MAPPING THE OFF-GRID SOLAR MARKET IN NIGERIA

2019

Source: Signify Foundation

Signify foundation

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Contents

Abbreviations

Bn	Billion
CBN	Central Bank of Nigeria
DisCos	Distribution Companies
DFID	Department for International Development
DRE	Decentralized Renewable Energy
EE	Energy Efficiency
EEP	Energizing economies programme
ESMAP	Energy Sector Management Assistance Programne
FGN	Federal Government of Nigeria
HH	Household
IDEN	Independent Electricity Distribution Network
MMO	Mobile Money Operator
MNO	Mobile Network Operator
MFI	Microfinance Institution
Mn	Million
NDPHC	Niger Delta Power Holding Company
NEP	Nigeria Electrification Project
NESP	Nigeria Energy Support Programme
NERC	Nigerian Electricity Regulatory Comission
NREAP	National Renewable Energy Action Plan
ESMAP	Energy Sector Management Assistance Programne
NREEEP	National Renewable Energy and Energy Efficiency Policy
OGS	Off-Grid Solar

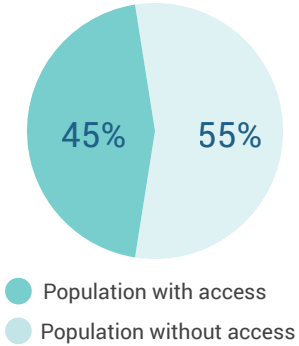
Abbreviations

PAYGO	Pay-as-you-go
REA	Rural Electrification Agency
SE4ALL	Sustainable Energy for All
REAN	Renewable Energy Association of Nigeria
SHS	Solar Home Systems
SHG	Self Help Group
SLS	Solar Lighting Systems
SIDA	The Swedish International Development Cooperation Agency
SREP	Scaling up Renewable Energy Programme
TCN	Transmission Company of Nigeria
USAID	United States Agency for International Development
WTP	Willingness to Pay

MARKET OVERVIEW

Source: Signify Foundation

Market potential: 55% of Nigeria's citizens lack electricity access. FGN plans to partly address this problem by deploying 10,000 minigrids and 5 Mn solar stand-alone systems in Nigeria by 2023



ACCESS TO ELECTRICITY

- **Nigeria's national electrification rate is 45%**, the rural electrification rate is 36% and urban electrification rate is 55%. The country has the **largest access deficit in Sub-Saharan Africa** and the second-largest in the world, after India
- Nigerians **spend an estimated $14 Bn per year** on small-scale diesel generators to offset poor or non-existent grid supply
- Lack of adequate power supply results in over **$25 Bn in annual losses to the economy** (6% of GDP)

KEY GOVERNMENT TARGETS THAT CONTRIBUTE TO THE OVERALL MARKET OPPORTUNITY

Rural Electrification Agency

- **10,000 minigrids** by 2023
- **5 Mn solar stand-alone systems** for Households and SMEs by 2023
- Increase access to electricity to 75% and 90% of the population by 2020 and 2030 respectively and **at least 10% of renewable energy mix by 2025**

National Renewable Energy Action Plans

25% of rural population to be served by off-grid RE (minigrid and stand-alone systems) **by 2020** and **40% by 2030**

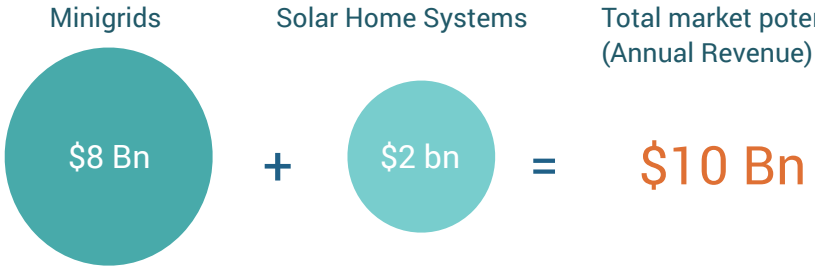
Nigeria Electrification Project (With World Bank)

- **Minigrids:** Electricity access to **300,000 HHs, and 30,000 MSMEs. ~850 minigrids** expected to be built by private firms
- **Solar stand-alone systems:** Access to more than **1 Mn HHs** and MSMEs through stand-alone solar systems and **distribution of 1 Mn single solar lanterns**

Source: National Renewable Energy Action Plan (2015-2030), National Council on Power, July 2016 (Link); Nigeria Power Africa Fact Sheet, USAID (Link); Master Plan of the Rural Electrification Agency (Link); The Nigeria Electrification Project: Project Appraisal Document, World Bank, May 2018 (Link)

Market potential: The Rural Electrification Agency (REA) has estimated an annual market opportunity of $10 Bn/year for minigrids and solar home systems in Nigeria, with a saving potential of $6 Bn/year

ANNUAL MARKET OPPORTUNITY ESTIMATED BY REA*



SAVINGS POTENTIAL FROM OFF-GRID ALTERNATIVES: $6BN/YEAR

*The Nigerian Rural Electrification Agency (REA) is the Implementing Agency of FGN tasked with electrification of rural and unserved communities. REA has created the Off-Grid Electrification Strategy which is part of the Power Sector Recovery Programme (PSRP).

Key Objectives Of REA's Off-Grid Electrification Strategy

- Provision of reliable power supply for 250,000 SMEs
- Supply of uninterrupted power in **Federal Universities and University Teaching Hospitals**
- **Support FGN's climate change obligations** under the Paris Agreement, w.r.t. promoting RE and reducing carbon emissions

The Energizing economies programme of REA (EEP) aims to **power 4 large markets and economic centers in Nigeria with OGS power**

Minigrids*:

- **Nigerian minigrid market can scale upto 10,000 sites by 2023, powering 14% of the population with capacity up to 3,000 MW,** creating an estimated investment potential of ~$20 Bn and **annual revenue opportunity exceeding $3 Bn**. This is contingent on an enabling environment, continued cost reductions, and targeted finance
- There remains **a large potential for scaling minigrids** as 10,000 minigrids of 100 kW each by 2023 will only meet 30% of anticipated demand
- According to GIZ, **over 25 Mn Nigerians can be most effectively provided with electricity via nearly 8,000 isolated minigrid systems** providing 4.4 GWh per year

Solar Home Systems:

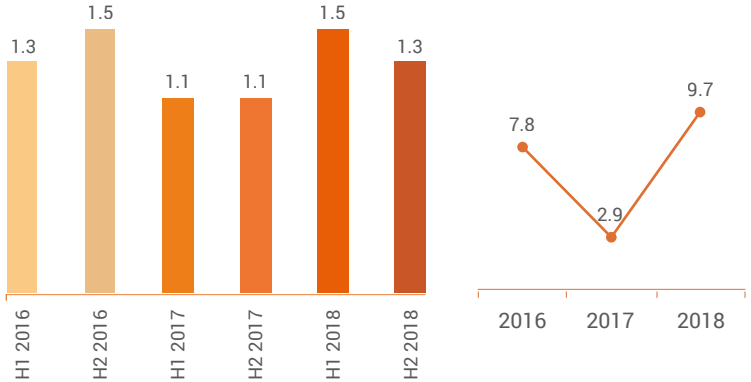
- The revenue potential from solar home systems is estimated at **$2 Bn/year**
- An expenditure of **$6/month by most rural HHs** on **kerosene** or battery powered torches, makes a compelling case for SHS

Source: Nigeria Minigrid Investment Brief, REA, Dec 2017 (Link), Source: Nigeria Minigrid Investment Brief, REA, Dec 2017 (Link)

Volume of products sold (in lakhs)

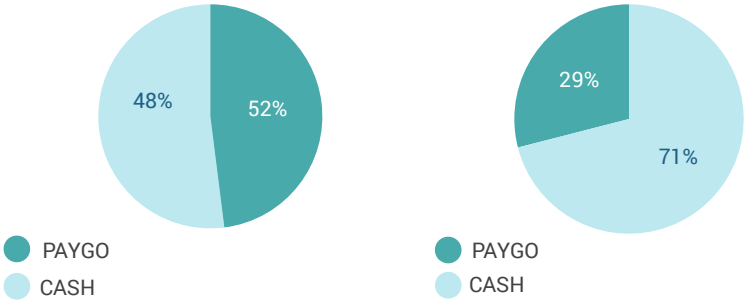
Market penetration: Sales volume of stand-alone systems (SHS, SLS and solar lanterns) grew by 33% from Dec'17-Dec'18 and value rose by 231%. Despite huge potential, current minigrid penetration remains low

A 231% JUMP IN OGS SALES VALUE IN 2018 REFLECTS A MIGRATION TO HIGH COST OGS SOLUTIONS



- **Total installed capacity of solar stand-alone systems from Jan-Dec'18 was 4.47 MW, 0.48 MW** through cash sales and 3.99 MW through PAYGO
- **Minigrids:** Despite high potential, minigrid penetration remains relatively low. GIZ **estimates 30 solar minigrids with a total installed capacity of 1 MW, serving 6,000 customers**
- Average sales of solar stand-alone systems in 2018 were **~24,000 units per month. The market has 14 active SHS distributors** of the Lighting Global verified solar products in Nigeria

52% OF TOTAL VALUE AND 29% OF TOTAL VOLUME OF OGS GOODS SOLD WAS ATTRIBUTED TO PAYGO MODELS BETWEEN JAN – DEC 2018



- **Increasing penetration by PAYGO SHS within sections of the market using diesel generators.** "Lease to own" PAYGO models are most prevalent in Nigeria.
- In 2018, **~89% of total installed capacity** of solar stand-alone systems came from PAYGO sales
- **Companies deploying PAYGO attracted 91% of total investment** in OGS market globally, between 2016 and 2018

Source: Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data, GOGLA - H1 2016 (Link), H2 2016 (Link), H1 2017 (Link), H2 2017 (Link), H1 2018 (Link), H2 2018 (Link)

Market penetration (Minigrids): As per REA, atleast 10 minigrid projects currently serve 2000 HHs and 250 commercial businesses with a plan to start 200 additional projects yielding 10 MW in installed capacity

10 MINIGRID OPERATORS IN NIGERIA SERVE 10,000 INDIVIDUALS WITH A COMBINED CAPACITY OF 364 KW

Most minigrid projects today are situated in densely populated agrarian communities, with a population of ~2,500 distributed among 300–500 households. Prior to the arrival of the minigrid, community members used kerosene lamps, candles, torchlights, and generators as lighting sources

Rocky Mountain Institute (commissioned by REA) audited 10 key minigrid projects in Nigeria. They serve **~2,000 households** (65% of local homes) and over **250 commercial connections**. The combined **system capacity of 364 kW supplies electricity to at least 10,000 individuals**

Rapid expansion plans of minigrid developers demonstrate a high degree of confidence in existing business models and potential demand for minigrid solutions

