Foreword

Nigeria is a country blessed with enough natural resources to be energy independent. However, a lack of investment in energy infrastructure over a long period of time has brought the sector to a comatose state. Several attempts to revive the sector have not yielded significant change in the quantum and availability of power delivered to the Nigerian citizen and energy access across the country.

The Federal Government was the sole investor in the power sector after the end of colonial role in the 1960s and made significant infrastructural investments especially during the mid-1970s to the early 1980s but by the 1990s this had dried up and the sector was allowed to fall into decay. The return of democratic rule in 1999 brought a renewed hope for and this saw efforts to break up the state owned National Electric Power Authority’s (NEPA) monopoly with the formation of the Power Holding Company of Nigeria (PHCN) in 2005 as the holding company for the 18 successor companies created (11 Distribution and 7 Generation Companies). Then in 2008, the Federal Government made another significant step to improve power generation in the country with the $5 billion Nigeria Integrated Power Project (NIPP), which saw investment in infrastructure projects (Generation, Transmission, Distribution and Gas Transportation) and the creation of the Niger Delta Power Holding Company (NDPHC) to manage these assets.

The successful privatization exercise of 2013 transferred the majority of the PHCN successor companies to private hands but this has not been without challenges. In November 2016, the Regulator informed that the revenue shortfall in the Electricity Supply Industry is projected to hit ₦3 trillion by the end of 2016 as a result of non-payment for services received across the value chain.

But things are not all doom and gloom. The Government is making significant investment to increase the transmission capacity to 7,500 MW by 2017 and 8,200 MW by 2018 as part of its 5 year expansion plan, which aims to increase the transmission capacity to 11,500 MW. It plans to invest $4.1 billion by 2019 and raise about $3.4 billion from DFIs and via loans and subsidies. Also, 14 companies signed PPAs with the bulk trader in July 2016 and they are willing to invest $2 to $2.5 billion to build Solar IPPs (combined installed capacity of 1,125 MW) across the country.

On the policy side, the Government approved the National Renewable Energy and Energy Efficiency Policy in 2015 and the Rural Electrification Strategy and Implementation Plan in 2016. Public consultation on the mini-grid policy will be concluded soon. The Government is investing and strengthening the policy environment for the sector, and all of this point to the greenshoots of a more structured market. Herein lies the opportunity for the investing community.

Across the market segments, investors have the opportunity to make attractive returns in Nigeria, which boasts the largest population in Africa, the second largest economy in Africa and one of the lowest electrification rates per capita in the world. The heavy reliance on self-generation, both in rural and urban areas where people continue to pay exorbitant sums of money to run diesel and petrol generators, is unsustainable. Distributed, decentralized renewable energy, for instance, can offer immediate, clean energy solutions at competitive rates to replace fuel generators.

Nigeria needs energy; lots of it and quickly, if it is to realize its economic potential. The Solar Future Nigeria conference could not have come at a better time, when the country and industry players are actively charting a way forward. It is my hope that this whitepaper will enlighten investors about our beautiful country’s landscape and encourage them to make the decision to invest in our energy market to bridge the supply shortfall.
Why Nigeria?

Over the span of half a decade Nigeria has risen to the forefront of renewable energy investment in the developing world. Developers and investors alike are flocking to the sunny African nation with the hopes of becoming one of the early pioneers in a solar energy market that is projected to expand tenfold over the next ten years.

The mood among stakeholders is unanimously positive. The Nigerian government stands as a role model for its serious and progressive attitude towards the rising threat of climate change. Undoubtedly, a big reason for this is the fact that Nigeria is already suffering the early effects of climate change: it has suffered ever intensifying streaks of extreme weather and scorching droughts. This has disillusioned both the people and the government, and currently climate change is among Nigeria’s three most serious concerns.

Despite being faced with political unrest, domestic currency inflation and low oil prices, the Nigerian government has enacted new regulations, frameworks and reforms to encourage renewable energy at an unprecedented pace.

The purpose of this report is to provide an overview of the key facts and figures related to Nigeria’s political situation, power sector and solar market developments. It serves as a prelude to The Solar Future Nigeria conference Solarplaza will be organizing 25-26 April 2017 in Lagos.

The Solar Future Nigeria will be a unique international platform and 2-day conference focusing on unlocking capital for new solar project development in the country. This event will connect solar project development and finance & investment in both on-grid and distributed generation solar energy sectors, addressing key issues and opportunities in the development of the Nigerian market.

