
PwC's Annual Power and Utilities Roundtable

The challenges with transforming the Nigerian power landscape



Introduction



Nigeria's potential to become one of the world's largest economies will remain just an aspiration without the electricity required to pursue aggressive industrialisation, including the revitalisation of moribund local industries. Furthermore, the acknowledgement that economies thrive with a virile small and medium scale enterprise culture makes it even more imperative to transform the Nigerian power sector.

Much as the challenges in the Power industry will be tackled gradually, constant modification of approach is fundamental given emerging technologies and the growing complexities of the problems confronting the power sector. This will necessitate focused discussions geared towards overcoming the crisis identified in the sector with a view to fast-tracking the delivery of constant electricity to the long-suffering people of Nigeria who, in turn, are expected to pay appropriate tariffs for the electric power they consume.

The Annual Power and Utilities Roundtable is part of our contribution to the on-going reforms in the Nigerian power sector. It is a forum for key players to discuss the present and the future of a fully privatised Nigerian power sector.

In November, 2015, two years after the unbundling of the Power Holding Company of Nigeria (PHCN), about 100 industry leaders and stakeholders gathered in Lagos for the 6th edition of the Roundtable, to discuss the challenges to transforming Nigeria's power landscape and the hindrances to the transformation of the industry. Drawbacks to the reliability and quality of power distribution, gas-to-power initiatives, funding challenges, the attraction and retention of investment in the sector plus other concerns were robustly discussed at the event.

This report is a detailed account of the Roundtable, which top players and industry experts as well as the media and other participants found enlightening. We hope you will find the report insightful.

Pedro Omontuemhen

Partner and leader, Power & Utilities
PwC Nigeria

A stylized, handwritten signature in dark blue ink, appearing to read 'Pedro'.