8 minigrid developers plan to begin work on **additional 200 minigrid projects by the end of 2018.** Some of these projects would participate in REA and development partner programmes, but many are expected to be independently financed

These 200 projects are expected to yield an additional 10 MW installed capacity throughout Nigeria and would require a $28 Mn investment

Developer	Location (Community)	Local Govt. Area	State
ACOB Lighting Technologies,	Dokan Karji	Kauru	Kaduna
Arnergy Solar Ltd.	Obayantor	Ikpoba-Okha	Edo
CREDC	Umon Island	Biase	Cross River
GoSolar	Kurdula	Gudu	Sokoto
GVE Projects Ltd.	Bisanti	Katcha	Niger
GVE Projects Ltd.	Egbeke	Etche	Rivers
GVE Projects Ltd.	Angwan Rina Demshin	Shendam	Plateau
Havenhill Synergy Ltd.	Kigbe	Kwali	FCT (Abuja)
Nayo Tropic Technology Ltd.	Tungan Jika	Magama	Niger
Rubitech Solar Ltd.	Gbamu Gbamu	Ijebu-East	Ogun

Source: Minigrid Investment Report: Scaling the Nigerian Market, Rocky Mountain Institute, 2018 (Link)

Products: Off-Grid ecosystem is commonly divided into Pico lamps, Solar Home Systems (SHS) and Minigrids

- Basic Lighting
- Phone Charging
- Lighting
- Basic Appliances
- Productive use power
- Heavy Appliances
- Small commercial

Minigrids

Larger solar home systems (component based)

Smaller solar home systems (multi-light point)

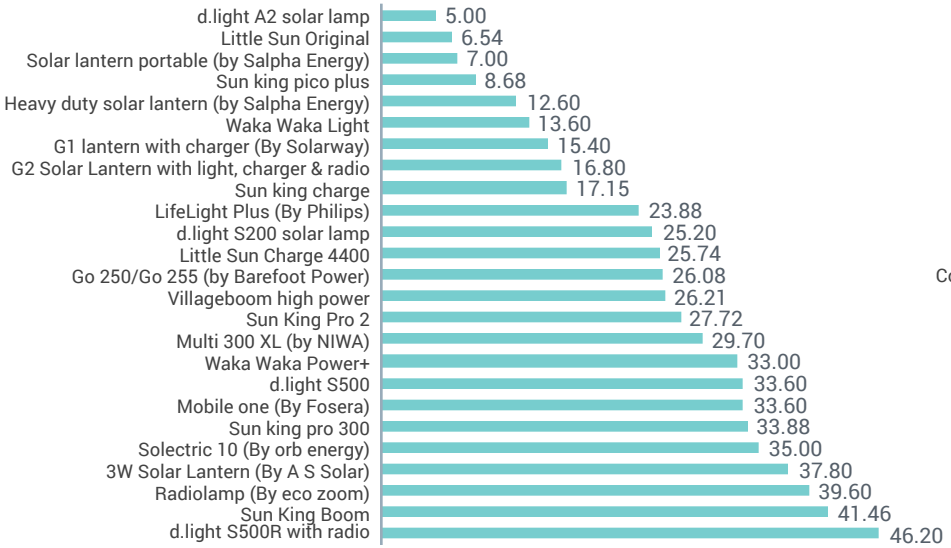
Pico Lamps

Increase in size (kW)

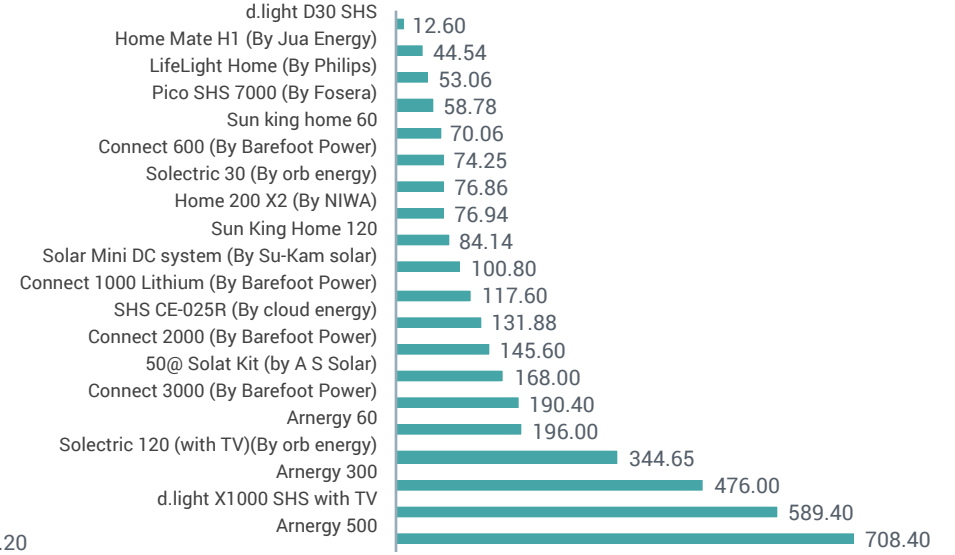
Source: Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data, GOGLA

Products: Product landscape in Nigeria is wide ranging and divided, with price driven by quality, warranty, after sales service and PAYGO options

SOLAR LANTERNS AND SOLAR LIGHTING SYSTEMS



SOLAR HOME SYSTEMS

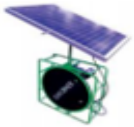


	Off-Brand Generics	Branded Retail	Branded Service Level
Description	Low cost, generally and may offer similar specs to brand name products but maybe of lower quality	Brand-name, reputable systems sold via retail or through distributors	Brand-name, reputable systems sold via retail or through distributors and sold through PAYGO Highest cost due to PAYGO
Examples Of Operators In Nigeria	Labelling varies	d.light, sunking, NIWA	LUMOS, AS SOLAR, OOLU, Azuri, greenlight planet

Source: Mangoo Marketplace (Link)

Note: For more details on private OGS operators, refer to Annexure

Products (Productive use technologies): A few companies are incorporating productive use solar products in their offering such as solar water heaters, water pumps, fridges etc.

Category	Products	Private dealers in Nigeria (illustrative)
Household & Institutional use	 Solar water heater	Cold Hubs; AS Solar
Small businesses	 Solar refrigerator;  Solar Kiosks	Leks Environmental ...Power of Nature
Agricultural Use	 Solar water pump;  Solar Powered Cold Storage	rensource

SUPPLIER MARKET TRENDS

Source: Signify Foundation

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Supplier landscape: The OGS value chain comprises of developers (manufacturers); distributors (assemblers, wholesalers, retailers), last mile distribution agents and consumers

Active
- ■ (orange) Can also provide productive use tech
- ■ (teal) Can also provide minigrids

Manufacturers/Developers: Design And Engineering → Production | Distributors and retailers: International Distribution → National Distribution → Retailing → After Sales | Consumers: Consumer Financing

Company	Minigrids	Productive use tech	LG	Partnerships / models
COLU				Partners with MFIs for consumer financing; Angaza for PAYGO
azuri				Co-marketed by FirstBank*; Partnered with NDPHC** for PAYGO
d.light	■		LG	Partnered with LAPO MFI for soft loans
fosera / NIWA		■		Distributes through women entrepreneurs; Angaza for PAYGO
greenlight planet	■	■	LG	Partners with MFIs. Partners with MFIs
LUMOS				Partnered with MTN Nigeria for distribution, after sales and PAYGO
A&S Solar	■	■		Own PAYGO platform
Solar Sister				Distributes through women entrepreneurs
solynta		■		Lease to own PAYGO model for SHS
Leks Environmental	■	■		
Barefoot Power				Partners with MFI for consumer financing
rensource				Tiered subscription-based model for customers to pay for energy as service
arnergy		■	LG	PAYGO models include 'Lease to own' and 'energy subscription'

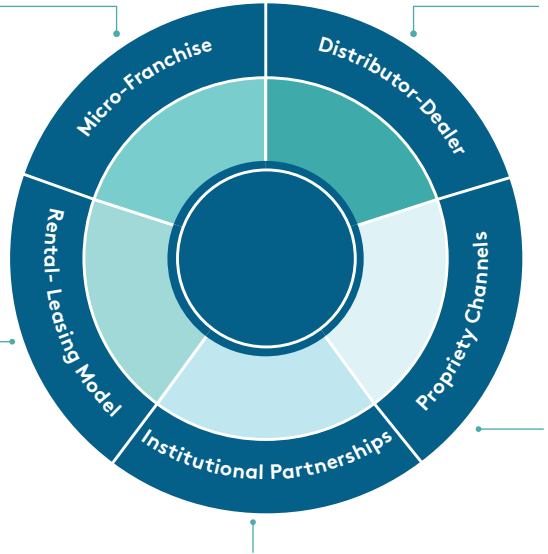
*Customers use the bank's Firstmonie agent network & mobile payment platform to pay **Niger Delta Power Holding Company

Lighting global associates include D.light, Greenlight Planet, A4&T power solutions, ovSolar Power, Smart Grid International, and Village boom (social enterprise)

Distribution models: Most players distribute through institutional partnerships with MFIs and conventional dealer networks

Microfranchise model

The company offers franchising packages (such as financing, training, marketing support etc.) to micro-entrepreneurs who wish to become formalized retailers of exclusive company products



Distributor-Dealer

The company sells through established networks of generalist or specialist distributors, leveraging the traditional consumer durables supply chain. Products are retailed in a basket of consumer durables. A distribution hierarchy of at least two levels (distributor and dealer/retailer) is maintained

Rental/Leasing Model

The solar company contracts or franchises to micro-entrepreneurs who set up solar charging kiosks. The micro-entrepreneurs either (1) rent products out to consumers on an hourly/daily basis or (2) sell systems without a power source and offer a fixed fee for charging.

