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Impact Energy:
Case Studies of
Successful Off Grid
Energy Businesses in
Nigeria.

In collaboration with



RURAL ELECTRIFICATION AGENCY

ENERGY * EMPOWERMENT * EFFICIENCY



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Research conducted by:



Impact Energy: Case Studies of Successful Off-Grid Energy Businesses in Nigeria

Key Findings

1

Community engagement is key to the success of off-grid projects

2

Projects are best situated where input fuel is readily available

3

Access to low cost patient capital is essential for long run project profitability

4

Partnership with Original Equipment Manufacturers (OEM) helps to acquire installation materials at low cost and reduce project capital expenditure (CAPEX)

5

Companies with good corporate governance are able to thrive sustainably in the industry

6

A strong culture of maintenance is important for long term sustainability of operations



Green Village Electricity (GVE): Solar Power for Off-grid Communities

Green Village Electricity (GVE) is Nigeria's largest solar mini-grid solutions provider and was founded in 2012. GVE has a total installed capacity of 500kW solar mini-grids powering 5,200 households in 9 rural communities across six states.

History

GVE was founded by three Nigerian undergraduates of the Federal University of Technology Owerri (FUTO). While conducting oil field inspections during an internship, the FUTO cohorts observed how poorly electrified the surrounding communities were. The discovery inspired the trio to kick start an initiative to provide energy access solutions to small under-served communities. What began as a social project in one community quickly evolved into a viable business. Backed by market research, GVE discovered that the rural dwellers were willing to pay for electricity – and more notably, GVE's proposition could cut energy expenditure in rural communities by 70%

GVE's pilot project, a 6kW solar mini-grid in Egbeke Rivers State, was launched in 2013. GVE has since expanded to 12 locations across the country. The company has partnered with local and international organizations like the Bank of Industry (BOI), Institute of Electrical Electronics Engineering (IEEE) and the United States Africa Development Foundation (USADF).

GVE raised its first funding from angel investments, family and friends; it has since received grants and concessional debts from donors and DFIs. The company is now in advanced discussions with impact investors to raise capital for future expansion. The company plans to install 20MW of solar power to supply electricity to over 500 communities by 2022.

GVE's Nationwide Coverage

Niger

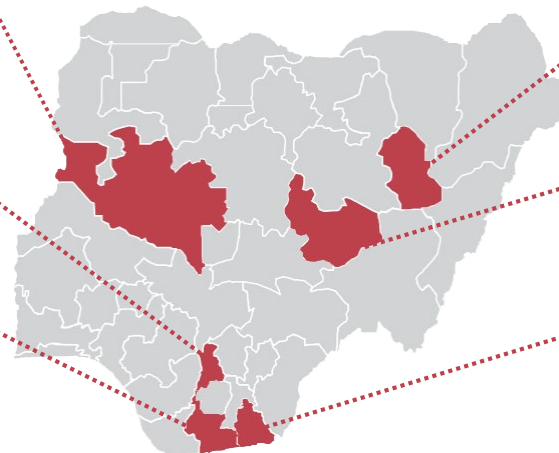
Katcha – 78.5 kWp, 520 connections

Anambra

Anambra West - 146.5 kWp, 500 connections

Akwa Ibom

Onna – 40.95 kWp 200 connections



Gombe

Kaltungo – 37.8kWp, 200 connections
Balanga - 46.8 kWp, 350 connections
Biliri -17.55 kWp 150 connections

Plateau

Demshin - 52.65 kWp 352 connections
AngwanRina - 52.65 kWp 346 connections

Rivers

Etche – 28.14 kWp 320 connections

Operating Model

GVE sells power to communities through a network of vendors who purchase electricity in bulk and resell to consumers. The vendors act as GVE agents and facilitate access to payment in remote areas.

Residential consumers are required to pay a one-time connection fee of NGN 6,000 (USD20). This fee covers

installation of a prepaid meter and load limiter to track consumption. Subsequent payments are based on applicable tariffs and depend on consumer type.

Discounted tariff for small to medium enterprises (SME) forms part of GVE's strategic objective of stimulating growth of rural businesses, improving productivity and boosting profitability.



Success Factors

Community Engagement

GVE projects are preceded by extensive community engagement to ensure full buy-in from all stakeholders, educate them on the benefits of the solution, and to build a strong sense of ownership among locals. The company also hires maintenance officers locally, thus ensuring community involvement in the day-to-day running of the projects.