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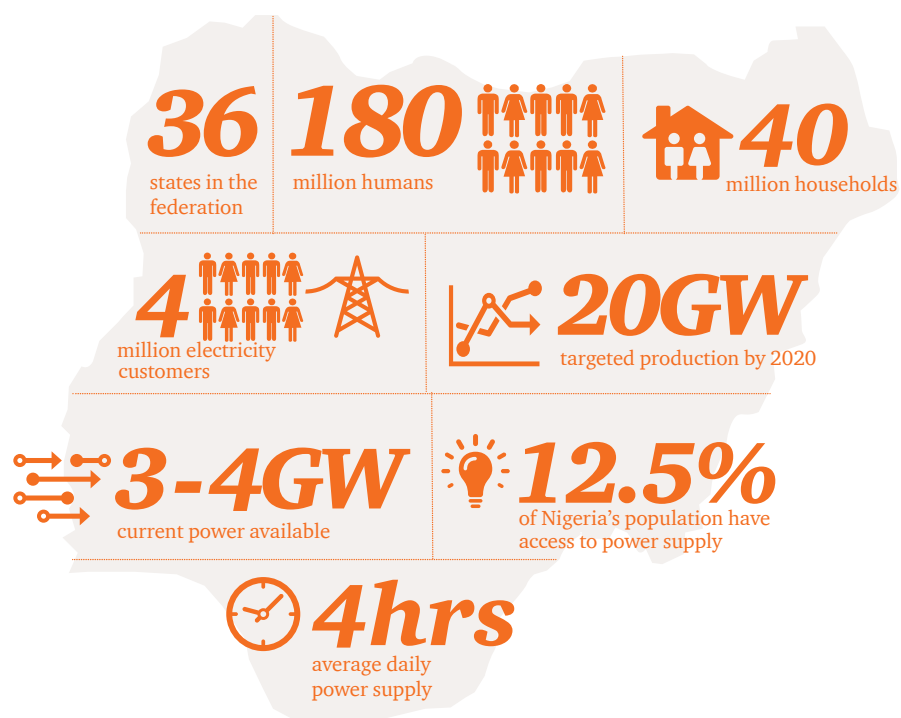
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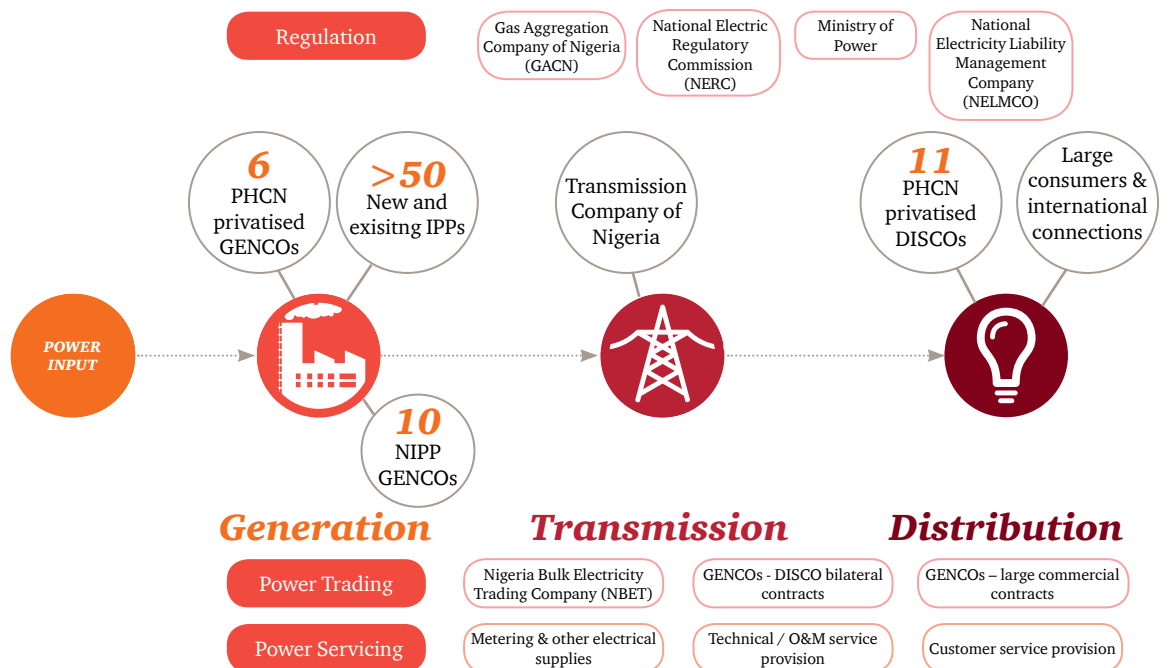
Nigeria Power landscape

