THE NIGERIAN ENERGY REPORT

THE ADVANCE OF RENEWABLES IN NIGERA

BUSINESS DAY

in association with

Sterling

Disruptors: How off-grid energy companies are closing Nigeria's energy access gap

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Foreward

The Light at the End of the Tunnel

The power sector is always front and centre on the minds of Nigerians. Within the last few weeks; many of the headlines of leading national dailies once again told the story of how bad things are with the on-grid power sector. In The Nation, we read that "Nigeria loses $29.3 Billion Yearly to Erratic Power Supply", while The Punch tells us "The Nation's Power Firms are Weak, Technically Bankrupt – TCN Boss." In The Vanguard we are told, "Economy Bleeds as Power Generation Drops to 2,039 MW".

This is a shockingly poor on- grid power supply statistic for a country with almost 200 million people. To put that in perspective, the small Caribbean twin island nation of Trinidad and Tobago has 2,200 MW on their national grid for a population of 1.35 million people, equivalent to the combined populations of just three LGAs in Lagos State-Mushin, Surulere and Eti Osa.

While the problems continue to mount for Nigeria's on grid power sector, opportunities are on the rise for companies operating in the country's off grid power sector. Backed by a sound regulatory environment, strong government support from the centre, and increasing capital from investors and donors, the off-grid energy sector is fast emerging as one of Nigeria's most exciting new sectors. With over 90 million Nigerians off the grid and another 30 million with less than four hours a day of grid power, the opportunity is enormous.

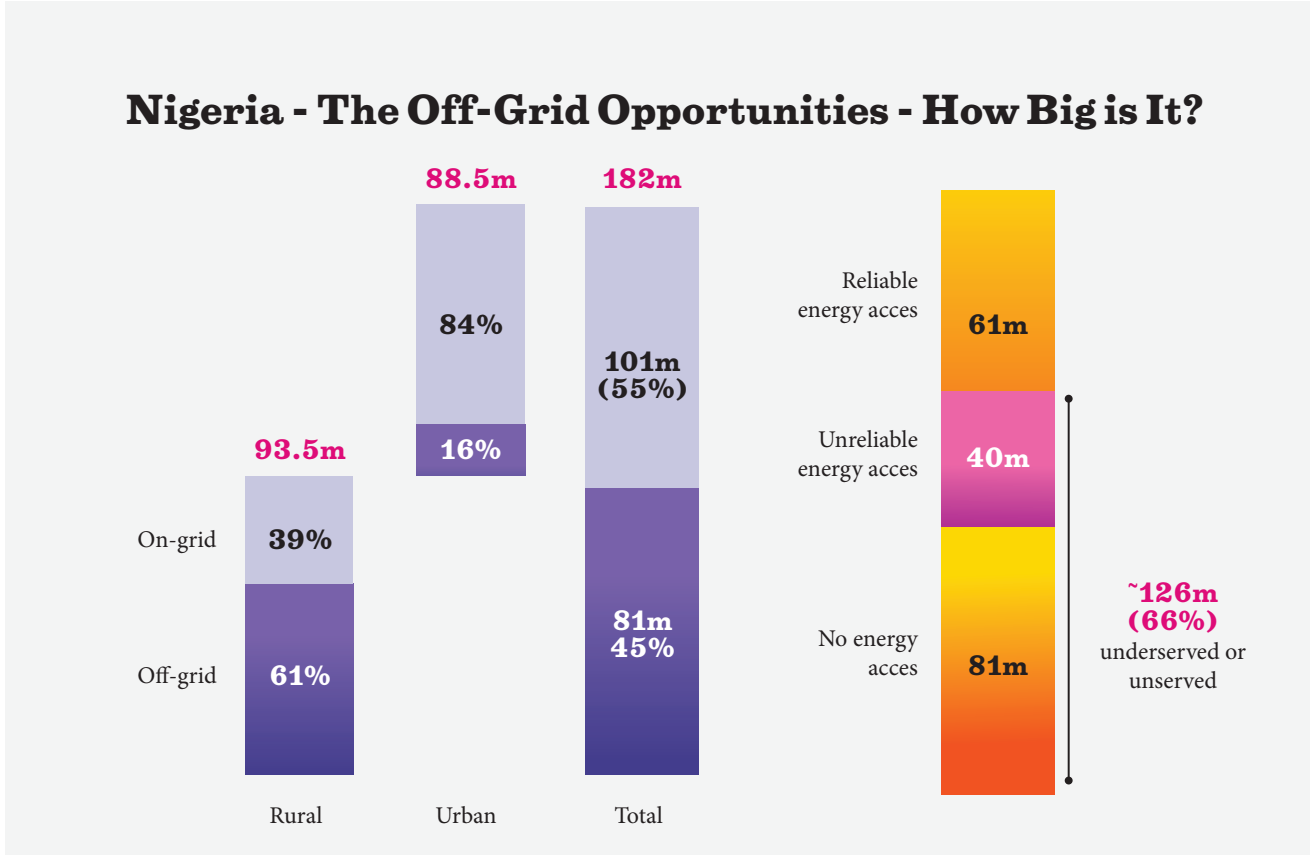
In this special report on Nigeria's off grid energy sector, BusinessDay is helping to create awareness about the companies providing solutions to Nigeria's perennial power problems. More importantly, the report highlights the tenacious entrepreneurs who are leading the way to address the country's foundational socio-economic development challenge.

Currently, only one off-grid company in Nigeria is a household name – Lumos. But there are many more coming up behind them ranging from Solar Home Systems to larger standalone systems to minigrids to small IPPs, and everything in between. A handful of these companies are positioned to become the MTNs of power in Nigeria, and several of these entrepreneurs will be among Nigeria's next generation of billionaires. The good news for Nigerians is that there is literally light at the end of the tunnel of our current power sector morass. These are the companies that are making it happen.

Dr. Wiebe Boer, CEO, All On

Dr. Boer is the CEO of All On, an off-grid energy investment company funded by Shell. He is also a member of the BusinessDay Editorial Advisory Board.

Overview



Sources: NPSP Team Research

According to the Nigerian Meteorological Agency (NIMET), Africa's biggest economy is endowed with an annual daily sunshine that averages 6.25 hours. This means Nigeria has boundless opportunities to tap from the power of the sun for energy and indeed a quiet revolution is afoot.

The rise of solar as a renewable energy source and the various technological advances to improve battery technology and photovoltaic capacity is changing the lives of millions of people in rural communities and even in cities where grid power is insufficient.

When it comes to hydro, Nigeria also has vast untapped potential. The Federal Government has committed to completing huge hydro power projects including the 3,050 MW Mambilla projects, 700-MW Zungeru and 30MW Gurara. There are several smaller hydro projects lying idle.

A 2013 study by the United Nations Industrial Development Organisation (UNIDO) showed that six hydro power sites including: Ikere Gorge Dam, Oyan Dam, Bakalori Dam, Tiga Dam, Challawa Dam, Doma Dam have huge hydro power potential. Revamping these abandoned dams around the country will deliver 350MW of hydro power which can serve about 350,000 people.

The Power Sector Recovery Plan, a document that outlines reforms required to ramp up grid power states that the national economy is losing $29.3 billion annually, due to the lack of adequate power. Imagine a situation where the vast potentials of solar, wind, and hydro power are harnessed to help close Nigeria's energy gap. The possibilities are endless.

There are over 80 million people in rural areas without access to power and over 40 million people in semi urban areas with limited supply from a failing national grid. The national grid is so fragile that both too much generation and too little generation triggers a collapse. The only way to get out of this logjam is to seek viable alternatives.

In terms of access, thirteen states in the country still have access rates below the 40 percent mark. According to World Bank statistics, Nigeria still ranks second worst in the global electricity access charts.

Gas constraints and liquidity challenges often cut a third of output in a country where 75 percent of power is generated through gas-fired plants. According to the Power Sector Performance Report of the Presidential Task Force on Power, in September 2018, the power sector witnessed a power loss of 107,340MW, (about ₦51.519 billion in monetary terms) due to insufficient gas supply, distribution and transmission infrastructure. In 2018, the number of idle power plants increased from seven to 15, as a result of gas limitations, resulting in a revenue shortfall of ₦52.45 Billion in October last year.

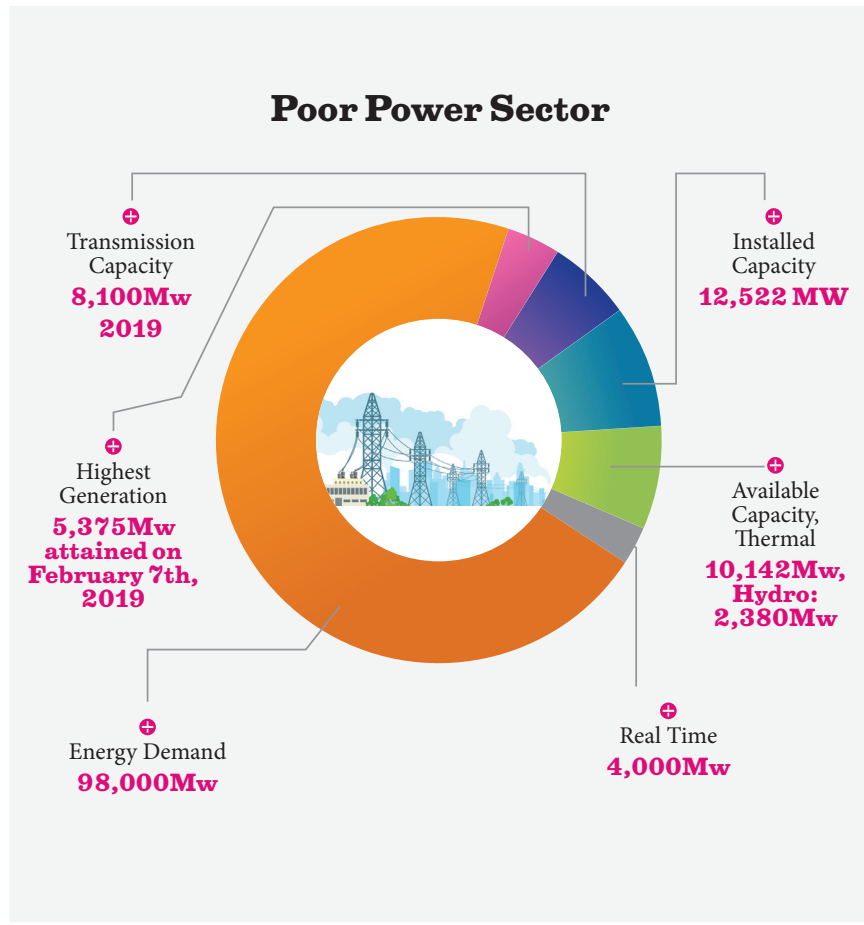
The reality is that Nigeria's current transmission grid structure does not reflect the goal of energy mix touted by the government. It should , hence be reviewed to create a structurally divided regional grid, with the ability to take energy from diversified sources.

This situation brings to the fore the quiet revolution in the off-grid market in Nigeria. The size of the problem and the grit of these companies blazing the trail to offer solutions to this national malaise demands more than just a passing interest in their work. It demands careful introspection about the models that work, the game plan of the operators and the connection between policy and market conditions.

Nigeria is very attractive for off-grid energy. It has the largest economy in Sub-Saharan Africa (GDP of $397 billion), , and a population of 201 million according to the latest data from the United Nations. Over 80 million of these are without adequate access to energy. A significant part of the economy is powered largely by small-scale generators (10–15 GW) and almost 50 percent of the population have limited or no access to the grid.

As a result, the Rural Electrification Agency (REA), a government agency under the Ministry of Power says Nigerians and their businesses spend almost $14 billion (₦5 trillion) annually on inefficient generation that is expensive ($0.40/kWh or ₦140/kWh or more), of poor quality power, noisy, and polluting.

In a country with a weak national grid, the market opportunities lie in developing off-grid alternatives to complement the national grid. According to a study by the Rocky Mountain Institute and REA, supported by the Rockefeller Foundation, providing energy access could create a $9.2B/year (₦3.2Trllion/year) market opportunity for mini grids and solar home systems that will save $4.4B/year (₦1.5T/year) for Nigerian homes and businesses.



Sterling Bank lights Nigeria's path to accelerated development

Imagine a world without electricity? Without it, our lives would be radically different, and in almost every instance a whole lot harder. Regrettably, access to electricity for Nigeria's over 100 million rural inhabitants is estimated at 36% while it is almost 60% for urban dwellers.

It is not surprising that the World Bank has ranked Nigeria as the second largest country in the world after India and the first in Sub-Saharan Africa with the highest number of people deprived of electricity. Ironically, electricity generation started in Nigeria in 1896 with her first electric utility company established in 1929.

As it stands, between 500,000 to 800,000 new households would have to be connected to electricity sources every year between now and 2030 for the country to achieve her target of universal access to electricity for all its citizens.

Certainly, life without electricity is tortuous and has been aptly described as living in the dark. It deprives excluded people or communities every basic comfort and fuels migration. For instance, residents of Unguwar Dogo, a village in northern Katsina, travel 40 minutes to another village to charge their mobile phones. This community is limited to the use of traditional sources of energy such as firewood, animal dung, and crop residues for heating and cooking which are effective causes of harmful indoor air pollution.

