4D Utilities Innovation Fund to offer smart metering to the domestic market and improve power distribution network monitoring capability.

The project faced technical and regulatory challenges, but 2,500 meters have been installed with plans to test prepaid functionality.

LOOKING AHEAD

Dialog, LECO and the government are enthusiastic about the service and 25,000 additional meters have been manufactured. LECO plans to deploy 100,000 over the next two years.

SOLARWORKS!

MACHINE LEARNING-ENABLED SOLAR HOME SYSTEMS IN MOZAMBIQUE

LOCATION
Mozambique

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

More than 75% of Mozambique's population lacks access to energy due to limited transmission and distribution networks, and unfavourable market conditions for new generation. This figure rises to 95% in rural areas.[92]

SOLUTION / PROJECT

Based in the Netherlands, South Africa and Mozambique, **SolarWorks!** was founded in 2007 to sell solar home systems and related products to off-grid households and small businesses in rural and peri-urban areas of Mozambique.

In June 2018, SolarWorks! received a grant from the GSMA M4D Utilities Innovation Fund to improve access to energy services for residents in Mozambique by testing machine learning optimisation of their solar home systems. The tool combines weather forecasting data and user data to make SHS self-learning and reduce system downtime. Through the grant, SHS downtime has been minimised, resulting in greater customer satisfaction and lower energy costs due to higher repayment rates.

LOOKING AHEAD

In October 2018, the renewable energy investor EDP purchased a stake in SolarWorks!. The investment will give a boost to the company's goal to expand from Mozambique into Malawi and other markets in southern Africa.

ENERGY

SIMGAS

REMOTE-CONTROLLED CLEAN COOKING SOLUTIONS IN KENYA

LOCATION
Kenya

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

Over 80% of Kenya's population relies on solid fuel for household cooking. Exposure to smoke from traditional cookstoves and open fires causes 16,600 deaths in Kenya every year.[93]

SOLUTION / PROJECT

SimGas, founded in 2009, offers affordable, high-quality biogas systems for household use in Kenya.

In May 2018, SimGas received a grant from the GSMA M4D Utilities Innovation Fund to install a remote monitoring and control system with smart meters to monitor and control real-time performance of biogas digesters for smallholder farmers. The aim of the project is to prove that the system will increase and improve biogas access and enable the business model to scale.

LOOKING AHEAD

Simgas has installed over 100 modules as of November 2018, and plans to offer the smart meters to other biodigester companies to enable scale in the sector.

SMARTER GRID

PILOTING MOBILE PAYMENTS FOR SOLAR HOME SYSTEMS IN NIGERIA

LOCATION
Nigeria

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

120 million people, or 75% of the Nigerian population, are living without access to reliable and affordable power.[94] Meanwhile, Nigeria's off-grid sector is dominated by over 60 million diesel generators,[95] which are not only dirty and environmentally damaging, but also inexpensive and ineffective.

SOLUTION / PROJECT

Smarter Grid International is an SHS distributor founded in 2015 in Nigeria.

In May 2018, Smarter Grid International received a grant from the GSMA M4D Utilities Innovation Fund to work with Airtel Nigeria to launch mobile payments for PAYG solar systems. It is also expanding its sales to reach more states and regions in Nigeria.

LOOKING AHEAD

As part of SGI's grant, the company will focus on training at least 50 women as technicians and agents. This is a key sales strategy to reach women customers.

JAZZ

MOBILE-ENABLED ELECTRICITY THEFT PREVENTION IN PAKISTAN

LOCATION
Pakistan

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

The Pakistani Senate Committee on Circular Debt estimates the cost of power theft during 2017–18 was over Rs 53 billion (£295 million).[96]

SOLUTION / PROJECT

Jazz is the largest mobile operator in Pakistan with a user base of over 56 million as of the end of 2018.[97]

In May 2018, Jazz received a grant from the GSMA M4D Utilities Innovation Fund to develop and implement mobile-enabled theft prevention and a system loss reduction solution for a mainstream grid distributor. Jazz, along with its technology partner CISNR and grid distributor PESCO, is designing, developing and implementing an electricity theft prevention and distribution line-loss reduction solution.

LOOKING AHEAD

Jazz's smart metering system has been designed in collaboration with CISNR to perform household metering at a centralised distribution point where individual household connections meet, eliminating the need for a meter at every household and reducing the cost of the system.

ENERGY

ELECTRIC VINE INDUSTRIES

MICROGRIDS TO ELECTRIFY RURAL INDONESIA

LOCATION
Indonesia

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

Although rural electricity access in Indonesia stands at 95%,[98] it is often unreliable, forcing Indonesians to purchase costly and environmentally damaging generators.

SOLUTION / PROJECT

Electric Vine Industries (EVI) is a Jakarta-based private microgrid developer founded in 2015.