OEM Partnership

Partnership arrangements with original equipment manufacturers allows GVE source its installation materials at low prices.

Tax Breaks

The company benefits from a five-year tax holiday owing to its pioneer status.

Corporate Governance From inception, the GVE team instituted good corporate governance structures aimed at increasing corporate accountability and mitigate the risk of corporate failure.

Continuous Learning and Improvement

GVE has a strong learning and improvement culture. Deliberate efforts are made to transfer

lessons from past projects to future ones. For example, while the first Egbeke plant was completed in 72 weeks, other plants subsequently installed by GVE were completed within an average time of 4-6weeks.

Early stage Funding

Low-cost long-term funding from development organizations and donor agencies enabled the company to make reasonable a profit during its formative years.



Customer Testimonials

“Prior to 2015, I powered my corner store via a 1Kv petrol generator which I ran for a few hours each day. Since I subscribed to the GVE solar plant in 2015, my monthly average energy spend has reduced by 70%. My revenues have also increased by over 150% due to the influx of customers from nearby communities (seeking cold beverages etc), new migrants, and the improving incomes of local business.”

Ramatu Idris,
Small Scale Entrepreneur, Bisanti, Niger State

“Having electricity has brought my family closer... My family and I now spend quality time together in the evenings. My children are also able to study in the evenings because there is light”

Abdulahi Hassan,
Youth Leader and GVE Community Liaison, Bisanti, Niger State.

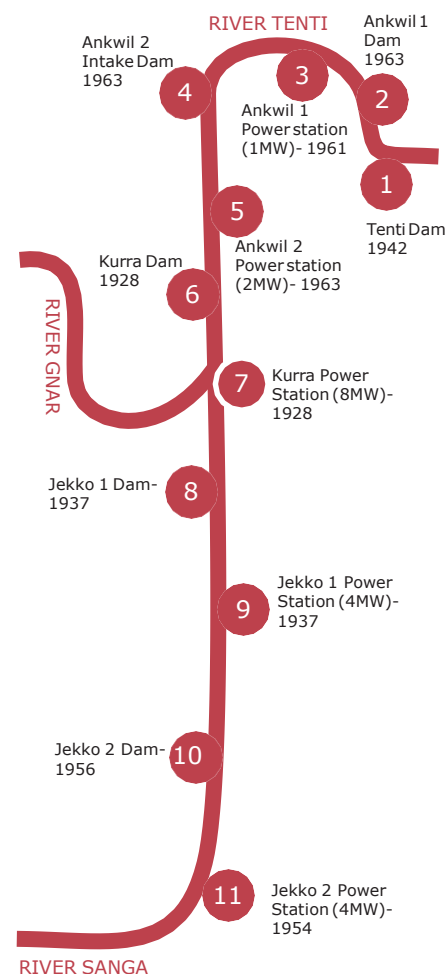


Nigeria Electricity Supply Company (NESCO): Hydro power for Rural Electrification

Many communities in Plateau State have enjoyed access to 24/7 power supply for almost 90 years, a reality made possible through hydro power from Nigeria Electricity Supply Corporation (NESCO). NESCO was established in 1929 as Nigeria's first integrated utility company. It has a total installed capacity of 26MW of hydro plants, which powers rural communities in seven local governments in Plateau State.

History

NESCO was initially established to supply power to the tin mines in the Benue-Plateau area of Nigeria. Between 1929 and 1963, NESCO constructed five hydro power plants around the Kura area to serve the Amalgamated Tin Mines of Nigeria and other tin mining companies in the area. Following the 1962 decline of the tin mining industry and subsequent loss of its key customers, NESCO shifted focus to the communities and towns that surrounded the mines. By 1970, NESCO had electrified 27 towns in the Benue-Plateau region and were the sole electricity supplier to Jos. When the Nigerian Electric Power Authority (NEPA) took over electricity supply in the city in 1978, NESCO seemed likely to lose its customer base, and worryingly, its license. However, due to its reputation for reliability and superior service, the government permitted NESCO to operate independent of NEPA. The company was authorized to supply power to designated customers and 10MW to NEPA. In August 2000, the Federal Government granted NESCO a 25-year license to generate, transmit and distribute power to rural communities in Plateau, Kaduna, Nasarawa, and the FCT.