In contrast, access to electricity improves the quality of life and accelerates development of rural communities by enabling access to safe potable water, improved sanitary and health conditions, food security, as well as lighting and information. Access to electricity is not only critical for improving living standards but regarded as indispensable for eradicating poverty.

To bridge the country's gaping electricity deficit estimated at more than 20 million homes, Sterling Bank Plc has identified renewable energy as an alternative form of energy which can be easily and conveniently delivered to millions of Nigerian homes, small, medium and large enterprises in both urban and rural areas.

Affirming this, Abubakar Suleiman, Chief Executive Officer, Sterling Bank, disclosed that the bank has committed itself to be at the heart of Nigeria's accelerated development by focusing on five critical sectors of the economy namely Health, Education, Agriculture, Renewable Energy and Transport. Taking the first letters of these sectors, one is pleasantly surprised to see them form the word HEART. Abubakar calls these five critical sectors, the HEART of Sterling.

According to the Bank Chief, Nigeria's power problem affects businesses and communities, and must be solved to ensure quality life for all citizens as well as accelerated economic development. He believes that resolution of the power problem through decentralized renewable energy solutions will lead to rapid industrialization, job creation, quality education and healthcare delivery, among many other benefits.

The bank's three-pronged approach to achieving this are financing, trading and partnerships. It has set aside funds for large projects that provide electricity to communities and businesses. From the trading perspective, it is creating a platform that enables the sale of renewable energy solutions between electricity generators, distributors and users. Finally, Sterling Bank is creating partnerships to encourage the flow of foreign investments into the renewable energy space in order to bridge the service gaps which currently exist in market.

Remarkably, the bank has signed an agreement with the Kaduna State Government, Kaduna Business School and Blue Camel Energy to deliver a renewable energy solution called 'Solar-fi hub.' The hub was developed by a start-up incubated by the Kaduna Business School.

Dr. Dahiru Sani, Rector, Kaduna Business School, said the mini accelerator project was created to improve access to electricity with the invention of Solar-fi hub as outcome. "The Solar-fi hub is powered by solar energy to meet the day-to-day needs of the average citizen who may want to listen to news, watch football matches, or boil water for domestic use", Sani disclosed.

According to the Rector, the Solar-fi hub can be used by farmers in rural communities to power grinding machines and water pumps for irrigation while also bridging small power needs like charging of phones in homes where there is no power. He added the partnership between the Kaduna Business School, Blue Camel Energy and Sterling Bank to deliver the Solar-fi hub will improve the quality of life and earning potential of rural dwellers.

Commending Sterling Bank for believing in the renewable energy dream, Yusuf Suleiman, Managing Director, Blue Camel Energy, said solar energy is the future of electricity in developing countries. He added that Blue Camel Energy is laying the foundation for the democratisation of electricity to homes, businesses and schools ensuring that they can generate their own cost-effective electricity using solar energy.

Yusuf disclosed that Blue Camel Energy initiated and completed its assembly plant and academy within eight months. The plant has the capacity to assemble over 10,000 units of clean, affordable and reliable solar products in a year while the academy has the capacity to provide energy entrepreneurship training to about 3,000 youths within the same period.

"We are ready to lead in solving energy-related problems across different sectors of the economy. So far, we have invested over $1 million and would be investing another $5 million in the next 24 months to ensure delivery of solar-generated power to factories", Suleiman informs.

Similarly, Sterling Bank partnered with Zola Electric, a for profit social enterprise, to make distributed renewable energy accessible to Nigerians businesses and households in need of constant and clean power supply. Adaptable to energy need and income, Zola's renewable energy solutions can be easily accessed through consumer finance from Sterling Bank.

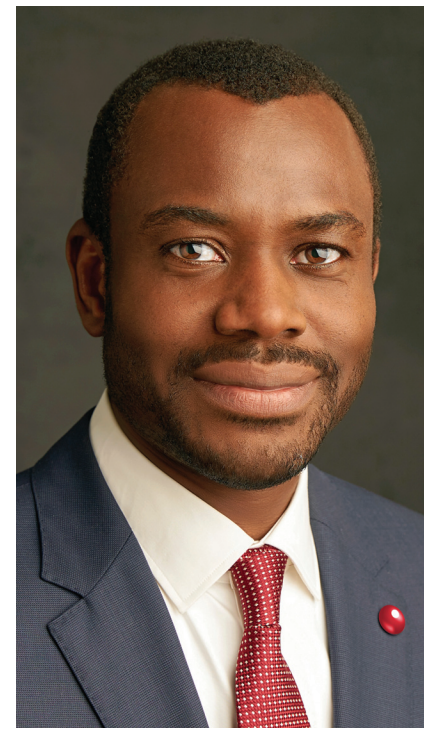
Chief Executive Officer, Zola Electric, Mr. Bill Lenihan said the company has studied the Nigerian electricity market and figured out a way to proffer lasting solution to the country's electricity needs. "Our solutions are designed to solve every level of the energy access problem. And while financing has been identified as one of the key limitations for consumers to acquire renewable power solutions, our partnership with Sterling Bank ensures access to product finance for interested customers."

Despite the commitment of Nigerian Electricity Regulatory Commission (NERC) to stimulating investment in renewable energy, little progress has been made in the sector. Existing investments in power grids built on fossil fuels keep players tied to costly and pollution inducing energy sources regardless of the obvious advantages of renewable energy solutions.

However, all of this might become a thing of the past considering Sterling Bank's commitment to bridging the funding gap hitherto faced by would-be adopters of renewable energy solutions. This indicates that Nigeria will eventually tap the potential of its abundant renewable energy resources for socio-economic benefits.

International development agency, Oxfam, believes renewable energy solutions are more reliable, effective and affordable for poor people in developing countries who do not have access to electricity. This is especially true for northern Nigeria where the electricity grid does not extend to remote areas and the distances between villages are significant. Apart from being generally clean and pollution-free, renewable energy sources are sustainable natural forms of energy which require less maintenance than traditional generators.

Truly so, renewable energy facilities are more suitable for community management and ownership because they can be set up in small units. By investing heavily in renewable energy solutions, Sterling Bank is lighting Nigeria's path to development. It is apparent that the bank has its HEART in the right place.



Abubakar Suleiman
MD/CEO, Sterling Bank

Policy and Regulatory Environment

Nigeria's power sector has not been short on policy ideas but they have consistently failed to address energy poverty in the country. The key reason is because the focus of national policy has always been on centralized conventional power generation. Subsidies on grid power and petrol/ diesel have hampered investments in alternative energy solutions creating an uneven playing field.

Worse still, there have been contradictions in both policy formation and implementation. Some of the finer policies introduced by one government ministry could be scuttled by the actions of another government agency indicating a misalignment. This is the case with the tariff on solar panels introduced last year by the Nigerian Customs at a time when the Ministry of Power, Works and Housing and the Nigerian Electricity Regulatory Commission (NERC) were writing regulations that offered incentives to improve alternative power through solar.

Sticking point - Tariff on solar panels

Stakeholders in the sector interviewed for this report are unequivocally against the introduction of tariffs on solar panels. In fact, they argue that tariffs on all equipment related to delivering solar power – including batteries, should be tax exempt.

"This has grave implications for Nigeria's quest to improve the ease of doing business and deepen energy access for over 70million people with inadequate access to power," said Segun Adaju, president of the Renewable Energy Association of Nigeria (REAN), a trade group of renewable energy operators in the country

The concern was that the imposition of arbitrary tariffs will accelerate value destruction within an emerging industry, cause prices to rise to uncompetitive levels for rural dwellers who constitute the bulk of solar energy users and negates the country's clean energy ambition.

To effect this new tariff review, the Nigerian Customs argued that solar panels are made up of minute photovoltaic cells which when put together can be used for power generation. Hence it changed the classification and imposed 5 percent Value Added Tax and 5 percent duty. This re-classification effectively puts solar panels used to generate electricity in the same class as diesel generators.

Operators however fault this classification on the ground that panels are not mechanical components with moving parts. They also said that even if the Customs wants to reclassify panels, it should give them a moratorium of at least 6 months instead of arbitrarily imposing duties without regards to their business model.

The Customs as well as some analysts have argued that imposing the tariff will encourage local manufacturing. But Nigeria currently does not have capacity to manufacture solar panels but does limited assembly in volumes that cannot meet up to 10 percent of market demand by only two plants – Auxano in Lagos and Blue Carmel in Kaduna. NASENI, a government agency set up to assemble solar panels, does not produce to meet commercial demand.

"Locally we don't even have capacity to assemble enough panels to meet demand. Nigeria cannot live in isolation in comparison with other West African countries, imposing this kind of tariff will only move investments to other countries," said Chuks Umezulora co-founder of Auxano Solar Nigeria Llimited, a company that assembles solar panels in Lagos.

The new duty has increased acquisition cost of solar panels and made other African markets attractive for new investments. East African countries are already miles ahead of Nigeria in terms of solar adoption attracting tens of millions of dollars in new investments. Ghana recently abolished VAT and duties on solar panel, Nigeria should too.

Perspectives

RENEWABLE ENERGY ASSOCIATION OF NIGERIA (REAN)

…How we're helping shape policy in Nigeria's off-grid sector

When your mission statement boldly states that you want "to be the umbrella association for all Renewable Energy promoters enabling and encouraging the sustainable development of the Nigerian economy through Renewable Energy", you cannot afford to be complacent.

Renewable Energy is Nigeria's new trendy byword; it is receiving untold attention. This is in part due to the government's Vision 30:30:30 which aims at achieving 30,000MW of electricity by the year 2030 with renewable energy contributing 30 per cent of the energy mix. This target has redirected focus to the sector and in part because in solving the country's energy access gap, renewable energy solutions must play a large part as existing power infrastructure cannot alone do this. We cannot allow it to be a fad; renewable energy must serve as a long-term solution to taking 90 million Nigerians out of the darkness and into the light, both literally and figuratively.

At the Renewable Energy Association of Nigeria (REAN), in recognition of the socio-economic advantages that will come with reducing the gap in access to energy, we continue to work strategically and tirelessly towards building a robust renewable energy sector. What will this entail?

There needs to be an enabling environment across the entire value chain; increasing Nigeria's ease of doing business that will include improved access to finance for RE developers is a fundamental action that has seen REAN collaborate with the finance sector and potential investors to increase opportunities across board; to give an example, exploring single-digit interest rates for developers, or tax holidays for local assembly of RE components; partnering and engaging with the bodies responsible for regulating and standardising the sector for quality and assurance that meets global expectations. Creating awareness and increasing capacity within the sector is key to sustainable growth. REAN is in collaboration on public and private sector initiatives to move this forward.

What will support these efforts? Policy documents and Bills without rigorous implementation are useless. REAN is at the forefront of multi-stakeholder activities to ensure that legislation supports policies and initiatives set out by the government. Legislation must focus on protecting the industry from opportunists, must protect existing players in the sector, must include long term sustainability initiatives that will support local manufacturing, must recognise that the RE sector is an evolving one and needs to meet the

industry needs decades from now. We are confident that our commitment to this process will deliver advantageous results. Our vibrant membership includes players in biomass, hydropower and solar energy all contributing their quota despite a sometimes-challenging terrain.

Ultimately, reducing Nigeria's energy poverty cannot be tackled by any one agency or company. It must be a collaborative effort. Access to clean, reliable and affordable power is essential to nation-building: we will be reducing unemployment by invigorating the economy, reducing pollution, contributing to improved health and education as only a few of the socio-economic benefits. The positive impact cannot be over emphasised. Without growth in the energy sector, the growth of the nation will be limited. Renewable Energy is the way forward.

Perspectives

RURAL ELECTRIFICATION AGENCY

'What we are doing at REA'

Introduction

Decentralised energy solutions through renewable energy technologies have proven to be the most viable option in reducing energy access deficit for unserved and underserved locations in Nigeria. The Nigerian Government has therefore prioritized the exploitation of renewable energy sources to complement the limited power generation and supply and to provide clean and cost-effective electricity especially to unserved and underserved rural areas, economic clusters and federal universities. The Rural Electrification Agency (REA) has developed and is implementing the off grid strategy. This paper provides an insight to some of the key milestones achieved in deepening renewable energy in Nigeria.

REA Program

The REA is currently implementing multiple off grid electrification programs with the support of the World Bank, African Development Bank and the private sector, mostly through the deployment of solar power to electrify, homes, communities and businesses. The following programs are currently being implemented.

Energizing Economies Initiative-Decentralized Energy Programme (DEP)

The EEI program has been developed to support the rapid deployment of clean and sustainable off-grid electricity solutions to economic clusters in Nigeria. The aim of the EEI is to increase energy access and economic growth by assisting private sector developers provide clean, reliable and affordable power to economic clusters across Nigeria. The aim of the initiative is to provide sustainable and affordably power to 500,000 SME's.

