

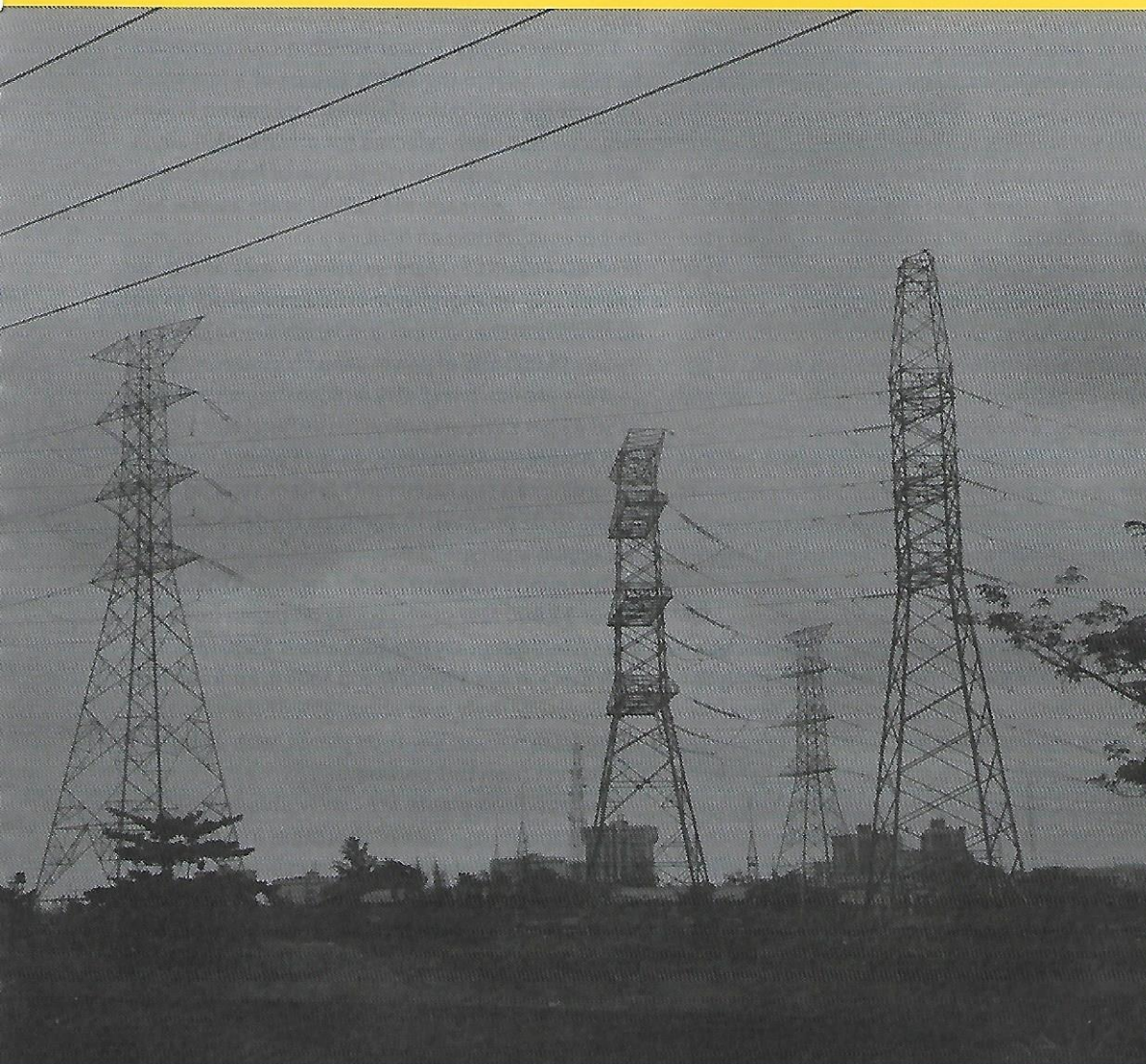
Utilities

Independent producers increase their contribution

Legislative support aiding off-grid power expansion

Risk-mitigation offers extra security for investors

Tariffs and distribution targeted for improvement





As of early 2018 the national grid had a combined 6870 MW of capacity

Powering up

International support and regulatory measures are helping develop the grid and expand electricity access