Proprietary Channels

Products move through a proprietary distribution channel from manufacturer to in-house storage/assembling facilities to a salaried/contracted salesforce, which delivers them to customers directly

Institutional Partnerships

The company partners with an institution (e.g. MNOs, NGO, MFI, rural bank, SHGs, MNC, assemblers, with links to a large potential customer base) to market its products to its customer base/members and/or to leverage its assembling & after-sales support services

Distribution models: Businesses are exploring a variety of last mile distribution channels including MFI, local retailer/distributor and MNO networks

Villageboom has been working in rural Nigeria to implement market-oriented business models for adoption of OGS devices

WakaWaka (Off-Grid Solutions B.V.) distributes solar lights and chargers in Nigeria

Players like **D.light, Barefoot power, Greenlight Planet** etc. collaborate with MFIs for distribution and consumer financing. **Azuri** partnered with **FirstBank,** to leverage its Firstmonie agent network (~16000 agents) and mobile payment platform for distribution and payment

USAID's beyond the grid programme partnered with **LAPO MFI**, with 400+ branches in 35 states. It is helping other MFIs, including Grooming People, Accion, Fortis and Mutual Benefits, partner with the SHS companies

Solar Sister has a woman-centric direct sales network to bring OGS solutions to communities across Nigeria. Solar Sister's last mile customers include rural homes, health clinics, schools or small businesses

IFC's Lighting Africa programme has set up a retail channel development programme to expand the distribution footprint of solar lanterns and SHS by training retailers in different areas of Nigeria, adding 6,000 new retailers into the value chain

Lumos partnered with **MTN** for distribution and end-user financing. MTN co-brands **Lumos** products, distributes them at its outlets, enables mobile payments via airtime and ensures first-tier customer support

Source: Nigerian Micro-Finance Banks Start Selling Solar, Medium, May 2018 (Link); Lighting Africa Programme: Nigeria, IFC (Link); Waka Waka Nigeria (Link)

Financing models: PAYGO models are fairly nascent in Nigeria. While many OGS players are adopting them, there are multiple infrastructural, regulatory, technological and cultural barriers limiting their scale

COMMON PAYGO MODELS IN NIGERIA

- **Use of airtime as prepaid credit model:** The Lumos pay-as-you-go solar service is gaining traction.
  - Customers top-up mobile airtime balance to pay for the service (same balance they use to make calls or buy data)
  - Customers send an SMS with the chosen package to credit their MTN mobile electricity service
  - MTN receives the request, deducts customer's airtime account and notifies Lumos's back-end system
  - Lumos sends a command to SHS to credit and unlock it. The embedded SIM receives and executes the command.
  - Customers receive power for the no. of days selected
  - The embedded M2M SIM card sends information on system usage and performance to Lumos back-end system
  - The SHS automatically shuts off after the credit is exhausted
- **Unstructured supplementary service data (USSD) model:** It is a session-based, real-time messaging communication technology, implemented as an interactive menu-driven service. It is an option for providers to enable access and transmit data, including SMS text and interactive voice response. It is cost effective, user-friendly, fast in concluding transactions, and handset agnostic

BARRIERS TO ADOPTION OF PAYGO

- **Regulatory barriers:** Until Oct 2018, CBN prevented MNOs from issuing mobile money for either bill payments or merchant payments. To circumvent this, MNOs have approved PAYGO solar companies as a Value-Added Service vendor. This allows them to provide pre-paid energy services through the purchase of airtime. In Oct 2018, CBN released new guidelines allowing Telcos to promote Payment Service Banks (PSBs) that can make payments and remittances, accept deposits, operate e-wallets etc. As a result, MTN has launched its MoMo agent mobile money service, and Airtel Nigeria is expected to follow suit. This will boost mobile money usage in Nigeria
- **Very low mobile money penetration:** Mobile money has not gained traction in Nigeria. Among those in the poorest 40% of households, only 2.79% have mobile money accounts
- **Inadequate agent network coverage and liquidity:** Digital finance solutions are inaccessible in rural areas with little agent network coverage and bank branches. FIs are hesitant to invest in rural agent network expansion. Agents in rural areas often lack sufficient liquidity to manage all customer payments
- **Technical interoperability problems:** Though interoperability is a requirement for MMO licensing in Nigeria, some MMOs have restricted their platforms from interacting with the platforms of other providers, thereby constraining the flow of mobile money transactions as well as uptake of mobile money service.
- **Cultural barriers:** Uptake of PAYGO SHS is influenced by contextual factors such as a reluctance to take on debt, and preference for asset ownership

Source: The Digital Financial Services Landscape in Nigeria: Enabling Market Conditions for Pay-As-You-Go Solar, USAID, Sep 2018 (Link)

Financing models: Customer relationship models like "Lease to own" and "Energy as service" are popular in Nigeria. Payment platforms like prepaid energy credits through mobile airtime have also been adopted

Business model	Benefits
PAYGO is a financing platform for off-grid energy systems with high up-front capital costs. An IT system underlies the platform, allowing automated payments and system monitoring/activation	• Ability to provide longer duration and big-ticket loans to users • High consumer confidence in product due to financing by the supplier • Improved operational efficiency of suppliers as no coordination needed between financial and technology providers • Reduced cost of payment collection (incase of mobile payments)

Companies on PAYGO platforms

LUMOS, azuri, OOLU, greenlight planet, rensource, solynta

PAYGO BUSINESS MODEL ATTRIBUTES

Payment Platform

- **Full connectivity model** – M2M and mobile money
- **Prepaid credit agent-based model** (off-network, requires manual input of unique code) (e.g. **Azuri, OOLU)**
- **Use of mobile airtime as prepaid credit** (e.g. **Lumos)**
- **USSD models**
- **Partial PAYGO models:** Agents accept cash and activate solar lights through a cable, bluetooth, or a manually-entered SMS code

Customer Relationships

- **Micro loans/Lease to own:** Transfer of asset ownership to user after limited payment period (e.g. **Azuri, Lumos, Solynta, d.light)**
- **Energy service:** Co. provides electric service rather than financing. Service comes from a company-owned solar system **(Rensource)**
- **B2B players:** Hardware/software support for energy service and payment logistics (e.g. **Swifta)**

System Size

PAYGO solar products can be divided by system size, which dictates the service level that each provides.

- HH products: Solar lanterns, SLS, SHS
- Community level shared minigrids

Connectivity

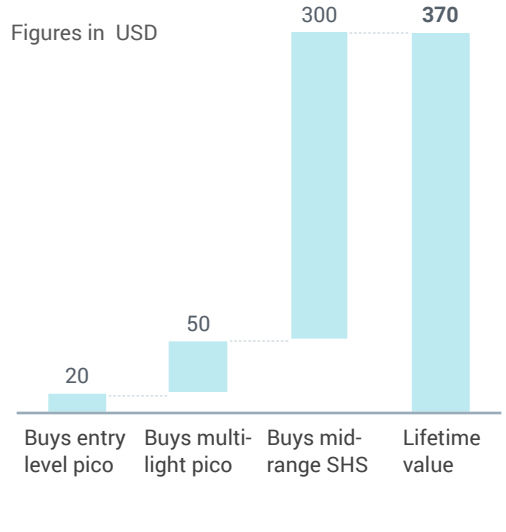
- Systems that are fully online, including **mobile money and remote, real time connections** with the energy system
- Systems that are intermittently connected

Partnership Strategy

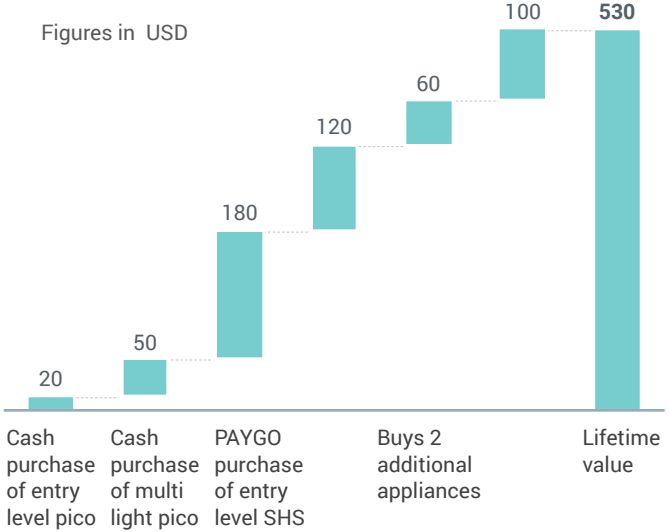
- Partnerships could be made on distribution, payment portals, hardware/software service support, or other core business aspects

Financing models: The lifetime value of a customer through PAYGO models is much higher than it is with Cash based or Cash + PAYGO payment mechanisms

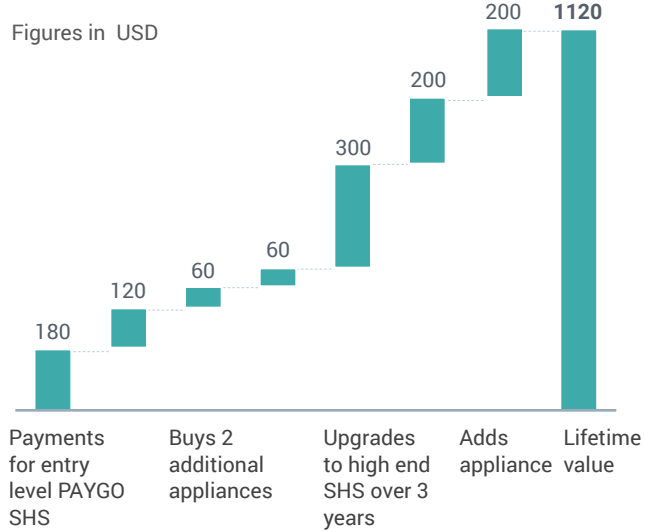
Cash



Cash + PAYGO



PAYGO



8-Year Horizon

- Players are **increasingly focusing on the lifetime value** they can derive from a consumer as consumers migrate from basic products to products with higher functionality
- **PAYGO models offer the highest lifetime customer value**, as is reflected by the increasing adoption of PAYGO models by most suppliers in the market

Sources: Accelerating Access to Electricity in Africa with Off-grid Solar, ODI, Jan 2016 (Link)

Financing models: Partnerships with MFIs is the most common way of advancing finance to consumers by energy enterprises

	DESCRIPTION
One Stop Shop Model	In this model, the same organization provides the products and finance. This happens when a finance provider decides to offer energy products, or when an energy enterprise decides to offer finance. (e.g. Lease to own options offered by **Lumos, Solynta, Arnergy, Greenlight Planet** etc.)
FI Partners With Energy Enterprise	In this case, an energy enterprise enters into a partnership with a local financial institution to sell OGS products. This model typically involves a financial institution (FI) providing credit to an end-user and managing the monitoring and repayment processes, while the energy company provides the energy product, installation, service and maintenance. (e.g. **Lapo MFB and d.light, Accion MFB and Greenlight Planet)**
Umbrella Partnership Model	The energy enterprise enters into a partnership arrangement with an "apex institution" that manages a network of local FIs (e.g. a union of credit cooperatives, credit unions, or other village-based FIs). The apex institution lends money to the local finance providers, who lend to an end-user and manage the monitoring and repayment processes. The energy enterprise provides the product, installation, service and maintenance
Franchise/ Dealership Model	The energy enterprise provides credit to dealers and/or franchises to allow them to sell to clients on an installment basis. This particular model is common for relatively inexpensive products — usually those that cost under $50
Brokering Model	A third-party organization is paid by the finance provider and the energy enterprise to market energy products and assess customers' suitability for financing. They bring viable customers forward to buy energy products. The broker may also be involved with loan payment collection, after-sales service, and technical upkeep

Source: Accelerating Access to Electricity in Africa with Off-grid Solar, ODI, Jan 2016 (Link)