Electricity generation: Current reality



Source: PwC Power Advisory

Gas production and utilisation



DISCOs Distribution Companies

GENCOs Generation Companies

IPPs Independent Power Plants

NIPP National Integrated Power Project

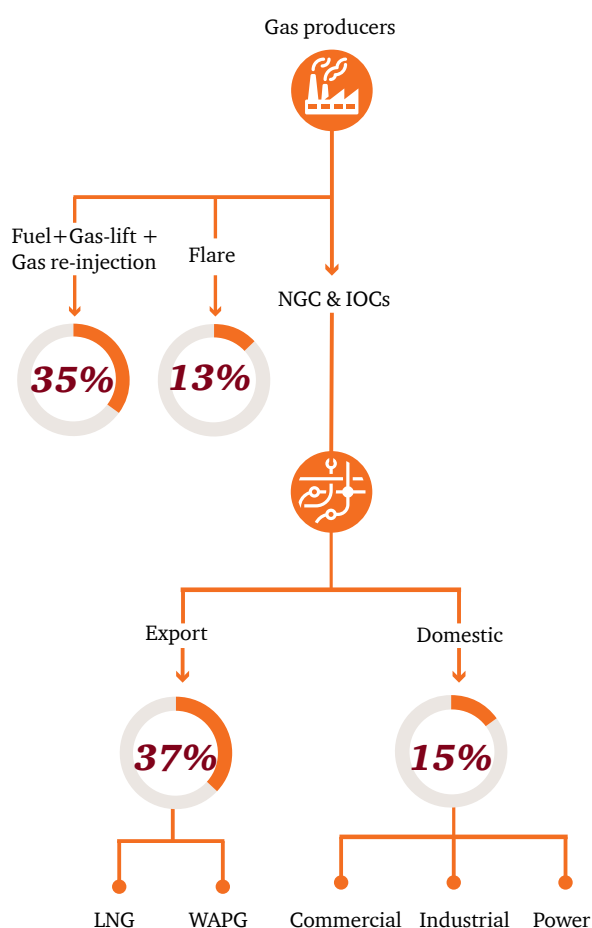
O&M Operations and Maintenance

Source: PwC Power Advisory



Executive summary

Gas production and utilisation



Source: Department of Petroleum Resources

Nigeria has about 13GigaWatt (GW) of electricity generating capacity, a transmission capacity of 5GW and distribution that hovers between 3.5 and 4.2GW. Currently, natural gas accounts for more than 80% of Nigeria's generating fuel needs. About 30% increase in available generation is possible if the gas constraints are resolved.

Natural gas is set to become the leading fossil fuel by 2030 and is expected to replace oil by 2040. Nigeria ranks as the 8th largest country in terms of gas reserves and 13th largest producer of the commodity.

Gas consumption, rather than reserve base, is fundamental to economic growth and development. Therefore, domestic use should be the priority whilst the Liquefied Natural Gas (LNG) and export ambitions should be limited. Nigeria consumes 15% of her gas production domestically; exports one third whilst almost a half of the total production is wasted.

The electricity sector provides the natural edge for the demand-supply imbalance and there should be sites that can support the embedded generation goals of the Distribution Companies (DISCOs). In Nigeria, there are approximately equal volumes of both associated and non-associated gas, with the latter appearing in small-to-medium and sometimes, stranded fields.

The appropriate and prompt implementation of swap arrangements, a reinforced commercial framework, the aggressive pursuit of the Gas Master Plan, Government-backed instruments and regulation, will culminate in a more robust sector. Vandalism of gas pipelines and transmission infrastructure, which are major pitfalls in the power industry also have to be addressed.

The speedy execution and delivery of a number of on-going infrastructure projects is inevitable. The supply, processing, transportation and distribution challenges in the gas sector need to be handled for optimal performance. Gas

prices should not be subjected to a subsidy, thereby politicising it. Its price should be determined by global trends and market forces.

It is commendable that some policies and regulations have resulted in the resolution of a number of challenges. The forerunners in the generation sub-sector are also extolled for their ingenuity, resulting in considerable independence in that sub-sector.

More than 50% of distributed power is consumed free-of-charge. In other words, less than half of customers pay for electricity usage. Power must be realistically priced because it is only through cost-reflective tariffs that the cost of generation will be recovered and investments made in new large-scale generation and transmission projects.

Distribution and transmission capacities must significantly increase to warrant further gas supplies. The DISCOs particularly need to improve their own networks in preparation for the probable resolution of the bureaucracy in generation. If that bureaucracy is broken today, the DISCOs cannot take up all the available power.

The Petroleum Industry Bill (PIB) is still a contentious document because the promoters of the bill want it to tackle all the inconsistencies in the oil and gas sector. Bureaucracy and troublesome business processes must be jettisoned; investor-friendly policies and incentives together with appropriate transport laws and competent regulation have to be created and/or enforced so as to reassure entrants to invest in the power sector and to prove that the creation of an enabling environment is not theory.

A continuity machinery and adherence to contracts cannot be dispensed with. Policy inconsistency must be eschewed, paving way for clarity and certainty.

Private sector financing will provide the infrastructure required for the transformation of the transmission sub-sector. The emergence of mini and micro-grids, co-existing alongside the large grids, should be encouraged.

Population growth, impelled by the emergence of megacities, will have a profound effect on Nigeria's power sector. The scale of investments needed in the sector is illustrated by the rule of thumb for industrialised nations that approximately every one million people require 1,000 MW of electricity.

Climate change, revealing itself as water scarcity, will affect hydroelectricity in future. There are gaping holes created by the skill-scarcity and reactive policies in harnessing dormant resources that can aid power generation.