Gas-fired plants provide

85%

of the country's energy

Access to power remains one of Nigeria's chief economic and social issues: according to Babatunde Fashola, minister of power, works and housing, about 90m citizens lack access to electricity, while World Bank data estimates per capita usage is lower in just eight other countries. As the biggest domestic market in Africa, the country has great potential for manufacturing, but most investment in the sector tends to prioritise a steady and reliable supply of power. According to government calculations, shortfalls in power sector infrastructure resulted in a cumulative loss to GDP of \$470bn between 2000 and 2015. Though government efforts to address this issue, such as the 2013 transfer of most of the state's power sector assets to commercial entities in hopes of boosting efficiency and marshalling the capital needed to make improvements, have yet to offer a clear solution, optimism remains.

The 2017 Power Sector Recovery Programme (PSRP) is providing a series of reforms aimed at prioritising investment, restructuring the sector and re-evaluating problems related to payment and tariffs. Alongside this, the development of new sources of energy, progress of independent power producers (IPPs), local control of regional grid development and funding to upgrade and expand the existing network are generating opportunities going forward.

SECTOR ORGANISATION: Policy is set by the Ministry of Power, Works and Housing, with regulation from the Nigerian Electricity Regulatory Commission (NERC) and the Nigerian Electricity Management Services Authority, which was created in 2015 to oversee technical matters. Another important state body is Nigerian Bulk Electricity Trading (NBET), which was created to buy power from generators and sell it to distributors. The agency is seen as a temporary fix to help the sector transition from state ownership to a private, market-based system. The Niger Delta Power Holding Company is an additional sector body, which

owns and operates ten power plants, the majority of which are not producing and lack gas supply. "Gas as a feedstock in Nigeria is still a big untapped opportunity," Yinka Olugbode, managing director and CEO of engineering firm TABA Nigeria, told OBG. "The country cannot build gas pipelines fast enough to meet the demands of the power sector and consumers. Liquefied natural gas receiving facilities trucking gas to power plants could be a good solution."

The Niger Delta Power Holding Company's 10 facilities – built in the 2000s as part of a fast-track programme called the National Integrated Power Project – had been selected for privatisation along with potential buyers by the Bureau of Private Enterprise, which oversees the sale of state assets, but that process is now on hold.

MACRO FIGURES: Many existing homes and businesses rely on diesel-powered generators as an alternative to the national grid, which supply approximately 14,000 MW of power annually. However, these sources are much less efficient, costing an average of \$0.45 per KWh, according to the Rural Electrification Authority. Meanwhile, on-grid power is priced according to a regulated tariff system, ranging from about \$0.01 per KWh to about \$0.10, depending on the region and type of user.

The country currently has the capacity to generate about 12,000 MW of electricity on paper; however, the system generally provides about 4000 MW. The daily average was 3985 MW and 3805 in April and May 2018, respectively, and about 85% of that capacity came from natural gas-fired plants, with almost all of the rest from hydropower.

The gas-fired plants are rarely able to operate at full capacity because of shortages in supply as a result of attacks and sabotage by militant groups as well as the general reluctance of suppliers to sell the feedstock to the power facilities. This is in part due to past failures of the sector to make payments, along

While in the past the shortage of generation capacity and the inefficiency of the national grid were key focus areas, power distribution has emerged as a new priority for development.

with the government setting tariffs at a rate too low for potential investors to justify capital expenditure.

There are additional constraints further downstream. As of 2018, for example, power distribution has emerged as a key area of focus, whereas in previous years the shortage of generation capacity or the inefficiency of the national grid were tabbed as the bigger issues. In early 2018 the grid had a combined capacity of 6870 MW, an increase from 5500 MW seen at the beginning of 2017. However, the 11 regional distribution companies that were privatised in 2013 only have the aggregate capacity to deliver about 5000 MW of power over their local lines. Further boosting capacity will require investment in new lines and also in organisational structure and policy.

