

Country briefing



Accelerating access to electricity in Africa with off-grid solar

Off-grid solar country briefing: Nigeria

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The analysis and conclusions in this briefing, and other reports from study, are those of the authors and do not necessarily reflect the views of their organisations, ODI, GOGLA, Practical Action and SolarAid, nor those of DFID.

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Background

Nigeria is Africa's largest economy and the continent's most populous nation with over 170 million people. Approximately 70 million Nigerians living in rural areas are without electricity.¹ According to the Federal Government, over 60% of Nigeria's entire population lacks access to electricity.² Furthermore, the power sector in Nigeria is often cited as the key constraint to economic development. Assessing the ease of accessing electricity, the World Bank ranked Nigeria 187 of 189 countries in the 2015 edition of its Ease of Doing Business report.³ There is therefore a huge unmet demand for electricity in Nigeria, and off-grid solar PV has significant potential in meeting this demand.

Despite the economy having seen growth rates of more than 7% per annum, the number of people below the poverty line has increased over the past decade. In 2010 it was estimated that 62% of Nigeria's population, over 100 million people, live on less than \$ 1.25 a day.⁴ The purchasing power of rural households is therefore very low, and affordability will be key for the proliferation of solar products.

Of all renewable energy resources, solar PV offers by far the best fit with energy requirements in Nigeria, primarily due to the excellent solar resources in the country. Global horizontal irradiation "ranges from an average of 3.5 kWh per m² per day in southern states (still higher than countries such as Germany) to as high as 7.0 kWh per m² per day in northern states which is on par with the best regions in Africa and the Middle East. Assessed on the basis of lifetime costs, off-grid power supply using PV is cheaper than supply from diesel generators. In northern Nigeria, diesel and petrol generators supply electricity at Naira (N) 40-70 per kWh⁵. PV systems could supply electricity for

N35-53 per kWh once financing and market barriers are addressed."⁶

The Nigerian Government remains committed to increasing energy production from renewable energy sources, and solar power is envisaged to play a key role in their national power strategy. Nigeria plans to increase renewable electricity supply from 13% of total electricity generation in 2015 to 23% in 2025 and 36% by 2030. Renewable electricity will account for 10% of Nigeria's total energy consumption by 2025 according to these plans, and solar is envisaged to play a key part in the electricity mix.⁷

Despite the Government's support for solar power and its citizen's need for rural electrification, the Solar PV market in Nigeria is still negligible.

Policy environment

The policy environment in Nigeria has become increasingly supportive of private sector supplied solar PV systems as a solution to the task of rural electrification. DFID found that "The Federal Ministry of Power is strongly supportive of increasing solar use"⁸ and that it has the "reform of the country's electricity grid and the privatisation of generation and distribution at its heart, but also prioritises balancing future grid expansion with off-grid solutions and the introduction of renewables into the fuel mix."⁹ Indeed, the Federal Government is planning for solar power to "outstrip all sources of electricity generation other than gas and thus become the second key pillar of energy delivery in the nation"¹⁰ over the next few decades.

The Government has drafted the Rural Electrification Strategy and Plan (RESP). However, as of mid-2015 it still remains a draft and has not yet been enacted by government.¹¹ The law sets out Nigeria's strategy for rural electrification:

¹ GIZ, *The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification*, 2015. p.118. The IEA's *Africa Energy Outlook* (2014) estimated 93 million without access to electricity in 2012.

² <http://www.thisdaylive.com/articles/60-nigerians-lacks-access-to-electricity-says-nebo/181116/>. The IEA's estimate for 2012 is 45%, and the SE4All *Global Tracking Framework* estimate is 56%, also for 2012.

³ GIZ, *The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification*, 2015.

⁴ World Bank DataBank

⁵ Depending on cost of diesel, diesel generator efficiency, etc.

⁶ DFID, *SolarNigeria Business Case* pp.3-4.

