STAND-ALONE SOLAR MARKET STUDY

GOVERNMENT INSIGHTS: CLOSING THE ELECTRICITY GAP WITH STAND-ALONE SOLAR

Nigeria

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Catalysing Africa's Solar Markets

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1. INTRODUCTION

1.1 Nigeria's Electricity Gap Means Millions lack Basic Services

Nigeria's population is estimated at 201 million,[1] of which 77 million do not have access to any electricity source,[2] which is an essential driver of economic growth.

Nigeria's national grid will not provide universal coverage within the next decade based on current grid electrification rates, and hence a large part of the country will need off-grid solutions such as mini-grids and stand-alone solar systems to meet the country's electrification target (Figure 1).

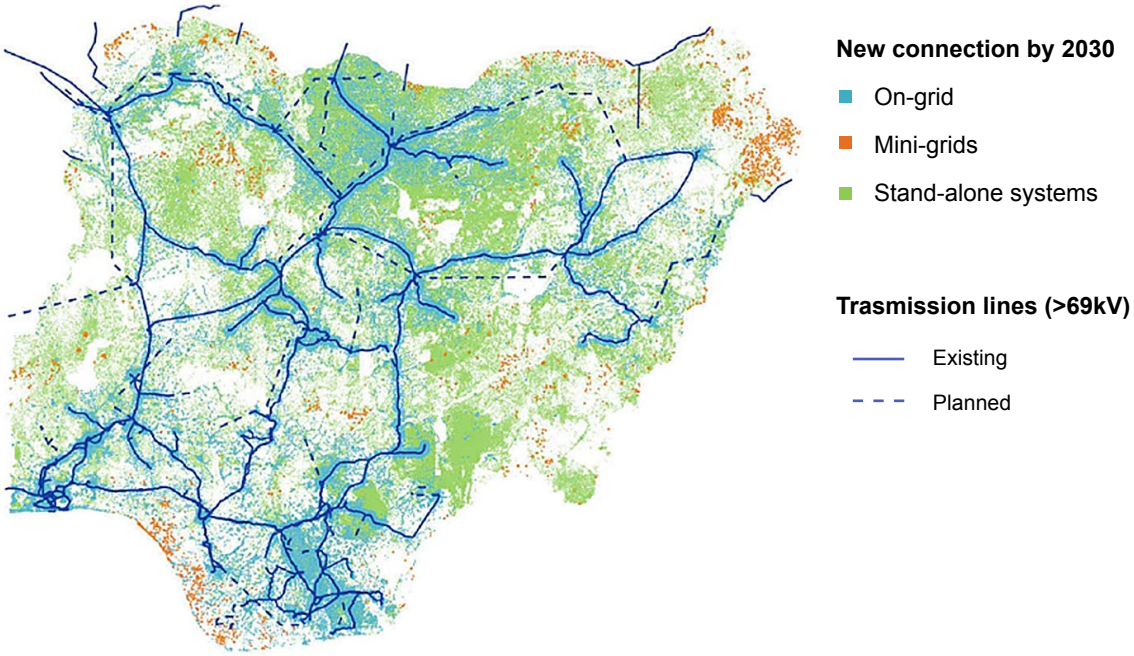

Figure 1: Nigeria Energy Outlook in 2030

Source: International Enargy Agency - Nigeria Energy Outlook

It is not only off-grid communities that need alternative solutions. Among the grid-connected population, just 25% of households and businesses receive four or more hours of power per day; an estimated 80% of them supplement unreliable electricity with costly, polluting alternatives such as kerosene, diesel, or petrol generators.[3] Nigerians spend an estimated $14 billion on these power sources annually.[4]

These off-grid and underserved markets exist all over Nigeria and across economic status – although rural and vulnerable populations are generally worse off. Recognising this, the Government of Nigeria (GoN) has targeted reaching 5% of the population through stand-alone solar (SAS) as part of achieving 100% access by 2040. SAS products are a cost-effective, clean power source that come in sizes attractive to all income brackets and with power for most electricity needs – including income generating activities.