Unravelling technologies in the power sector will assume a lot of prominence in the coming years. Cross-border electricity flows and regional power integration will surface in the coming years.

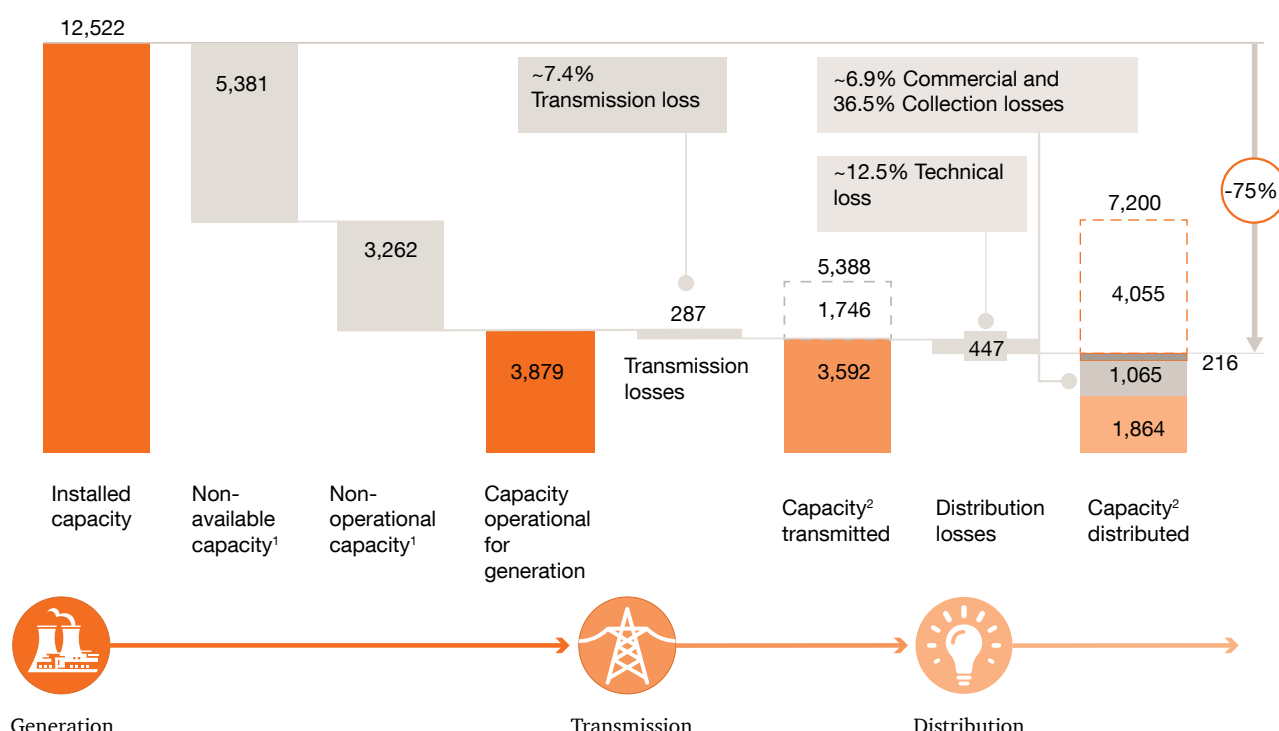
Power companies will be better positioned to contain losses if they utilise efficient risk and capital management techniques, plus proficient customer service – consumer-interactive websites and other Information Communication Technology (ICT) interactive tools.

Nigerians must realise that power will not automatically improve solely because of privatisation; but that it will get better when large-scale capital investments, which are presently hindered by lack of funding, are made.