⁷ GIZ, *The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification*, 2015. p.76

⁸ DFID, *SolarNigeria Business Case*

⁹ DFID, *SolarNigeria Business Case*

¹⁰ GIZ, *The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification*, 2015. p.35

¹¹ GIZ, *The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification*, 2015. p.125

“The FGN [Federal Government of Nigeria] will promote a centrally coordinated but demand-driven approach, that is, market-oriented approach to rural electrification. While the REA [Rural Electrification Agency] will still provide overall coordination of rural electrification activities centrally, the development of projects themselves will come from the communities, operators and promoters that identify a particular need.”¹²

This shows a commitment from the Government to enable the private sector to develop rural off-grid solar systems in Nigeria.¹³

In spite of this general policy statement, there has been little in the way of specific policy support for private sector renewables such as clear MW targets to attract private investors, tenders, net metering or financial policy incentives for the solar sector.

Access to finance for the private sector

Nigerian SMEs and households suffer from chronic underinvestment due to the lack of access to finance. Only 2% of Nigeria’s adult population have received loans from a financial institution in the past year and only 14% of SMEs have access to a loan or overdraft account, according to the World Bank.¹⁴ A 2009 survey concluded that 64 million, or 74% of Nigerian adults, have never had a bank account.¹⁵ Especially challenging for rural households wishing to invest in solar PV is the fact that the same study found that 86% of rural adults are unbanked.¹⁶

Not only is the lack of finance a major obstacle to Nigerian solar companies and rural households, the cost of loans is very high. As of September 2015, the Central Bank’s interest rate was held at 13% meaning that when Nigerians do get access to finance, it comes at an immense cost, usually in the region of 22-28% for commercial entities and individuals.

¹² As cited in GIZ, The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification, 2015. p.126

¹³ GIZ, The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification, 2015. p.34

¹⁴ [http://www.economistinsights.com/sites/default/files/LON%20-%20AG%20-Nigeria%20report%20WEB%20\(4\).pdf](http://www.economistinsights.com/sites/default/files/LON%20-%20AG%20-Nigeria%20report%20WEB%20(4).pdf)

¹⁵ http://www.ruralfinanceandinvestment.org/sites/default/files/Access_to_Finance_pdf.pdf

¹⁶ http://www.ruralfinanceandinvestment.org/sites/default/files/Access_to_Finance_pdf.pdf

As the solar sector is in its nascent stage, there is high uncertainty within domestic finance institutions of the risks involved, and they have generally been unwilling to lend money. This financing problem has been highlighted as one of the biggest barriers for the growth of solar providers. The DFID-funded SolarNigeria programme is working to assist sustainable development of solar PV systems in social institutions in Northern Nigeria and Lagos. The programme is promoting the supply of household systems and commercial systems by the private sector and increasing access to finance for those private sector entities and individuals involved in the sale and purchase of solar systems. One of its main strategies for unlocking finance is to deploy a £5.7 million credit risk sharing facility, to be developed with the IFC, to attract financial institutions to lend to the solar private sector market at attractive interest rates. This is expected to unlock financing of over £40 million for the solar sector, and will over time reduce the perception of solar power as being a high-risk sector, thus overcoming a key barrier to solar market growth.

Import of solar household related equipment and fiscal barriers

Solar panels have recently been given a 0% import duty. However, when the PV to be imported into the country forms a part of the complete solar device including battery storage it attracts a minimum of 21% import duty.¹⁷ Lighting Africa has reported that for very small solar lanterns and charging systems the import taxes can reach up to 30%. This disproportionately impacts lower income solar consumers and hinders PV system affordability for rural SMEs and households.

Consumer protection and quality assurance

There are significant hurdles to the importation of solar products into Nigeria. Solar companies importing products must work with the Standards Organisation of Nigeria (SON). The process for quality assuring imported products is arduous. It includes applying for certification from the SON for each shipment, and a physical inspection and sampling.¹⁸ This causes delays and increased costs

¹⁷ IFC Lighting Africa have reported this to be as high as 35%

¹⁸ http://www.hannover.ihk.de/fileadmin/data/Dokumente/Themen/International/130301_Nigeria_Exporter_and_Importer_Guidelines_en.pdf

for solar providers. Furthermore, the SON does not recognise international solar standards (i.e. IEC/ISO) and carries out its own individual investigation of solar products before permitting importation.

Consumer Awareness

There is a considerable obstacle in Nigeria in terms of the low level of awareness of solar power and the existing reputation of solar technology. Some estimate that as much as 40% of Nigeria's population is unaware of solar power.¹⁹ There is therefore a considerable challenge in driving demand for solar power among rural SMEs or households.