Value proposition offered by select suppliers

Product Offering	Financing And Distribution
LUMOS	
• Sells a **single product on a long-term leases** • Lumos SHS includes an **80Wp solar panel,** a control unit with a battery, two LED bulbs, eight power sockets, and a mobile phone adapter. The SHS can power small appliances like fans, TVs, radios, or laptops • Offers **5-year warranty** and service • Offers DC-AC converter so customers can use their old appliances • Customers include both off-grid households (about 80% of sales), small business owners and community institutions (e.g. schools, health centers, mosques)	• **Partnered with Nigeria's largest MNO, MTN which co-brands Lumos products, distributes them across its 150+ outlets,** enables mobile payments via airtime, and provides customer support • Customers pay a **down payment of $65** before making **payments via mobile phone (deducted from airtime)**. In absence of payments, SHS are remotely locked out. **Prices vary from $3.3 for 5 days to $156 for 1 year,** with a mandatory purchase at least 20 days/month. After 5 years, customers own the systems • **MTN handles logistics from Lumos warehouses to outlets (franchised stores)** where SHS are sold
arnergy	
• Sells **ARNERGY 5000, a modular, stackable system** available in single and multi-phase. Features include **5000 VA output power,** real time monitoring, maintenance included, 24 hr contact center, and plug and play functions • Arnergy provides solar power systems to homes and businesses, with a focus on **hospitality, education, financial, agriculture, and healthcare industries**	**Arnergy 5000 solar power system is sold through three financing models:** • **Lease to own:** The customer leases the asset towards ownership after 36 months • **Energy subscription:** Arnergy charges a monthly fixed fee over a renewable 10-year contract • **Outright sale:** Customers pay the outright cost to buy it Arnergy provides architectural, environmental and structural analysis, as well as installation and O&M services

Source: Reaching Scale in Access to Energy: Lessons from Practitioners, Hystra Hybrid Strategy Consulting, May 2017 (Link);Arnergy Products (Link)

Value proposition offered by select suppliers

Product Offering	Financing And Distribution
greenlight planet sun king. from Greenlight Planet	• Offers **5 lanterns and 2 SHS** (6-12W, 3 lights, and phone charging); exploring DC radios & TVs • **Flagship product is Sun King Pro series,** a $35 lantern equipped with 1-2 USB phone charging ports and a detachable solar panel, that provides 15 times brighter lighting than kerosene lanterns • Products have a **5-year battery life, 2-year warranty,** can provide 36 hrs of lighting per charge and are Lighting Global certified	• **Customers may buy directly or from partners, in cash, on credit** (via MFIs), or with **EasyBuy™ PAYGO** • **Financing can be costly for products like SHS** which costs $80 in cash, but $125 with PAYGO (over 9 months) • **Partnered with Angaza for the PAYGO metering** (remote shut off) technology and back-end • Distributes through **24 stores in 23 states; 1,200 sales agents** ('Energy Officers') and a door-to-door channel
d.light	• **Entry level solar lanterns:** Start at $5; life of ~5 years; 4–8 hrs light per charge, 2–3 times brighter than kerosene lamp • **Multifunction solar lanterns:** Starts at ~$20 with mobile phone charging, 4-16 hrs of light /charge, 10 times brighter • **SHS:** Starts from ~$100, with 2–3 light points, 1 portable lantern / torch and a radio, 16–25 hours of runtime per charge, and 8–12 times brighter than kerosene lamp. Also offers a SHS, which includes a solar TV and/or solar fan • Products are Lighting Global certified with 2-year warranty	• **Customers can buy these products in cash or on credit,** through **consumer finance provided by MFIs**, who bundle the product with a large asset loan • In Nigeria, **LAPO Microfinance Bank in partnership with D.light designed a soft loan scheme** to provide solar power lanterns • **D.light offers one of its SHS through its proprietary PAYGO technology** which enables a customer to procure the SHS for a deposit of $20–25 and pay for the product in instalments of $0.4–0.5 over 12 months

Source: Reaching Scale in Access to Energy: Lessons from Practitioners, Hystra Hybrid Strategy Consulting, May 2017 (Link)

Value proposition offered by select suppliers

Product Offering	Financing And Distribution
• Azuri's PAYGO Solar Home systems have the capacity to **power four LED bulbs providing up to 8 hours of lighting,** a radio and a USB port with charging cables for mobile phones • The deployment of 20,000 Azuri solar home systems is expected to create 500 direct jobs, including solar installers and agents (for a minimum of 24 months) and 5,000 indirect jobs in Nigeria	• Partnered with First Bank of Nigeria Ltd. (FirstBank) to expand access to electricity in Nigeria, with SHS packages being **co-branded and co-marketed by FirstBank.** Customers can use FirstBank's **Firstmonie agent network (~16,000 agents)** and mobile payment platform to pay for their solar systems • **Partnered with the Niger Delta Power Holding Company (NDPHC) to launch its PAYGO SHS in Nigeria.** Customers pay the monthly top-up rate via mobile money for 36 months after which time the unit can be unlocked and the customer owns the unit
The product offered by Oolu have the following specs: • Solar Panel, solar charge controller with solar lithium battery • **3-6 LED light** with switches • **19" Solar HD TV** with safety function • USB cable for phone charger • Up to 4 phone charges per day • Warranty and after sales service available on select financing plans	• Works with various payment channels such as a**gent networks, banks with USSD codes and MFIs** • Partnered with **Swifta's (20,000+ agents) for last mile cash collection** (Along with companies like Azuri Technologies, A Solar, Smarter Grid International and Sosai Renewable Energy Company

*Swifta is an IT company providing integration, development services and scalable enterprise software solutions. Swifta's proprietary platform, OmniBranches, manages a 20,000 agent network for last mile collection.

Source: Azuri Partners with NDPHC to Launch PAYGO Solar in Nigeria, Azuri (Link); Five PAYGO Solar Companies Integrated into Swifta's Agent Network, Nigeria Off-grid Market Accelerator Program (Link)

Barriers to Scale: Poor access to finance, lack of mobile money ecosystem, import duties, currency fluctuations and low consumer awareness are common barriers to scale in Nigeria

Barriers To Scale

Poor Access To Enterprise Finance	• Nigerian DRE enterprises are primarily owner equity financed and source funds through grants (for which there is increased competition), equity, debt, and crowd-funding. Reasonably priced debt is difficult to obtain due to **high collateral requirements and high interest rates, usually 25% to 35% from commercial banks.** Long term equity and debt finance is required for DRE enterprises to fund projects, expansion, capital needs, operational costs and consumer lease financing
Import Duties On Solar Panels	• Since 2018, **5% import duty and 5% VAT is imposed by the Nigeria Customs Service (NCS) on import of solar panels.** According to Renewable Energy Association of Nigeria (REAN), the price of solar-PV systems could potentially come down by up to 25% if zero duty is considered for solar-PV systems, including the components that accompany them
Poor Uptake Of Digital Finance	• A number of challenges are preventing the takeoff of digital finance in Nigeria which include **regulatory barriers limiting the ability of MNOs to issue mobile money (Until Oct 2018), inadequate agent network, a lack of interoperability and poor infrastructure.** This raises the cost of business for off-grid solar suppliers in Nigeria. **However, in October 2018, CBN released new guidelines allowing Telcos to promote Payment Service Banks (PSBs), to promote financial inclusion**
Arduous Quality Assurance Process	• Solar companies importing products must work with the Standards Organization of Nigeria (SON). The process for quality assuring imported products includes **applying for certification from the SON for each shipment, and a physical inspection and sampling. This causes delays and increased costs**. SON does not recognize international solar standards (i.e. IEC/ISO) and carries out its own individual investigation of solar products before permitting importation.
Currency Fluctuations	• Foreign currency risk is a commonly cited risk by most suppliers of OGS as most debt raised is in EUR or USD while the customers pay in local currency. A**ny devaluation of local currencies can adversely affect the business. Most suppliers integrate this risk in their pricing,** therefore passing it on to the consumer

Source: Nigeria Taskforce Seeks New Ways to Confront Energy Access Challenges, Power for All, Nov 2018 (Link); Research Summary: Nigeria Finance, Power for All, May 2018 (Link); Off-Grid Solar in Nigeria: Enablers and Hurdles, Sun Connect News, April 2018 (Link); Solar Import Duty and Tariffs: Exempt or Not, Heinrich Boll Stiftung, July 2019 (Link); Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link); Accelerating Access to Electricity in Africa with Off-grid Solar: Off-grid solar country briefing Nigeria, ODI, Jan 2016 (Link)

Barriers to Scale (Minigrids): Barriers to scale such as high hardware and ESIA costs, poor capacity utilization and lack of cooperation and transparency from DisCos are unique to minigrid operators

Barriers To Scale (Minigrids)

Lack Of Transparency Among DisCos	• Lack of transparency by distribution companies (DisCos) creates uncertainty around grid expansion plans. This **lowers investor and developer confidence in isolated minigrids** located close to the grid edge, pushing many to select less optimal locations far away from the grid, to reduce the chances of grid interconnection. Such locations often suffer from lower electricity demand
Limited Project Financing	• Limited project financing and high commercial interest rates discourage market entry. Commercial projects are often delayed by year to acquire sufficient debt and equity, which is available at **rates of 20% or higher from most FIs.** Access to affordable capital (from investors like the Nigerian Bank of Industry (BOI), All On, and ElectriFi) is hampered by **funding restrictions or documentation requirements**
High Hardware Costs	• High hardware costs incurred during procurement and system installation exacerbate developer challenges in accessing capital. The **high up-front costs** are passed onto the end-user when the minigrid becomes operational
High ESIA Costs	• The prohibitive cost of Environmental And Social Impact Assessments (ESIA) has discouraged developers from undertaking permitted minigrid projects (i.e., projects larger than 100 kW). **ESIAs required for these systems can take up to a year to complete,** hindering the rapid scaling of minigrid systems in Nigeria
Poor Capacity Utilization	• Daytime commercial electricity consumption is low in rural communities. This leads to poor capacity utilization of minigrids and **higher operating costs**. Load profiles in these areas often peak in the evening from household electricity use. This further increases the cost of electricity by requiring **expensive battery or generators** to complement the low-cost daytime solar resource

Source: Minigrid Investment Report, Scaling the Nigerian Market, Rocky Mountain Institute, 2018 (Link)

DEMAND **TRENDS**

Source: https://agreenerlifeagreenerworld.net/2013/03/11/in-africa-solar-offers-much-more-than-clean-energy/

Affordability: Nigerians have a high ability to pay given that they are already spending $14 Bn annually on off-grid power from small gen-sets and ~$6.5 Bn on energy substitutes like torches, kerosene etc.