NESCO's Barkin Ladi Power Station Network

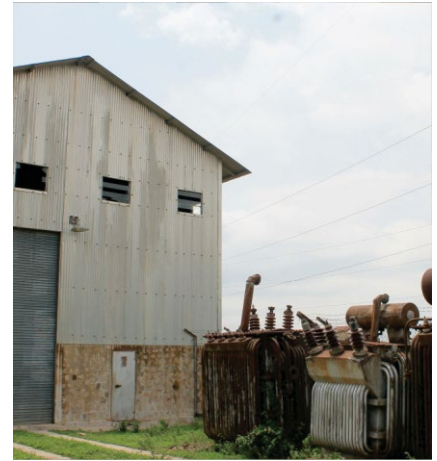
Operating Model

NESCO runs a monthly postpaid billing system. New customers pay the following onetime connection fees

- A Capacity Charge
- A Connection Charge which depends on proximity to NESCO's distribution infrastructure. The connection charge covers the cost of cables, installation materials and other associated costs.

NESCO also supplies electricity to some communities through the Jos Electricity Distribution Company (JEDC). Consumers in these communities are billed by JEDC which in turn pays NESCO.

From inception, NESCO has run entirely debt-free. All projects and operations are funded by equity and retained earnings. As a policy, the company retains 65-70% of annual earnings to reinvest in the business.



Success Factors

Made in Nigeria

NESCO fabricates equipment spare parts locally from imported raw materials.

Culture of Maintenance NESCO has a very strong in-house culture of maintenance. Workshops are manned by well-trained engineers who are properly equipped to carry out repairs and maintenance. Equipment installed decades ago still operate efficiently.

Integrated Water Management System

To meet a 'year-round water availability' goal, NESCO runs a central water management system with interconnected dams that feed the company's power stations.

People-Centered Culture

NESCO management has consciously built a performance driven and people-oriented culture. NESCO employees have a strong sense of ownership and job

satisfaction. The company also has a very low staff turnover – with some employees working for the company for as long as 50 years.

Community Relations

NESCO has also built a long standing relationship with host communities, and with other stakeholders including the government. This has enabled them to thrive in spite of regulatory uncertainty and changes in administration.

Customer Testimonials

“ Miango Rest Home (MRH), a guest house in Miango Town, receives electricity supply directly from NESCO. MRH enjoys a high occupancy rate due to its 24-hour electricity supply. NESCO supply saves MRH an average of NGN 1,715,500 (c. USD 5,624) per annum and saves the environment an estimated 270 tonnes in CO2 emissions annually.



Presco Plc: Biomass and Biogas Power for Industrial Consumption

Presco Plc (Presco) operates a palm oil milling and refining factory in Edo State. In the Presco factory, oil palm waste products are recycled and used to produce the electricity for the factory. This electricity is also distributed to the staff housing estate.

History

Erratic power supply prompted the company to seek alternative power solutions, resulting in the installation of a 600kVA biomass-powered steam turbine. As factory capacity increased, the 600 kVA steam turbine was upgraded and additional capacity added, bringing the capacity to 4MW of

biomass generated power.

In 2016, the Biomass and Biogas generation plants saved Presco 1,064,000 liters of diesel and USD 861,185 (SIAT Sustainability Report 2016).

Operating Model

Presco could potentially generate an aggregate 8MW of electricity from both biomass and biogas. Their biomass plant powers the oil mill complex and the staff quarters, while the biogas facility

generates heat for the oil refining process. Electricity is transmitted to the staff housing estate through overhead power lines to provide 24/7 electricity to the estate.



Success Factors

Ready Availability of Input Fuels

The primary success factor for these facilities is the availability of input fuels for both plants. The empty fruit bunches, byproducts of oil palm processing, serve as the feedstock for the energy generation.

Embracing Recycling

Recycling has enabled Presco to minimize its cost of operations. Presco's operating system ensures that often-discarded items are reused. For example, recycling of detoxified Palm Oil Mill Effluent (POME) into fertilizer for the plantation. The water used in

cooling and steam generation in both facilities is derived from repurposed waste. About half of the steam fed to the 2.5MW turbine is re-captured and condensed into useable water.





Bonny Utility Company: Gas to Power for a Community Utility

The Bonny Utility Company (BUC) supplies virtually all of Bonny Kingdom in Rivers State with gas turbine generated electricity. Over 10,000 households currently enjoy BUC-supplied power.