1. *World Bank (2018)*
2. *International Energy Agency (2020) World Energy Outlook*
3. *Power for All (2018) Research Summary: Nigeria Finance*
4. *Nairametrics (2020) Nigerians spend $14 billion on generators, fuel*

1.2 Stand-Alone Solar can make a Difference

The use of SAS in Nigeria has grown significantly in the last five years, as customers become more familiar with the technology and experience the benefits. In response to the growing demand, solar companies are increasing their product range, consumer financing options and expanding their distribution reach. Foreign and local investors are increasingly interested in the market opportunity of SAS which by one estimate can be up to USD 9.2 billion annually[5]. Government and development partners have been ramping up support as well.

GoN has been actively promoting SAS through various initiatives of the Rural Electrification Agency (REA) such as the Nigeria Electrification Project (NEP), the Rural Electrification Fund (REF), and the Solar Naija programme which aims to deploy 5 million new connections via solar home systems (SHS) and solar mini-grids by 2023. As SAS are not considered part of the traditional energy infrastructure, they are typically sold by private companies albeit with government encouragement and support. Government sets electrification targets and then ideally provides a favourable business environment for the companies to deliver.

To put the government targets in context, 303,914 quality verified[6] SAS products were sold in 2020 – a major increase from negligible sales five years earlier, but still not close to meeting off-grid and underserved-grid customers' electricity needs. According to BCG, there is the opportunity to distribute SAS solutions to an estimated 3.2 million unelectrified households through SAS solutions, but the market needs an injection of $750 million to achieve this.[7]

This constitutes a major opportunity to reach the underserved population but it is not without its challenges.

1.3 Market Research to Evaluate Rural Access to SAS Products

The UK-funded Africa Clean Energy Technical Assistance Facility (ACE TAF) commissioned a nationwide study to assess the extent to which vulnerable communities have access to SAS. It looked at trade and consumer segments in rural, peri-urban, and urban areas across 10 states (Abia, Ado Ekiti, Bauchi, Cross Rivers, Ebonyi, Edo, Kano, Kogi, Oyo and Plateau) in the country's six geo-political regions. This study was carried out between June and September 2020 during the covid-19 pandemic, and also assessed the impact of the pandemic on traders and end users of SAS products.

The researchers interviewed traders, end users, and other stakeholders assessing how many sell or use SAS products, which products are available and preferred[8], the end-user experience and benefits, and other important aspects of the SAS market including quality, affordability, and after-sales support. The full report is available on the ACE TAF website and can be accessed here[9].

The following sections summarize key findings and recommendations on how governments can collaborate with and support the SAS sector private sector and other stakeholders to ensure that SAS solutions are integrated into their universal energy access plans.

5. *Africa Clean Energy Technical Assistance Facility (2021) Stand-Alone Solar Investment Map, Nigeria*
6. *There is a glut of low-quality solar in the Nigerian market – as in all countries. This sales figure includes only SAS product that meets an international standard from Lighting Global / VeraSol. Quality SAS probably constitutes just a fraction of the total market.*
7. *BCG (2020) Scale Up of Solar Home Systems: Preliminary Perspective, October 2020*
8. *Stand-alone solar (SAS) products can be grouped into 3 categories: lanterns, which are portable devices with a single light and maybe a phone charger; solar home systems (SHS), which are plug-and-play 'kits' that include solar panels, battery, multiple lights, and sometimes appliances such as a TV or fan; and solar panels, which are bought alongside other components (battery, inverter, cables, etc.) to form a system. Each has its pros and cons in terms of cost, capacity and convenience.*
9. *ACE TAF (2021) Stand-Alone Off-Grid Solar Market Research – Nigeria. https://www.ace-taf.org/kb/stand-alone-off-grid-solar-market-research-nigeria-2/*

1.4 Key Findings

SAS products have become a reliable and affordable means of electrification, but despite government efforts, most rural areas especially the poor and vulnerable, lack access to electricity including quality SAS solutions. Government should encourage sales of SAS to lower-income, harder-to-reach rural communities especially areas not immediately attractive to traders.

Just 13.6% of shops in Nigeria stock solar products, presenting a sizeable opportunity to expand the market. The 'trade' market (retail and wholesale shops) forms a parallel supply chain to door-to-door agents, microfinance institutions (MFIs) and other network-based distribution channels that are used particularly by higher quality brands.