Managing working capital and investment funding requirements in a challenging environment

by Mrs Funke Osibodu, Managing Director Benin Electricity Distribution Company

Nigeria power sector energy flow (MW)



Generation

Transmission

Distribution

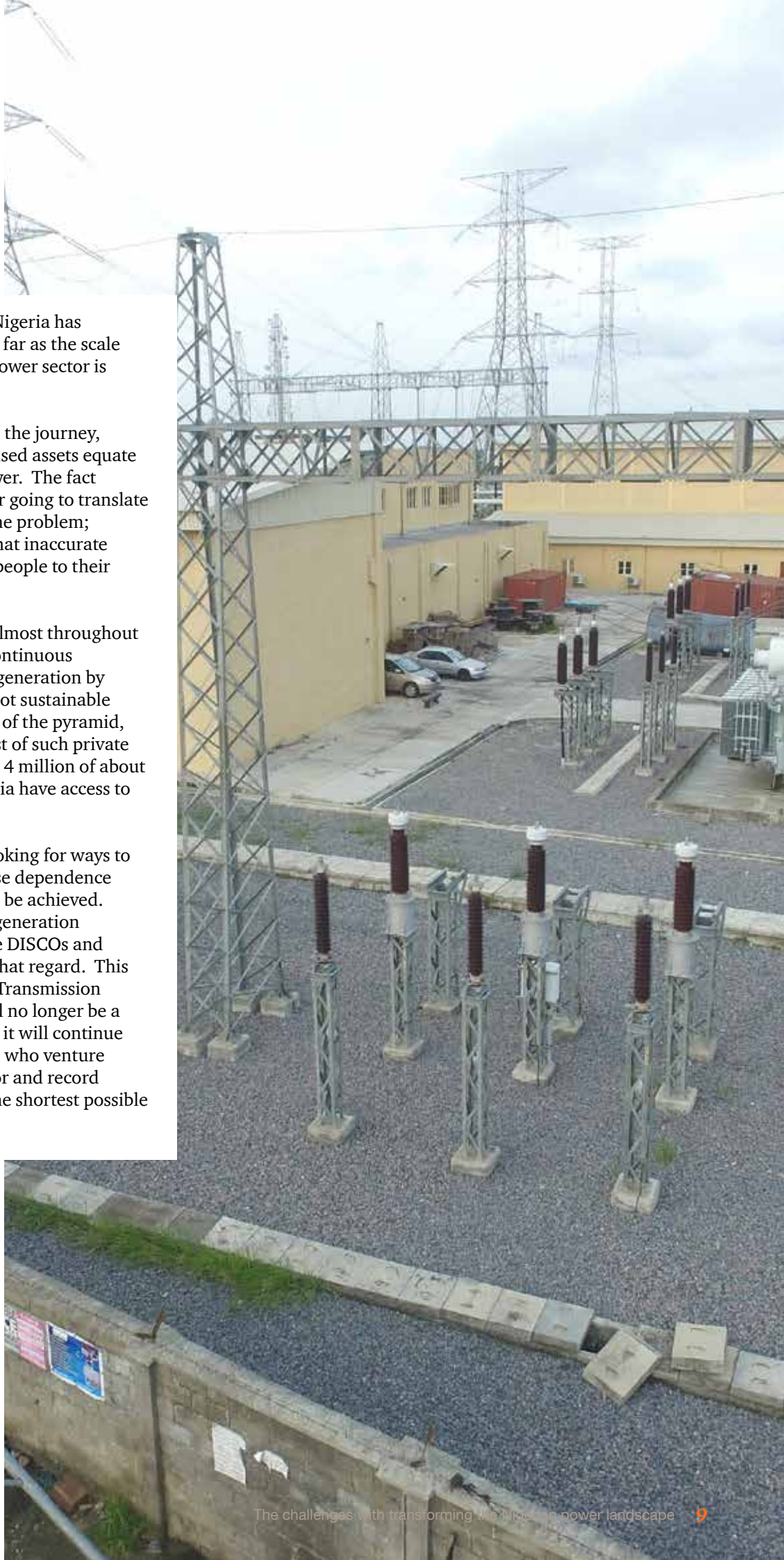
1 Refers to average daily capacity of units non-available and non-operational from January - August 2015 (assumes peak demand)
2 Effective capacity for transmission and distribution post losses; assumes peak demand

Source: Nigeria Power Baseline Report, VP FRN 2015

Biting realities

The first milestone in the reform of the power sector was reached when the process of making the market more viable for investments began a little over a decade ago. The industry has been in pre-transition phase since the 2013 privatisation of the sector. Though some of the players are already referring to the market as one in the transition phase. Indeed, the transition market which was scheduled to begin in February, 2015 is yet to materialise owing to challenges facing the industry.