The Solar Future Nigeria, Solarplaza’s 8th event on the continent, will bring together hundreds of representatives from development banks, investment funds, solar developers, IPPs, EPCs & other solar stakeholders.

Key characteristics
• 200+ senior executives, finance and project development
• Unprecedented depth and focus through dedicated sessions for on-grid solar and distributed solar solutions focusing on financing and development
• Guaranteed matchmaking through our customized software and interactive networking breaks
• Taking place in Lagos, Nigeria’s commercial and financial hub

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Political Overview

Nigeria has been plagued by political turmoil ever since it gained independence in 1960. The transition to democracy has not been smooth, and although today Nigeria has made significant progress in combating corruption and achieving governmental transparency, the current political climate remains fragile. The country has been the victim of sectarian violence for almost fifteen years in the face of Boko Haram, an extremist Islamic group that has terrorized Nigeria and other countries in the Lake Chad Basin. Separatism is also a growing domestic concern for Nigeria, whose northern provinces have seen a reestablishment of Islamic law.

2015 was a pivotal year for the political landscape of Nigeria. It saw the unprecedented victory of Muhammadu Buhari, who became the first ever opposition candidate to secure the Nigerian presidency by a wide margin of over 2 million votes. Buhari had previously served as head of state after successfully staging a military coup d'état in 1983. Despite his history, Buhari has declared his faith in democracy, and to that end he made significant efforts to improve the country, both through domestic and foreign policy.

Buhari scored a major international victory in June 2015 when the Government negotiated for Nigeria to take command of the joint force with neighboring countries that is currently fighting the growing threat of Boko Haram. Meanwhile he has reduced the size of his cabinet and has vowed to increase government transparency.

Although he has yet to successfully enact some of the promises of his campaign, like alleviating human rights concerns over accidents during the previous administration, over the past year Buhari has made significant progress towards stabilizing the country. During the summer of 2016 Boko Haram split and suffered major losses in the north-eastern part of Nigeria. The jihadist threat appears to be subsiding, but the Nigerian government does not have an easy road ahead. Militants have risen across the oil-rich Niger delta after Buhari centralized government control over the state oil company and purged several high-level oil kingpins that had previous operated unchecked.

All the various security threats that have arisen are a manifestation of a single problem: Nigeria is a divided country, both ethnically and religiously. Over 250 different ethnicities speaking more than 500 languages are split between the predominantly Muslim north and the mostly Christian south. The widespread poverty and severe population growth put further strain on Nigerian society.
Economic Overview

As Africa’s most populous nation, Nigeria is hailed as the continent’s economic powerhouse. Unlike most African nations, Nigeria has reached middle income status and now ranks at the world’s 20th largest economy.

Despite suffering from economic mismanagement during the early years of its independence, Nigeria has made immense progress over the past decade. Quantitatively, since 2000 Nigeria’s GDP at purchasing power parity has more than tripled and its GDP per capita has doubled. Economic reforms have created a boom in various industries, from telecommunications and banking to entertainment.

Although famous for its vast reserves of fossil fuels, the petroleum sector represents no more than 11% of the Nigerian economy. This explains why the government was able to deal with the dramatic crash in oil prices since 2014. Although Nigeria’s GDP contracted during 2015 due to the plunge in revenue from its most exported commodity, the country has fared significantly better than other petroleum exporters like Venezuela and Iraq.

Overall the economy of Nigeria is well diversified and has been estimated to be the fastest growing economy in the world and to remain in that position over the next three decades. Currently a third of Nigeria’s total population lives below the poverty line, but over the coming decades the World Bank expects them to emerge from poverty and become a leading driver for growth in the Nigerian economy.

The government of Nigeria is in large part responsible for the country’s economic resurgence. The economic reforms they’ve enacted over the past decades in particular have been a stabilizing force, especially for the strained agricultural sector, which has been incapable of matching Nigeria’s rapid
population growth.

Agriculture is one of the cornerstones of the new administration's development policies. In a report released earlier this year, the National Bureau of Statistics outlined President Buhari's three main areas of focus: agriculture, industry, and services. The government intends to develop critical infrastructure to transport natural gas, one of Nigeria's most plentiful natural resources, to power plants across the nation; it hopes that by increasing the country's power stock it can stimulate the growth of Nigeria's manufacturing sector, which is currently underperforming and is ranked third among African nations.