History

In an effort to give back to their host community, the oil and gas corporations on Bonny Island committed to supplying the community with uninterrupted power and water. In 1998, three oil and gas giants: Nigeria Liquefied Natural Gas (NLNG), Shell Petroleum Development Company (SPDC) and Mobil (now ExxonMobil) signed a

memorandum of understanding to meet this goal. These firms, known as the Joint Industry Companies (JIC), established the Bonny Utility Company (BUC) in 2002 to oversee power and water supply generation. In the sixteen years since BUC's launch, power availability on Bonny Island has never fallen below 90%.

Operating Model

BUC was incorporated as an independent non-profit organization. Stakeholders include the JIC members, Bonny Kingdom, local government agencies, and the Ministry of Power. JIC-member firms Nigeria Liquefied Natural Gas (NLNG) and Shell Petroleum Development Company (SPDC) donate gas-powered electricity to the BUC, which is then distributed into the community. The JIC companies and the Rivers State Ministry of Power supply manpower via seconded staff.

Under the Basic Electricity Allowance Program, BUC provides the Bonny Island community with a fixed amount of free power. This allowance sufficiently meets the power consumption needs of over 40% of consumers. Other consumers purchase additional power from the BUC at an affordable rate. On average, the BUC charges less than 20% of the Port Harcourt Distribution Company's (PHDC) tariffs.



Success Factors

Pre-payment Metering System

BUC's pre-payment metering system has reduced payment evasion. To curb power theft, BUC installed a sophisticated tracking system to identify discrepancies between customer payment and power consumption. The pre-paid metering model has reduced energy wastage, consequently promoting power sustainability.

Community Support

Bonny Kingdom indigenes currently account for 95% of

BUC's workforce. By hiring locally, BUC has instilled company pride in its indigenes. Because the people of Bonny Kingdom take a sense of pride and ownership in the company, they actively work towards its best interest. Members of the Bonny Island community frequently serve as volunteer vigilantes to protect the power infrastructure against vandalism, and report suspicions of power theft.

Corporate Partnerships

Support from BUC parent companies NLNG and Shell has been vital to the success of BUC's operations. The JICs supply electricity and top talent to BUC.

Government Support

The ministries and government agencies ensure that applicable tax exemptions and required operational licenses were provided, which have helped reduce BUC's tax bill and improved the ease of operations.



Customer Testimonials

“In the six years that I've been running my supermarket, I've been able to triple my inventory thanks to BUC. Because light is constant, my goods can be stored for a long period of time, which has allowed me to grow my business exponentially.”

Supermarket manager

“My hotel business is booming. We've enjoyed a significant profit margin in my hotel business because of the low cost of electricity. We've successfully expanded from one hotel in Finima to two additional hotels in Bonny and the city of Port Harcourt.”

Hotelier

“Back in the eighties and nineties, there were only a few schools on the island. Lack of power and the long boat journey to Bonny Kingdom discouraged quality teachers from working here. Partly because of the BUC's power, the quantity and quality of schools have increased, and my children now have a shot at getting into university and competing in today's job market”

Bonny Island indigene and life-long resident



Alausa Power Limited (APL): Gas to Power for Public Sector Customers

APL is a Public Private Partnership (PPP) that serves public institutions within the Ikeja area of Lagos. The plant serves over 4,000 staff in 40 government parastatals, 120 households in three government staff quarters, and over 70km of street lighting.

History

In 2009, the Lagos State Government (LASG) embarked on a drive to have stable and cost effective power supply for the running of its secretariat and other facilities within the state capital. Prior to that, the state relied on diesel generators to power the state secretariat, staff quarters, government house and other government facilities in the Alausa area of Lagos due to the unstable power supply from the national grid.

Alausa Power Limited (APL) was established in 2013 as a Public-Partnership Project between Lagos State and Oando Gas and Power Limited (now Axxela Limited) to serve the government facilities only.

As operations commenced, APL observed that the government's load profile was usually very high

Operating Model

As a captive power project, APL does not rely on grid infrastructure for its operations. It was built with its own underground cable network and distribution infrastructure.