On top of this, evidence shows that solar power has acquired a poor reputation for reliability and performance. Past efforts by the Nigerian government and donors that have applied a 'supply and install' model has led to inadequate maintenance and the rapid collapse of installed solar systems.²⁰ "This has resulted in higher failure rates, in turn reinforcing the view amongst consumers and lenders that PV is unsuitable for the Nigerian market."²¹

Providing a Level Playing Field

Through state subsidisation, Nigeria maintains the cheapest gasoline prices in the West African region, almost 50% less than the regional average.²² In Nigeria, gasoline and kerosene subsidies are universal. They are not targeted at the most vulnerable groups. Subsidies of these fossil fuels are an integral part of Nigerian society and "most Nigerians consider fuel subsidies to be the country's primary welfare mechanism."²³ In 2011, the cash-strapped Nigerian Government spent \$ 13 billion on gasoline import subsidies alone.²⁴

The Federal Government has provided economic incentives such as tariffs waivers and subsidies to

encourage energy investments through conventional fossil sources. High subsidies for fossil fuels have encouraged "energy generation from conventional energy sources leading to a fall in their prices and thereby creating an unfair competitive environment for solar energy exploitation."²⁵ This has in turn led to a slow in the growth of demand for solar products among Nigerians.²⁶ These incentives are not open to renewable resources projects. Making them so would create a level playing ground between fossil fuel and renewable energy sources meaning that the risk-return profile of renewable energy compared to conventional energy could be improved.²⁷ Subsidies thus remain a disincentive for Nigerians to choose solar PV over diesel generators.

Availability of Consumer Financing

As traditional sources of finance are largely inaccessible for most Nigerians, a key alternative for ensuring access to credit could be the use of mobile money. However, due to regulatory barriers, less than 0.1% of Nigerian adults have access to the mobile money market in Nigeria.²⁸ In 2013 Nigeria's Central Bank banned mobile operators from participating in the mobile money market and gave this responsibility to the country's banks. This is despite a growing amount of evidence showing "that mobile network operators (MNOs) have proven themselves the [most capable entities of launching and scaling mobile money services](#) and to lead the [partnership with banks](#)."²⁹

Furthermore, access to mobile money is hindered by poor infrastructure. In terms of mobile coverage "the country is well provisioned in urban areas but there remains a lack of infrastructure in many rural regions. This is understandable given the combination of challenging terrain and vast distances, a lack of electricity and road access, and

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http://www.researchgate.net/publication/267709075_Designing_a_Photovoltaic_Sustained_Power_Sector_A_review_of_current_practice

²⁰ DFID, SolarNigeria Business Case p.4

²¹ DFID, SolarNigeria Business Case p.4

²² https://www.iisd.org/gsi/sites/default/files/ffs_nigeria_czguide.pdf p.10

²³ https://www.iisd.org/gsi/sites/default/files/ffs_nigeria_czguide.pdf p.26

²⁴ <http://www.greengrowthknowledge.org/blog/fuel-subsidies-nigeria-there-are-better-ways-help-poor-and-economy-and-environment>

²⁵ Solar energy applications and development in Nigeria: Drivers and barriers p.299

²⁶ Solar energy applications and development in Nigeria: Drivers and barriers p.299

²⁷ Solar energy applications and development in Nigeria: Drivers and barriers p.300

²⁸ <http://www.grameenfoundation.org/sites/grameenfoundation.org/files/resources/Nigeria%20Landscape%20Report%20FINAL%20Dec%2013%202014.pdf>

²⁹ <http://www.gsma.com/mobilefordevelopment/what-could-we-learn-from-nigeria-barring-mnos-from-participating-in-the-mobile-money-market>

persistent security threats.”³⁰ This further hinders the possibility for rural households or SMEs to access simpler mobile financing in Nigeria.