Based on the assumptions that the price of oil will not increase significantly over the coming years, the Central Bank of Nigeria has projected headline inflation between 2017 and 2019 to average 9 percent. Comparatively, over the same period trade is forecast to grow at 15.6% annually. In order to alleviate the risk from falling oil prices and inflation, the Central Bank floated Nigeria's currency by dropping its peg to the US dollar on June 20th.

**Energy Overview**

Nigeria currently produces around 13 GW of energy, the vast majority of which originates from fossil fuels. This is no surprise, considering the country's vast reserves of oil and natural gas.

In reality, however, Nigeria's actual capacity is estimated to be closer to 6.1 GW, as its grid suffers from outdated technology and poor maintenance. The nation's second-biggest energy source is hydropower, which takes advantage of Nigeria's plentiful river systems. The presence of biomass in the energy mix is perhaps the most surprising aspect of Nigeria's energy production, due to its mass usage in the poorest rural regions.

Figure 2: Total energy production and final energy consumption in Nigeria

![Energy Overview Diagram](image)
Only 45% of Nigeria’s population has access to grid-connected electricity. Consequently, one of the cornerstones of the government’s reform plan is electrifying Nigeria’s rural regions and improving existing infrastructure. Power outages and intermittent power supply remain a key challenge that stems from Nigeria’s weak radial transmission system. Renewable energy is a viable solution to this problem, especially when deployed in micro- and off-grid form. Solar energy is likely the most promising energy source, as irradiation levels average 5.5 - 6.7 kWh/m2/day with an average of six hours of sunshine per day.

Table 1: Electricity generation profile (GIZ)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ave. Gen. availability (MW)</th>
<th>Maximum peak generation (MW)</th>
<th>Maximum daily energy generated (MWh)</th>
<th>Total energy generated (MWh)</th>
<th>Total energy sent out (MWh)</th>
<th>Per Capita Energy Supply (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>3,781.3</td>
<td>3,599.6</td>
<td>77,322.3</td>
<td>22,519,330.5</td>
<td>21,546,192.2</td>
<td>155.3</td>
</tr>
<tr>
<td>2008</td>
<td>3,917.8</td>
<td>3,595.9</td>
<td>86,564.9</td>
<td>18,058,894.9</td>
<td>17,545,382.5</td>
<td>120.4</td>
</tr>
<tr>
<td>2009</td>
<td>4,401.8</td>
<td>3,710.0</td>
<td>82,652.3</td>
<td>18,904,588.9</td>
<td>18,342,034.7</td>
<td>122.0</td>
</tr>
<tr>
<td>2010</td>
<td>4,030.5</td>
<td>4,333.0</td>
<td>85,457.5</td>
<td>24,556,331.5</td>
<td>23,939,898.9</td>
<td>153.5</td>
</tr>
<tr>
<td>2011</td>
<td>4,435.8</td>
<td>4,089.3</td>
<td>90,315.3</td>
<td>27,521,772.5</td>
<td>26,766,992.0</td>
<td>165.8</td>
</tr>
<tr>
<td>2012</td>
<td>5,251.6</td>
<td>4,517.6</td>
<td>97,781.0</td>
<td>29,240,239.2</td>
<td>28,699,300.8</td>
<td>176.4</td>
</tr>
<tr>
<td>2013</td>
<td>5,150.6</td>
<td>4,458.2</td>
<td>98,619.0</td>
<td>29,537,539.4</td>
<td>28,937,199.8</td>
<td>181.4</td>
</tr>
<tr>
<td>2014</td>
<td>6,156.4</td>
<td>4,395.2</td>
<td>98,893.8</td>
<td>29,697,360.1</td>
<td>29,013,501.0</td>
<td>187.6</td>
</tr>
</tbody>
</table>
Table 2: Energy stakeholders / institutions in Nigeria