APL has a 10-year take-or-pay Power Purchase Agreement (PPA) to supply power to LASG as their

during the day – up to 80% of plant capacity – between 8am and 4pm while it was usually as low as 20% in the evenings. Apart from power wastage, this inefficiency posed a threat to the functionality of the plant as the engines have minimum required capacity utilization. To efficiently utilize the stranded capacity in the evenings, Lagos State decided to connect the power to government staff quarters and to street lights in the state capital to increase nighttime load. The State also had to construct more street lights across the city to increase night-time consumption.

In its bid to diversify into the power sector, Elektron Corporation bought over APL from Axxela in December 2016, and took over its operations in 2017.

sole customer. LASG in turn charges the staff quarters residents for their consumption through a prepaid metering system. The government pays APL a connection charge, which covers the cost of materials for connecting new facilities to the plant as they are added.

Success Factors

Ready Off-taker

APL's take-or-pay agreement with the state government guarantees that the government will always pay for the power generated. This guarantees consistent cash flow for APL to meet its operational and commercial obligations. The agreement also serves as a backstop for APL in securing loans from financial institutions.

Feedstock Availability

APL was designed to leverage the existing gas pipeline infrastructure

in the Ikeja area. The plant was built with a pipeline connecting it to the Ikeja 1B pipeline under the Greater Lagos pipeline network. APL has a minimum take-or-pay contract with Gaslink who owns the greater Lagos gas supply franchise. The agreement ensures that APL gets priority gas supply at competitive rates.

Cost-Reflective Pricing

APL's agreement with the state government allows it to charge

cost-reflective tariffs. Its tariff is reviewed periodically based on gas pricing and other economic realities.

Government Support

APL benefits from a pioneering status granted by the federal tax authorities. The state government also supports the business by providing offtake guarantees needed to access commercial funding.



Customer Testimonials

“Our electricity supply has been superb. Because of the constant electricity supply, my team is more productive than they were in their previous roles. They are not only able to better contribute to the state's mission, they are also better able to attain their personal development goals.”

Senior civil servant, Alausa Secretariat



Lumos Nigeria: Retail Solar for Homes & Small Businesses

Lumos, Nigeria's largest solar home systems provider was founded in 2015. They have a total installed capacity of 6MW of solar home systems powering over 75,000 consumers across Nigeria.

History

Lumos was established to provide sustainable and affordable electricity directly to off-grid consumers. Lumos was founded by two partners, one with experience in solar project development and the other with experience with emerging market mobile operators. The Lumos' pay-as-you-go home solar systems idea was borne out of two major trends: the explosion of mobile payments in Africa and the dramatic decrease in prices of solar technology. The Lumos founders believed that they could do to electricity access what mobile phones did to traditional landlines in Africa; which is to sell directly to customers, and use prepaid technology to make the service affordable. The resulting

business has seen exponential growth: selling 3,700 systems in 2015 during a pilot phase, 22,000 more systems in 2016, and 48,000 more systems in 2017 after rolling out the service nationwide in Nigeria. As of mid-2018, Lumos has installed nearly 6MW of solar electricity in Nigeria.

In 2016, Lumos signed a partnership with MTN Nigeria to access MTN's mobile payment infrastructure and retail distribution network. Lumos also secured \$50M in debt financing from the Overseas Private Investment Corporation (OPIC), the U.S. development bank. This amount was at the time the largest debt facility in the off-grid home solar industry.

Operating Model

Lumos systems are supplied in MTN stores across the country. Customers sign up for the service by paying a one-time commitment fee, after which they purchase pre-paid electricity bundles. Customers pay for electricity using their MTN airtime accounts just the way they currently purchase airtime or data for their phone.

The Lumos proprietary technology locks the system remotely, and only turns the system on after payment. After five years of electricity usage, customers gain ownership of the system, and Lumos unlocks the system so that customers can have free electricity.

Success Factors

High Capacity Systems

Whereas most of the major solar off-grid home solar systems are 8-20W, the Lumos system is 80W, giving enough power for lights, fans, TV and cell phone charging all at the same time. This attracts customers who prefer Lumos systems as it can be used to power more appliances than the conventional smaller solar home system.

Strategic Partnership

The Lumos partnership with MTN allows it to leverage MTN's

nationwide retail footprint to sell its products to customers across Nigeria. MTN also offers Lumos its mobile payment infrastructure that is easy for customers to use and adopt.

After Sales Support

Lumos provides a five-year guaranteed repair service to its customers.