The EEI project is divided into Phases; Phase 0, which is the pilot phase has powered and commissioned 3 markets in Sura Market in Lagos, Ariaria market in Aba, and Sabon Gari market in Kano. Under Phase 0, about 8000 shops are currently receiving uninterrupted power supply. Phase 1 of the EEI have identified 13 more markets. Currently, power has been provided in 6 more markets in Iponri market Lagos, Nepa 1, Nepa 2 and Isinkan markets in Ondo State, Edaiken Market in Edo State and Ita Osu market in Ogun State. Cumulatively, around 2000 shops are currently receiving power across these markets and pilots running in BIIBCO market Oyo State as well as Kantin Kwari market in Kano.

Energizing Education Programme (EEP)

The EEP is expected to provide adequate power supply (89.6MW in total) to thirty-seven (37) Federal Universities and seven (7) University Teaching Hospitals across Nigeria. It also aims to provide streetlights to promote and facilitate safe, secure and productive learning environments as well as to develop and operate training centers to build capacities of university students in renewable energy technology innovations. The REA has been mandated to implement the EEP. The EEP has been divided into phases to ensure effective implementation. Phase I of the EEP is fully funded by the Federal Government of Nigeria, while Phase 2 and 3 will be funded through the World Bank and the African Development Bank respectively. Phase I involves the powering of nine (9) Federal Universities across the six (6) geo-political zones.

1. University of Petroleum Resources (Delta State)
2. University of Lagos (Lagos State)
3. Obafemi Awolowo University (Osun State)
4. Nnamdi Azikiwe University (Anambra State)
5. Ndufu Alike University (Ebonyi State)
6. University (Kano State)
7. Abubakar Tafawa Balewa University (Bauchi State)
8. Usmanu Danfodiyo University (Sokoto State)
9. University of Agriculture (Benue State)

These sites are at various stages of completion, with the first site expected to be commissioned by the end of June, 2019.

Nigeria Electrification Project (NEP)

The Nigeria Electrification Project (NEP) is an innovative programme to catalyse off-grid development in Nigeria, through the provision of grant funding, detailed market data and technical assistance. To support this effort, FGN has secured funding from both the World Bank ($350m) and the AfDB ($200m).

The NEP is broken into the following four components:

I. Solar Hybrid Minigrid Developer solar hybrid mini grids to serve >2 million people and >100,000 SMEs
II. Rural Standalone Solar Home Systems (SHS) - Deploy Solar Home Systems to 1.5 million households, this includes solar panels, batteries, fans, TV, lights etc
III. Energizing Education Phase 2- Develop solar hybrid independent power plants at 7 universities
IV. Technical Assistance

The applications for the bids to build and operate mini grids have been launched. Additionally, the REA is receiving applications from eligible companies to build and operate mini grids in their choice locations through the performance-based grants funding.

Suleiman Babamanu,

Senior Technical Project Manager, REA

REA
RURAL ELECTRIFICATION AGENCY
ENERGY • EMPOWERMENT • EFFICIENCY

Summary of Existing Legislations & Regulations (1/2)

	Industrial Development (Income Tax Relief) Act, 2004	Energy Commission of Nigeria Act Cap E10 LFN 2004	The Electric Power Sector Reform Act, No. 6 of 2005 (EPSR Act)	Companies Income Tax Act 2007	Regulations for Independent Electricity Distribution Networks (IEDN), 2012
Profile	• The Act repealed & re-enacted the Industrial Development (Income Tax Relief) Act and made provisions for tax incentives to certain qualifying industries	• The Act established the ECN which is charged with the responsibility for the strategic planning and coordination of national policies in the field of energy	• The Act established NERC and provides for the licensing and regulation of the generation, transmission, system operations, distribution and trading of electricity in Nigeria	• The Act regulates the levying and collection of taxes on profits accruing in, derived from, brought into or received in Nigeria.	• The Regulation provides the framework for the issuance of licenses to all independent electricity distribution systems, the owners, operators and users of such distribution systems .
Specific impact on Renewable Energy	• Eligible manufacturers of solar energy powered equipment and gadgets are granted a tax holiday for a period of 3 years and renewable for a further period of 2 years	• Not applicable	• Not applicable	• Tax Relief for research and development • Reconstruction Investment Allowance • Rural Investment Allowance • Investment Tax Relief • Tax holiday, capital allowances, tax free dividends for gas utilisation companies	• Not applicable
Specific impact on off-grid	• Same as above	• Not applicable	• The Act set up the REA and the REF to promote, support and provide rural electrification programmes through public and private sector participation	• Same as above	• The Regulation defines two off-grid IEDN: "Isolated off-grid rural IEDN" and "Isolated off-grid urban IEDN"

Summary of Existing Legislations & Regulations (2/2)

	Embedded Power Generation Regulations 2012	Regulations on Feed-In Tariff for Renewable Energy Sourced Electricity 2015	Regulation for Mini-Grids 2016	Eligible Customers Regulations 2017
Overview	• The Regulation provides the framework for the issuance of licenses to qualified operators to engage in embedded generation of electricity in Nigeria	• The objective of the Regulation is to boost power supply and improve the national renewable energy sourced electricity target by setting a guaranteed price for electricity generated from renewables	• The Regulation applies to mini-grids with power generation capacity of up to 1MW. It provides the framework for the registration and operations of mini-grids in Nigeria	• The Regulation provides the framework for the direct purchase of electricity by end-users from power generation companies
Specific impact on Renewable Energy	• Not applicable	• Offtake guarantee • Standard 20-year PPA • Renewable energy sources enjoy purchase priority • Renewable energy producers enjoy special tariffs which will last the duration of the PPA	• Not applicable	• Not applicable
Specific impact on off-grid	• Not applicable	• Promotes off-grid energy generation	• Promotes off-grid energy generation and distribution	• Promotes off-grid energy generation and distribution

Excerpt from a study commissioned by All On, undertaken by PwC Nigeria, titled Strategic Fiscal Incentives to Unlock the Off-Grid Clean Energy Sector in Nigeria: Opportunities & Recommendations.

Funding Models

The Nigerian off-grid market has been able to attract massive support within the last three years in the form of grants, low interest loans and equity investments. Our analysis show that the sector now attracts the biggest foreign direct investments into Nigeria

In the last three years, organisations like the USAID Power Africa, United States Africa Development Foundation, African Development Bank, GIZ, DfID, Heinrich Boell Foundation (a German Foundation), and Shell-funded All On have ramped up funding and advocacy about the prospect of off grid to deliver energy access to Nigerians without power. These organisations have provided both material and technical support to off-grid energy companies in Nigeria.

There is another $80 million in debt capital coming through the EU/ AFD's SUNREF program through Access Bank and United Bank for Africa.

Bank of Industry (BOI), a Nigerian development finance Institution and All On, signed a financing agreement which offers N1billion to off-grid project developers in the nine states of the Niger Delta.

In 2016, BOI signed a $2 million agreement with the United Nations Development Programme, (UNDP) to provide solar-powered electricity to six communities in six states of the federation.

All On has provided funding for nationwide Challenges for the incubation of early stage of grid energy companies through the Co-Creation Hub and the Nigerian Climate Innovation Center.

Limited local content

However there have been concerns that mostly foreign investors are taking important position in investments in the off-grid energy sector.

"80 percent of investment flows into the off-grid sector are coming from outside the country and local investors run the risk of getting into the game late," warns Ify Malo, Nigeria Campaign Manager for Power For All, a decentralised renewable energy advocacy organisation, citing the African Progress Report, at a capacity development workshop for energy reporters in Lagos last year.

Malo said that no investor will come into any sector without a promise of value hence the sector offers vast opportunities waiting to be tapped. The danger is that local investors who get in the game when the market has become saturated would have to play catch up.

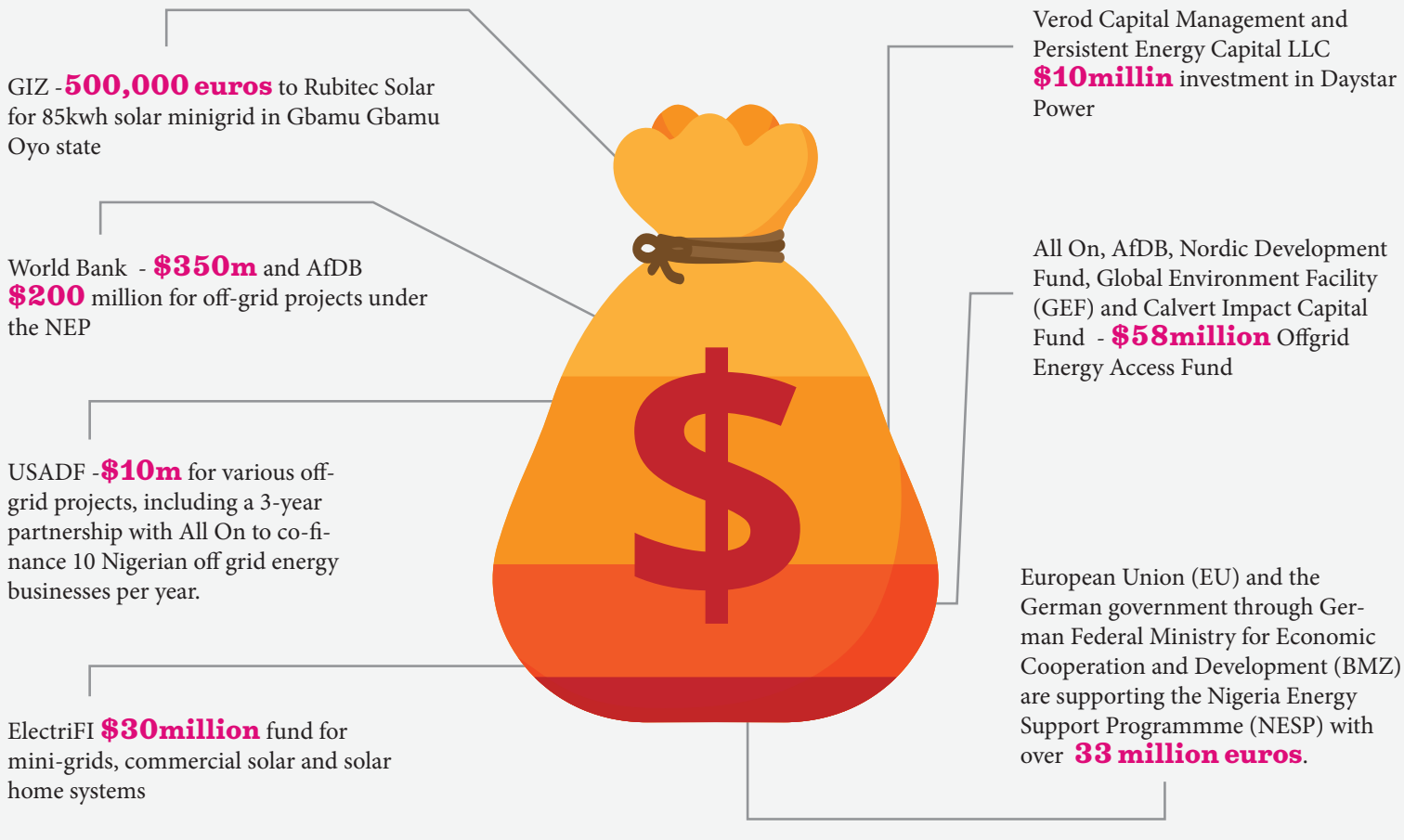
Many Nigerians are yet to be weaned from the false narrative about solar being unreliable and unable to power heavy equipment. There is also the concern that solar is too expensive. However, the falling cost of solar panels and battery systems is making the sector attractive especially in Nigeria where market opportunities are huge. However, there are local investors such as Verod Capital and All On as well as local commercial banks such as Sterling Bank and FCMB deploying capital in the sector.

When the grants run dry

While grants and low interest funding can help the industry get off its feet, these are not sustainable investment approaches. Unlike the banking sector which has withstood shocks and continued to thrive, the off-grid energy market has not been sufficiently tried and tested. This brings to the fore the concern of how the industry will sustain itself after grants funding and concessional debt finance dries up.

Femi Adeyemo, one of the founders of Arnergy, a leading indigenous distributed solar energy provider, said the industry is moving past grants and donor funding though it remained a critical funding model. Some are gradually expanding and helping their customers in local communities to use the energy provided for productive purposes. Haven Hill Synergy in Abuja, for example, also provides soft loans to local people to run small businesses.

The dollar rain



Perspectives

FUNDING THE OFF-GRID SECTOR: THE NEW NARRATIVE FOR POWER IN NIGERIA

Like many others in the growing off grid energy sector in Nigeria, I left a comfortable role in an established industry (gas and power) to join the investment team of All On, a company seeded by Shell to invest in off grid energy companies in Nigeria. We all have different motivations for making a move to the emerging off grid energy sector, but for most of us, it's based on personal experiences as well as a desire to impact on the quality of life of other Nigerians. My decision was a combination of both. I remember my time studying at a Nigerian Federal University where we had to use rechargeable lamps (if you could afford one) or candles to study a lot of nights when the central diesel generator was switched off; or the frustration I felt working on some national grid-connected power projects due to the unrelenting sector challenges.

