A photograph of a family of five—two adults and three children—standing in front of a building with a corrugated metal roof. The entire image is overlaid with a blue tint. The woman in the center is smiling, while the others have neutral expressions.

# Mobile for Development Utilities Lumos: Pay-as-you-go solar in Nigeria with MTN

OCTOBER 2016



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The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and Internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

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## Mobile for Development Utilities

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The Mobile for Development Utilities Programme promotes the use of mobile technology and infrastructure to improve or increase access to basic utility services for the underserved. Our programme focuses on any energy, water or sanitation services which include a mobile component such as mobile services (voice, data, SMS, USSD), mobile money, Machine to Machine (M2M) communication, or leverage a mobile operator's brand, marketing or infrastructure (distribution and agent networks, tower infrastructure). The Programme receives support from the UK Government.

Authors: Mary Roach and Ilana Cohen

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### The Innovation Fund

The Mobile for Development Utilities Innovation Fund was launched in June 2013 to test and scale the use of mobile to improve or increase access to energy, water and sanitation services. In two phases of funding, grants were competitively awarded to 34 organisations across Asia and Africa. Seed grants were awarded for early stage trials, Market Validation grants for scaling or replication of business models, and Utility Partnership grants to foster partnerships between utility companies and innovators.

The specific objective of the Innovation Fund is to extract insights from the trial and scaling of these innovative models to inform three key questions for growing the sector:

- How can mobile support utility services?
- For a mobile-enabled solution to be adopted at scale, what building blocks are needed?
- What are the social and commercial impacts of delivering community services to underserved mobile subscribers?

These insights, as well as grant-specific learning objectives, are included in individual case studies such as this one, as well as thematic reports that will be published throughout 2015 and 2016.



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This document is an output from a project co-funded by UK aid from the UK Government. The views expressed do not necessarily reflect the UK Government's official policies.

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# Executive Summary

In December 2013, the Mobile for Development Utilities Programme awarded the Netherlands based company Nova Lumos (“Lumos”), a Seed grant to trial the development of a mobile-enabled energy service with MTN Nigeria. MTN Mobile Electricity, an MTN and Lumos co-branded service, offers off-grid customers in Nigeria energy-as-a-service via a solar home system (SHS). This pay-as-you-go (PAYG) model is enabled by the use of airtime credit and GSM-based machine-to-machine (M2M) connectivity to remotely control and monitor the solar home system’s usage, billing and performance.

PAYG companies have proven the ability to scale and replicate their model across countries in East Africa, yet there have been questions on the feasibility of PAYG solar in other regions, where mobile money penetration is less prevalent. Nigeria, with 96 million people living without access to electricity, is Africa’s largest off-grid market.<sup>1</sup> Despite the attractiveness of the market, the entry of private players into it has been held back by a negative reputation around security challenges and general questions on the ease of doing business.<sup>2</sup>

The key objectives of the grant were to trial a prepaid utility service that uses airtime credit to test the feasibility of PAYG solar in West African markets with limited mobile money penetration. Through this pilot, Lumos generated insights into the Nigerian market and valuable learnings in developing strong partnerships with mobile operators. Key findings include:

- Airtime is a viable payment mechanism for PAYG in markets with limited mobile money penetration.** The rise of PAYG energy providers in East Africa has been partially attributed to the ubiquity of mobile money. To replicate the PAYG energy model into markets with limited mobile money penetration requires the use of other digital payment services. During the course of
- PAYG energy can generate as much gross revenue as voice and SMS while reducing churn for mobile operators in large off-grid markets.** In Lumos’ approach to PAYG, mobile operators are treated as essential partners in the delivery of the service and compensated through a revenue share agreement. With the Nigerian mobile industry’s monthly Average Revenue per User (ARPU) of USD 8.09<sup>3</sup> approximately equal to half the amount that Lumos’ customers pay for 30 days of energy, MTN recognised the opportunity to generate significantly more revenue from its low-value, off-grid customers. MTN data indicates Lumos customers spend as much or more on energy as they do on voice and SMS (although only a portion of this goes to MTN and MTN also contributes towards the cost of sale). MTN has also benefited from increased customer loyalty through regular payments, evident in a few months showing a customer churn rate that is half the normal rate.
- Mobile operators can provide a path to scale for sales and distribution.** In Nigeria, MTN is co-branding the service with Lumos and helps build the customer facing relationship. The overall benefits of the partnership allow MTN to support distribution, sales and after-sales customer support. Since the first day of joint sales of the product, thanks to the MTN partnership, Lumos enjoys access to MTN’s nationwide logistics, warehousing, inventory management, retail

1. International Energy Agency, World Energy Outlook, 2015. <http://www.worldenergyoutlook.org/weo2015/>

2. International Institute for Environment and Development, 2012, “Renewable Energy Potential in Nigeria”, <http://pubs.iied.org/pdfs/G03512.pdf>

3. GSMA Intelligence data, Q1 2016

stores and call centre services, keeping the cost of service to a minimum and overcoming one of the main challenges PAYG providers face. MTN's understanding of the local market was instrumental to better address and communicate with customers while their existing customer base of 60 million subscribers offers a head start and fast access to the Nigerian Market.

- **The Lumos system is a viable alternative to household petrol generators.** The high prevalence of petrol generator ownership in Nigeria is perceived to be a hurdle to the sale of SHS and potential success of PAYG in the country. However, a customer survey revealed that 55% of customers owned a petrol generator prior to purchasing a Lumos system. The value proposition of the Lumos service is thus evenly split between

providing first-access to high quality electricity and reducing customer's monthly expenditure on petrol. Customers' experience with generators has increased their expectations and need for energy, therefore making a larger SHS a more robust solution to answer Nigerians' energy aspirations.