ANNUAL ON- AND OFF-GRID ELECTRICITY EXPENDITURES IN NIGERIA, 2016 ($BN)

Battery-powered torches and other energy substitutes: 85 Mn Nigerians spend ~$1.50/ week on mobile phone charging, torches, kerosene

Small-scale self generation: estimated 14 GW at $0.45/kWh on average

On-grid power: generation, T&D, and losses

Ability To Pay (Based On Case Studies By REA)

Obot Ekpene, Cross River (Small off-grid site)

- Higher-income residents pay **$0.75/kWh for diesel generators**
- Most households are unelectrified and spend **~ $3/month for kerosene and $6/month to charge cell phones, torches etc.**
- Regular income from palm oil and gari sales

Onyen-Okpon, Cross River (Medium off-grid site)

- Community leaders and residents stated **high willingness to pay** and contribute to capital costs for a local system
- Most residents pay **~$0.43/kWh for petrol generation or $0.52/kWh for diesel, or up to $25/month**
- Unelectrified HHs spend **~$6/month for kerosene,** plus extra for rechargeable torches, candles, cell charging, etc.

Mokoloki, Ogun (Medium Underserved Peri-urban Site)

- Residents spend **$0.39/kWh for small scale electricity generation**
- The average household spends **$3 per week on energy substitutes,** especially battery-powered torches and cell phone charging

Okun-Owa, Ogun (Large Underserved Peri-urban Site)

- Community leaders and residents stated **high willingness to pay and contribute to capital costs for a local system**
- **Factories pay ~$0.25/kWh for diesel generation**
- Small businesses pay **~$6/week to run diesel gensets, and $10/month for grid power**

Source: Nigeria Minigrid Investment Brief, REA, Dec 2017 (Link)

Affordability: There is a significant demand for off-grid PAYGO energy services, but high lead times for business development (3 years before first sale) and limited policy support create barriers to scale

NIGERIA SCORES HIGH ON BOTH ATP AS WELL AS MARKET SIZE FOR PAYGO OGS SOLUTIONS

Market Attractiveness Index, IFC

Country	Demand Score			Supply Score				Enabling Environment Score		
	Market Size	Ability to Pay	Willingness to Pay	Access to Finance	Operational Considerations	Market Penetration	Human Capital	ICT	Legal and regulatory	Trade and Commerce
Angola										
Cameroon										
Congo Dem Rep.										
Cote d'Ivoire										
Ethiopia										
Guinea										
Kenya										
Madagascar										
Malawi										
Mozambique										
Niger										
Nigeria										
Senegal										
Sierra Leone										
Tanzania										
Togo										
Uganda										
Zambia										
Zimbabwe										

- Nigeria's off-grid solar PAYGO market has experienced rapid growth over the years, with over **1.7 mn households using off-grid solar products**
- Nigeria also has innovative business models including **partnerships with MNOs** for airtime credit enabled PAYGO products **and retail banks to leverage agent networks** to serve hard to reach areas
- In addition, **the large existing market for diesel and gas generators has motivated PAYGO companies to sell off-grid solar solutions** to **serve as secondary sources of energy**
- However, as mobile money platforms limit their engagement to pre-existing bank account holders, consumer financing through them is a hurdle. Access to enterprise finance is another constraint

Less than 100

Less than 70

Less than 50

Source: PAYGO Market Attractiveness Index, Lighting Global IFC, 2019 (Link)

Demand Barriers: Poor access to consumer finance; and low consumer awareness and confidence in OGS devices, are critical barriers to demand in Nigeria

Demand Barriers

Poor Access To Consumer Finance

- **Traditional sources of finance are largely inaccessible for most Nigerians** (As per a 2017 report by World Bank, 60% of Nigeria's population remains unbanked). Uptake and awareness of mobile money and agency banking services remain low at 1% and 16% of the population respectively, according to the financial sector development organization, Enhancing Financial Innovation & Access (Efina)
- **In 2013 Nigeria's Central Bank banned mobile operators from participating in the mobile money market** and gave this responsibility to the country's banks (however a new guidelines in October 2018 allows MNOs to function as payment service banks to improve mobile money penetration)
- Furthermore, **access to mobile money is hindered by poor infrastructure especially in rural regions, given the combination of challenging terrain and vast distances, a lack of electricity and road access.** This further hinders the possibility for rural households to access simpler and more affordable mobile financing solutions in Nigeria

Low Consumer Awareness And Confidence

- According to a 2016 study by ODI, **low level of awareness of solar power and the existing reputation of solar technology hamper the demand for off-grid solar solutions.** Evidence shows that solar power has acquired a poor reputation for reliability and performance as past efforts by the government and donors that have applied a 'supply and install' model has led to inadequate maintenance and the rapid collapse of installed solar systems
- There is a **need to raise consumer awareness** of the financial, environmental and health benefits of using solar home systems (SHS) over fossil-fuel generators, as well as their awareness of various types of solar products available and payment models offered by off-grid solar companies

Source: Accelerating Access to Electricity in Africa with Off-grid Solar: Off-grid solar country briefing Nigeria, ODI, Jan 2016 (Link); Regulators Give Mobile Money in Nigeria a Boost, Euromoney, Jan 2019 (Link)

ENABLING **ECOSYSTEM**

Source: Signify Foundation

4.1 Government

4.2 Development partners

4.3 Financiers

4.4 Association and others

Government: Ministry and several agencies dedicated to advancing access to energy

Institutions	Mandate
Federal Ministry of Power Works and Housing (MPWH)	• Generate, distribute and transmit electricity nationwide and facilitate the provision of adequate and affordable housing
Rural Electrification Agency (REA)	• REA's mandate includes: ▸ Promoting rural electrification in the country ▸ Coordinating rural electrification programmes in the country and, ▸ Administering the Rural Electrification Fund to promote, support and provide rural electrification through public and private sector participation
Nigeria Bulk Electricity Trading Company (NBET)	• Incorporated in 2010 as part of the roadmap for reforms towards full implementation of the Electric Power Sector Reform (EPSR) Act
Federal Ministry Of Environment	• Ensures environmental compliance of energy products including Environmental Impact Assessment (EIA) studies
Nigeria Electricity Regulatory Commission (NERC)	• Independent regulatory agency that is mandated to conduct monitoring and regulation of the electricity industry, issue licenses to market participants and ensure compliance to market rules and operating guidelines
Energy Commission Of Nigeria (ECN)	• Responsible for strategic planning and coordination of national policies in the field of energy
Transmission Company Of Nigeria (TCN)	• Responsible for developing, operating and maintaining the transmission grid of Nigeria

Source: Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link)

Government: The rural electrification strategy and implementation plan, NREEEP and the power sector recovery programme are key government policies guiding the country's off-grid market

Policy /Programme/Plan	Activities
National Renewable Energy And Energy Efficiency Policy (NREEEP) And National Renewable Energy Action Plan (NREAP 2015 – 2030)	• Develops renewable energy and energy efficiency (RE & EE) targets and action plans; and the power roadmap and support for electricity market reforms • Promotes off-grid renewables development and financing • Recommends additional regulations and economic instruments; and conducts R&D and training
Rural Electrification Strategy And Implementation Plan (2016)	• Coordinates and implements Nigeria's rural electrification policies, target and strategies • Administers REF and promotes low-cost technologies and private sector participation
Power Sector Recovery Programme	• Increases electricity access by implementing off-grid renewable solutions • Establishes data driven processes for decision making across the sector • Develops and implements a foreign exchange policy for the power sector • Makes electricity market contracts effective and ensures cost reflective tariffs
Electric Power Sector Reform Act (EPSRA)	• Unbundled and privatized the Nigerian electricity market , developing a competitive electricity market • Established the NERC; REA, 6 generation companies, 11 DisCos, TCN and NBET • Oversees consumer protection, licenses and tariffs
National Grid & Distribution Codes	• Details the technical specifications for electricity systems operating in Nigeria
Regulations of Independent Electricity Distribution Network	• Outlines regulations for IDENs which includes minigrid systems above 1MW whether isolated or interconnected

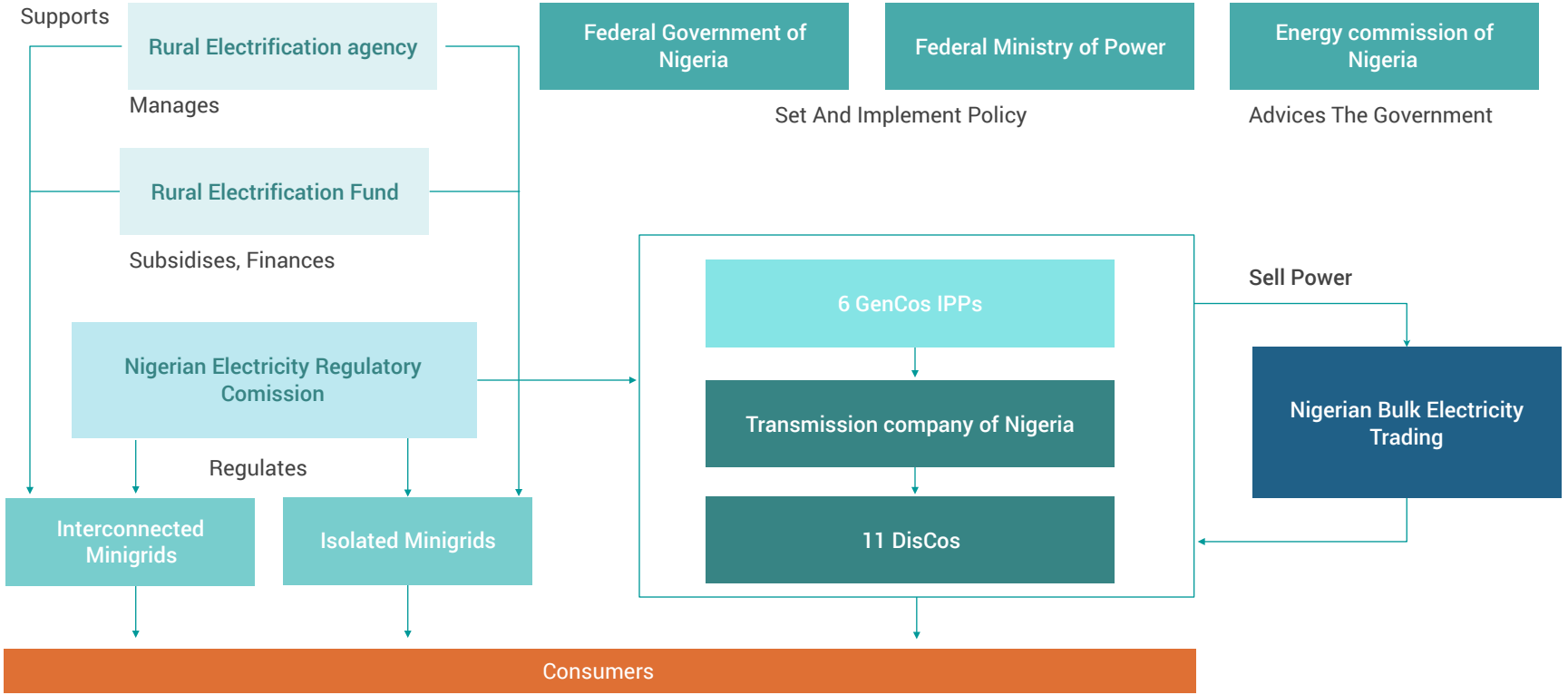
Source: Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link)