Beyond my own personal experience, it's about impact. I want to ensure that more children/ students are able to study at night; that more lives are saved at clinics – fewer women dying at childbirth, and vaccines preserved for longer. I want to give premature babies that need to be kept in incubators a chance at life; and businesses an opportunity to generate more income by staying open longer hours. I want to see unemployment reduced since fewer factories have to shut down permanently due to the cost of running inefficient sources of electricity; and fewer people die from fumes from "I better pass my neighbor generators" ... and so on.

The transition to All On was an easy decision for me as it brought me closer to making an impact through access to energy. At All On, we invest in early and growth-stage businesses in Nigeria's nascent off-grid energy sector spanning solar, wind, hydro, biomass and gas technologies deployed by both foreign and local access-to-energy companies that complement available grid power across Nigeria and help bridge the significant energy gap.

It has been an interesting journey so far providing funding and support to these energy businesses. I believe that although all stakeholders along the value chain are crucial (investors, donors, regulators, etc.) the project developers (i.e. the businesses that deploy the solutions to these customers) are clearly the MVPs. They have taken the risk to start innovative businesses solving one of the most difficult problems in Nigeria – they engage with the users, raise funding, deploy the solutions in this huge but challenging market.

In the last few months, we have worked with some of the most innovative businesses in the sector – Lumos, the biggest solar home system company; GVE, the pioneer mini-grid company in Nigeria founded by 3 young men when they were university students; Cold Hubs, a company that provides cold storage hubs that prolongs the quality and shelf life of perishable fruits and vegetables in Nigerian markets; Auxano, an indigenous solar panel assembly company, and many more. It is inspiring to see the level of dedication by these companies. Given how new the industry is, it is a learning process for everyone involved. Developers are learning to make their businesses investment ready, build their teams adequately and give up some control to become more sustainable. Investors are also learning to be patient, to hand-hold the developers where necessary while tailoring solutions to meet the needs of these businesses. Regulators and government agencies are putting in place the right policies and enabling environment for the sector to flourish.

As always, where there is a huge challenge, there are great opportunities - in this case, to make both economic and social impact. There is an influx of international energy companies who want to take advantage of the size of the market and the various support programs being put in place. Impact investors are seeking investment opportunities in the off-grid energy sector such as Breakthrough Energy Venture (the $1 Billion fund to invest in innovations that mitigate climate change by Bill Gates and Richard Branson), ElectriFI, funded by the European Union who recently launched a dedicated €30 Million for Nigeria, Acumen moved its West Africa operations from Ghana to Nigeria, Persistent Capital, SunFunder, etc. Then there are donor programs such as the World Bank ($350 million) and AfDB ($200 million) support for the Rural Electrification Agency's (REA) Nigerian Electrification Program, EU/AFD $80 million SUNREF program through local commercial banks, GIZ technical support programs, etc.

Most remarkable however is the emergence of indigenous clean energy entrepreneurs who are set to drive the sector. Indeed, recent studies show that developing off-grid alternatives to complement the grid creates a $10B/year market opportunity for mini-grids and solar home systems that will save $6B/year for Nigerian homes and businesses.

I am excited about the next few years in the industry and looking to see the transformational impact this sector will have on Nigeria. I am tired of living with the statistic that "120 million people are living without access to reliable and affordable power in Nigeria" – the country with the second highest number in the world after India with a much larger population. The stage is now set for us to collectively change this narrative, and I am proud to be right in the middle of it.

Ujunwa Ojemeni
(Senior Investment Associate), All On

Technology and Skill Transfer

The World Bank says that progress is being made in closing energy access gaps in Africa and Asia. "For the first time ever, the number of people gaining access to electricity in Sub-Saharan Africa is outstripping population growth. More than 700,000 home solar systems have been installed in Kenya alone and another 240,000 poor, rural households are expected to be connected soon under a new $150 million off-grid project backed by the World Bank.

A key reason for this growth is falling renewable energy costs, which have made home solar systems, mini-grids and other distributed renewable energy (DRE) solutions a viable option for providing first-ever electricity in remote, rural areas far removed from electric grids.

Yet, technological and skill transfer has not grown at the same pace. There is a growing shortage of job-ready talent to finance develops, install, operate and manage these systems especially in Sub-Saharan Africa. The World Bank says there are only 76,000 jobs in the renewable energy sector on the whole continent. This compares poorly with India which has half of as many people without electricity and 10 times more people working in the Solar PV sector alone.

Re-skilling as a game plan

In Nigeria, there is an acute lack of skilled capacity for the off grid energy sector, meaning that renewable energy firms worry about losing their best talent to competitors. In light of the capacity gap, development agencies like the GIZ have organised training sessions for installers to improve their skill set. Staff who benefit from these trainings have been mandated to train others.

"As a company our focus has always being to develop the very best technical talents we could ever have which is why we are very focused on training or standardization," said Anu Adasolum, chief operating officer at Rensource during an interview for this report.

"So we bring in people and train them to a level that is expected. What that will do to the ecosystem in general is that the more we train the more we grow. Although we admit that some people will leave our company or join other companies however we can only control what we can by ensuring only the best people works with us and in doing that we are helping the ecosystem in general."

Arnergy's strategy is to build critical elements used in the business in-house. "So what we have done as a company from the onset is we have designed and developed what we see as critical components to our business model," said Femi Adeyemo.

Trainings

There are also local training programmes organised by operators. For example in April 2019 All On partnered with Rubitec Solar to train up to 120 professionals affiliated to the Niger Delta to give them skills to deploy and manage solar installations.

In March 2018, **Asteven Group** launched a Renewable Energy Academy and Cenre of Excellence in Ogun state. Sunny Akpoyibo, company CEO said the Academy was borne out of the necessity to develop local capacity, change the course of power access in Nigeria and increase job creation.

Blue Carmel Energy, a renewable energy firm based in Kaduna State, has built a renewable energy production plant and a training academy seating on a 3 hectares piece of land to roll out trained technical personnel for the deployment of solar solutions, entrepreneurs in the industry and project developers, customized products through research and development and other numerous lines of activities which present investment opportunities for both local and foreign investors.

Value Creation

As part of this report, we visited locations around Nigeria where some of these projects are sited and found that a quiet revolution is taking place in rural Nigeria. Girls attendance in local schools is rising, children can read in the night using solar lamps rather than dirty kerosene stoves, some women have replaced charcoal stoves with cleaner alternatives, there are now fans at night and even young men avidly follow the English premiership in the backwaters of Kigbe, four hours away from the Abuja airport.

"In the rural areas, the living conditions of community residents have greatly improved. There has been drastic reduction of CO2 emission due to unsafe and hazardous means of energy generation (generators)," says Olusegun Odunaiye of Havenhill.

"We have been able to stimulate a few businesses that even operate at night. School children can study at night, clean and potable water is available to all. We are steadily and critically addressing the United Nations Sustainable Development Goals 6 & 7."

"We have witnessed firsthand rural – rural migration, some residents from rural communities where electricity & clean water is not available have relocated to Kigbe where there is 24 hours power supply. Electricity truly brings life and development."

Since rural communities have limited purchasing power, the decision on where to site a mini-grid is usually based on the availability of capacity to use energy generated for productive uses.

So investors during scoping engagements, look for communities where processing of agricultural produce, fish farming or poultry activities are undertaken and these small businesses serve as anchor customers for the minigrid business. To remain profitable, some investors have gone out of their way to provide the means to generate economic activity in the community. Some provide interest-free loans for women to start business centers selling cold drinks or iced fish. This helps to create economic value in these communities.

Case Study

"YOU CAN CALL OUR PLACE SMALL LONDON"

The journey to Kigbe community, in Kwali Area Council of Abuja from the Central Business District will take you nearly over four hours, two you have to spend on a motorcycle because the road looks like it was modeled after the path of a tornado. It is unpaved, rugged with deep gullies and miles of jagged edges.

But arriving Kigbe village made it all worth it. There is no grid connection in the community. To make a phone call, residents travel about 20 minutes to the next community. There are as many mud houses complete with thatched roofs as there are buildings made of cement. But unlike the seven other communities you pass on your way, only Kigbe has electricity, thanks to a mini grid set up by HavenHill Synergy Limited. And this has made all the difference.

Residents in Kigbe have stopped going to streams a kilometre away to fetch water due to solar-powered borehole constructed by the company. The local school has reported improved attendance as parents are willing to let their children especially girls go to school since they can read in the night. A local business center provides cold drinks along with groceries due to soft loan provided by the mini grid company and even youths avidly follow the English premiership through a local viewing center.

"We call our place small London," says Sule Bamaiye, the 56 year old Kpandanki or second in command to the traditional ruler. Bamaiye has four wives and sixteen children all housed in five houses ringed to allow a square at the middle where the women sit in the night under the glare of solar powered bulbs.

Bamaiye says that Kigbe has become some type of truck stop as truck drivers who move logs of wood, the main business in the communities, now stop by at Kigbe for cold drinks.

Bamaiye pays between N1000 or N2000 every month for electricity depending on usage. Electricity from the mini grid powers his 14-inch colour television and home theatre electronics. There is a standing fan in the five houses and five bulbs.

I entered his sparsely furnished living room to the sound of an afrobeat tune with his seven year old daughter humming to the latest Davido track. London may be over 6,500 kilometres away via the Trans-Sahara highway, Bamaiye has London right there in his community.

HavenHill Synergy constructed the 20kW mini grid in the community along with a 3km grid line distribution to power about 145 households in the community. It is anchored around five business including agricultural processing facilities and business centres. Sun rays captured by solar panels are stored in 115kW battery storage capacity and are distributed to the community.

The company as part of its support initiative provided a 20,000 litres solar powered borehole for the community. Following the benefits of electricity at Kigbe, two of neighbouring communities have also asked to be connected. The company is currently on a scoping mission to connect six communities in the country.

Ify Malo

Mark Amaza

Perspectives

CLEANTECH HUB: OFF-GRID ENERGY ADVOCACY THAT IS IMPACTING LIVES

Although renewable energy is yet to enjoy widespread adoption in Nigeria with less than 30MW of installed capacity, it is clearly making enormous impact on the lives and businesses of those using it. For example, companies who invest in large solar projects for their businesses (commercial and industrial solar) tend to benefit from cost savings, especially in the long-run from huge costs associated with alternative power generation from diesel generators.

Also, individuals and businesses using renewable energy solutions ranging from pico-solar products and solar home systems to stand-alone solar systems and productive-use systems enjoy not just the cost-savings but also get a better standard of living - devoid of toxic fumes from kerosene lamps or fossil-fuel generators as well as a noise-free environment.

There is ample evidence to support this: SoSAI Renewables, a Kaduna-based renewable energy company deployed an innovative solar tunnel dryer for drying vegetables in a village in Makarfi Local Government Area of the state for a women's cooperative under a lease-to-own model; for as little as N200, farmers in the community and beyond dry a bag of pepper, extending its shelf life and enabling them to earn more income.

Also, ColdHubs which is based in Owerri is pioneering walk-in solar-powered cold stations for use in off-grid farming communities, allowing the farmers to store their perishable produce for as little as N100 a day, which extends the shelf life rather than selling it quickly to avoid spoilage.

Also, communities such as Bisanti in Niger State who have had uninterrupted power supply from mini-grids, are experiencing a new lease of life, with an explosion in the number of micro-businesses, better school performances by children, as well as more family and social cohesion.

Renewable energy in Nigeria is also impacting lives by opening up opportunities for micro, small and medium businesses and enterprises particularly at the grassroots level. There is a growing collage of small solar retailers as well as operators of solar kiosks for charging mobile devices and selling cold drinks in off-grid communities across the country.

There is ample evidence to show the absence of energy access across Sub-Saharan Africa - including Nigeria, is felt more by women than men. It is important that the sector creates opportunities for women to not just benefit from using renewable energy products, but to also earn income both by being distributors of renewable energy products and by employing them for productive use.

Evidence has shown that when women are exposed to the benefits and methods of renewable energy that they flock into the sector as entrepreneurs in significant numbers.

Our organization, the Clean Technology Hub has held two workshops for grassroots women on the potentials of renewable energy not just to provide cleaner, cheaper and more sustainable energy but also on how it can open a vista of income-earning opportunities. These workshops were well-received with several women signing up to be retailers with renewable energy companies such as Solar Sisters (a social enterprise that engages only women as its last-mile retailers), AStevens and SoSAI Renewables.