Distribution firms are also hindered by missed payments from customers and an inability to secure financing for improvements to their systems, such as the installations of pre-paid meters to streamline the collections process. The collections rate fell from 51% in 2015 to 57% in 2016, but cash retained by the companies swung from a loss to a gain over the same period, which the government sees as an indication of dysfunction at the companies in the system. Collection losses reverberate through the supply chain, which reached an estimated combined figure for 2015 and 2016 of N931bn (\$3bn).

NEW ROADMAP: Abuja's updated plan to address the problem, the PSRP, acknowledges the government's role in this lack of success, including a legacy of underinvestment in the power segment and a failure to boost regulated tariffs to cost-reflective levels. It estimates that in addition to higher tariffs, the sector needs investment of \$1.5bn annually over the five years leading up to 2021 to reach viability. The PSRP mandates a mix of governance reforms and financial injections into the system, including N701bn (\$2.3m) from the Central Bank of Nigeria (CBN) to clear up the existing debt in the system, and \$2.5bn in support from the World Bank, an amount that will be disbursed once the government executes 18 of the reforms outlined in the plan.

The PSRP replaces the 2010 Roadmap for Power Sector Reform as the government's main articulation of its policy and execution strategy for the sector. Both documents are based on the 2005 Electric Power Sector Reform Act, which outlined an approach in which the state would develop the sector by retaining control over pricing and the transmission grid, but ceding ownership and control of generation and distribution to private investors, who would invest in new capacity. Commercial interest in the national system and grid has fallen since the move failed to create the expected new investments and subsequent increase in power supply. However, this has boosted the appeal of investment in off-grid power solutions, which include options ranging from home solar kits to captive and embedded power arrangements in which a producer sells to a small local group of customers without relying on



Access to electricity remains a top economic and social issue, with as many as 90m people without power

the national grid for transmission. Sector regulators have responded by loosening legal restrictions to allow more room for off-grid options and granting local government the ability take on a larger role in overseeing their own power sectors, such as by making clear to the Lagos State Government that it would not object to the creation of locally owned power sector bodies, institutions and investment plans. Smaller installations may lack the scale needed to solve the country's power problem, but could certainly help shrink it while addressing immediate regional needs (see analysis).

GENERATION: Nigeria has 28 power plants feeding its national grid, with an actual output that is usually about 30% to 40% of the country's installed capacity. The plants are a mix of publicly and privately owned facilities. Gas-fired plant supply jumped 30% in late 2016 and early 2017, after vice-president Oluyemi Osinbajo visited the Niger Delta region in January 2017 to negotiate with local stakeholders, study problems and promise future development in the area. In the first six months of 2016 alone there were 1477 incidents of pipeline vandalism in the delta, however, the region has been relatively peaceful since the vice-president's visit, allowing more fuel to pass through the network to the power plants.

The newest on-grid plant is the Azura-Edo IPP, a 459-MW facility that began generating power in late 2017 and as of October 2018 was contributing 6-10% to total power. While Nigeria has an array of IPPs, they are mostly off-grid producers catering to small customer groups or built by firms for individual use. The Azura project stands out as an IPP that provides power to the national grid and is considered a model investment structure that could be copied. Azura was built by local entrepreneurs using mostly foreign finance, including commercial loans and development funding. The deal included multiple risk-mitigation instruments, notably a guarantee from the World

Beginning operations in early 2017, Nigeria's first independent power supplier was contributing roughly 6-10% of the national grid's power as of October 2018.

28

power plants supply the national grid



On-grid power is priced between \$0.01 and \$0.10 per KWh depending on the region and type of consumer

In July 2018 the World Bank approved a

\$150m

partial-risk guarantee for the Qua Iboe Power Plant

Bank, which will pay the company if the NBET fails to do so, as well as a put/call option that gives its owners the right to sell the plant to the state at a price determined by international arbitration.

Some of these financial tools shift part of the risk from investors to the government and were once expected to be deployed across the electricity market, including the 17 entities that purchased state assets in the round of privatisation in 2013, but some feel this has not occurred justly. In March 2018 the generation companies in control of privatised assets sued the federal government as well as Azura, alleging that their lack of access to these risk reducing instruments amounted to unfair treatment. The lawsuit aims to ensure that Azura will not receive any of the N701bn (\$2.3bn) from the CBN to help NBET pay generators for the power it distributes.