Government: The NERC Minigrid regulation regulates the minigrid market in Nigeria

Policy /Programme/Plan	Activities
NERC Minigrid Regulation	• Provides definition, registration and grant of permit for minigrid systems • Develops contract templates and enforcement of electricity contracts between all parties concerned • Describes operation of the minigrid including technical specifications • Proposes commercial arrangement including tariff setting • Establishes framework for investor and consumer protection
Rural Electrification Fund Operational Guidelines (REFOG)	• Provides capital subsidies/grants and technical support to developers of rural electrification projects • Establishes the investor eligibility and the project selection criteria under REF • Outlines the sources and allocation of REF resources • Develops a database of possible locations to be targeted by the REF • Outlines the REF grant award process, monitoring and evaluation of projects

Source: Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link); Minigrid Investment Report, Scaling the Nigerian Market, Rocky Mountain Institute, 2018 (Link)

Government: Institutional Framework



Source: Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link)

Government: FGN has set ambitious targets to expand electricity access to 75% of the population by 2020 and 90% by 2030, with 30% of total energy coming from renewable sources by 2030

Programmes	Mandate
National Renewable Energy Action Plan (2015-2030)	NREAP's objective is to advance RE development in Nigeria, set measures and plans to meet 2020 and 2030 targets, and provide a framework for businesses to develop in the new industries, providing jobs and cutting harmful greenhouse gases
Nigeria Electrification Project (2018-2023) (With World Bank)	The aim of the project is to increase access to electricity services for households, public educational institutions, and underserved micro, small and medium enterprises
Off-Grid Electrification Strategy (Part of Power Sector Recovery Programme)	The Off-Grid Electrification Strategy aims to provide access to clean and sustainable electricity to Nigerians through off-grid solutions

Off-Grid Solar Targets

By 2030

- 40% of rural population to be served by off-grid RE (minigrid and stand-alone systems

By 2023

- Reach 300,000 HHs, and 30,000 MSMEs, with 15 minigrid operators
- Reach 1 Mn HHs and MSMEs through stand-alone solar systems
- Distribute 1 Mn single solar lanterns

By 2023

- Set up 10,000 minigrids
- Distribute 5 Mn solar stand-alone systems for Households and SMEs

Source: Nigeria SE4ALL Targets until 2030 (Link); National Renewable Energy Action Plan (2015-2030), National Council on Power, July 2016 (Link); Nigeria Power Africa Fact Sheet, USAID (Link); Master Plan of the Rural Electrification Agency (Link); The Nigeria Electrification Project: Project Appraisal Document, World Bank, May 2018 (Link)

Development Partners: A large number of development organisations are working to develop the OGS market in Nigeria, especially contributing to business development, policy enablement and enterprise financing

Programme	Consumer Awareness	Policy Enabling	Access To Finance		Transaction Advisory	BD Support And TA*	Quality Assurance	Market Intelligence	Funding (Mn USD)
			Consumer	Enterprise					
Lighting Africa	●	●		●		●	●	●	350
NESP		●		●		●		●	36
Solar Nigeria		●		●		●		●	73
GET.Invest		●		●		●		●	
NCIC						●		●	
Power Africa		●		●	●	●		●	
SOGE	●	●		●			●	●	
Power For All	●	●		●				●	

Programmes covering minigrids

Exchange Rate: 1 EUR = 1.09 USD and 1 GBP = 1.26 USD

*BD support includes skills development and capacity building for SMEs, for the development of business plans

Development Partners: The World Bank is supporting FGN through a $350 Mn loan to increase off-grid electrification access in Nigeria

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
ESMAP Energy Sector Management Assistance Program THE WORLD BANK IFC International Finance Corporation WORLD BANK GROUP	Lighting Africa (2013 – ongoing) (ELEAP*)	Key intervention areas include awareness creation, BD support, access to finance, quality assurance and market intelligence Two major programmes in Nigeria include: • **Regional Off-Grid Electrification Project (ROGEP):** It seeks to identify sustainable mechanisms to electrify public institutions, increasing electricity access to households, businesses, and communities through off-grid solutions • **Nigeria Electrification Project (NEP) -** The World Bank is providing a $350 Mn loan to FGN to use solely to increase off- grid electrification access **($75 Mn of this is to promote market growth of SHS and $150 Mn Solar Hybrid Minigrids)** ▸ **Market Scale Up Challenge Fund** will offer up-front grants to existing providers to accelerate households and MSME sales ▸ **Output Based Fund** will focus on enabling strong new entrants	• **1.8 Mn** people reached • **734,000** quality verified products sold – 734,000 • **162,100 tons** of GHG Emissions avoided • **Over 50 Mn people** across 21 states exposed to consumer education campaigns	• SREP** of Climate investment funds • PPIAF (supported by World bank) • Govt. Of Italy and Netherlands • IKEA foundation	**$350 Mn**

Source: Lighting Africa Nigeria (Link); The Nigeria Electrification Project: Project Appraisal Document, World Bank, May 2018 (Link)

Development Partners: GIZ is helping FGN scale off-grid energy solutions through public private partnerships. It is also actively influencing Nigeria's public policy on Renewable Energy and Energy Efficiency

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
giz	Nigeria Energy Support Programme (NESP 2013 – 2017) (NESP 2017-2021)	NESP II is focused on – • **Data Management & Electrification Planning** • **Sustainable energy access:** Supports the REA and State Governments in public-private mechanisms to scale off-grid distributed energy solutions to 100,000 people • **Enabling the environment** for investments into renewable energy (RE) and energy efficiency (EE)	**NESP I (2013-2017) results:** • Developed six off-grid solar minigrids in 5 partner states (using PPP and split asset model) and reached more than 15,000 people with solar-powered minigrids • Supported the implementation of energy efficient pilot projects in public and industry buildings leading to energy savings of 15% • Set up a solar water heating system in a school in Plateau state that increased energy efficiency by 84% • 11 measures such as the NREEEP, a minigrid regulation, a building energy efficiency code and an energy efficiency label for HH appliances introduced post NESP I • Capacity development of over 120 participants on RE and energy efficiency	• European Union	**$36 Mn** (2017-2021)

Source: Nigerian Energy Support Programme II: Project Description, GIZ (Link); Nigerian Energy Support Programme II: Factsheet, GIZ/EU, Feb 2019 (Link)

Development Partners: DFID's Solar Nigeria programme is promoting solar power electrification of public institutions, schools and health centres in Nigeria through enterprise financing

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
Adam Smith International AECOM DFID Department for International Development	Solar Nigeria (2014-2020)	The programme aims to - • Improve the outcomes of the currently underserved communities in Lagos state and Northern Nigeria through **financial contribution towards solar power electrification of public institutions** • **Offer financial grants to companies** that provide solar products, services and/or financing to consumers • Work in partnership with federal and state governments and donors to **create an enabling environment by influencing policy** • By 2020, the programme aims to improve the welfare of 2.8 Mn people using domestic PV systems and create more than 3000 jobs	• Improved energy access for over **1.5 Mn** people • Achieved solar installations in **175 schools and 11 clinics** in Lagos and 34 primary health clinics in Kaduna, providing 6 MW of solar power • In 2016 more than **166,000 solar systems** were acquired on commercial terms by individual consumers from companies supported by the consumer grants (£2 Mn)	• DFID • International Climate Fund	**$73 Mn**

Source: Solar Nigeria Programme: Annual Report 2019, DFID, Sep 2019 (Link)

Development Partners: The World Bank's Climate Innovation Centre supports early stage enterprises deploying OGS technologies in Nigeria through incubation support

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
THE WORLD BANK	Nigeria Climate Innovation Centre (NCIC)	Established through a partnership between the World Bank and the FGN, the NCIC seeks to accelerate access to energy in Nigeria by supporting and accelerating innovations and early stage enterprises The Center aims to support Nigerian entrepreneurs and SMEs in developing profitable and context-specific solutions to climate change, particularly the deployment of solar off-grid technologies	Through EU's Climate Launchpad (CLP) Global Idea Challenge Competition, NCIC has **identified 15 early stage Nigerian companies with innovative 'green' business ideas and is providing incubation support** to ensure they move from the ideation and proof of concept phases to market entry and venture scaling phases Some of the companies being incubated include **Ubabio Energy, Energija and Eco-LiFe Now**	NCIC has **a grant funding partnership with All On** to support the 2018-2019 Climate Launchpad winning teams' incubation	

Source: All On Partners the Nigeria Climate Innovation Centre, All On (Link); Nigeria Climate Innovation Centre (Link)

Development Partners: The World Bank's Climate Innovation Centre supports early stage enterprises deploying OGS technologies in Nigeria through incubation support

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
giz	GET.Invest (2018-2021)	The programme aims to- • **Enable access to finance** for project and business developers by providing advisory services through a finance catalyst team • **Provide market Insights** studies to help entrepreneurs identify markets and opportunities • **Support industry associations**, in organizing networking and information sharing events • **Help regulators implement regulatory processes for private investments** to accelerate transactions and balance the risk for all parties	The programme is hosted on the multi-donor platform GET.pro (Global Energy Transformation Programme), implemented by GIZ. It builds on its predecessor, the Africa-EU Renewable Energy Cooperation Programme (RECP). RECP achieved the following results: • 50+ project and business developers received advisory support • 17 projects successfully assisted in accessing investment • 34 national and international events held with more than 4,400 participants	• EU (DG DEVCO) • Germany (BMZ) • Austrian Development Cooperation • Ministry of foreign affairs of the Netherland • Sweden (Sida)	

Source: About GET.Invest (Link); Introducing GET.Invest, Global Energy Transformation, EU (Link)

Development Partners: USAID's Power Africa has been instrumental in promoting local lending and providing enterprise finance to OGS service providers in Nigeria

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
USAID FROM THE AMERICAN PEOPLE	Power Africa (2013-ongoing)	• Early-stage transaction assistance • Early-stage support for innovative business models • Financial assistance • Capacity building • Policy and regulatory design and reform assistance	• With a $15 Mn OPIC loan, Lumos, Inc. is deploying **rooftop solar panel kits to 70,000 residential and small commercial customers** in Nigeria, using a lease-to- own business model • Along with General Electric, the U.S. African Development Foundation (USADF) and others, Power Africa has **awarded nine $100,000 grants to entrepreneurs for innovative, off-grid projects in Nigeria** • The Nigeria Power Sector Support Programme (NPSP), worked with the REA and CBN to develop innovative financing solutions resulting in **$1.5 Mn+ of local lending into Energizing Economies Initiative,** increasing Nigeria's capacity to self-finance development objectives	12 U.S. Government Agencies, over 145 private companies, and 18 bilateral and multilateral development partners	