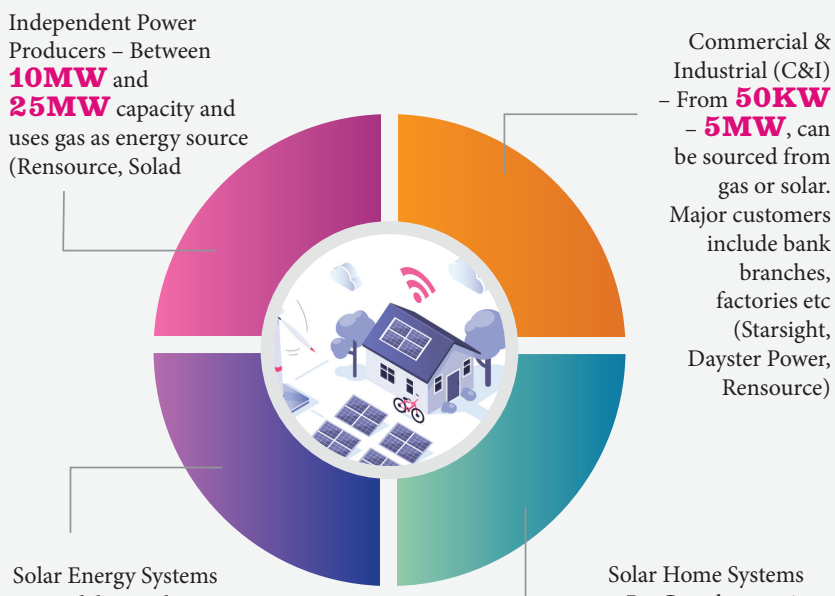
Clean Technology Hub has also held broader workshops for communities in a bid to democratize access to renewable energy through raising their awareness of solutions available and the benefits. These workshops were attended by a large number of participants including women, which has led to new markets for renewable energy solutions.

The outcome has been more retailers and distributors, with the customers enjoying constant electricity for their needs at savings, when compared to using fossil-fuel alternatives.

As the adoption of renewable energy increases, there is no doubt that there will continue to be clear and measurable impact of its usage on lives and businesses across the country, which will motivate more individuals, families and businesses to adopt it as their primary energy source.

Top Ten Off-grid Renewable Energy Companies

Segments In Nigeria's Off-Grid Space



In this report we have chosen to profile renewable energy companies operating in the off-grid space. While these companies are blazing a trail in the different segments they are playing, be it the commercial and industrial (C&I) energy space, mini grids and solar home systems solutions, we realise that there are many others equally adding value. The challenges, struggles and success of these companies we have profiled mirror their counterparts everywhere else in Nigeria.

However, the vast majority of companies in the off-grid space in Nigeria are in the Mini Grid, Commercial & Industrial and Solar Home systems segments. Many companies operate in one or more.

Focus

Mini-grid

- Green Village Electricity (GVE) Projects Ltd
- Havenhill Synergy Limited
- Rubitec Solar Limited

Commercial & Industrial

- Rensource Distributed Energy Limited
- Starsight Power Utility Ltd
- Cold Hubs

Solar Energy Systems

- Arnergy Solar Limited

Solar Home Systems

- Lumos Nigeria
- Smarter Grid International

Sector Enabler

- Auxano Solar Limited

Mini grids

The Nigerian mini grid market today has reached an inflection point - costs are competitive with alternatives like diesel and petrol generators, and projects are moving away from grant funding to commercial investments.

Nigeria currently has about 20 mini grids but there is a large potential for installing 10,000 mini grids of 100 kW each by 2023. Yet this will only meet 30% of anticipated demand.

In the last few years, the Federal Government of Nigeria has created a plethora of policies to enable the takeoff of off-grid energy development in the country. But the NERC's Mini Grid Regulation of 2017 has been the most potent, driving investments into the sector.

The government has increasingly committed to off-grid development and electrification. This commitment has ranged from enabling regulation and policy to direct investment through budgeted funds and facilitating development partner loans and grants.

A study by the Rocky Mountain Institute found these mini-grids could drive a significant economic change in rural Nigeria. It also reports that accelerating development of this market will require building on the foundation in place and addressing key challenges that may slow progress.

There is a need to provide more clarity on policy by addressing overlapping mandates and competing frameworks, as well as to more consistently enforce existing regulation. The government can also continue to improve the ease of doing business, considering customs issues and supporting finance development in particular, the report said.

Mini grid tariffs

Metric	Range	Median
Tariff	N120 -N300/kWh (US$0.34 - $0.86/kWh)	N200/kWh (US$0.578/kWh)
System size	16-100kW	45kW
Capture expenditure	N30 -N100 million (US$90,000 - $300,000)	N50 million (US$140,000)
Operating expenditure (per annum)	N300,000 -N2.4 million (US$900 - $6,900)	N690,000 (US$2,000)
Load	16-300kWh/day	218kWh/day
Capacity utilisation	2%-100%	19%
Collections	98-100%	99%

Mini grid costs are becoming more competitive as operators seek new supplies and embrace new technologies. Tariff rates vary from site to site with many having a flat tariff structure (a single fixed price per unit of electricity) for all customers.

Some operators mirror tariffs along close substitutes especially diesel generators and some charge residential and commercial users different tariffs. For most projects, tariffs were developed in agreement with the host community and community members say they spent less on electricity from the mini grid now than they did on energy alternatives before the mini grid's installation.

Cost-reflective mini grid tariffs are typically near N200/kWh (US$0.57/kWh), which is less expensive than the cost to run a small diesel or petrol generator set. Although this cost reflects the small scale and risk of a nascent market, minigrid tariffs are expected to continue falling and can be reduced by 60% by 2020, the report said. In comparison to diesel, the report said that "the levelised cost of electricity (LCOE) from a small diesel generator is at least N250/kWh (US$0.71/kWh)."

To build a mini grid, operators spend between N20 –N100 million but as they build new grids, they gain more experience and, cost come down as they scale.

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EMAIL: INFO@GVE-GROUP.COM
WEBSITE: WWW.GVE-GROUP.COM

Profiles of top firms in the mini-grid space

GREEN VILLAGE ELECTRICITY (GVE) PROJECTS LIMITED

Incorporation Date:	2012-10-12
Registered Address:	Winorac Engineering Building, Plot 34 Boskel Road, Port Harcourt, Rivers State Nigeria
Vision:	To be the first choice renewable energy enterprise sought globally
Mission Statement:	To create an enterprise focused on deploying clean, reliable, affordable and sustainable renewable energy solutions to clients.
Management:	Ifeanyi B. Orajaka (Chief Executive Officer), Chinedu Azodoh (Chief Financial Officer) Chuka P. Eze (Dir. Technology& Operation)
Products/ Services:	PV Solar Installation, Solar EPC, Renewable energy project development, Clean Energy Financing, PV Solar O&M

Ifeanyi B. Orajaka
CEO

Chuka P. Eze
Executive Director: Technology & Operation

Chinedu Azodoh
C.F.O

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.

"We started formally in 2009 as undergraduate students in FUTO but we got incorporated in 2012, and we distributed our first mini-grid which happened to be the very first in the West African region in 2013," said Orajaka.

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.

From this humble beginning, the company has built 13 minigrids around Nigeria and now serves about 7000 households with cumulative solar energy capacity of 0.65 megawatts.

"Our target in the medium-term is by 2023 to impact 3.6 million Nigerians," Orajaka said.

"It is a very herculean task but currently we have been able to attract the right partnerships from both the investment and the financing and business development world to help us achieve that goal. Currently we have the Bank of Industry as shareholders, member of the board of the company. Most recently we also on-boarded All On and we are also working with ElectriFI."

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

Corporate governance. It has a diversified board and maintains a long-term relationship with critical stakeholders. This is important when you are running a business in your mid-20s having to manage millions of dollars in funding and revenues.

GVE has an active corporate board comprising of the three chief promoters, a C.F.O with professional experience at Barclays Capital New York, three seasoned non-executive directors, All On, and the Bank of Industry Nigeria. The management team is led by a Chief Executive Officer who has a strong entrepreneurial spirit and three Executive Directors who are all founders and shareholders of the business, and are professional engineers.

An advisory board also exists due to the dynamic and complex nature of energy projects as well as the risks associated with the infancy stage of the overall RE industry in the country. Its role is to provide expert advice on technical issues and management of risk within the organization and its business. This implies that a strong corporate governance structure has been put in place to effectively manage risks and ensure best practices within the organization

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.

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

CEO Comment

From the pilot projects we have deployed, our business model has proven sustainable and scalable. Our fee structure is designed to give customers the best service at the lowest possible rate, making off-grid electricity provision reliable and affordable.

This ambitious plan will sustain GVE Projects, Ltd., if all goes well. One of our major drivers has been the satisfaction we take in creating value and the socio-economic uplift in the lives of the indigenes of our host communities. We are agents of change, for the common good. I asked one of my customers to describe the impact of reliable, affordable electricity on his life. How did he light his home at night? How did he charge cell phone batteries?

RUBITEC SOLAR NIGERIA LIMITED

Incorporation Date:	2016-05-10
Registered Address:	5 Talabi st, off Adeniyi Jones Avenue, Ikeja
Vision/ Mission Statement:	To be an Integrated Renewable Energy company and Independent Power Producer providing electric power from Renewable Energy Technologies, RETs, for the benefit of rural and urban communities.
Management:	Bolade Soremekun, founder and managing director
Products/ Services:	Solar and Inverter, Backup Systems, Small Hydro Power, Biomass energy systems, Waste to energy plant, Land-Fill Gas Plants and Wind Energy.

History

Rubitec Solar was founded by Bolade Soremekun, a trained pharmacist with over two decades of experience, locally and internationally, from multinational organisations like Johnson and Johnson; Glaxo Smith Kline, and others. He was head of the pharma division of Glaxo Smithkline up till May 1996 and went on to become a director for West Africa.

"Originally there was no plan to do solar because I am a pharmacist and had been a director for West Africa for GlaxoSmithkline. I left and started my own business. It was during that time I was trying to supply vaccines to the Federal Ministry of Health for a national programme on immunisation when I was asked if I could supply solar-powered refrigerators because vaccines have to be in a cold chain from manufacture to supply," Soremekun told BusinessDay in an interview.

Success Factors

Grant funding. Rubitec like many other renewable energy firms in Nigeria has benefitted from grants and concessional debt finance.

Government contracts. In 2005, it was awarded a contract to install 500 solar refrigerators across local government areas in Nigeria. It also secured contracts from REA and the Energy Commission of Nigeria to install street lights and solar pumping systems for rural areas.

Diversification. The company has moved from solar home systems to own a huge mini grid plant. It also set up Rubitec Academy in 2019 and partners with academic and training institutions in Nigeria and abroad to improve capacity of installers.

Operational Model

Rubitec built the Gbamu Gbamu mini-grid, composed of more than 300 large solar panels on a compact plot of land. A small powerhouse is lined with imported inverters and batteries that can store enough energy for electricity, even during the rainy season. Wires on wooden poles run from the mini-grid to homes and businesses that have paid for a connection.

The investment comprises 50% grant from GIZ, 39% loan from Bettervest of Germany, and 11% equity from Rubitec Nigeria Ltd. Customers are charged N175 per kwh as tariff.

Key Project

Rubitec commissioned its first mini-grid in Gbamu Gbamu community in Ogun State Nigeria in February 2018 and will be using this expertise to train successful candidates in solar PV installation, mini-grid design, installation and operation amongst others.

Funding - €500,000

Source - GIZ, a German development agency and USAID, under the Nigerian Energy Support Programme

Capacity - 85kw solar hybrid mini-grid

Launched – February 9, 2018

CEO Comment

Rubitec emerged successful out of 70 companies that responded to a request for proposal by The Nigerian Energy Support Programme (NESP) funded by the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ) and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the Federal Ministry of Power (FMP) and five (5) selected State Governments (Cross River, Niger, Ogun, Plateau and Sokoto). Winrock, the implementing partner of USAID, also supported the project by promoting access to finance workshops and initiatives.

We were still sceptical, but we went along and began to develop the business plan, and through several workshops over the next two years, we developed the many skills – technical, business development, financial and business modelling to build a mini grid.

We spent time in several finance workshops supported by our partnering agencies and presented our project to local and international banks and financial institutions. With time we were able to put together a financing package that consisted of our equity, a loan from a Bettervest, a German Crowdfunding organization, and a Grant from GIZ. Winrock/USAID provided the crucial connection with Bettervest.

The village of Gbamugbamu has a population of 3,500 people. The village is well organized with a Baale, sectioned into zones with a leader for each zone. It is mainly an agrarian village growing and processing economic crops including cocoa, palm oil, plantain, kolanuts, cassava, yam, and maize.

Our mini grid will serve 487 metered customers, with 462 1phase connections, and 25 3phase customers. The PV system will generate >190,000kWh/year of electricity, transmitted and distributed across 5.2 Km of grid for different categories of consumers – businesses and households. We have installed pre-paid meters. We encourage the people of Gbamugbamu to pay for their electricity as this will make the project sustainable.