In June 2018, EVI received a grant from the GSMA M4D Utilities Innovation Fund to integrate TCASH, Telkomsel's mobile money service, into EVI's power metering payment platform.

LOOKING AHEAD

Following a pilot in five villages in Sumba, EVI will expand to cover the entire island and Papua New Guinea. This £184 million project is supported by Engie.[99] EVI will also launch a device-leasing programme to enable users to manage and purchase electricity on demand through their EVI wallet.

ELECTRICITÉ DE MADAGASCAR

MOBILE-ENABLED SOLAR-POWERED MINI-GRID FOR REMOTE VILLAGES

LOCATION
Madagascar

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

Over the last 20 years, demand for electricity in Madagascar has increased by an average of 5% per year.[100] Despite some progress, only 22% of Madagascar's population has access to electricity.[101]

SOLUTION / PROJECT

Electricité de Madagascar was founded in 2005 to offer a range of energy solutions to Malagasy households.

In May 2018, Electricité de Madagascar received a grant from the GSMA M4D Utilities Innovation Fund to deploy mini-grids in three rural off-grid villages in the north of Madagascar. The mini-grids are supported by mobile to enable smart metering and mobile payments. Telma serves as the anchor client, while Sagemcom is the project's smart meter hardware provider.

LOOKING AHEAD

Electricité de Madagascar aims to launch three mini-grids in the north of the country that are expected to reach approximately 300 households by 2019.

VITALITE

SMARTPHONE AND COOK STOVE ADD-ONS FOR PAYG SOLAR HOME SYSTEMS

LOCATION
Zambia

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

In Zambia, more than 83% of the population relies on costly and dirty solid fuels for cooking.[102] Using solid fuels for cooking is not only bad for the environment, but can also pose severe health risks that reduce life expectancy.

SOLUTION / PROJECT

VITALITE Zambia, founded in 2013, is a PAYG solar home system, cook stove and agriculture solutions provider in Zambia.

In October 2017, VITALITE received a grant from the GSMA M4D Utilities Innovation Fund to trial smartphone and cook stove add-on products for its PAYG SHS in Zambia. The project aims to leverage the PAYG mechanism to deploy 1,500 smartphones and 500 cookstoves across rural areas of Zambia. VITALITE partners with Zambia's two leading mobile operators, MTN and Airtel, to allow the start-up to rely on mobile money for payments.

LOOKING AHEAD

As of October 2018, VITALITE has sold 739 add-on products (438 smartphones and 301 cook stoves), impacting nearly 2,000 beneficiaries. It aims to reach over 4,000 beneficiaries by the end of the grant in July 2019. Over 30% of VITALITE customers are using mobile money to pay for the products.

ENERGY

ORANGE MADAGASCAR

SOLAR HOME SYSTEMS FOR RURAL ELECTRIFICATION LED BY A MOBILE OPERATOR

LOCATION
Madagascar

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

Only 22% of the population in Madagascar has access to electricity,[103] and this rate is even lower in rural areas. People often have to rely on poor quality and unclean fuels like kerosene and diesel to meet their energy needs.

SOLUTION / PROJECT

In Madagascar, **Orange** has a mobile connection base of nearly two million as of the end of 2018.[104]

In October 2017, Orange Madagascar received a grant from the GSMA M4D Utilities Innovation Fund to launch PAYG solar home systems leveraging the Orange brand in partnership with d.light, a supplier of SHS products. The energy offering is expected to provide electricity access to underserved households around Antananarivo, the northern and western areas of Madagascar. Orange had initially prioritised launching its services in the central region, but in November 2018 expanded the launch to the north region in line with the grant proposal.

ORANGE BURKINA FASO

SOFTWARE-AS-A SERVICE SMART METERING SOLUTION LED BY A MOBILE OPERATOR

LOCATION
Burkina Faso

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

Only 19% of the population in Burkina Faso has access to electricity and in rural areas this rate is less than 1%.[105]

SOLUTION / PROJECT

In Burkina Faso, **Orange** is the largest mobile operator with a mobile connection base of over eight million as of the end of 2018.[106]

In October 2017, Orange Burkina Faso received a grant from the GSMA M4D Utilities Innovation Fund to pilot prepaid smart metering on mini-grids in partnership with SINCO, a cooperative that manages electricity distribution through rural grids. This smart metering, software-as-a-service solution aims to enable SINCO's customers to manage their energy expenditure. The smart meter solution leverages mobile money, M2M connectivity, SMS and other mobile technologies. Orange also has an online, real-time dashboard synced with each meter to monitor fraud, alarms, disconnection and usage.

LOOKING AHEAD

Orange is currently using mobile payments for postpaid services and intends to add prepayment integration with mobile money soon.