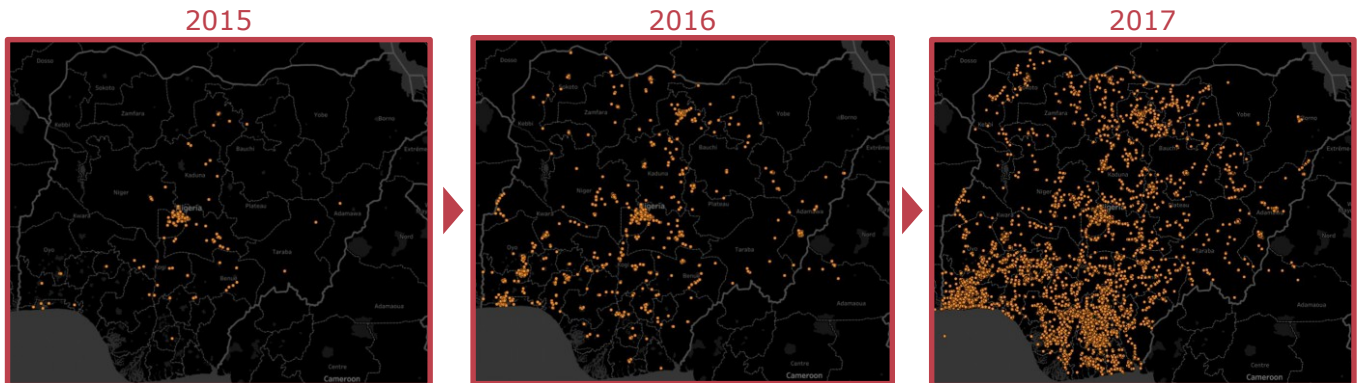
Financing

Access to long term finance is key to succeeding in deploying pay-as-you-go solar home systems.

Cutting Edge Technology

Lumos' back-end technology controls each of the solar home systems remotely. It also receives hourly data on consumption and functionality of the system. Every system sends a statistical report on generation and consumption to the Lumos database at the end of each day. The Lumos customer center can also monitor the status of any system in real time. This helps provide timely after sales services to their customers.

Lumos Nigeria Installations Over Time



Customer Testimonials

“Our business here normally requires us to work late into the night sorting mails. We don't close until every single mail has been dispatched. In the past, we had to depend on petrol generators due to the unreliability of power supply from the grid. Since purchasing the Lumos system, we've completely stopped using the generator because there is simply no need for it anymore! The system is very reliable and there have been absolutely no issue with it. It is very convenient, provides very bright electricity and we use it until we close at night with no problems at all. Today, we can work as late as we want without worrying and we're saving a lot of cost by not spending money on expensive fuel anymore. It's very affordable, and my boss just got one for his house. Everyone is very happy with it”.

Kabiru (Area 10 EMS Postal Service) Abuja, FCT.



Energizing Economies Initiative (EEI): Off-Grid Power for Micro, Small, and Medium Enterprise (MSME) Clusters

EEI is a government initiative under the Rural Electrification Agency. It is targeted at providing electricity to Micro, Small and Medium Enterprises (MSME) in economic clusters across Nigeria.

History

The Energizing Economies Initiative (EEI) is an initiative of the Federal Government of Nigeria (FGN) launched in September 2017. The initiative targets Micro, Small, and Medium Enterprises (MSMEs) with the objective of supporting the rapid deployment of off-grid decentralized electricity solutions to provide affordable, clean and consistent power to economic clusters in Nigeria through private sector developers. The initiative is being implemented by the Rural Electrification Agency (REA), which is an agency under the Ministry of Power, Works and Housing.

The EEI is being implemented using a private sector-driven model where the projects are developed and funded by private sector developers. The REA is responsible for creating the enabling environment and carrying out all of the pre-development activities for successful project

implementation.

The REA also facilitates all regulatory project activities and fast tracks the project roll-out by managing all interactions and correspondence with Ministries, Departments and Agencies (MDA) at the federal and state levels. The USAID Nigeria Power Sector Programme (NPSP) through Deloitte, McKinsey & Company and Cross-Boundary Energy provides REA with technical support for the initiative.