The village has grown rapidly, from the time of our first research up until now. We shall be deploying very soon to connect the new customers and houses being added as we speak. The Baale, Chief Adekunle Fayomi and his team have been very cooperative, and have supported all the work we have done," says

Bolade Soremekun

HAVENHILL SYNERGY

Incorporation Date:	2010-02-23.
Registered Address:	Suite B-12&13, Kenuj 02 Mall, Kaura District, Abuja.
Vision:	To be among the top five leading renewable energy service providers in Africa by providing lease-to-own Solar financing service to over 10,000 urban homes and Solar Mini-grids in rural communities all by 2023.
Mission Statement:	To use solar energy to generate clean, safe, cost effective and sustainable electricity in urban and rural areas within the Federal Capital Territory of Nigeria and other states of the Federation.
Management:	Olusegun Odunaiya, (Chief Executive Officer)
Products/ Services:	Solar Mini-Grids Development / Rural Electrification - Solar Installations for Homes & Organizations - Engineering Procurement and Construction - Solar Powered Street Lighting Systems - Solar Powered Water Pumping Solutions - Site Assessments & Pipeline Development - Energy Management and Audit

Projects

- 40kWp Solar EPC for a HealthCare Institution in Ogun State, Nigeria
- Kwaku Solar Mini-Grid Project, Abuja, Nigeria
- 2KW Solar Hybrid System for twin bungalows @ Citec, Abuja, Nigeria
- 3.84kW – 10KVA Hybrid Solar System for a 5 bedroom duplex in Life Camp, Abuja, Nigeria
- Solar Mini-Grid Project at Kigbe
- 6KVA Xantrex Power Backup System in Abuja, Nigeria
- 10KVA Power Backup System in Wuse 2, Abuja, Nigeria
- 12.5KWP Fully Off-grid Solar Power in Kuje Nigeria

History

Havenhill Synergy is an Abuja-based green energy technology utility company founded in 2010 by Olusegun Odunaiya. It started as a power backup system installing inverters and batteries for homes and from there it started installing small solar systems, rooftops, 1kw, 2kw solar installations.

Operating Model

HavenHill builds mini-grids in off-grid communities and vends power to residents who pay a fee between N1000 and N2000 depending on usage. The company puts some of revenue generated back into the community to do appliance finance and help residents set up businesses which help them repay loans.

The company does not play in the mini-grid space alone, it also have projects in the commercial and industrial space. "In fact we have C&I projects that are operational and we also have a pipeline of almost 2 megawatts that we are currently fundraising for because at the end of the day you want to balance your business model," said Odunaiya.

Success Factors

The company received $100,000 from USADF as seed capital which helped finance the first mini-grid it built. It has a system where it revenues from the minigrids are used to maintain the plant and service its loans. It banks on profits after scaling the business.

The company also has a strategy to spend less on capital expenditure so as to reduce tariff paid by customers.

"If you build expensively, your tariff will be high and there is no way the community will pay. If you look at eastern African countries like Tanzania and Kenya, they charge as much as between $1 and $2 per kilowatt hour because the project we might build for $150,000 in Nigeria they might build for say $300,000. Here we don't charge for construction in our company so the cost of our engineers we don't put it on our projects especially when we have an obligation to an investor, our goal is to first of all, meet that obligation and then we can make profit afterward.

Tariff. In Nigeria today you would find that tariff ranges N120 to N180 per kilowatt hour that's where you find almost all developers but our own tarrif is between N120 and N140. We have never exceeded N140.

Olusegun Odunaiya

CEO Comment

The first 3 to 5 years were very challenging. In 2014 I applied for the Mandela-Washington Young African Leaders Initiative by president Obama and I was selected and that was a turning point in our organisation and changed everything. We got involved with USADF they practically held our hands to achieve things we couldn't achieve with the government of Nigeria or banking institutions became possible.

Nigeria's mini grid regulation is a good one but we do not need tariffs on solar panels. If you go to other countries you would see that they have completely removed duty on the importation of solar products.

We cannot have a country that is producing 4,000-6,000 megawatt of power for 180 million people and then you have South Africa which produces 40,000-45,000 megawatts for 55 million people which is 15 times what Nigeria is producing and for a quarter of Nigeria's population and then the government is discouraging people are trying to get power through other sources while claiming to be supporting local production.

People need to go to the rural area to appreciate the work being done in those areas. If you stay in the urban area and put 10 percent duty on panel, you would make your money.

However in rural areas people are requesting for instalment payments and things like that but we have had a case where a client asked for a solar system and we couldn't finance it but we spoke to an individual who was willing to finance it at 3 percent interest every month and the client agreed and paid over 9 months. You cannot do that in a rural community so a lot needs to be done if we are going to achieve our vision 2030 goal.

Commercial and Industrial Solar

According to the 2019 report by research company BloombergNEF (BNEF), Nigeria's market is very distributed, with the majority of installations being smaller than 30kW while sites over 30kW are estimated to add up to just 8.9MW.

The report acknowledged that the government's efforts to encourage local solar module assembly are not working as solar modules with bypass diodes must pay a 5 percent import duty plus 5percent VAT.

There are also very high transaction costs for customs handling. Merchandise can often sit in the port for weeks, at a high cost to the importer. Developers also mentioned that there are often delays in evacuating merchandise from the port.

Major barriers are financial, from debt availability to credit risk and foreign exchange hedges.

Retail power tariffs have not been updated to their indexed formula since year-end 2014, leading to under-recovery of costs and an expectation that they are more likely to rise than to fall in coming years.

Commercial banks are largely absent from the C&I solar market, offering debt that developers consider too costly mostly over 25 percent and only for tenors up to two years.

Rooftop solar in major systems is lacking and the land for ground-mounted installations is often too expensive. Industrial off-takers are often preferred because they have plentiful land for on-site solar installations.

The report said the cost of C&1 project will decline to $0.10/kWh by 2030, the cost today for C&I solar with battery storage is $0.19/kWh is 67percent higher than the industrial grid tariffs and 63percent above the commercial rate, but lower than electricity from a diesel generator, which generally costs $0.28-0.32/kWh.

Some big C&I solar projects in Nigeria was 2.35MW Tulip Cocoa Processing Plant developed by Alfen BV, designed by Solarcentury, and built by Solarmate. Next is the 1.2MW Usuma Dam Solar Power Plant built by Japan International Cooperation Agency (JICA) in Abuja, followed by the 1MW project built by Enerwhere for Bayero University in Kano state.

In Nigeria, captive independent power producers with a generating capacity of over 1MW must hold a captive generation permit issued by the Nigerian Electricity Regulatory Commission (NERC).

RENSOURCE ENERGY

Incorporation Date	2016-02-23
Registered Address:	3B, Tiamiyu Savage Street Victoria Island, Lagos Nigeria
Vision/Mission Statement:	Rensource Energy is a leading provider of off-grid energy. It is using best-in-class technology, financial innovation, and a robust operational infrastructure to build West Africa's largest portfolio of micro-utilities.
Management:	Ademola Adesina (Founder &CEO) & Jussi Savukoski (Co-founder executive director)
Products/Services:	Advanced lithium-based battery technology integrated with robust battery management systems

History

Rensource, a distributed energy company was founded in 2015 by Ademola Adeshina. It is based in Lagos but has operations in Kano and Abuja. The company has set up a system that uses a combination of long-lasting lithium based batteries and solar energy offered through a mobile based user interface that allows its customers to pay their bills, and to understand how they use their power.

Operational Model

The company offers a subscription model to its customers. It is active under the Energizing Economies Initiative of REA which involves being able to start more micro utilities in markets, providing traders with access to energy. It plans expansion into more markets in Nigeria.

Success Factors

Financing. In 2018, Rensource raised $3.5 million in a bridge financing round. The round was led by Amaya Capital with participation from the Omidyar Network and CRE Venture Capital. This funding round adds to the $1.1 million seed round previously raised from CRE Venture Capital and Sissili Limited, among others

The company looks at the current cost or client power consumption and sets a lower tariff. It builds financial models that allow for innovations in ensuring that it provides enough value to customers.

Technical skill. Rensource invests in training progammes for technical staff which has helped it to deliver better service.

Experience with Energizing Economies Initiatives (EEI)

What the REA has done is to encourage players by identifying prospects; which was why they went out to evaluate the best players who can execute projects.

Also, what makes the REA stand out is they engage with whoever they need to get the job going. They work with players to make sure the job is done efficiently well. For example if you're going to the market you don't need to do an end to end geographic design, you might just be verifying the design which would have been done already after which the private player raise the money itself so there is no government at all in EEI. Also if you run into difficulty with communities issues, the REA always come to the rescue, they also help with project management capacity which they are doing with several companies.

View on Tariff

Of course, it wasn't a good idea because we don't manufacture solar panels here in Nigeria, so what market are you trying to encourage here in Nigeria by increasing tariff? With this increase, landing cost would be a lot higher than normal which will definitely affect retail price, and even increase cost of operations for producers.

Ademola Adesina
Founder / CEO

Part of the issues with panels in particular is because of the need for extreme scale. The depth of capital you will need to have local assembly that will match international prices must be huge, because the Nigerian market will not be sufficient to sustain the manufacturers as there must be demand from multiple countries. Unlike the local players; foreign solar panel assembly plants have access to credit at low interest rates and operate in multiple countries which allows them to scale, it is the same here.

The government is doing its best to encourage solar in certain areas for example there are areas that are easy to align and there are also areas that involve more complex alignment. For instances we have DFI's or other government agencies coming together to try and encourage a lot in solar space due to the strong movement coming from renewable energy.

COLD HUBS LIMITED

Incorporation Date	2015-07-30
Registered Address:	1, Umugakwo-Umuoba Road Off Mcc Uratta Road
Vision/ Mission Statement:	Reduce Food Waste, Increase Local Farmer Income, Create Jobs for Women, Reduce Malnutrition and build Self-Sustainable Business Model
Management:	Nnaemeka Ikegwuonu (CEO) & Bright Benjamin Igbokwe (Chief Operating Officers)
Products/ Services:	Modular, solar-powered walk-in cold room, for 24/7 off-grid storage and preservation of perishable foods

History

Coldhubs started out as a Small Holder's Foundation which helped rural farmers maximize yield by giving them information on new techniques, strategies to cut down post-harvest loss and use of pesticides through radio programmes and townhall style- interactions. It took off when it secured funding from the MIT Solve initiative and the Microsoft Airband Grant Fund.

ColdHubs was launched in December 2016 and became commercially operational on March 8 2017. It was able to fill up its first cold hub on August 18 2017. Since then, the company's cold rooms have been operating at maximum capacity.

Operational Model

It deploys an energy efficient monoblock refrigeration unit is connected to an inverter that enables the solar-powered batteries to supply energy for night cooling. Each ColdHub can fit approximately three tonnes of perishable food, arranged in at least 150 units of 20kg plastic crates stacked on the floor. The concept is relatively simple, a 120mm thick insulating cold room panels to retain cold, with energy provided by solar panels mounted on the roof.

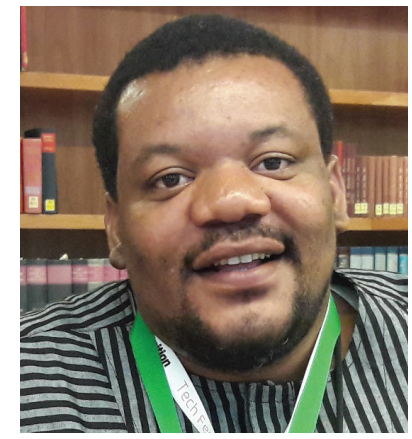
Cold hubs provide small holder farmers, retailers and wholesalers storage and preservation facility for fresh fruits, vegetables and other perishable foods. The cold rooms are strategically located in markets and traders store agricultural produce in crates for a fee of N150.

One cold hubs cost $27,000 to build which include cost of power infrastructure, solar panels, battery, inverters, shipping, clearing from custom and bringing from Onne seaport which will move to our warehouse and many more.

Success Factors

Value. The company has been able to increase its customers income by an estimated 50 percent helping to build trust.

Grant funding. Through funding from All On it was able to build two ColdHubs while the UKAID funding is helping to build seven new cold rooms



Nnaemeka Ikegwuonu
Founder ColdHubs

Smart marketing. It developed educational comics, translated into Igbo, Hausa and Yoruba which it used to conduct training sessions with market women and small holder farmers on market to farm strategies and managing post-harvest losses. This helped to build relationships, cultivate trust and enhanced acceptance.

Expertise. Coldhubs has gone from exporting expertise to building its own cold rooms. It hires installers locally and provide them both local and international training to improve their skill helping to cut down cost on hiring foreign expertise.

Turnaround. If it fills up its cold rooms from day one, it generates income within 12 months but due uncertainties exchange rates it can breakeven in 24 months.

Impact

The company has been able to increase its customers income by an estimated 50 percent. ColdHubs has deployed five operational ColdHubs -three in Imo state, two are in Kano State and plans a fresh set of 35 which will serve an estimated 3,500 farmers, wholesalers and fishermen. It has created 10 new jobs for women by recruiting and training them to be hub operators and market attendants.

CEO Comment

We have a 40 feet container filled of batteries at Onne port and part of our challenges is that we pay 20 percent duties on those batteries; we also pay duty on imported solar and imported inverter. The point is the regulatory environment does not encourage small and medium scale enterprise in any way, because you are going to pay a credible amount of money to clear goods which you could have use to support the deficient power sector in Nigeria or support National development, because it's

actually power that drives the economy or key to industrialization.

Unlike everywhere else in the world were its always friendly, regulatory environment its seems harsh in Nigeria and when I talk about regulation am not talking about Nigerian Electricity Regulatory Commission (NERC) or Ministry of Power am taking about these little agencies that we interface with every day in the course of doing business. Part of what we are doing at Cold-Hubs is we are building lot of refrigerated warehouses across the country.