A key outcome of the GBP 200,000 grant was that it helped to establish PAYG in Nigeria, the largest off-grid market in Africa and catalyse additional equity and USD 15 million of debt investment from OPIC to Lumos to expand services across the country.<sup>4</sup> In 2016, Lumos launched a commercial expansion into multiple MTN stores across several Nigerian states and have since seen month-on-month sales growth of over 100%, leading to current sales rates of hundreds of systems daily and thousands of systems monthly with over 11,000 systems as of March 2016.

Source: GSMA



4. OPIC (The Overseas Private Investment Corporation), 2015, "OPIC Partners with Lumos to Power Nigerian Homes and Businesses", <https://www.opic.gov/press-releases/2015/opic-partners-lumos-power-nigerian-homes-and-businesses>

# Introduction

Lumos, established in 2013, designs and manufactures mobile-enabled solar home systems (SHS) and partners with mobile operators to make pay-as-you-go (PAYG) solar available in markets with a large addressable off-grid population and limited mobile money adoption. Just as prepaid airtime enabled the growth of the mobile industry in emerging markets, Lumos believes that mobile operators can become

leading partners for providing electricity solutions in the off-grid world.

Through this Seed grant, Lumos, along with its mobile operator partner, MTN Nigeria, set out to trial a prepaid electricity service paid for by airtime and delivered by mobile operators. The service is marketed under the name “MTN Mobile Electricity, Powered by Lumos.”

## Key Facts about Lumos

FIGURE 1

### Company overview as of May 2015

Name	Lumos
Sector	Energy (Solar)
Year Established	2013
Country Footprint	Nigeria
Product/Service	80W Pay-as-you-go (PAYG) solar home systems
Market Segment	Off-grid residential and small businesses
Total systems/ Customers Served	Lumos reached its 500 system goal for the pilot in May 2015 and sold over 3,000 solar home systems in 2015
Use of Mobile	<ul style="list-style-type: none"> <li>• Mobile operators responsible for payment collections, marketing, sales, distribution of product to their retail stores, and customer care hotline</li> <li>• M2M connectivity for remote monitoring and control</li> <li>• Airtime for payments</li> </ul>

## Project Objectives

The objectives of Lumos' Seed Grant were as follows:

- To confirm the viability of PAYG solar in a market with limited mobile money adoption, using airtime to collect payments.
- To trial the delivery of PAYG through a deep partnership with a mobile operator, where the mobile operator takes on responsibility for sales and distribution.
- To test whether or not customers could install the 80W SHS independently, reducing the need for technical field staff.

The expected learnings for the broader PAYG solar sector, as defined by Lumos at the outset of the project include:

1. Customer benefits, repayment and usage patterns;
2. The preference for energy-as-a-service versus a lease-to-own PAYG model; and
3. The benefits to mobile operators in regards to revenue and brand.

When the grant was first awarded to Lumos, the intent was to trial the service with two mobile operators: Cellcom Guinea and MTN Nigeria. Lumos set out to sell 500 systems across both countries, starting with Guinea. With the outbreak of Ebola in Guinea starting in March 2014, a decision was made to focus the entirety of the pilot in Nigeria. The case study only includes information and results from the Nigerian pilot.

## Market Opportunity

### Addressable Market

The market opportunity for Lumos' offering is the population without access to the electricity grid but covered by GSM Networks (referred to as the Addressable Market) in the country of operation of their mobile operator partners.

In Nigeria, where 55% of people live without access to electricity<sup>5</sup> and 90% of the population is covered by 2G networks,<sup>6</sup> the addressable market is 70 million people.<sup>7</sup> While Nigeria has a relatively high electrification rate, in comparison to the Sub-Saharan African average, the grid is unstable and over 80% of all Nigerians (180 million) rely on petrol generators for their primary or "back-up" source of energy.<sup>8</sup> As a result, most Nigerians, regardless of their socio-

economic background, experience unstable grid and energy supply.

### Mobile Ecosystem

Nigeria has one of the most dynamic and largest mobile ecosystems in Sub-Saharan Africa. The country's market penetration of unique subscribers is 45%, which is on par with the Western Africa average of 47%, and represents 83 million users.<sup>9</sup>

MTN is the market leader with a 39% market share, followed by Glo Mobile (23%), Airtel (23%) and Etisalat (15%).<sup>10</sup> The large market opportunity and stiff competition result in operators investing significantly in value-added-services to meet the growing number of personal and business clients' requirements.

5. International Energy Agency, World Energy Outlook, 2015. <http://www.worldenergyoutlook.org/weo2015/>

6. GSMA intelligence data, Q4 2015

7. GSMA Mobile for Development Utilities Programme, January 2016, "Assessing the opportunity for pay-as-you-go solar in Nigeria", [http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/GSMA\\_Etisalat\\_PAYG\\_Final-20160211.pdf](http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/GSMA_Etisalat_PAYG_Final-20160211.pdf)

8. Ibid

9. GSMA Intelligence data, Q1 2016

10. GSMA Intelligence data, Q1 2016

In recent years, MTN has become the largest distributor of Nigerian music with their MTN Music+ platform.<sup>11</sup>

MTN is also a prominent player in the e-commerce space through its investments in popular digital trading platform Jumia and Kaymu.<sup>12</sup> The company also offers tailored services to Small Medium Enterprises (SMEs) and corporate clients that include Machine-to-Machine (M2M) services for fleet and security services.

Despite the impressive size and innovation of the Nigerian mobile industry, monthly ARPU is USD 8.09, which is in line with other Sub-Saharan African countries, but has declined by 7% in the last 2 years due to competition and declining voice and SMS revenue.<sup>13</sup>

## Mobile Money

The Central Bank of Nigeria's regulatory framework, allows two models of mobile financial services, bank led and non-bank led, but specifically limits the role of mobile operators to the provision of the channel through which other providers offer their services. There are 19 licensed mobile money service providers in Nigeria provided by banking and non-banking institutions. Despite having the highest number of mobile money service providers per country in the world,<sup>14</sup> penetration of the service is very limited as there are just under 13 million mobile money accounts for a population of approximately 177 million people.