SECURING PROGRESS: Foreign development entities, such as the World Bank and US agencies participating in the Power Africa programme, remain keen to help provide security for foreign investment in Nigeria using these types of financial instruments. An example of this occurred in July 2018 when the World Bank approved a \$150m partial-risk guarantee to help secure the creation of the country's second plant operating under the Azura model in Akwa Ibom State. The Qua Iboe Power Plant (QIPP) is being developed by Black Rhino, a joint venture of the US-based investment company Blackstone Capital and Sanusi Lamido Sanusi, the former governor of the Central Bank of Nigeria and current emir of the state of Kano. QIPP is a 540-MW gas-fired plant that was originally planned by Exxon Mobil's local subsidiary, Mobil Producing Nigeria. Black Rhino has secured a gas sales agreement from Mobil Producing Nigeria, as well as a power purchase agreement from the NBET and a put-call option agreement with the NBET and federal government. Black Rhino is developing the project with Dangote Group and expects financial close for

the \$1.1bn deal in the second half of 2018, though no new updates had been reported as of October 2018.

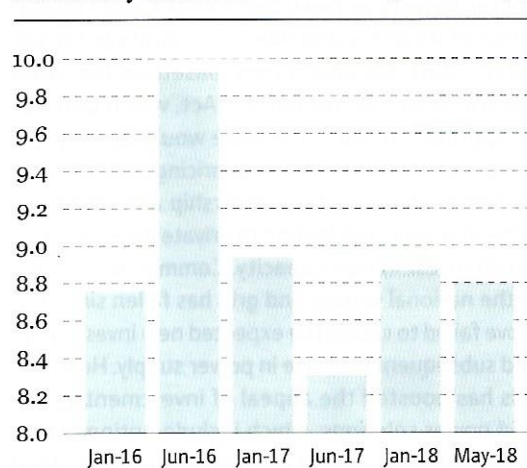
Developers in the IPP segment have thus far built more plants off grid, and at a much smaller scale, where the perceived risk is lower. These projects are considered more secure because they are not subject to the problems of the national system, such as issues related to transmission and payment collections downstream and the possibility of an unsteady supply upstream. Banks are also generally more likely to finance off-grid rather than on-grid activity, as many of the successful bidders in the 2013 privatisation have struggled to pay back loans.

TRANSMISSION: The Lagos State government is one of the main builders in this market segment, having constructed five IPPs with a total capacity of 48.5 MW. The state generally consumes about a quarter of the power produced in Nigeria and is home to the largest single power plant, the 1320-MW Egbin Power Plant. Given the transmission losses due to technical issues, many question the logic of having the biggest producing facility send its electricity to the grid, where the system mandates it travel to a substation in central Nigeria before being sent back for use.

Although transmission capacity has increased, losses on the grid remain a factor. According to the NERC, while the target for transmission losses is 8.05%, it was met in just six months of the 2016-17 period. This has led Lagos to look for ways to insulate itself from the struggles of the national system. In August 2017 the NERC endorsed a \$5bn state plan to generate 3000 MW in the state over the next three to six years through accelerated development of key plants across the region, creating a local electricity sector that can guarantee a steady supply of power.

The country's grid, operated by the government-owned Transmission Company of Nigeria, has 6870 MW of capacity, which is sufficient to handle all the power the distributors can take. Significant progress in this area has been made in recent years due to a collaborative effort by the Ministry of Power Works and Housing and the National Ports Authority

Electricity transmission losses*, 2016-18 (%)