Solar is more commonly available in peri-urban areas although targeted solar customers live in rural areas. It may be that traders in peri-urban or urban areas do not have the capacity or business appetite to carry solar to the "last mile". This is the opposite of what has been found in Kenya, Tanzania and Ethiopia, where there has been deliberate targeting of rural customers.[10]

Research has found that low availability of solar in the shops does not mean there is no demand – to the contrary 27% of households own a solar product. This is double the rate at which they were found for sale in trade outlets. This implies latent demand, a concentration of supply in fewer shops, and some purchases made through non-trade channels. Indeed, though not easily quantified, it is evident that growing volumes of SAS, particularly mid-sized SHS, are available through other sales channels such as microfinance institutions (MFIs), women's groups, savings and credit cooperatives (SACCOs), and door-to-door sales agents.

In addition, SAS is not found evenly across the population. It is 3 times more common in peri-urban homes than in rural homes, and lesser to find SAS in urban homes – even though 80% of peri-urban solar owners are also connected to the main grid. Many people are using solar as backup for an unreliable or expensive power supply and nearly a third of SAS owners also have generators. This may be because the peri-urban populations may have more disposable income and are nearer to sales outlets than their rural counterparts.


Photo credit. © ARESS

10. *Lighting Africa (2017-18) Off-Grid Solar Market Deep Dive reports (Kenya, Ethiopia & Tanzania)*

Electricity access for the most vulnerable members of society is more complex. About 20% of rural households own a solar product and about one-third of vulnerable[11] solar owners are in areas with no grid access, indicating it is probably their primary source of lighting and power. And in grid-covered areas, 25% of these respondents cannot afford grid electricity.

To accelerate electricity access with SAS, government should collaborate with both trade and non-trade businesses to reach rural, poor and vulnerable populations through:

- Providing end user subsidies or tax waivers for selling quality SAS products particularly in rural areas, so that mainstream traders are incentivised to reach beyond current markets.
- Supporting a favourable business environment such as through localised energy access policies that promote quality SAS products, and incentives for private sector businesses that are delivering SAS products to rural communities and creating economic empowerment opportunities[12].
- Enforcing quality standards for solar products at the point of importation and in the market.
- Engaging with community leaders, women, and youth groups in rural areas on electrification through SAS and its socio-economic benefits. Government should create public awareness campaigns for SAS products.

Stand-alone solar is growing rapidly as an electricity solution for Nigerians – but cost is still a major barrier. Government should proactively address affordability constraints if it is to achieve inclusive national energy access targets.

GoN aims to achieve 100% rural electrification by 2040 with 5% through SAS. The government has developed several energy access policies that promote off-grid energy electrification and recognises the importance of SAS, and has recently launched an ambitious plan t**o connect 5 million un-electrified households in the country through solar home systems and mini-grids by 2023.**

The up-front cost of quality SAS products remains a major challenge. Pricing is a main driver of customer product choice particularly for lower income and vulnerable populations, and hence for traders in choosing what to stock. High-quality solar presents a long-term alternative to the grid, petrol generators or kerosene lamps, but the market is flooded with low quality products sold at cheaper prices, and lower-income consumers are particularly vulnerable to ending up with 'cheap' products.[13] Not only do these low-quality products cost consumers more over time, but they cause damage to the reputation of solar products, and contribute to a growing e-waste problem.

In addition, quality SAS solutions – particularly products customers demand with multiple lights and other features such as phone chargers and appliances, such as TVs, fans or refrigerators – are expensive to buy up-front. Larger 'productive use' solar products – which can be used for income generation in agriculture, MSMEs or cottage industries, for example – are likewise an emerging opportunity but remain out of reach for consumers who could benefit from them the most.

Providing micro-loans and credit are important financing options if the market is to grow. Just 5 per cent of SAS owners have been given credit from the shop where they bought it, and the majority have not been able to secure micro-loans from elsewhere (e.g. a SACCO or MFI). Many of the high-quality solar brands recognise the challenge and are offering consumer financing in the form of 'pay-as-you-go' (PAYG) instalment payments. However, this is not yet widely utilised by customers in Nigeria in contrast to other countries where PAYG solar companies dominate the national market. Microfinance institutions (MFIs) offering SAS alongside micro-loans also form a growing non-trade supply channel for solar products, especially in cities.