## MTN Nigeria's Diamond Y'ello

In August 2014, Nigeria's Diamond Bank partnered with MTN Nigeria to launch Diamond Y'ello, a mobile bank account MTN customers can subscribe to by dialling \*710#. The Diamond Y'ello account leverages MTN's existing Know Your Customer registration requirements to provide the convenience of opening a full bank account without the need to visit a bank branch to fill forms or provide any documentation.

The bank account allows customers:

- "The ability to send and receive money to and from any bank account in Nigeria and also to non-account holders.
- Easy access to bank services through [a] network of Agents for deposits and withdrawals.
- Enjoy Loyalty points for carrying out transactions on your account
- Earn interest payments on account balances"<sup>15</sup>

Over 6.2 million Diamond Y'ello account holders are serviced through a network of 26,000 agents.<sup>16</sup> While Diamond Bank, MTN and its partners are making significant investments to increase the uptake and usage of Diamond Y'ello, only 7% of MTN subscribers are currently enrolled in the service as of June 2016.

11. Bloomberg, 2015, "Nigeria's Answer to Spotify Lures Investors from MTN to Jay-Z", <http://www.bloomberg.com/news/articles/2015-10-20/nigeria-s-answer-to-spotify-lures-investors-from-mtn-to-jay-z>

12. <https://www.jumia.com.ng/>; <http://www.kaymu.com/>

13. GSMA Intelligence data, Q1 2016

14. GSMA Mobile Money deployment tracker, 2015

15. MTN, <http://www.mtnonline.com/diamond-yello-account>

16. Chikero, 2016, "Deepening Women's Financial Inclusion: Diamond Bank Partners with Women World's Banking, MTN to Develop Global Model for Digital Financial Services", <http://www.chikero.com.ng/nigerian-politics/deepening-womens-financial-inclusion-diamond-bank-partners-with-womens-world-banking-mtn-to-develop-global-model-for-digital-financial-services/>

The growth of PAYG providers in East Africa has been attributed in part to the high-level of mobile money penetration of the region. The limited reach of mobile money services in Nigeria constrains the development of PAYG solar and requires the use of alternative digital payment mechanisms. Therefore, by using airtime credit as payment, Lumos' service is accessible to all mobile customers, regardless of mobile money adoption.

### Market Assumptions

Lumos began operations based on the following assumptions about their target customers:

- An off-grid customer spends as much as USD 0.5/day (USD 180/year) on lighting and phone charging

- Most off-grid customers are active mobile subscribers and are familiar with prepaid airtime.
- Average Revenue per User (ARPU) is approximately USD 75/year for mobile operators across Sub-Saharan Africa.
- Off-grid customers spend significantly more on energy than they do on airtime.
- Mobile operators are well poised to increase revenues from their off-grid, lower value customers by providing energy services.

Source: Lumos



# Lumos' Business Model

## The Value Proposition

Lumos creates value by offering end-customers a reliable source of electricity at an affordable price replacing customers' existing high expenditure on kerosene, candles, charging services, and petrol fuel. The 80W solar home systems provide them higher quality lighting, independence from intermittent grid power supply, and enough energy to power several lights, a fan, a television, mobile phones, laptops and other small electronic devices. Lumos units are strong

enough to support small businesses, schools, hospitals, churches and mosques.

Lumos' value proposition is delivered through the business model components discussed in detail in the following sections, including products and pricing structure, and partnerships with mobile operators that support sales, marketing, distribution and after-sales support.

## Products and Pricing

Throughout the trial, Lumos and MTN provided customers with an energy utility service at the prices shown in Figure 2. While MTN Mobile Electricity is marketed as a service, contractually, customers enter into a 5-year lease (1,500 days of payment) agreement with Lumos. Customers first pay a commitment fee to subscribe to the service and receive the unit and then

have a choice to purchase 3, 7 or 30 days' worth of service at a time. The payment structure is meant to incentivise customers to purchase larger bundles by providing a small discount on the price per day for the 7 and 30-day packages. Once a customer has completed the 5-year lease or 1,500 days of payment, the SHS is unlocked and the customer owns the system.

FIGURE 2

### Lumos' product and pricing in Nigeria<sup>17</sup>

System Components	Commitment Fee	3-day Usage Fee	7-day Usage Fee	30-day Usage Fee
80W panel 2 LED Lights 1 Phone Charger 2 Cigarette ports, 4 DC jack ports, 2 USB ports	NGN 15,000 (USD 75)	NGN 400 (USD 2)	NGN 850 (USD 4.25)	NGN 3300 (USD 16.5)

17. Prices converted based on a rate of 0.005 NGN/USD based on the average rate between early 2015 and mid 2016.

### Lease-to-own versus Energy-as-a-service

PAYG providers either offer their customers a lease-to-own or energy-as-a-service model. In the lease-to-own model, customer payments go towards paying off the system and the customer eventually becomes the owner of the SHS. In this model, customers can complete their payments ahead of the collection schedule. In the energy-as-a-service model, customers pay for access to a reliable service (similar

to a utility) and there is no incentive for customers to complete their payments sooner. As most PAYG players delivering energy-as-a service currently do not operate as a utility (sometimes due to regulatory restrictions), they must enter into time-bound agreements with their customers where ownership of the SHS is eventually transferred to their customers. In the case of Lumos, customers enter into a 5-year agreement and commit to a minimum of 1500 days' worth of payments.