EEI has launched three projects in Phase 0 aimed at electrifying 50,000 shops within the following economic clusters: Sabon Gari Market (Kano State), Ariaria Market (Abia State), and Sura Market (Lagos State). EEI also has another 13 markets in Phase 1 at various stages of development and construction across the country.

EEI Projects

Sabon Gari Market Kano, Kano State, built in 1914, is a one-stop, all-inclusive market for commodities located in the heart of Kano city in Kano State with 13,000 shops. Sabon Gari Energy Solutions Limited (SGESL) is the developer of the project. The energy audit carried out by REA indicated that most shops were powered by alternative sources of power,

with 98% relying on some form of generator for their power supply. In February 2018, SGESL installed high capacity solar lithium based standalone systems to provide stable power to the market. As of October 2018, SGESL is providing sustainable power to 1,198 shops with plans to expand the customer base to cover all 13,000 stalls in the market.

Ariaria Market, Aba, Abia State has 50,000 shops with a 95% utilization rate. The provision of electricity for trading operations has been primarily through privately owned generators installed for each of the market's 90 zones.

The developer on this project is Ariaria Market Energy Solutions Limited (AMESL), an SPV consisting of three companies: Total Support (power generation services), Talevares (power distribution services), and Candesco Limited (metering services).

Sura Shopping Complex, Lagos Island, Lagos State is a market with 1,047 shops located only 2 kilometers away from an existing independent power plant (IPP). As a result, the electricity solution is to take the excess capacity from the gas powered Lagos Island IPP to power the shopping complex through a dedicated underground distribution network.

The developer for Sura shopping complex is Sura Independent Power Limited (SIPL). SIPL covers the cost of design, distribution network infrastructure

to connect the IPP to the complex, distribution equipment (control panels upgrades within the complex, metering of every shop and provision of alternative power as a backup to the IPP.

Operating Models

SGESL produces and sells solar power directly to the traders under a collaboration agreement with the market association and state government.

AMESL has an agreement with the Ariaria International Market Association and end users to guarantee exclusivity and off-take payments for power supply and distribution to the market.

AMESL provides electricity to the market using gas-fired engines, with customers connected via an extensive distribution and metering network.

SIPL has signed agreements with IPL to off-take power and has subsequent agreements with the Sura market association and its end users to supply power.

All three companies have customer care centers located within the markets which serve as customer registration, payment, and complaint resolution points. Customers pay a one-time connection fee and daily/weekly charge depending on appliances utilized.

In all three markets, every shop has a meter installed and customers only pay for the power they utilize.

Success Factors

Government Support

REA serving as a 'one stop shop' in government to support with negotiations, fast-tracking of agreements, issuance of licenses, and engagement with the market associations and end-users ensured all stakeholders of the project's viability

Data-driven Solutions

Holistic baseline surveys and energy audit data collected by REA were provided to the developers to design customer-focused solutions.

The comprehensive data also facilitated the development of concise financial models and earnings projections which aided with securing financing.

Community Engagement

The projects were preceded by extensive community engagement by the REA to ensure stakeholder buy-in and education on the benefits of the solution. The developers continue to focus on engaging with local stakeholders to build a sense of community ownership as well as trust between the developer and customers.

Ready Off-Takers

The agreements between the developers, the end-users and market associations guarantee exclusivity of power supply and off-take to the markets. This guarantees consistent cash flow for the developers to meet operational and commercial obligations while also ensuring affordable and reliable power for the customers



Customer Testimonials

“Customers coming into the shop now feel more comfortable, we can entertain them with music and fans because there is light for all and the noise from the generators, I don't get to hear the noise anymore”

Ms. Chinagorom – Clothes Trader (Ariaria Market, Abia State)

“It helps us a lot in saving money, instead of spending N1000 a day on generator, you spend only N150 to N200 daily on the solar”

Mr. Ahmed - Shoe Trader (Sabon Gari Market, Kano State)

“One of the major issues that made the occupancy ratio in Sura to be less than 50% was because of electricity, since the IPP this has significantly increased and shop owners that were using their shops for storage are now converting them back to shops”

Mrs. Ajayi - Association of Shop Owners (Sura Market, Lagos State)



All On is an impact investing fund seeded by Shell that invests in companies providing access to commercial energy products and services for under-served and un-served off-grid markets in Nigeria, with a special focus on the Niger Delta. All On seeks both financial returns and social impact - to provide and/or improve access-to-energy for millions of households and SMEs.

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