Source: NERC

*target=8.05

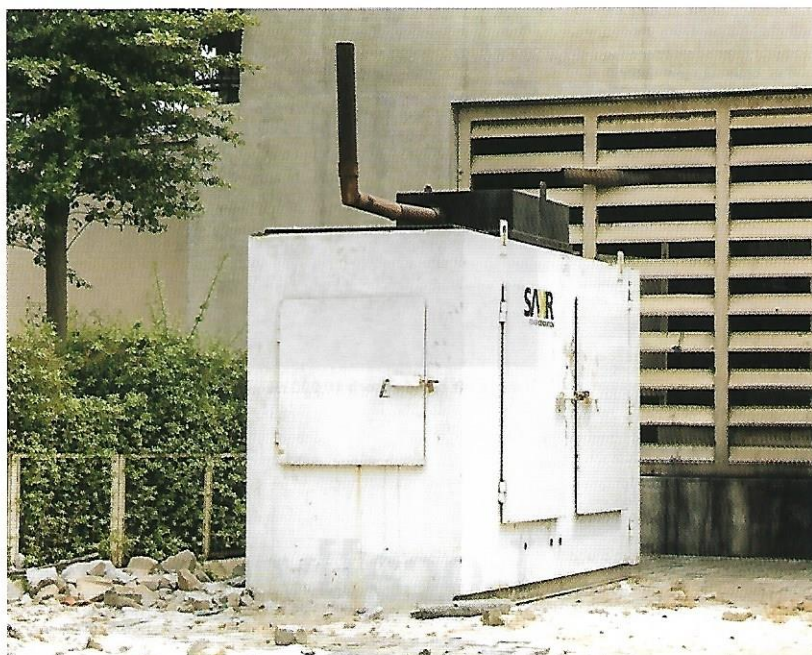
to recover shipping containers full of unused transmission lines and other grid equipment that had piled up in ports over the past decade. Fashola said in May 2018 that over the previous two years 502 containers had been received of a total of 805, which previous administrations had failed to pay port charges and agent fees. In February 2018 \$486m in development credit from the World Bank was approved to help fund another 90 transmission projects, which aim to improve lines and expand the network, with completion set for the end of the year.

DISTRIBUTION: Consumer attitudes toward electricity are similar to those for fuels, as both are heavily subsidised and generally expected to remain so. Collection rates across the 11 distribution companies range from 37% of what was recoverable by the Jos Electricity Distribution Company in 2016 to 74% for the Eko Distribution Company, which covers the choice territory of Lagos' island districts, which contain its most-wealthy retail customers as well as its central business district. Overall, seven of the 11 companies failed to collect at least than 60% of what they were owed in 2016, according to the PSRP.

Distributors have long made up for these shortfalls using estimated billing, a process in which paying customers are overcharged. However, this leads to some customers carrying more than their own share of the burden. A more viable solution to the problem of non-paying customers is increased metering, although only 46% of connections have been fitted with meters. While pre-paid meters would allow distributors to collect beforehand, and protect consumers by allowing them to pay for only the power they use, distribution companies cannot collect enough revenue to pay for these improvements themselves, and access to other forms of finance is limited due to past failures to pay back the loans that funded the round of privatisation in 2013.

In June 2018 it was reported that legislation under consideration by the National Assembly to make estimated billing illegal was meeting resistance from Fashola, the NERC and the Association of Nigerian Electricity Distributors. Although some said the change is necessary to curb the unjust pricing practices of distributors, its opponents argued that it would lead firms to disconnect customers who do not have pre-paid meters, rather than attempting to bill them accurately. Fashola stated that metering issues should be addressed first and proposed shifting this responsibility from distributors to a new group of power sector licensees specifically specialising in metering. The NERC has already approved 22 companies to perform this function. However, this would mark a departure from the PSRP, which could reflect a lack of political will behind the framework.

While some elements of the plan have been executed, such as a restructuring of the Transmission Company of Nigeria and the staffing of the board of directors of agencies including the NERC, board memberships and other key positions had been left vacant for most of the current presidential regime.



Legislative restrictions have been loosened to allow for more off-grid power options, such as home solar kits

Another factor is the regulated tariff, which the government acknowledges is too low to cover costs or allow for a profit. Overall, for 2015 and 2016 the government estimated revenue shortfalls of N473bn (\$1.53m) as a result of collections failures and N458bn (\$1.48m) due to insufficiently priced tariffs, which are regulated through the NERC's multi-year tariff order. The PSRP addresses the need to make charges more reflective of value, but it states this may take up to five years to accomplish.