Source: Lumos



## Use of Mobile: Technology and Partnership

### Technology:

The Lumos pay-as-you-go solar service is enabled by machine-to-machine (M2M) connectivity and billing integration between Lumos' back-end system and the mobile operator's real-time billing platform. A SIM card embedded in the solar home system enables two-way communication via the GSM network, allowing Lumos to remotely monitor and control the system. The payment process is as follows (see Figure 3):

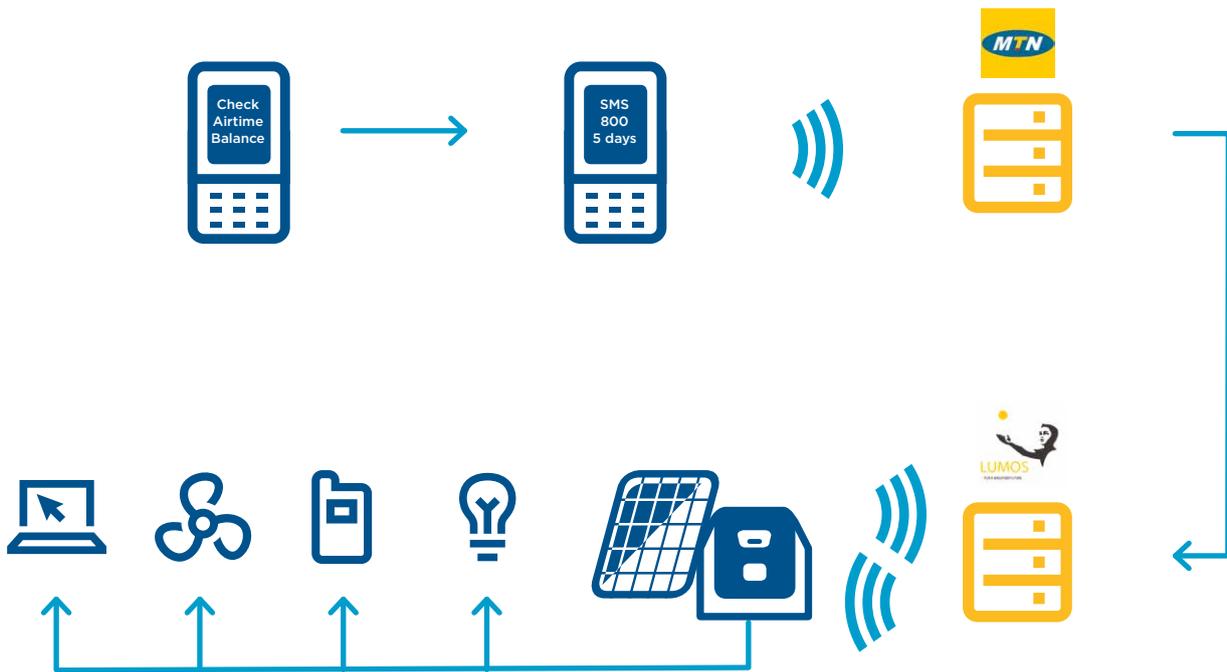
1. Customers top-up their mobile airtime balance to ensure they have sufficient balance to pay for the service package of their choice (this is the same balance they can use to make phone calls or buy data bundles).
2. To credit their MTN Mobile Electricity service, customers send an SMS with their chosen service package, "3", "7" or "30," to a dedicated number.
3. MTN receives the request, deducts the customer's airtime account and the Lumos back-end system is notified of the payment.
4. Lumos sends a command to the solar home system to credit and unlock it. The embedded SIM receives and executes the command.

5. Customers receive power for the number of days selected as part of the service package. The embedded M2M SIM card sends information regularly on system usage and performance back to the Lumos back-end system.

6. The SHS automatically shuts off after the credit is exhausted. Customers cannot use the system until they top-up their MTN Mobile Electricity account.

**FIGURE 3**

### Lumos Pay-as-you-go Process



**Partnership with a Mobile Operator:**

Lumos’ partnership with MTN Nigeria allows it to deliver PAYG solar in a market with limited mobile money adoption. MTN markets, distributes and sells the Lumos solution. MTN also provides Lumos with the SIM cards for the SHS. MTN’s call-centre teams also act as the front line for customer care. The benefits to MTN are as follows:

- Significant revenue generation via a revenue share agreement with Lumos.
- Increased market penetration by gaining subscribers attracted to the pay-as-you-go solar offering.
- Reduced customer churn.

“Digital inclusion of any kind is underpinned by consumer access to electricity. We therefore view our partnership with Lumos as an essential enabler in the attainment of MTN Nigeria’s strategic vision of delivering a bold new digital for its customers.”

**Henry Okoede SM, Business Development MTN Nigeria**



## Marketing, Sales, Distribution and Customer Service

The success of the partnership between MTN and Lumos depends on the coordinated delivery of the service across both partners. To capture the full benefits of the large market potential, Lumos and MTN

have been focussed on building processes and clear roles and responsibilities that can be easily scaled to provide national coverage.

**FIGURE 4**

### Description of Lumos/MTN Operations for Core Business Components

Business Component	Structure & Strategies
Marketing	<p>Above the Line:</p> <ul style="list-style-type: none"> <li>• Multiple radio advertisements</li> <li>• Print campaigns</li> <li>• Flyers in MTN retail stores</li> </ul> <p>Below the Line:</p> <ul style="list-style-type: none"> <li>• Lumos conducted demonstrations in selected communities and market centres to attract the first ~100 customers,</li> <li>• MTN retail store owners market the product to their customers</li> <li>• “Friend-Bring-Friend” – word of mouth (run with financial incentives and without) was found to be most effective in driving sales</li> </ul>
Sales	<ul style="list-style-type: none"> <li>• Customers go to an MTN retail store to register for the service and pay the commitment fee</li> <li>• MTN retail staff register customers</li> <li>• MTN retail store owners receive commissions for customer registration</li> <li>• Customers are responsible for transporting the unit from the MTN store to their home/business</li> </ul>
Distribution	MTN manages transport of products to the MTN owned retail stores.