AFGHAN WIRELESS COMMUNICATION COMPANY

LEASE-TO-OWN SOLAR HOME SYSTEMS LED BY A MOBILE OPERATOR IN A GREENFIELD MARKET

LOCATION
Afghanistan

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

For many decades, the electric grid in Afghanistan has been significantly disrupted by conflict. Although 84% of the Afghan population has access to electricity, power cuts are very frequent.[107]

SOLUTION / PROJECT

The **Afghan Wireless Communication Company** (AWCC) is a mobile operator in Afghanistan with a mobile connection base of over nearly five million as of the end of 2018.[108]

In May 2018, AWCC received a grant from the GSMA M4D Utilities Innovation Fund to launch PAYG solar home systems to provide new energy services to residents of Afghanistan without any access to reliable energy. AWCC has partnered with SHS manufacturer d.Light for this project and intends to expand energy access in Afghanistan while also driving mobile penetration.

LOOKING AHEAD

Following the pilot funded by the GSMA grant in Kabul and Kandahar, AWCC plans to maximise its distribution and agent network to offer other utility services beyond energy.

ENERGY

BRIGHTERLITE

PIONEERING SOLAR HOME SYSTEMS IN MYANMAR

LOCATION
Myanmar

USE OF MOBILE CHANNELS
Mobile Payments / Mobile Services

PROBLEM

National energy access in Myanmar stands at 57% and is worse in rural areas where only 40% of residents have access to energy.[109]

SOLUTION / PROJECT

Brighterlite, founded in 2012, provides solar home systems on a PAYG basis in Asia. In May 2015, Brighterlite received a grant from the GSMA M4D Utilities Innovation Fund to launch its SHS in Myanmar with Telenor Myanmar as a mobile operator partner.

Despite early successes, in February 2017, Brighterlite's board of directors decided to end the company's operations in Myanmar. The decision was based on a series of factors, including unclear policies regarding subsidies for SHS in Myanmar.

LOOKING AHEAD

Before EcoEnergy acquired its portfolio in November 2017, Brighterlite had collaborated with the World Wide Fund for Nature Pakistan and K-Electric, an energy utility, to deliver PAYG services in Pakistan. The initial pilot with K-Electric reached over 1,745 households, but Brighterlite was unable to scale further.

EASYPAISA

ENABLING AFFORDABLE SOLAR ENERGY IN PAKISTAN THROUGH A JOINT VENTURE

LOCATION
Pakistan

USE OF MOBILE CHANNELS
Mobile Payments / Mobile Services

PROBLEM

In 2012, Pakistan had an electrification rate of 69%, with 57% access in rural areas and 88% access in urban areas. It is estimated that 144 million people (about 78%) in Pakistan who are either off-grid or experience more than 12 hours of load shedding per day.[110]

SOLUTION / PROJECT

Easypaisa is a joint initiative with Telenor Pakistan, the country's second largest mobile network operator, and Tameer Microfinance Bank, the country's largest microfinance bank. Easypaisa leverages key operator assets, such as the cellular data network, mobile money service, distribution network and knowledge of customers' historical mobile usage to extend solar power services.

In January 2014, Easypasia received a grant from the GSMA M4D Utilities Innovation Fund to trial this solution in two regions of Pakistan. Easypaisa collaborated with two vendors, Roshan Energy in Sindh and Brighterlite Pakistan in Punjab, KPK and Sindh, to test the two PAYG business models.

LOOKING AHEAD

Over 1,500 SHS were sold or rented by March 2016, well above the target of 125 under the grant-funded project. Thanks to mobile payments, Easypaisa agents increased their transaction volumes significantly. In underserved urban areas, one Easypaisa agent saw an increase from three to four money transfer transactions per day to 18 to 20.

MOBILE4ENERGY

NABLING MOBILE OPERATORS' EXISTING PREPAID BILLING AND COLLECTIONS INFRASTRUCTURE FOR ENERGY PROVISION IN RURAL KENYA

LOCATION
Kenya

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

While electrification in Kenya has grown to cover 50% of the population,[111] many people in reach of the grid are still not connected.[112]

SOLUTION / PROJECT

Mobile4Energy sought to work with the Rural Electrification Authority (REA) in Kenya to construct a mini-grid extension to a community near the grid, but with limited connections. It planned to buy power from the grid wholesale and sell to households through a mini-grid, while providing customers with prepaid smart metering supported by Airtel for payments using airtime scratch cards.

In May 2015, Mobile4Energy received a grant from the GSMA M4D Utilities Innovation Fund to develop and deploy a mobile-enabled turnkey meter-to-cash solution for utilities supporting rural electrification in Kenya. Mobile4Energy had hoped to showcase this as a solution for utilities to use mobile operators' existing billing systems.

LOOKING AHEAD

Mobile4Energy made some initial progress with Airtel designing the payment system, but could not finalise plans with REA to extend the grid and operate a parallel mini-grid. Mobile4Energy was a consortium of organisations that did not continue working on this.