Given these difficulties, recent reforms and solutions under consideration typically involve a shrinkage of the role of distribution companies, which were once seen as monopolies within the boundaries that they operated in. Fortunately, it is now easier for large-scale users to access off-grid solutions or to buy grid power directly from generation companies, thanks to the NERC's eligible customer regulation. The legislation, approved in 2017, allows buyers who use at least 2 MWh over the course of one month to negotiate a bulk-supply deal with a generation company, bypassing the NBET and local distributors. Those able to negotiate include single users and groups, such as a housing estates. As of June 2018, however, this opportunity was yet to be taken advantage of by any eligible customers.

OUTLOOK: With the PRSP estimates that it will take until the early 2020s for tariffs to rise to the cost-reflective levels investors say they require before allocating more cash to the power network, conditions remain more favourable in the off-grid segment, where tariffs can in some cases be negotiated and where there is no exposure to legacy debts and technical struggles. The on-grid sector could see a boost in 2018 should the QIPP project reach financial close, and perhaps more proposals for such deals may emerge if Azura's plant completes its first year of production smoothly. This would also help to show that the country's gas industry is a reliable supplier.

The release of 502 shipping containers filled with unused power lines and equipment from the country's ports in 2016 and 2017 facilitated significant improvements to the national grid.



The market could absorb 10,000 new mini-grids in the next 10 years

Small solar power systems offer the opportunity to lower consumption costs in a country that spends \$14bn a year on diesel-fuelled power.

Locally generated

Off-line grids and smaller systems targeted to boost reliability

Although Nigeria's 2013 move to privatise the majority of its power sector assets has by many standards failed to create the level of returns hoped for, market participants still see the country's electrification as an investment opportunity. However, there has been a shift in focus from the national system to smaller, local projects. The 2017 Power Sector Recovery Programme (PSRP) is unique in comparison to past master plans, as it moves beyond issues related to the nationwide supply chain and includes policy prescriptions for off-grid production, expanding the role of the Rural Electrification Authority (REA). Renewables-based mini-grids, in-home solar kits and a plan to give the capital city and its environs a full-service value chain have all become new aims in Abuja's evolving priorities.

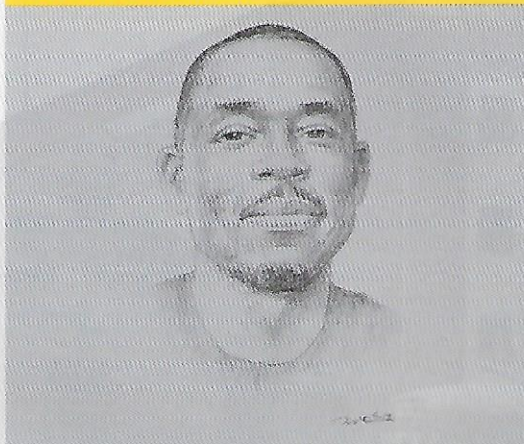
MINI-GRIDS: Defined as stand-alone generation-and-distribution systems with a capacity of up to 1 MW of generation capacity or 100 KW of distributed power, mini-grids allow investors the chance to avoid the Nigerian Electricity Regulatory Commission's licensing process in favour of a simpler registration. As of October 2018, there were about 10 mini-grid pilot projects, including one to power 12,000 shops in a market district in the northern city of Kano called Sabon Gari, which is being built by local firm Rensource. The development is backed by foreign philanthropic organisations, such as the Omidyar Network, and by Amaya Capital, the investment vehicle behind the Azura-Edo Independent Power Producer, the first of its kind to produce electricity for the national grid.

According to the REA, the market could absorb 10,000 new mini-grids in the next 10 years. Assuming a capacity of 100 KW each, this would only meet 30% of demand. Moreover, a medium-sized system, with about 200 KW of capacity is estimated to provide commercial returns within three years. The agency has been working with the World Bank as well as the US-based Rocky Mountain Institute, an energy-sector non-profit profit backed by Virgin Group's Richard Branson, to study and

develop the mini-grids market. Of the 10,000 potential sites identified, 100 have been prioritised as promising.