Business Component	Structure & Strategies
Service	<p>Installation:</p> <ul style="list-style-type: none"> <li>• Customers are responsible for installation; they are provided with a manual and a list of technicians who are trained to install the system that they can use at their discretion</li> </ul> <p>Customer Support:</p> <ul style="list-style-type: none"> <li>• 24/7 MTN customer care line that is free for MTN subscribers; MTN staff have been trained on the Lumos product and service</li> <li>• Technical problems are escalated to Lumos technical staff</li> </ul> <p>Maintenance:</p> <ul style="list-style-type: none"> <li>• 5-year warranty, during the lease period; most technical maintenance can be done remotely, but if a malfunctioning component needs to be replaced, customers must go to the local MTN store</li> </ul>



Lumos and MTN marketing flyer

# Early Results

## Business Model Viability

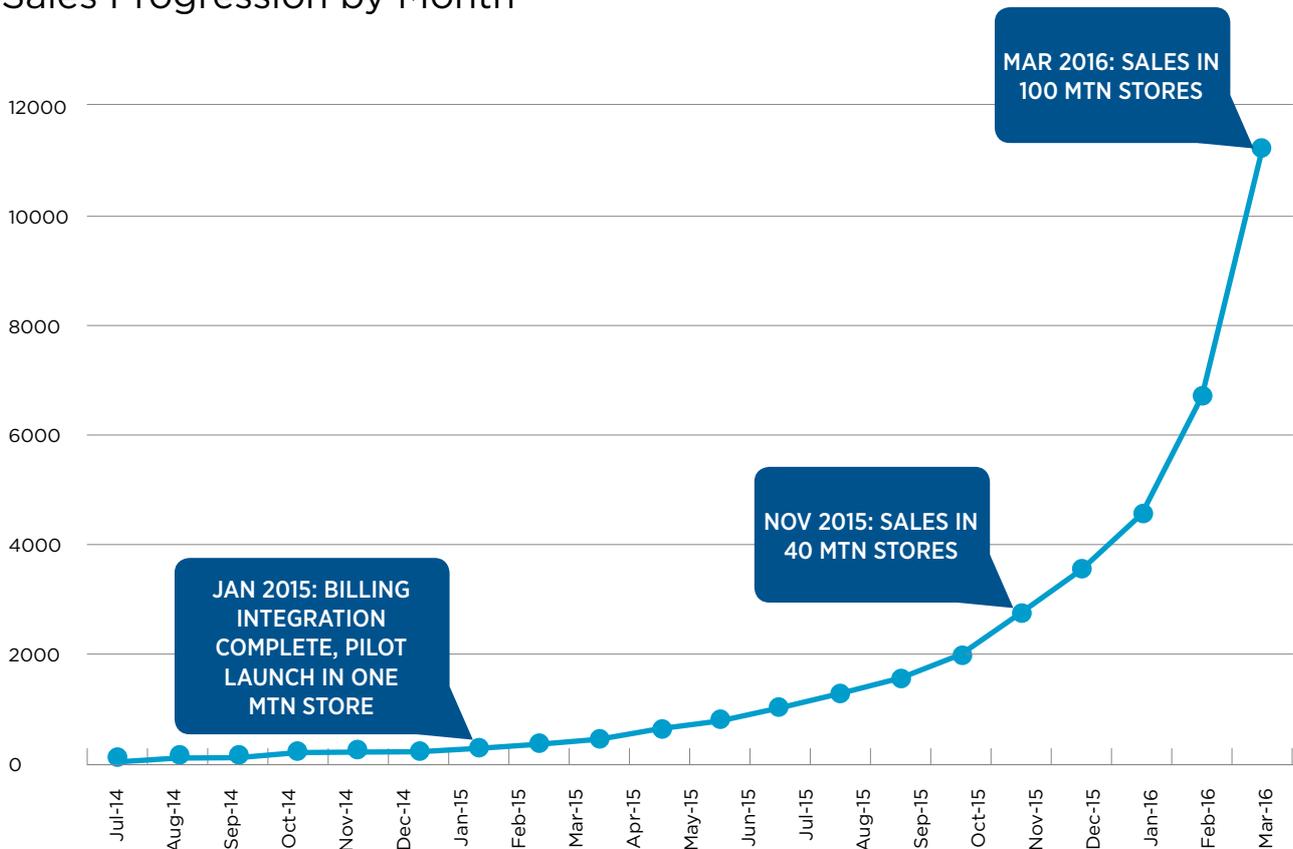
### Sales

Sales of the Lumos Solar Home Systems in Nigeria began in July 2014 as part of a pre-commercial pilot to test the market. During this time, Lumos had a small number of dedicated sales agents selling the product directly to end customers. Sales did not begin in earnest with MTN until billing integration and

customer care staff were trained in early 2015. Lumos reached its 500 system goal for the pilot in May 2015 and sold over 3,000 solar home systems in 2015. In 2016, Lumos launched a commercial expansion in multiple MTN stores in multiple Nigerian states and has since seen month on month sales growth of over 100%, leading to current sales rates of hundreds of systems daily and thousands of systems monthly.

FIGURE 5

### Sales Progression by Month





**Mobile operators can provide a path to scale for sales and distribution.** In Nigeria, MTN is co-branding the service with Lumos and helps build the customer facing relationship. The revenue generated and broader benefits to MTN via their partnership allow them to support distribution, sales and after-sales customer support. From the first day of joint sales of the product, thanks to the MTN partnership, Lumos had access to nationwide logistics, warehousing, inventory management, retail stores and call centre services, keeping the cost of service to a minimum and overcoming one of the main challenges PAYG providers face.