11. Women, youth and persons with disabilities – PWD

*12. Some SAS suppliers are providing structured financing (credit) to their customers, in recognition of a major affordability gap. *

13. It is very difficult for traders and customers alike to recognize low-quality or counterfeit products, except sometimes by price or warranty.

Government should facilitate affordability of SAS through:

- Evaluating and allocating equitable supply and consumer subsidies, and fiscal privileges to the SAS sector as to the grid and fossil-fuel sectors.
- Implementing and enforcing import duty and VAT exemptions for only quality verified solar products such that companies can pass on the incentives to consumers and keep prices as low as possible.
- Proactively encouraging the inclusion of PAYG and alternative consumer finance models as a mechanism for consumer credit, as the rapidly expanding digital payment infrastructure and regulatory environment are considered.
- Scaling Payment Service Banks to deeply broaden financial inclusion.
- Providing soft low-interest consumer loans to end users to afford quality solar products such as those available in the agriculture sector.

The Nigerian economy, long dependent on fossil fuels, is shifting to diversify and de-carbonise its energy sources whilst improving electrification. A rapidly growing SAS sector is creating jobs and income – an opportunity not to be missed. Government should support solar suppliers to access finance to grow their businesses…

The trade in SAS is conducted almost exclusively in cash, not credit – presenting a major limitation on the supply of solar in the country. International brands, many of which offer PAYG, account for 93% of the estimated $227 million invested in the SAS market.[14] However, the vast majority of mainstream traders self-finance their businesses or raise funds through friends and family. Less than 5% have gotten formal financing mainly through MFIs and SACCOs.

…and skills to boost their competitiveness

Despite having been in the market for many years, solar is still a specialist technology requiring skills and tools for installation, repair and maintenance that many traders and some electrical technicians do not have. Just 25% of solar traders offer installation, maintenance or repair services – and most are in urban areas, far from their customers. Electrical technicians are responsible for most of the installation and repair in the market and most are either self-taught or have learned their trade through apprenticeship. In interviews conducted they report a lack of appropriate tools and insufficient training on solar products. Therefore, unfortunately many SAS systems are installed or repaired inadequately, customers experience product failures and increased associated costs more often, and solar products are relegated to the trash heap far more often.

The solar business in Nigeria is heavily male dominated. Women account for just 4 per cent of SAS shop owners and 20 per cent of shop employees. This presents a high-value opportunity for women empowerment.

Government should continue to facilitate business financing and workforce development, particularly in the trade, through

- Engaging traders and their industry representatives to understand concerns and obtain information that will be useful in developing financing instruments, and favourable policies and regulations.
- Simplifying access to sector-specific government funds for solar companies to enable them to scale and reach rural and vulnerable groups.
- Setting SAS targets at the sub-national and rural level to show government's increased commitment in order to attract additional private sector investment.
- Supporting and expanding technical training and brand-agnostic guidance through vocational training centres.
- Targeting women and youth for information and skill-building, including through existing social empowerment programs such as the Rural Electricity Users Cooperative Society (REUCS) of the Rural Electrification Agency and federal or state government ministries, departments, and agencies (MDAs) on gender and social inclusion.

14. ACE TAF (2020) Nigeria Stand-alone Solar Investment Map

In conclusion…

The Government of Nigeria has recognised the important contribution SAS can make to electrifying the Nigerian population – to improving livelihoods, empowering the vulnerable, and providing an essential service to its people. Quality SAS products are an excellent complement to the national grid. Homes and businesses can choose the size and configuration that works best for them – from a simple light to a large system with various appliances – and upgrade as their needs grow. Solar is cost-competitive to the grid, diesel generators and kerosene lanterns over its life cycle – and less polluting. The government now needs to build on the current momentum and continue to develop a conducive enabling environment to ensure the effective private delivery of quality SAS products in order to reach Nigeria's universal access targets.

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