Level of Local Skills

Nigeria has a large unskilled workforce. A 2007 study found that nearly 4 in 10 Nigerians were unskilled labourers.³¹ The relatively low access to a skilled workforce to draw upon is compounded by the low experience of solar power systems in the past. According to certain estimates, the current installed capacity of solar power dispersed around Nigeria comes to 28 MW.³² With little demand for solar, there are very few experienced solar technicians who are capable of installing and maintaining systems. Even in Nigeria’s economic powerhouse, Lagos, there has been a low supply of skilled solar technicians. The absence of large solar providers and international solar players in the Nigerian market has meant there has been limited private sector demand for hiring local work force and providing them with the necessary training. It is for this reason that the Lagos Electricity Board has been working with SolarNigeria on establishing training of solar experts. In 2014 the Board established the Lagos Energy Academy to support the training of students in solar power installation and maintenance,³³ and it is these graduates who will be crucial in developing and maintaining the solar power systems in the state. However, creating a private sector solar market remains the most efficient way of training up local skills in the country. Profitable International players are often able to provide the necessary training for local staff at a cheaper cost than state counterparts. Once the private market grows, universities should respond to private sector demand by providing training courses.

Summary and Recommendations

There are several legislative, fiscal and information barriers to scaling up solar systems for SMEs and rural households in Nigeria. However, there is strong demand for off-grid systems, there are high

levels of solar radiation and a strong Government desire to unlock solar power. These opportunities will be key in overcoming the main obstacles to the proliferation of solar PV systems for SMEs and rural households in Nigeria.

³⁰ <https://gsmaintelligence.com/research/?file=140626-nigeria.pdf&download>

³¹ <http://www.nationsencyclopedia.com/WorldStats/ESI-unskilled-workers.html>

³² GIZ, The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification, 2015. p.81

³³ <http://www.lea.gov.ng/>

Area	Situation	Opportunities
Policy Framework	Government is committed to increasing solar power generation, both on and off grid. It is dedicated to ensuring a private sector solution to fulfil this ambition.	Possibility to leverage this political buy-in to improve regulatory, fiscal and infrastructure barriers to off grid power generation. E.g. net –metering at wholesale electricity tariff has the potential to vastly increase the commercial solar sector, displace a large amount of diesel generation and create grid power at a low cost to the energy and distribution sector.
Access to Finance	High interest and very low level of access to banks among population, especially for SMEs and consumers in rural areas. Solar sector seen as high-risk.	Promoting lending into the private sector both to ease working capital constraints and encourage consumers into the market is necessary to create a solar market in Nigeria. Innovative financial products such as credit risk sharing and a creation of good project pipelines through demonstrative private sector projects will push national financial institutions to lend to this sector. MFIs also need to be educated and encouraged to lend to potential solar consumers.
Fiscal Barriers	High cost tariffs for import of solar systems. Higher cost solar products reduces their competitiveness and attractiveness to customers, especially lower income customers.	Lower - or remove completely - import tariffs on solar PV systems (not just panels), especially the small systems market which are aimed at energy access and the poor rural consumer.
Consumer Protection and Quality Assurance	Non-existent consumer protection or quality assurance for solar products. This may already have caused poor reputation and market spoilage.	Implement effective quality assurance schemes and streamline existing processes especially by encouraging acceptance of international solar product standards by the Standards Organisation of Nigeria.
Level Playing Field	Very high subsidies on kerosene and petrol. This is seen as welfare measure and is highly supported by Nigerians.	Lower subsidies over time to create a level competitive playing field for solar products and move dependence onto renewable energy sources while reducing subsidy costs for government. Reallocate funds to promote solar market development.
Consumer	Low levels of awareness of solar power,	Insisting on international standards and

Awareness	up to 40% of population never heard of solar. Poor existing reputation due to previous failed solar programmes.	the involvement of the private sector in long term operations for demonstration will improve the reputation of solar power. Attracting international players and a greater emphasis on demonstration projects in the private market will also improve solar power's reputation.
Consumer Financing	Very low access to finance for SMEs and rural population. Only 0.1% of Nigerians have access to mobile financing.	Remove main barrier for proliferation of mobile money by allowing mobile service providers to deliver mobile finance. Invest in telecoms infrastructure in rural areas.
Level of Local Skills	Skilled solar technicians are rare due to low national experience in solar PV systems.	Encourage international players to enter the Nigerian market. These will provide training to local staff. Universities and state governments should respond to private sector demand by providing training courses.



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