Source: Power Africa Helps Nigeria Tap the Private Sector to Boost Off-Grid Electricity for Small Businesses, USAID, July 2019 (Link); Power Africa:Beyond the Grid, USAID (Link)

Development Partners: USAID's Power Africa has been instrumental in promoting local lending and providing enterprise finance to OGS service providers in Nigeria

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
DFID Department for International Development	Power for All (2016 – ongoing)	Power for All is a global coalition of 200 private and public organizations campaigning to deliver universal energy access before 2030 through the power of decentralized, renewable electricity through: • **Mobilization of capital for the entire value** chain (including financing for pay-as-you-go and distribution) • **Focusing on market-building** and policy grant making • **Driving higher quality and efficiency**	Recent programmes have included : • Supporting the Renewable Energy Association of Nigeria (REAN) to represent the private sector • Conducting demand estimation in rural communities to identify opportunities for SHSs and minigrids • Awareness raising of the off-grid sector • Facilitating coordination between key stakeholders including government, the private sector, donors and civil society to undertake commitments to actions that will grow the DRE sector	• DFID, UK • USAID/Power Africa • Schneider Electric • The Rockefeller Foundation • Climate Works • UN environment • Distributed Power Fund • The David Lucile and Packard Foundation • Charles Stewart Mott Foundation • Osprey Foundation	

Source: Nigeria Taskforce Ends Initial Phase: Reviews Accomplishments and Future Goals, Power for All, Dec 2018 (Link); Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link)

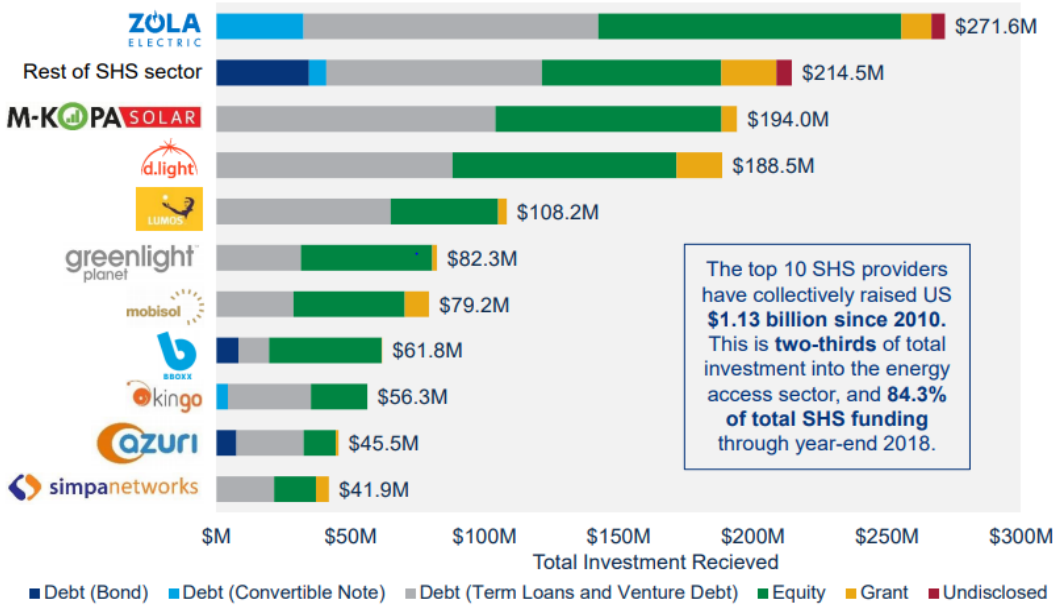
Development Partners: SOGE is a programme committed towards addressing various barriers to scaling OGS solutions in Nigeria, through active stakeholder participation and consultation

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
fhi360 THE SCIENCE OF IMPROVING LIVES POWER FOR ALL	Scaling Off-Grid Energy (SOGE): A Grand Challenge for Development	• **On supply side,** SOGE works with partners to channel financial and technical assistance to early-stage firms to help them become investment ready. (e.g. scaling off-grid energy enterprise awards, mobile for development utilities fund) • **On demand side,** SOGE collaborates on various approaches to stimulate innovation to support consumer demand (e.g. off- grid refrigerator competition) • **Aims to create an enabling ecosystem** for OGS through formation of Nigeria's Decentralized Renewable Energy (DRE) Taskforce	• **Engaged with FGN over the removal of import duties** on solar panels and components • **Advised CBN towards achieving consumer payment systems** through Payment Service Banks (PSBs) enabling mobile money usage • **Launched the Platform for Energy Access Knowledge,** interactive database for the DRE sector • **Increased consumer awareness** through 50 media outlets and participation in 10 events • Working towards achieving **standardization of components** and equipment	US Global Development Lab, Power Africa, USAID-Nigeria, FHI360 and Power for All	

Source: Nigeria Taskforce Ends Initial Phase: Reviews Accomplishments and Future Goals, Power for All, Dec 2018 (Link)

Financiers (Enterprise): Globally, off-grid access companies raised $1.7 Bn since 2010, of which 80% ($1.1 Bn) went to SHS providers (90% of whom used PAYGO models) and 80% was deployed in Africa.

TOP 10 SHS RECIPIENTS BY DISCLOSED FINANCING TYPE, CUMULATIVE TO YEAR-END 2018

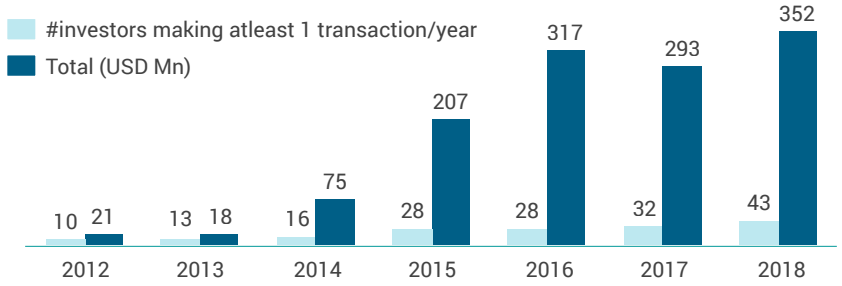


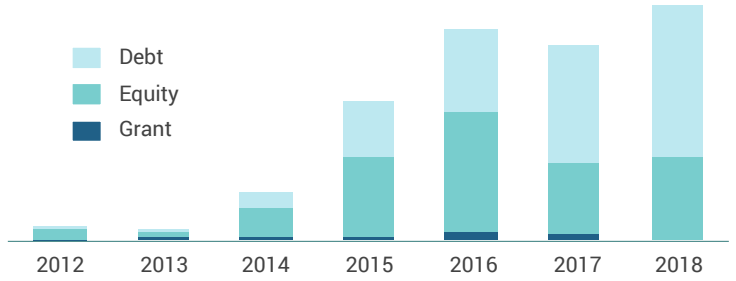
A few of these SHS market leaders such as Lumos, Greenlight Planet, Azuri and D.light, have presence in Nigeria. Zola Electric is also expanding its operations in Nigeria

- **Geography:** Africa is an attractive market for investors absorbing 80% of total OGS funding globally. As mobile money penetration increases, attention (and capital) have turned toward West African markets, particularly Nigeria
- **Product segment and financing models:** Companies deploying solar home systems (SHS), pay-as-you-go (PAYGO) business models have attracted 81% and 91% of investment, respectively
- **Asset Class:** Over 50% of total capital raised is debt, ~44% is equity and ~6% is grants
- **Source of financing:** 71% of energy access finance is sourced from private capital markets while 86% of investments are dollar-denominated, but local currency is on the rise

Source: Strategic Investments in Off-grid Energy Access (Link)

Financiers (Enterprise): In 2018, the OGS energy sector attracted a total investment of $352 Mn, 20% more than 2017, and highest since 2012. However, investment by local banks remained low





Funding overview

- **West Africa has high market potential as East African markets get saturated:** While East Africa received the largest amount of investment (44% of total) in 2018, it received the lowest absolute amounts of investment since 2012. Companies and investors are seeing growth potential in West Africa which attracted 19% of investments
- **Highest debt funding of $225 Mn since 2012:** Specialised intermediary debt finance providers along with crowdfunding platforms and DFIs have contributed significant amounts of debt funding for inventory finance, working capital and financing of receivables
- **Concentration of transactions dipped slightly from 2017 levels:** Top 10 fund recipients attracted 77% of the total funding compared to 85% in 2017 suggesting that more recipients now have access to capital

Barriers to investment in OGS by local FIs in East Africa

Investments from local banks and MFIs is limited due to the following factors:

- **Mid-sized banks:** Inadequate data quality of OGS players, weak credit management systems and controls, default risk due to poor product quality and limited internal capacity of banks in OGS sector
- **Regional banks:** Limited data transparency, management related challenges, inability to meet disbursement criteria and mismatched interest of banks and other providers of guarantees/credit lines
- **MFIs:** Competition from PAYGO businesses, high transaction cost of small sized loans for low cost SHS systems, low quality standards and limited internal capacity

Source: The Top 5 Investment Trends in the Off-Grid Solar Energy Sector, GOGLA, May 2019 (Link); Increasing Local Financial Institution Investment in the Off-grid Solar Sector, GOGLA, Sep 2018 (Link)

Financiers (Enterprise): Listed below are a few recent deals in OGS sector involving players who have operations in Nigeria

Investor	Company	Asset class	Amount (USD)	Date	Sources Of Fund Deployment
Verod Capital Management & Persistent Energy Capital LLC	**Daystar Power**	Equity	$10 Mn	Mar 2019	Expansion of solar power operations in West Africa
Multiple lenders (including TRINE)	**Daystar Power**	Debt	$16 Mn	2018-19	Expansion in West Africa (focusing on installation of solar systems in schools, colleges and banks in Nigeria)
Breakthrough Energy Ventures, Norfund), EDFI ElectriFI and All On	**Arnergy**	-	$9 Mn	Jun 2019	Develop new business models for consumer financing and channel expansion activities
Mauritius Amaya Capital Partners, Omidyar Network and CRE Venture Capital	**Rensource**	-	$3.5 Mn	Jan 2018	Expand operations to Kano and Abuja; and capture the B2B market with a 'Powered by Rensource' offering
TRINE	**Rensource**	Debt	€579,000	Aug 2019	Provide at least 4,000 shops in Nigeria access to electricity
TRINE	**Solynta**	Debt	€300,000	Jun 2019	Enable Solynta to install 350 solar home systems in urban residential homes in Lagos and Southern Nigeria