The second phase of our development is food logistics, which involves bringing food in a safe and hygienic model from the north to the southern part of Nigeria and also takes apples and grapple imported from South Africa from the southern part of Nigeria up to the northern part of Nigeria. For example from Kano to Owerri there are more than 30 checkpoints from touts, community youths, police, civil defense among others waiting to harass businessmen. So it's like everybody is against a businessman. Frankly speaking it's very difficult to do business in Nigeria and the government can do better by easing the ease of doing business by making policies and program friendly.

Better approach

What the government needs to realize is that all the volume of containers coming from the off grid sector is at the first phase which is installation, no company in Nigeria can beat its chest and say we are breaking even or we are on profit, so what we have over the last three years is people bringing in tons of solar batteries or panels because we are building mini-grid whether they are profitable or not we don't know. As we all know they are raising debt financing, they are raising equity they are raising tons of grants to build these things, we will know in the next five years if they are profitable or not because for me I don't see their profitability.

STARSIGHT POWER UTILITY

Incorporation Date:	2015-07-23
Registered Address:	9 Ondo St, Osborne Foreshore Estate, Ikoyi, Lagos.
Vision/ Mission Statement:	To achieve significant and measurable cost savings for our clients whilst being the catalyst to deliver a substantial reduction in Carbon Emissions for their business.
Management:	Anthony Carr (CEO)
Products/ Services:	Solar Solutions, Battery Storage, Energy Efficient Cooling Solution.

History

The company was set up in 2015 when Helios Investment Partners, a private equity investing firm operating in Africa and based in London, United Kingdom acquired assets of SNL and renamed the business StarSight Power Utility Limited and deployed additional capital and human resources in the energy company, one year after to enable a 30 site pilot.

African Infrastructure Investment Managers (AIIM), together with Helios Investment Partners acquired stakes in StarSight through a $30m a funding round led by the duo and the investment allowed StarSight to scale units operations, developing projects in 33 states in Nigeria in 2018.

The renewable company in 2019 expanded to 200 operational projects across the country with its budget for the year at $40m.

Operational Model

StarSight delivers both roof mount and ground mount solar system to meet specific need of the consumer. The panels and control systems deliver results without unscheduled outages or damage.

StarSight provides cooling solutions for clients across different industries. The energy firm optimum cooling solution for your facilities, ensuring a clearly defined guaranteed comfort level for work environments.

Tony Carr

Success Factors

StarSight proposes a sustainable solar power and cooling service to help customers enjoy green energy without concerns of carbon emission, noise pollution, and unnecessary cost from inefficiencies. The solution involves installation of cutting edge technologies and provision of support services to provide cost savings option for end-users at a fixed rate.

The green energy company visits the consumer to gather intelligence on current and potential future energy consumption pattern as a guide to provide bespoke solution and also price fairly.

StarSight deploys the solution at zero asset cost to the consumer for the full tenure of the power and cooling agreement. StarSight provide around the clock support to the customer from its monitoring and control centre to ensure that full value is transferred to the end-user.

Impact

StarSight has 200 operational projects in 33 states across all geo-political zones in Nigeria with 99.9% uptime life to date.

The energy company has 14.5 MW Installed Generating Capacity; 7.5MW Solar capacity and 7MW Diesel Generator. Starlight also boasts of 12.5 MWh of Installed Battery Storage and 5,000 HP Installed Cooling Capacity

"Whilst off-grid solar-diesel hybrid remains in its infancy in Nigeria, it is rapidly gaining acceptance as a competitive and more reliable solution than the current alternative energy sources on the market, provided the companies servicing the sector have the financial capacity and technical support to ensure O&M forms an integral part of the value chain.

"Key to acceptance has been the emergence of Power as a Service such as that provided by StarSight eliminating the upfront capital cost for clients. Following our success in the SME space and the additional USD30m investment from Helios and AIIM we are now poised to expand our service offering to the industrial sector in Nigeria which is lacking a viable alternative to diesel," explains Tony Carr, CEO of StarSight

Solar Energy System

ARNERGY LIMITED

Incorporation Date:	2014-07-22
Registered Address:	Head Office: Plot 91, DDPA Estate, Core Area, Null, Asaba, Delta
Vision/ Mission Statement:	Providing sustainable solutions to energy reliability issues across emerging markets. Our mission is to deliver energy solutions for productive use by deploying products, services and systems that power business operations and improve economic outcomes for our clients.
Management:	Femi Adeyemo (founder and CEO), Kunle Odebunmi
Products/ Services:	Arnergy 3000, a micro-grid ready, modular, stackable system available in single and multi-phase (Sold on ES, OS and LO packages). Arnergy 5000, a micro-grid ready, modular, stackable system available in single and multi-phase (Sold on ES, OS and LO packages).

History

Femi Adeyemo, an engineer, returned to Nigeria in 2013 and formed Arnergy along with Kunle Odebunmi to help improve energy access for millions of Nigeria. The company started by supplying affordable solar energy solutions to homes and businesses in the form a plug and play box that guarantees power half the day at the cost of less than N200 daily.

Arnergy partnered with reputable manufacturers from Europe and Asia to bring in its own OEM products, integrating the vital hardware of a complete Solar energy system like the Inverter, the charge controller, the AC bypass switch and the system control panel in a single box made us achieve smaller footprint at higher efficiency.

Operational Model

Arnergy started out in the solar home systems space but has gradually moved towards mini grids, commercial and industrial side of business. It also has connections in solar energy systems space.

Arnergy is now providing electricity to hospitals as part of its strategy to deepen penetration in the commercial and industrial solar space. So far, 20 hospitals have been connected and is expanding to provide power to 35,000 businesses in the next five years and 20 percent of that in the healthcare sector

In order to be competitive, the company has modelled tariff against its biggest competitor - generators. It has also created three models to sell its products and services: energy as a service which basically gives a customer access to the facilities while he pays rental for use as would a subscription, a lease to own model which can be settled between 12 – 48 months and outright acquisition.

For example, its Arnergy 3000, a 3 kilowatts system, customers pay N36,000 monthly as rental which comes to N1500-N1600 per day within 30 days. Customers would fork over N2.4 million to buy the facility with a 5 year warranty.

Success factors

Funding. The company has benefite from grant funding and concessional debt finance.

Technical skill. The company does its design locally but contracts OEM abroad to manufacture its products.

Impact

The company's has seen its biggest impact in healthcare and education. It is also hoping to get traction in the hospitality business helping to power hotels and resorts.

"We have not less than 20 hospitals at the moment, however, we are in a very good position and in general we will power about 35,000 businesses in the next 3-5 years and our target is to have at least 20 percent of that in the healthcare sector.

Arnergy has built more than 2 megawatts of installed capacity of solar PV capacity. "We have done almost the same size in distribution capacity and in storage capacity more than 5 megawatts hour. I can tell you all of those figures would be doubled at least in the next 12 months," Adeyemo said in an interview for this report.

CEO Comment

Ghana recently said they are changing form being a tax focused economy to a production focused economy. The argument could be let everybody manufacture in Nigeria but even if I bring cells. I am sure everyone would confirm that even the solar cells are being taxed.

So we actually need our government and policy makers to have a more holistic view about import duties and it has to be strategic but the way it is now seems like a " on the fly" decision. Because it could be another conversation, they could say if one is brining cells and putting it together in Nigeria, bring it at zero if at all you then want to tax, it should be the people importing the system whole. If you don't bring battery together as a whole but as cells and you assemble locally, you can bring it at zero. This should be the case.

But the tax on raw materials takes away the incentive of people to manufacture. This is the conversation we should be having, not that government should make money because if you look at the investment and all that, most of the investment is from outside Nigeria and if the investor sees more returns on investment in Ghana, s/he would take investment there.

Kunle Odebunmi and Femi Adeyemo
Founders, Arnergy

AUXANO SOLAR NIGERIA LIMITED

AUXANO
SOLAR
...Innovation that works.

We set up the first privately owned Solar Panel Assembling plant in Nigeria

Auxano is not only replacing imported solar panels, it is becoming an important center for research.

Auxano is challenging the status quo and setting new standards because we believe that ***"Nigeria will be built by Nigerians".***

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Sector Enabler

AUXANO SOLAR LIMITED

Incorporation Date:	2014-07-22
Registered Address:	Dunamis House, 367 Old Ojo Road Finniger Satellite Town Lagos.
Vision/Mission Statement:	To become the preferred renewable energy solution provider in Nigeria. To make Auxano Energy a household brand in Nigeria.
Management:	Chuks Umezulora (Co-Founder and Chief operating Officer)
Products/Services:	Designs, Solar Installations, Sales, Maintenance of Solar and Inverter Systems, Solar Panel Assembling, Residential &Commercial Solar, Solar power plant Design &Construction

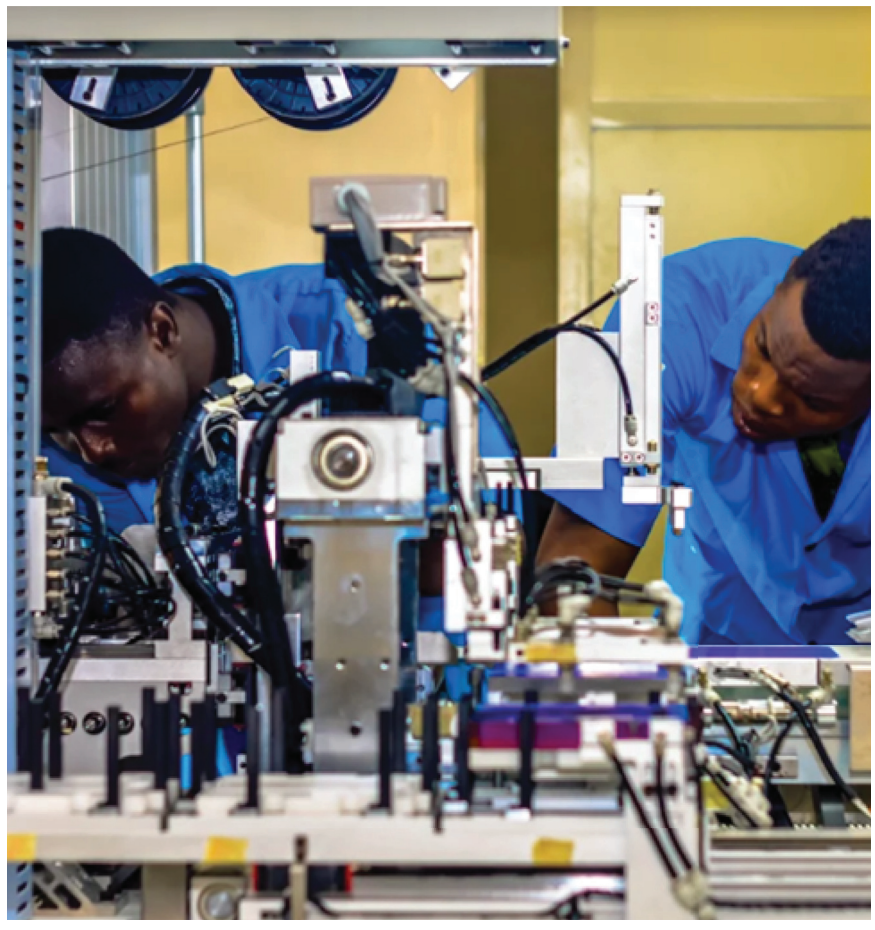
History

Formerly known as Chume Integrated Services Co. Ltd incorporated in 2005, Auxano Solar Nig Ltd was registered in 2014 specifically for Solar Business. It

runs the biggest solar assembly plant in the country and last year began plans to set up small sized operations scattered across different locations in Nigeria to reduce haulage costs and losses associated with moving panels across Nigeria due to bad roads.

Operational Model

Auxano's operation from a warehouse roughly 120 square meters, is fitted with all sorts of machines and equipment for cutting, welding, resizing and assembling the components required to build solar panels.



Chuks Umezulora

COO, Auxano

The outfit employs 25 people who have been trained through all the stages of the company's operations.

Critical success factors

Low labour cost. In the early stages of the business, the company hired labour from local technical schools and involved them in training sessions it had with the Chinese developers. These low-paid but better skilled workers helped it cut down on costs and compete in a highly technical and labour intensive field. The downside was that there was higher employee turn-over with many leaving within a year to pursue higher education.

Grant funding and concessional debt finance. Auxano won $100,000 energy challenge organised by USADF and All On. So far the company has received between N40-50 million in funding support.

Advanced machinery: The company recently acquired an auto stringer that helps to automate processes and has increased output seven fold.

Challenges

Absence of support systems like what is obtainable in China to assist local manufacturers through consistent exchange rate policy, access to finance and working capital and implementation policies to improve ease of doing business has hampered growth.

Distribution gaps. Umezulora says it is cheaper to import panels from China than to move them across Nigeria due to poor road network and extortive activities of traffic officials.

Starting out, Umezulora asked to be on the technical team of Sky Resources Nig Ltd where he was happy to work without pay just so he could work with a team doing installations for solar components. Though solar was yet to go main stream, he recognised early the potential that existed in the industry and stayed.

Ten years later he is still working in the renewable energy sector and has grown from merely installing solar components for customers of importers who sell at Alaba market to assembling the solar panels for operators in Nigeria.