<table>
<thead>
<tr>
<th>Institution</th>
<th>Site</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niger Delta Power Holding Company (NDPHC)</td>
<td><a href="http://ndphc.net/">http://ndphc.net/</a></td>
<td>Responsible for implementing the National Integrated Power Project (NIPP). Owns all 10 power stations developed under this project, which represent the bulk of Nigeria’s energy generation.</td>
</tr>
<tr>
<td>Nigerian Bulk Electricity Trading (NBET)</td>
<td><a href="http://nbet.com.ng/">http://nbet.com.ng/</a></td>
<td>Responsible for the purchase of electricity (PPAs) and ancillary services (from both private and state-owned generation companies). It is not envisioned as the sole electricity buyer in Nigeria, but currently it is by far the largest.</td>
</tr>
<tr>
<td>Nigeria Electricity Regulatory Commission (NERC)</td>
<td><a href="http://www.nercng.org/">http://www.nercng.org/</a></td>
<td>Responsible for monitoring and regulation of the electricity industry, issuance of licences to market participants and ensuring compliance with market rules and operating guidelines.</td>
</tr>
<tr>
<td>Transmission Company of Nigeria (TCN)</td>
<td><a href="http://www.tcnorg.com/">http://www.tcnorg.com/</a></td>
<td>TCN licensed activities include: electricity transmission, system operation and electricity trading.</td>
</tr>
<tr>
<td>Operator of the Nigerian Electricity Market (ONEM)</td>
<td><a href="http://www.onemnigeria.org/">http://www.onemnigeria.org/</a></td>
<td>Responsible for maintaining the wholesale market of the Nigerian electric supply industry and settling arrangements. Also facilitates the meetings between generation, transmission and distribution companies.</td>
</tr>
<tr>
<td>Nigeria System Operator (NSO)</td>
<td><a href="http://www.nsong.org/">http://www.nsong.org/</a></td>
<td>Responsible for maintaining the operations and security of the Nigerian transmission grid.</td>
</tr>
</tbody>
</table>

Figure 4: Global Horizontal Irradiation (SOLARGIS)
Regulatory Situation

The Nigerian government has been actively pushing for the proliferation of renewable energy since 2006 through its Renewable Energy Master Plan (REMP). The policy was implemented to increase the share of renewables to account for 10% of Nigeria's total energy consumption by 2025. The plan includes an installed capacity target of 500 MW by 2025. Nigeria's power minister has mentioned that the ministry aims to boost the installed solar PV capacity to 1 GW over the next 10 years.

More recently, the Nigerian Electricity Regulatory Commission approved regulations regarding feed-in-tariffs for RE sourced electricity. Electricity distribution companies are now required by law to purchase 50% of the energy produced by RE projects with sizes between 1 and 30 MW.

Tariffs

Last year the Nigerian government opted to increase tariff rates in an effort to stimulate foreign investment and development. The country’s tariffs are determined under a Multi-year Tariff Order (MYTO), with the latest MYTO covering the period of 1 April 2015 to December 2018.

The biggest change in the new MYTO was the abolition of fixed costs for both residential and commercial consumers.

However, the aforementioned raise enraged many Nigerian citizens in light of the intermittent energy supply and the outdated infrastructure. Nevertheless, the move by the government is a very positive sign for investors, as it shows Nigeria's willingness to promote long-term growth in the face of public opposition.

Table 3: Electricity Tariffs in Nigeria

<table>
<thead>
<tr>
<th>Distribution Companies (DISCOs)</th>
<th>Price in NGN // USD (per kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yola</td>
</tr>
<tr>
<td>R2 (residential)</td>
<td>R2A: N23.25 // $0.0744</td>
</tr>
<tr>
<td></td>
<td>R2B: N24.75 // $0.0792</td>
</tr>
<tr>
<td>C2 (commercial)</td>
<td>N43.78 // $0.140096</td>
</tr>
</tbody>
</table>

More information on: nigeria.thesolarfuture.com
Currently there are no utility scale power plants in Nigeria, and the country’s 15 MW solar PV capacity comes entirely from micro- and off-grid solutions. Companies from across the world have flocked to fill this void, however, and they’ve pledged to develop projects collectively worth 5 GW.

There are also numerous small scale projects in the pipeline that are expected to go ahead later this year. For example the 0.4 MW solar PV installation at the Noodle Factory in Kaduna, aimed to lower the costs of the current diesel operation. Nigeria has already signed its first official round of solar PV power purchase agreements (PPAs) with 12 producers for a total of 975 MW.

### Current Solar Projects

Despite the lack of major on-grid projects, mini-grid and off-grid solutions are proliferating in Nigeria at an unprecedented rate. Currently the NERC is in the second phase of drafting their mini-grid regulation, which once signed into law would greatly augment the ability of distribution companies to meet the rising demand in rural areas. In addition, the rise of Mobile Money and Pay-as-you-go systems has attracted dozens of Solar Home System companies, which are eager to fill the demand gap left by Nigeria’s insufficient power grid at an attractive premium.
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Current Solar Projects

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