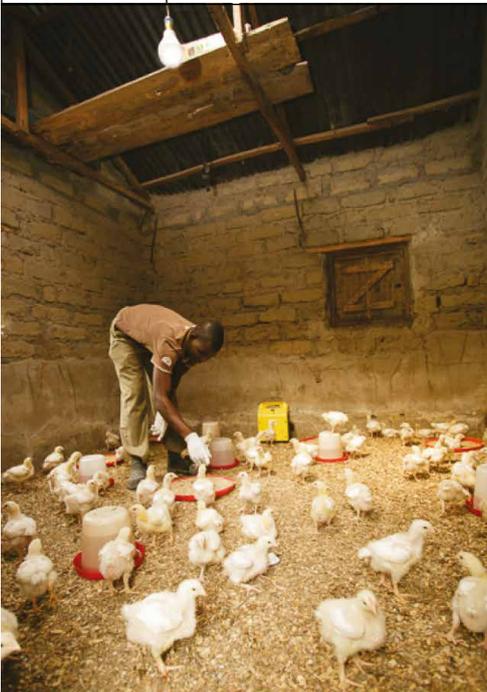
The pilot led to several key findings about customer demand:

**Approximately 80% of Lumos customers are households, while the remaining 20% are either small businesses or community services** such as hospitals, schools, mosques and churches.



**The Lumos system is a viable alternative to petrol generators.** The high prevalence of petrol generator ownership in Nigeria is perceived to be a hurdle to the sale of SHS and potential success of PAYG in the country. However, a customer survey revealed that 55% of customers owned a petrol generator prior to purchasing a Lumos system. The value proposition of the Lumos service is thus evenly split between providing first-access to high quality energy services and reducing customer’s monthly expenditure on petrol fuel and maintenance of the generator.

Source: Lumos



The Lumos system used in businesses

## Payment

**Airtime is a viable payment mechanism for PAYG in markets with limited mobile money penetration.** The rise of PAYG energy providers in East Africa has been partially attributed to the ubiquity of mobile money. To replicate the PAYG energy model into markets with limited mobile money penetration requires the

use of other digital payment services. During the course of the grant, Lumos proved that airtime credit could successfully be used as an alternative means to mobile money to collect payments for its energy service. Working hand-in-hand with MTN, Lumos had to integrate its IT systems with MTN's billing and collections systems.

## Airtime vs Mobile Money for Payment Collections

Payment via airtime is not synonymous with mobile money given that the first is a commodity and the second is digital currency and they are therefore regulated differently.

Another area where the use of airtime or mobile money differs for PAYG providers, and SMEs in general, is in the technical integration between the service provider and the mobile operator.

To use mobile money, companies register to receive a bill pay number and access the Instant Payment Notification (IPN) data. Through APIs over standard protocols (e.g HTTP/HTTPS), PAYG providers should be able to seamlessly integrate their back-end system (Customer Relationship Management system) with a mobile money provider's IPN. Since few mobile operators have fully opened up their APIs, most PAYG providers need to complete a custom technical integration with each mobile money platform they support. In cases where resources are constrained, this can take several months, several in-person visits and requires significant technical resources.

To use airtime, a company will be approved by a mobile operator as a Value Added Service (VAS) vendor and the VAS will be offered by the mobile operator directly. Customers pay for the service via premium SMS/USSD. From a technical perspective, mobile operators need to create a new product and short code for each VAS product so that customers can pay separately for each product or service. Payments, in the form of airtime deductions, are done and recorded by the mobile operator.

Unlike other VAS, PAYG providers require instant notification of payments to be able to unlock the PAYG systems in real-time. The solution requires a fully integrated connection to the mobile operator's messaging and billing systems that fulfils Telco-grade requirements (e.g. dynamic scalability, geo-redundancy, mutual service level agreements and more). The customer end-to-end flow includes handling message interfaces to receive customer payment requests, handling payment and subscription capabilities, processing successful payments, providing the electricity to the unit and handling unsuccessful messages (error handling, customer notification and more). This level of integration requires a deeper level of partnership and support with the mobile operator partner including a detailed service level agreement. Beyond being able to facilitate the payment service, the mobile operator is effectively vouching for the quality of the billing of the VAS provider.



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**Two thirds of customers purchased the 3-day bundle, while only 9% purchased the 30-day bundle.**

As the pilot was limited in size to 500 units and the vast majority of Lumos customers have less than one year of history with the service (at the time of writing), it is hard to determine the main reason for the preference for shorter service bundles. Potential reasons include:

- Customers prefer to make smaller, more conservative payments in line with their access to cash.
- New customers want to gain confidence and trust with the service before investing significantly for the prepayment option.

- The cost saving of the 30-day plan and convenience of a single monthly payment were insufficient incentives to overcome the issues stated above.

**PAYG payment plans need to provide flexibility in repayment schedules.**

Lumos' business model assumes that customers will use their system 1500 days within a 5-year period, or approximately 82% of the time. Lumos assumed that their customers may need to pause payments and usage of the system when they travelled or were cash constrained, just as they would their prepaid mobile account. During the course of the pilot, payment patterns were in line with Lumos' original assumptions as on average 80% of systems were credited and functioning on any given day.

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## Refinements to Operations

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### Products and Pricing

The pricing of the Lumos solution did not change during the course of the pilot.

Lumos worked with appliance retailers to ensure the supply of DC appliances. As noted, over 50% of Lumos' customers had prior access to petrol generators and were seeking a solution that could power larger appliances such as fans and TVs. The logistics and additional complexity of sourcing, supplying and financing DC appliances was unattractive to Lumos which preferred to focus on providing the electricity service. To make sure high quality compatible appliances were available to its customers, Lumos focused its efforts in developing a local ecosystem for 12V DC appliances to ensure nationwide access to appliances. To achieve this goal, Lumos developed

partnerships with the main importers and distributors of home appliances to make compatible appliances available for purchase to Lumos customers. During the pilot period, on average, all customers bought additional LED bulbs, one third bought a fan, and one quarter a TV. These numbers only reflect additional appliances reported by Lumos' partner appliance distributors and reported by a sample of customers. Due to the availability of products and number of retailers, these figures represent a minimum percentage, as many customers could have purchased additional appliances (including radios and MP3 players) independently.