HOME KITS: Several companies, such as Lumos Global and Azuri Technologies, have begun selling small solar-power systems designed to provide a basic level of power to households that lack access to electricity. Such kits have become popular in Kenya, where they are typically purchased by individuals who have little credit, but are provided financing if they are able to supply the buying history of their mobile money transfer service M-Pesa. In Nigeria, mobile money platforms have yet to become popular on a large scale; however, Retailers in Nigeria, who are offering the kits for about \$200 each, are confident in consumers' ability to repay because they believe their systems lower the overall cost of energy for users, especially for cooking. The REA estimates that the country spends \$14bn a year on diesel-fuelled power, which costs about \$0.45 per KWh, far more than the renewable alternatives. Sellers also maintain control over the equipment and can turn it off remotely in case of non-payment.

LIGHT UP LAGOS: The government also plans to spend \$5bn on a state-sized energy network featuring 3000 MW of generation capacity. Lagos now consumes 27% of the country's total power, but hopes to create a system independent from the national grid in hopes of providing power at a rate steady enough to attract industrial investment. It may choose to import liquefied natural gas and invest in an offshore regasification unit, which would be significantly more expensive than using domestic gas delivered through pipelines, but also more reliable, given past problems with the pipeline network. The state also plans to work with the two existing distributors that cover Lagos to install pre-paid meters and concession billing to private collection companies, which the government believes will boost compliance. The plan is part of a wider policy called Light Up Lagos, launched in 2016, which also emphasises developing street lighting and rural electrification within the state.



Ladi Sanni

Marked improvement

Ladi Sanni, CEO, Viathan Engineering, on boosting the financing and infrastructure climate for power projects

In what ways are captive power plants more attractive for developers in Nigeria?

SANNI: Focusing on the captive power model enables developers to avoid most of the challenges associated with the national grid's power value chain. This particularly applies to transmission challenges, as well as aggregate, technical and commercial losses. Since power purchase agreements (PPAs) under a captive model are secure, there are very few collection issues. PPAs are backed by bank guarantees including binding standing-order payments from the off-taker's bank. The model ensures that there is an anchor off-taker, which provides a commercial business case for the project. Once this is secured it is easy for the producer to further de-risk a project by adding new commercial and industrial consumers to the network.

In your opinion, what financing challenges do power developers in Nigeria face?

SANNI: The country's macroeconomic environment poses a challenge for its power sector. There is inadequate funding for the industry and the infrastructure in general. This is because Nigeria's financial markets are not developed enough to finance large-scale projects. Bank credit facilities in the country are typically short tenured to around four years, with high interest rates in the region of 23-25% per annum. Power asset financing requires medium to long tenured credit facilities to match the useful life of the asset, which is typically between 15-20 years. Reasonably priced, project friendly interest rates are almost non-existent for infrastructure projects in Nigeria.

In addition, because of the high yields on Treasury bills, particularly during 2017, investors were not encouraged to finance infrastructure projects, and instead opted for the risk-free investment options offered by government securities. Consequently, Nigerian infrastructure developers relied on foreign markets to secure the needed capital to fund their

projects, with the attendant exposure to foreign exchange fluctuation risks. The effect of this is that projects have been rendered commercially unattractive, as loan repayments are viewed as high risk by lenders. Furthermore, the country's overall climate of political and policy uncertainty, especially over the sanctity of contracts, has contributed towards making infrastructure financing challenging.

How can the government ensure a more adequate and reliable gas supply to power plants?

SANNI: The government needs to focus more on the development of gas supply infrastructure. Investment in this area requires long-term considerations, and therefore it is important for the government to incentivise private developers to make the sector more attractive to investors. When developers are sure that gas produced can get to the major demand centres for power generation around the country, there will be more investment in gas production since domestic power demand is high. The government is the biggest shareholder in joint-venture oil and gas projects, and therefore is in a better position to ensure that oil multinationals allocate a percentage of their production to domestic gas development and supply.

Meanwhile, the fiscal policy for the gas exploration and development business must also be aligned to encourage investment in this area, especially as Nigeria is competing with other countries for this kind of investment. If the fiscal framework for gas production is attractive for upstream companies, it will definitely have an impact on the delivery price of gas to end consumers. I am of the opinion that if we can focus on these areas as a country, there would be a marked improvement in local gas supply available for power generation. While the government's efforts over the past decade to make gas available for the domestic market has delivered noticeable results, there still remains a significant amount to be achieved.