Source: Rensource Raises $3.5 Mn to Take Affordable Renewable Energy to More Nigerians, Techpoint.africa, Jan 2018 (Link); Solynta in Nigeria, TRINE (Link);Rensource in Nigeria, TRINE (Link); Daystar Power 3 in Nigeria, TRINE (Link); Daystar Power Receives $10 Mn for Expansion of Solar Power Operations in West Africa, Daystar Power Energy Solutions, March 2019 (Link)Nigeria's Solar Energy Startup Arnergy Raises $9 Mn Series A to Scale Operations, EQ International, July 2019, (Link)

Financiers (Enterprise): Listed below are a few recent deals in OGS sector involving players who have operations in Nigeria

Investor	Company	Asset class	Amount (USD)	Date	Sources Of Fund Deployment
Inspired Evolution, FMO, Swedfund and Norfund	**D.Light**	Equity	$41 Mn	Dec 2018	To expand its solar and Pay-Go consumer finance business in Africa
European Investment Bank, responsAbility Investments, Social Investment Managers & Advisors (SIMA), SunFunder	**D.Light**	Debt	$50 Mn	Apr 2018	To scale-up globally, launch new appliance and solar home system offerings, and provide financed "Pay As You Go" solar home system products in existing and new markets.
Marubeni Corporation	**Azuri**	Equity	$26 Mn	Jun 2019	For its Africa clean energy initiative
EU Programme ElectriFi, TRINE	**Azuri**	Debt	$20 Mn	Jan 2018	To provide end-user financing for its PAYGO products
Apis Partners	**Greenlight Planet**	Debt and equity	$60 Mn	Dec 2017	To expand its solar-energy product lines, distribution networks, and financing capabilities in Africa and Asia.
SunFunder	**Zola Electric**	Debt	$20 Mn	Jul 2018	Expansion across Africa to bring affordable, accessible and reliable solar energy to an additional 25,000 customers in four countries.

Source: Azuri Technologies $26 Mn investment to accelerate Africa's Clean Energy Drive, June 2019 (Link); Greenlight Planet Raises $60 Mn for Off-Grid Solar Financing Business, Dec 2017 (Link); Azuri set for growth with Innovative $20 Mn Debt Financing (Link); Solar Products Maker D.light Raises $41 Mn from African Investment Firm, Vccircle, Dec 2018 (Link);D.light Raises $50 Million in Debt Financing, April 2018 (Link); SunFunder and ZOLA Electric Close New Debt Facility, SunFunder, July 2018 (Link)

Financiers: Funding opportunities in Nigeria

Financiers		Overarching Goal	Funding Amount
Sunref	**SUNREF**	• Select energy efficiency and renewable energy investments in Nigeria will be financed through SUNREF programme. The objective is to finance a minimum of 10 projects with an installed capacity per project comprised between 1 and 10 MW over a period of 2 to 3 years	**$74 Mn co-financed by Agence Française de Dévelopment and EU**
trine	**TRINE**	• A Swedish crowd funding investment platform financing solar power systems in West Africa, TRINE has funded 9 loans with 4 solar partners in Nigeria	
ENERGISE AFRICA	**Energise Africa**	• Crowdsourcing platform that allows for investors to lend money to companies that provide solar home units to African families through a financing plan	
EDFI ElectriFI	**ElectriFi**	• EU funded energy access impact investment facility, ElectriFi provides debt and equity financing for small scale private companies focusing on new or improved electricity connections as well as generation capacity from sustainable energy sources in emerging market	**€30 Mn dedicated to boosting Nigerian renewable energy market**
Ecobank The Pan African Bank	**Ecobank Nigeria**	• A transnational commercial bank that had funded off-grid projects in the past including Rubitec Solar Minigrid in Ogun State • Looking to partner with DFIs to offer more flexible loan terms	
Sterling Bank	**Sterling Bank**	• A commercial bank based in Nigeria that is actively considering off-grid and renewable projects. In the past they have funded import retailers in the off-grid space	

Source: ElectriFI inaugurates €30 Mn Renewable Energy Investment Scheme in Nigeria, ElectriFi, April 2019 (Link); The Progress of Making Change, TRINE (Link); AFD Supports the Nigerian Banking Sector with SUNREF, Sunref, July 2018 (Link); Minigrid Market Opportunity Assessment: Nigeria, AfDB, June 2018 (Link)

Financiers (End-user): A few MFIs in Nigeria have partnered with private sector enterprises to finance OGS devices through dedicated solar loan products

MFIs (Indicative list)	Details
Lapo Microfinance Bank	LAPO Microfinance Bank is a pro-poor financial institution committed to the social and economic empowerment of low-income households through provision of sustainable financial services. LAPO Microfinance Bank in **partnership with D.light** has designed a soft loan scheme to provide solar power lanterns to its customers.
Grooming Centre	Grooming Centre is an NGO that aims to improve access to finance to people engaged in small trading and micro productive activities in Nigeria. The Centre launched the solar loan product in August 2017. The product is a **collaboration between the Centre and the joint IFC-World Bank Lighting Africa Programme**, which provides clients access to a range of solar lighting products.
Accion Microfinance Bank	Established in 2006, Accion aims to economically empower micro-entrepreneurs and low income earners by providing financial services in a sustainable, ethical and profitable manner. Through its solar loan programme, Accion MfB **collaborated with Greenlight Planet (GLP)** to provide solar lighting products to its customers to boost their businesses and supply extended lighting in their homes for their children's education. Accion has designed a loan product, Brighta Solar Loan, to provide alternative power source for businesses and homes of micro, small and medium customers.

Source: LAPO Microfinance Bank and Partnership with D.light (Link); Products and Services at the Grooming Centre (Link); Accion Microfinance Bank: Annual Report 2018 (Link); Brighta Solar Loan, Accion Microfinance Bank (Link)

Associations: Represent private sector interests and advocate policy issues to the government

Organisation	Mandate And Description
Renewable Energy Association Of Nigeria	• Independent, non-profit industry association founded by stakeholders in the Renewable Energy Sector in Nigeria
Africa Minigrid Developers Association Nigeria	• A group of organizations and individuals committed and passionate about the Nigerian power sector especially in the off-grid space
Association Of Nigerian Electricity Distributors	• An association of eleven electricity distribution companies (DisCos) that are dedicated to advocacy on behalf of the Nigerian electricity supply industry
Solar Energy Society Of Nigeria (SESN))	• Provides a medium for national and international information dissemination on solar energy and cooperation among scientists, engineers and technologists working in the energy field

Others: There are a number of research institutions, networks and associations, universities, consultancies and training institutes active in Nigeria working to support the OGS market

Organization	Work In Nigeria
National Power Training Institute (NPTI)	• Provides training for power sector personnel and coordinates training activities in the sector
Clean Technology Hub	• A hybrid hub for the development of clean energy technologies in Africa, the Clean Technology Hub is a start up incubator for innovations in clean energy
National Center For Energy Research And Development (NCERD)	• Based in the University of Nigeria, Nsukka, NCERD carries out research, development, information dissemination and manpower training in the various areas of renewable and non-renewable energy technologies
International Centre For Energy, Environment And Development (ICEED)	• Seeking to link energy and climate change policy reform to prosperity for the bottom of the pyramid, the ICEED resource center is charged with enhancing technical standardization, and providing research and training services that support clean energy technologies
Tonbofa	• Provides multi-jurisdictional legal advisory and consultancy services to energy and infrastructure projects in developing nations
GOGLA	• It is the global association for the off-grid solar energy industry established in 2012, representing 150 members. GOGLA assists the industry to build sustainable markets and profitable businesses delivering quality, affordable off-grid electricity products to customers in the developing world
Heinrich Boll Foundation Nigeria	• It is a think tank, network and agency for the green political movement which supports activities that aim to identify greener development options

ANNEXURE

Source: medium.com

Private operators: The off-grid operators in Nigeria are commonly divided into developers, assemblers, wholesalers and last mile distribution agents.

Company Name	Products	Activities	Contact details
Lumos	• SHS	• Assembly/Manufacturing • Distribution through Nigeria's largest MNO, MTN • PAYGO	Ron Margalit, Principal Impact Financing, ron.margalit@lumos-global.com
d.Light	• Solar lanterns • SHS • Solar appliances	• Assembly/Manufacturing • Wholesale distribution • PAYGO for SHS	Ned Tozun, CEO and Founder ned@dlight.com
Solar Sister	• Solar lighting • Solar radios	• Last mile distribution	infonigeria@solarsister.org
Azuri technologies	• Solar lighting • SHS	• Assembly/Manufacturing • Last mile distribution • PAYGO	Simon Bransfield-Garth, CEO sbg@azuri-technologies.com
OOLU	• Solar lighting products	• Last mile distribution • PAYGO	
Sunking Solar	• Sunking solar – SHS • Solar lighting	• Assembly/Manufacturing • Wholesale distribution • PAYGO	

Note: This is an indicative list of suppliers

Private operators: The off-grid operators in Nigeria are commonly divided into developers, assemblers, wholesalers and last mile distribution agents.

Company Name	Products	Activities	Contact details
Asteven International Company Ltd	• Solar Lanterns • Solar Lighting Kits • SHS • Solar Kiosks • Microgrid • Special systems: water pumps	• Wholesaler • Assembling/Manufacturing • End-user finance	info@astevenltd.com
Leks Environmental Limited	• SHS • Minigrids • Solar pumping systems	• Wholesaler • End-user finance	info@leks-re.com
Port Shore Energy	• Solar powered lighting products	• Distribution	enquiries@portshoregroup.com
Rensource Distributed Energy Limited	• Micro utility • SME solutions	• Assembly/Manufacturing • Installation	support@rensource.energy
Solatrify	• Solar lanterns/Pico SHS	• Wholesale distributor • Solar financing	hello@solatrify.com

Note: This is an indicative list of suppliers

Source: Database of Distributors and Manufacturers in Nigeria, Sun-Connect Off-grid News (Link)

About The Organizations

signify foundation

The Signify Foundation is dedicated to supporting underprivileged and underserved communities across the world by enabling access to light. When pursuing this mission, the Foundation expects to leverage Signify's expertise and knowledge to help develop and provide easily-accessible, sustainable lighting systems that have a meaningful impact on people's lives.

For more details please visit https://www.signify.com/global/our-company/signify-foundation

intellecap
AAVISHKAAR GROUP

Intellecap, a part of the Aavishkaar Group, is a pioneer in building enabling ecosystems and channelling capital to create and nurture a sustainable & equitable society. Founded in 2002, Intellecap works across critical sectors like clean energy, climate change, agriculture, livelihoods, financial services, gender and inclusion, healthcare, water and sanitation. The organization has delivered over 500 global engagements across 40+ countries and syndicated investments of over $500 Million USD in Capital. Intellecap through its presence in India and Africa, provides a broad range of consulting, research and investment banking services, to multilateral agencies, development finance institutions, social enterprises, corporations, investors, policy makers and donors.

For more details please visit www.intellecap.net