To prevent customers from trying to plug in their existing AC TVs and fans, the Lumos system is fitted with cigarette lighter adapters and USB ports.

## Working with appliance importers to provide DC TVs

One of the leading appliances in demand by Lumos customers are LED TVs. Such TVs were found to be available across Nigeria, with both popular local brands and leading international brands importing and distributing products across the country. To prevent damage to the TVs due to the on-going power cuts and surges from grid instability, some Nigerian importers introduced an external AC/DC cable to the TVs. These TVs are equipped with a DC jack socket at the back of the screen that can be easily connected to the Lumos system via a DC jack cable.

At first, Lumos provided the DC cables to its local appliance partners. As the importers became comfortable with the market and realised its potential to scale, they began to include the DC cables with TVs being sold to Lumos customers. As local assembly is a common practice by many Nigerian home appliance importers, the cable change was easy to first pilot and then scale.



### Sales & Customer Service

**Installation of SHS by customers is possible.** One of the objectives of the pilot was to test whether or not customers could install the Lumos product independently. Lumos had observed that many PAYG providers working in East Africa provided their customers with installation services. This is often done to ensure that the SHS is properly installed, is positioned to benefit from the best solar radiance and to minimise any potential damage from amateur installations. Lumos saw the need to provide installation services as a barrier to scale as it would require a large on-the-ground presence of trained technicians, and would run contrary to their partnership approach, where the mobile operator was responsible for sales and after-sales support.

Through the course of the pilot, Lumos trialled several approaches to encourage independent installation. They developed a self-installation mounting kit along with step-by-step installation guide and video, they trained existing networks of satellite-TV technicians and they provided a list of installers to each MTN store. In the course of the pilot, Lumos discovered that the first customers in a new area would hire a technician to install the SHS, but as customer density and knowledge of the installation procedure increased in a geographic area, customers chose to install the system themselves, or hire a technician local to their community. Through

the remote monitoring of deployed systems, Lumos was able to test the quality of customer installations and notify customers if they needed to improve the positioning of the panel.

**MTN virtual training allowed them to quickly develop a strong foundation of call-centre staff versed in the Lumos service.** As MTN is responsible for the after-sales support of the Lumos product, including receiving calls about the product through their primary customer support line, MTN needed to ensure that they had trained staff on the Lumos product across their national network of call centre employees, regardless of the pilot's size. To train the call centre staff, Lumos worked with MTN's human resource team to develop content that could be broadcast across MTN's national training centres. This allowed a large number of call-centre employees to virtually attend presentations in order to become knowledgeable on the Lumos product. By working hand-in-hand with MTN's staff, Lumos was able to adapt the training material into a format that was familiar to the call-centre staff and allowed them to quickly get up to speed on the product and the escalation procedures. On-going quality control testing and updates of the training material are used to maintain high service levels. Multiple languages are supported to enable nationwide support. When needed, calls can be escalated to a dedicated Lumos technical support team.

## Customer Benefits

The quality of life and livelihood benefits to Lumos customers result from the replacement of expensive poor quality energy sources with cleaner, higher quality, reliable and more affordable solar powered service provided by Lumos. Increased revenue opportunities from keeping businesses open longer along with minimized electricity spending are beneficial for vast types of business users.

Through a customer survey:

- 81% of surveyed customers reported that their energy expenditure had decreased or greatly decreased since using the Lumos service.
- 92% of customers stated that they would either recommend or highly recommend Lumos service to others.
- 93% of customers said they increased their usage of light with the Lumos system, and 43% reported using light for more than 12 hours per day.

### Customer Experience

The testimonials from Lumos customers illustrate the improvement to their quality of life from access to reliable solar electricity in comparison to the national grid, and the lack of noise and smells associated with using a petrol generator:

- “The reason I like the system is because today I have 24 hours of light in my home. The system is noiseless”. – Male, early 40s
- “Generators make noise and you have to burn fuel in the house. With this [Lumos system], you don’t burn fuel, you just see light in the house” - Male, early 30s
- “We are very happy to have this [system] because with solar you are very sure you will have constant light. If you want to put it off, it is your choice. If you want to put it on, it is still your choice. And there is no disappointment, that is the most important reason why we love solar.” - Woman, mid 40s.

## Mobile Industry Benefits

One of the key objectives of the Innovation Fund is to identify how mobile technology can support mobile enabled utility services. This in part depends on the benefits that accrue to mobile operators from partnering to provide PAYG solar services. Lumos has brought several benefits to MTN by growing revenue from the service and reducing churn.

**PAYG energy is an attractive revenue stream for operators in large off-grid markets.** Lumos’ unique value proposition to mobile operators is the opportunity to directly increase the Average Revenue per User of their low-value, off-grid customers, as the PAYG payments are deducted from their airtime balance.

Mobile operators are treated as essential partners in the delivery of the Lumos service and compensated through a revenue share agreement. Therefore, MTN sees measurable revenue increase from Lumos customers spending as much or more on their Lumos systems as they do on voice and SMS, yet without decreasing their spend on other mobile services. Similarly, Lumos customers have an Average Revenue per User (including their spend on Lumos) which is more than that of the Nigerian mobile industry. Even with MTN’s expenditure towards sales, distribution, and customer support, their revenue and the additional benefits from the partnership are valuable for MTN. For example, MTN also believes that Lumos customers keep their phones on longer with

readily available phone charging and thus take more incoming calls.

### Reduction of churn among Lumos customers

As stiff competition drives prices down and mobile connectivity services become increasingly

commoditised, mobile operators face high rates of attrition (or churn) as customers seek cheaper prices. Across a few months of initial data, MTN has found that the Lumos service reduces churn by half as customers make regular payments for this unique service exclusively available through MTN.