COO Comment

The impact concessional debt finance has had on our business is that it has given us the opportunity to begin to actualise some of our dreams. This includes increasing our working capital and with more working capital we have been able to improve our profitability and our numbers now look better than what it used to be. We now have more raw materials to produce more finished products, profitability has gone up as we are still using the same workforce to do more.

Let me give a simple example, before when we were doing manual restringing we can do maximum of 20 panels in a day but with the auto stringer we can do 100, even up to 150 in a day. You can see the jump, so that has made a lot of difference and also it has eased off the pressure on me because when you know what to do but lack the resources it can be very depressing.

Importation

Yes, but its going to take some time because the honest truth is that most of the activities you seen in the Nigerian energy sector is being done in the downstream so maybe about 10 percent at the mid-stream but nobody has gone upstream, so it might take some time.

Policy quick wins

Based on my studies I have found out that the Chinese did a solar concession for 10 megawatts, sponsored it and took it as a case study for other 100 megawatt, 150 megawatt and so on.

What I recommended is that government do a tender for a smaller system , maybe 10 megawatts, sponsor it, take the risk, pay for it assume the risk so we can use it for a case study and iron out all the issues that have to do with costing. This approach would give the government the opportunity to know what the actual cost per watt that this thing was delivered at; forget theoretical and paper calculations, what is the actual watt in the Nigerian context.

Then what are the technical challenges faced which includes infrastructure, how much did it actually cost us because most of what the government add/had was actually learnt from other places. We need to upgrade our grid infrastructure what is the cost? We can now say we did for 10MW his is how much it costs and then extrapolate and say if we do 100 megawatts this is how much it is going to cost but if the government wants the company to take all the risk and get the guaranty it is not going to work.

Solar Home System

Access to basic electricity in Sub-Saharan Africa is a recurring challenge. A vast number of homes, businesses and firms do not have access to on-grid electricity due to lack of infrastructure and this has continued to plague economic development and quality of lives.

It is even worse in rural communities where many do not have in access to energy. This challenge is creating a market opportunity for solar home systems installations across Nigeria. Pico Soar uses small compact and light weight solar photovoltaic panels to generate just a few watts of power in a wide range of small and portable applications.

Pico Solar Systems are becoming more common place with firms like Lumos, Azuri and many others offering the service. Pico (small) solar systems are much smaller and cheaper than traditional solar systems but have the potential to provide useful amounts of electrical power to charge the increasing number of low power gadgets such as calculators, toys, cameras, mp3 players, cell phones, tablets, and other portable electronic devices etc, as well as a variety of chargers all use pico solar cells to charge batteries.

Pico solar systems are much smaller than traditional solar home systems generating just a few watts to power light emitting diode (LED) lights and a wide range of energy efficient portable devices. They have power outputs ranging from as little as 0.1 watts-peak (Wp) to 5 watts-peak for powering smartphones, portable devices or recharging batteries while systems up to 15 or 20 watts-peak are used for powering larger devices, multifunction systems and home use.

Traditional solar PV systems can save homeowners a great deal of money over time, the upfront cost involved in purchasing and installing a system is often too much preventing people from adopting solar power. Pico even saves costs for low income users. Also being small and portable, pico solar systems are relatively easy for non-specialist shops and distributors to physically stock and sell pico solar products plus you do not need specialist technicians to install. Just buy, plug-in and switch on.

Pico solar systems come in a range of shapes and sizes, with a typical system being made up of the following components:

- Rechargeable dry-cell battery or batteries of less than 12 volts to store the solar power for use when needed.
- Some form of charge control and battery management circuitry to protect the battery or batteries from overcharging or deep discharging.
- Power plugs and cables to connect and power devices such as phones, tablets and external lights.
- Internal lighting as most pico chargers now come with small highly efficient LED lighting built-in as standard.

LUMOS NIGERIA

Incorporation Date	2013-05-06
Registered Address:	8, Bodeola Jumoke off Olufemi Pedro Street Parkview estate, Ikoyi, Lagos
Vision/Mission Statement:	Lumos believes everyone has the right to enjoy a better quality of life offered by access to clean, affordable and reliable electricity.
Management:	Houssam Azem (CEO)
Products/ Services:	Large 80W solar panel unit and solar cable, Solar control unit with 8 sockets DC 12V max, USB mobile phone adapter, 2 powerful LED bulbs, Easy self-installation mounting kit.

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' payas- 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.

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 prepaid 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.

Houssam Azem

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

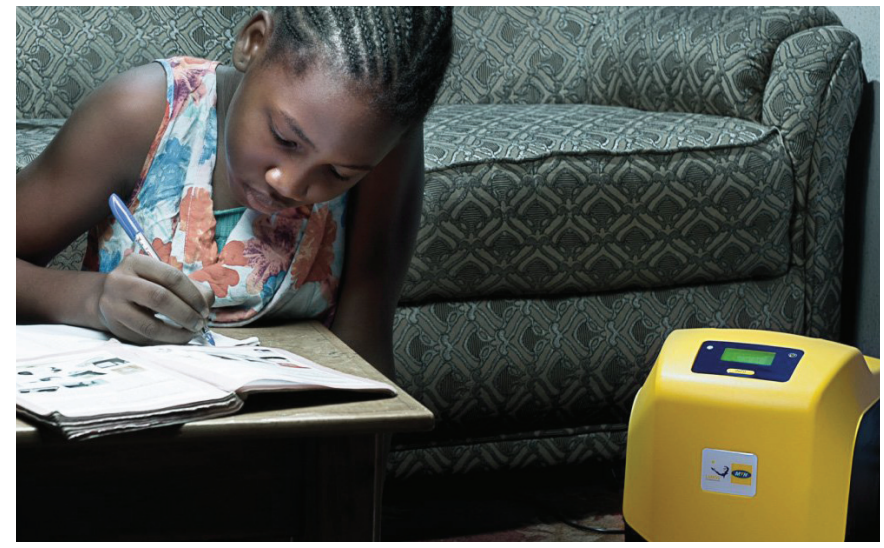
Access to long term finance is key to succeeding in deploying pay-asyou-

go solar home systems.

Cutting Edge Technology. Lumos' backend 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.

Funding. Lumos global deepened its business in Nigeria in 2016 having raised $90 million to support Lumos Nigeria as well as pursue opportunities in other countries. The fund comprised $50 million debt capital from Overseas Private Investment Corporation (OPIC) and $40 million in equity from a group led by Pembani Remgro Infrastructure Fund, existing investors, and Nigerian investor All On.



SMARTER GRID

Incorporation Date	2016-08-24
Registered Address:	24b A.J Marinho drive Victoria Island
Vision/Mission Statement:	We are a leading Nigerian company, developing and distributing solar systems, appliances and services for homes and businesses in emerging economies. Our mission is to improve the quality of the life of Africans by bolstering energy security that leads to enormous social-economic growth.
Management:	Anthony Onoh (Chairman), Heather Onoh (Chief Executive Officer)
Products/Services:	Smarter Energy Storage device, Multipurpose Smarter Kiosk, Smarter LED TV 19, 24,32 and 42, Smarter Portable Radio, Smarter Fan, Smarter Charging Hub, Smarter Led Bulb, Smarter Public Address System, Smarter Clipper, Smarter POS, Smarter Cooler, Smarter Fridge, and Smarter Tube.

History

Smarter grid was conceived in 2015 Heather Onoh, it did a pilot work in 2016, and started major distribution in 2017.

Operational Model

To solve the problem of energy access, Smarter Grid International (SGI) is using distributed energy resource to provide renewable and affordable electricity to the energy deprived populace in sub-Saharan Africa.

SGI finances and provides various flexible payment options such as Pay -As- You-Go and Lease to Own as well as payment platforms such as 'Paga' and 'Angaza'. This has enabled low income earners and micro businesses with minimal or no purchasing power to purchase solar products for productive use.

Success Factors

Strategic partnerships. The company has built partnerships with the Telcos and Banks and cooperatives. This relationship provides end to end business solutions from the point of off take of SGI's renewable energy solutions to its customers conducting its business and providing effective payment solutions.

Product mix. SGI product mix consist of smart technological devices that guarantees stable electricity for both the smart business owners, Telcos and banks in perform businesses such as Know Your Customer (KYC), effective communication between the Telco's and Banks and their respective agent networks especially in the rural areas.

Technical competence. The company has set up a Rural Women Technical Squad. These are trained female technicians who make installations of solar equipment and provide after sales support of the equipment. They are trained in collaboration with the International Financing Company, (IFC) and Lighting Africa.

Impact

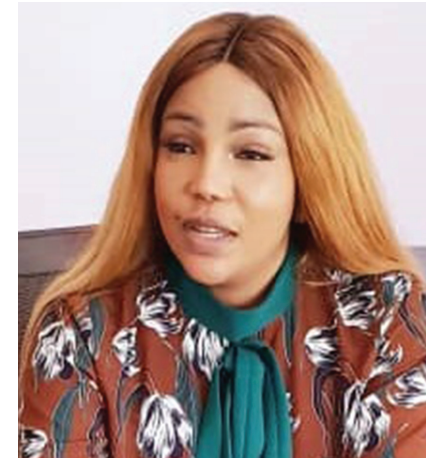
In the short while Smarter Grid International (SGI) has been in business it has installed over 7,000 solar systems and products across the nation. As a Millennia company, SGI has established its mobile smart business hub known as the SGI Solar Multi-Purpose Kiosk fitted with smart solar devices to enable businesses operate optimally and efficiently.

CEO Comment

A country like Nigeria with epileptic grid electricity supply requires favorable policies to drive the adoption of renewable energy. Tariffs on solar products will discourage businesses in the sector and business that continues must be profitable and as such the increased cost of the products is transferred to the end users.

It is an established fact that the people at the base of the pyramid are mostly affected with no accesses to electricity and that they have low purchasing power to afford renewable electricity due to the pass-through cost from tariff. Putting import tariff on renewable energy products is tantamount to the government sabotaging its efforts to increase access to electricity.

Import of renewable energy products should be duty free. An example is Kenya which has zero percentage on importation of renewable energy products and the country has recorded success rate in the adoption and use of renewable energy. There should also be policies regulating the standard and quality of solar products imported into Nigeria and policies that will drive and increase the manufacturing or assembling of solar products in Nigeria.



Heather Onoh
Chief Executive Officer

Future Prospects

One good way to gauge where a sector is headed is to measure trends another is to understand the plans of the operators. In preparing this report, we asked both operators and regulators where they think the sector is headed, and analysed local and international trends.

The off-grid sector in Nigeria is fueled by optimism and a passion that is almost zealotry. It is uncommon to see start-ups who are yet to break-even, who are yet to record their first profit carry on with the enthusiasm you will find around Jack Ma. Sometimes, for most of these operators, it is a mission, they intend to execute without letting an absence of profit get in the way.

Interestingly, they are building structured businesses because they cannot afford not to do so when the bulk of their financing is grants and donor funding. Companies like GVE who have benefited from millions of dollars' worth of investments have seasoned professionals on their boards. We observed that adherence to corporate governance is high in the sector. Board approvals are required for major expenses and investors actively participate in the boards of these start-ups. This may eventually prove to be the redeeming value of this sector.

In the next five years, we expect the sector to significantly move the needle on energy access for millions of Nigerians, especially in rural areas. We expect that operators will begin to record modest profits from mini-grids as energy for productive use gradually becomes the norm. This will lead to increased economic activities and dent rural-urban migration in Nigeria. Of course, chances of these happening are largely dependent on government getting out of the way of business people.

Many operators interviewed condemned the tariff on solar panels because it seems akin to pulling up the roots to see how the plants are coming on. It is more pragmatic to grant tax waivers to grow the sector and then tax economic activities generated through off-grid projects in rural communities. This will even assist states to improve their internally generated revenue. But to have reasonable policies, those who draw them up must be capable of sound reasoning and sadly, this is not always true in Nigeria.

Currently, the resilience of operators compensates for the unwise policy of tariff on solar panels but that may not be sustainable in the long-term. Nigeria already has one of the world's best off-grid policies in the 2017 Mini Grid regulation which both local and foreign experts including the World Bank have said is the best in developing market. Nigeria does not need to ruin it with thoughtless actions by government agencies that lack understanding about the sector. Nigeria's 2017 Mini Grid regulation is now a benchmark across the African continent.

"I feel so impress with the Offgrid sector so far, in ten years I think up to 30 percent of Nigeria power will be renewable generated. There are massive mini grid projects across the country, at the last count there are close to 50 to 100 of them so it's very promising but again it's still an early call its still a business without the right figures yet," said Nnaemeka Ikegwuonu of Cold Hubs.

The team at Rensource said, "It's not a quick money market, its capital intensive and there are no quick solutions to it. Proper Off grid solutions takes a while to recoup investment and you have to be more innovative .you have to work really hard to get your money market but it is the solution to Nigeria's energy problem."

We agree with these assessments and predict this quiet revolution will not remain so quiet for long. In the words of a Bassem Youssef, a revolution is not an event. It is a process. The process for Nigeria's off-grid revolution is already underway and it looks headed in the right direction.