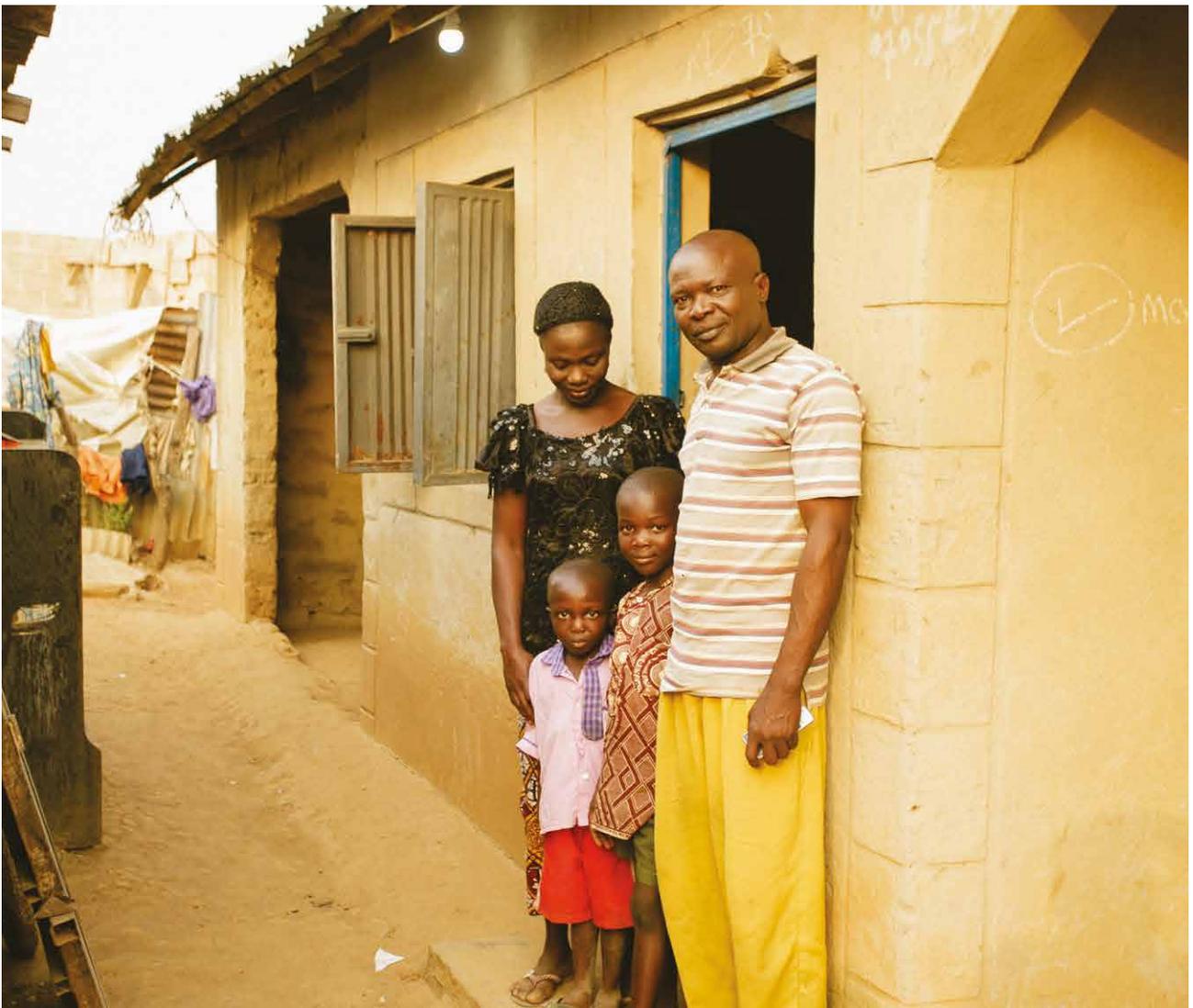
Source: Lumos



# Conclusions

One of the key objectives of the Seed Grants is to better understand what mobile-enabled innovations and business models are able to deliver access to sustainable utility services. Lumos' project provided important insights into the use of airtime as a payment mechanism and the benefits of a strong partnership between Lumos and MTN for sales and distribution of PAYG solar products.

As a first mover in the PAYG sector in Nigeria, Lumos' experience highlights the opportunity that exists in the market and the ways that business models can be adapted to the local context. Lumos' offering has demonstrated valuable revenue and customer loyalty benefits for MTN through their deep partnership. For Lumos, this partnership provides a promising route to scale. While most PAYG providers have shied away from challenging markets with lower mobile money penetration, the Lumos and MTN example suggests that a close partnership with mobile operators may be a particularly important strategy for these markets.



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## Appendix: Case Study Methodology

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**Overview:** This case study is based on learnings that emerged throughout Lumos' Seed Grant from the GSMA Mobile for Development Utilities programme. These were tracked through the following:

**Grantee reporting:** Monthly reports were completed on activities, project risks and mitigation, and key performance indicators. These were discussed during a one-hour call with the grant manager each month. Quarterly reports were completed to document progress on milestones, the grantee's learning objectives, barriers and other key project developments as well as financial compliance.

**Customer Surveys:** Nova Lumos carried out a customer survey via telephone interviews of 81 randomly selected customers in October 2015.

**Data from MTN:** MTN provided data on revenue breakdown from Lumos customers from January 2015 – July 2016. They also provided the churn rate among Lumos customers from June-July 2016.

**Limitations of this study:** The study aims to provide only the key learnings from Lumos' project and cannot possibly cover all the day-to-day learnings from Lumos. It also aims to share learnings with the broader sector without releasing commercially sensitive data from Lumos or MTN Nigeria.

The customer surveys are meant to be representative while not necessarily statistically significant to a specified degree of certainty. Customer surveys are known to have limitations in accuracy, particularly around expenditures, income and previously carried out activities, where people often fail to recall these correctly or are influenced by perverse incentives (e.g. stating a lower income than reality thinking it will reduce the future pricing).



For the full report please visit the GSMA website at [www.gsma.com](http://www.gsma.com)

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