Nigeria will only have the kind of power that will support full industrialisation when the country is capable of generating at least 150,000MW of electricity because a rule of thumb estimation postulates that approximately 1,000MW serves around a million people in a population. With the current generation capacity of less than



10,000 MW, it is obvious that Nigeria has barely scratched the surface as far as the scale of investments needed in the power sector is concerned.

Many Nigerians underestimate the journey, choosing to believe that privatised assets equate non-stop supply of electric power. The fact remains that the sale was never going to translate into an overnight panacea to the problem; and politicians need not give that inaccurate impression in a bid to win the people to their side.

Granted that access to power almost throughout the country is less than 20% continuous dependence on private power generation by households and businesses is not sustainable because of those at the bottom of the pyramid, who cannot afford the high cost of such private generation. In fact, only about 4 million of about 32 million households in Nigeria have access to private power supply.

Most players in the field are looking for ways to stay away from the grid because dependence on the grid means nothing will be achieved. Therefore, mini-grid, off-grid generation holds the future for most of the DISCOs and conversations are going on in that regard. This means that at some point, the Transmission Company of Nigeria (TCN) will no longer be a major part of the chain though it will continue to be relevant. However, those who venture into the transmission sub-sector and record measurable achievements in the shortest possible time will halt the misfortune.



Challenges in the Industry

Cash Flow

Putting together some form of guarantee that can allow the market issue bonds and create markets where cash flows are possible will guarantee the survival of the system. Capital Expenditure (CapEx) – required for long-term investments and which is presently insufficient – will then follow. This is because no lender will give CapEx if they are not sure the borrower can survive the short-term let, alone the long-term. Certainly, the short-term cash flows must be first sorted out and this should be done across the value chain and not just in distribution.

Funding gaps

Both the working capital needed for day-to-day expenses and CapEx are in shortfall. The approved CapEx to the industry is grossly inadequate to meet anticipated improvements. Consequently, CapEx spending has to increase to improve power supply, especially for transmission.

Accumulating shortfall

Across the industry, the accumulated shortfall was N290 billion between November 2013 and December 2014. However, it was mitigated by the N213 billion Central Bank of Nigeria (CBN) loan, which has only been partly disbursed. By October 2015, the shortfall had risen to N478 billion and will continue to increase at the rate of N20 billion per month unless the current tariff is reviewed.

Unrealistic tariff regime

There is an urgent need to enforce a cost-reflective tariff system, which will stimulate more investments in the industry, leading to the provision of electricity to the numerous places without power. The regulator is trying to avoid tariff shock, a situation where the consumer finds it difficult to cope with increased tariff.

Exchange rate

The exchange rate plays a crucial role in the power sector in Nigeria since more than 90% of the business is dependent on foreign exchange. This is unattractive to investors, who expect a recalibration of the official rate.



Q & A Session

Q *Many Nigerians are unduly apportioned high estimated bills. What are your metering plans?*

A The dearth of Capital Expenditure is to blame. If the limited CapEx is used just for metering, other improvements of the network cannot be achieved. About 3,600 customers had paid for meters, but the company had to use their money for the business's subsistence. However, those customers have been covered. At least, 70% of consumers are on estimated billing, giving these customers an excuse not to pay. So, we will rather meter; yet this cannot be done overnight.

Q *At the outset, did you not do due diligence that envisaged the teething problems you now face; for example, transformers, cables and other power amenities are deteriorating and many of the DISCOs are doing nothing to fix them?*

A The pre and post-purchase reviews were done on paper and both happened prior to purchase, owing to labour unrest and the consequent inability of the DISCOs to carry out due diligence physically. The first phase involved observations, baseline studies, clean-up before settling down to business.

There are ongoing changes: major upgrade of networks has commenced, energy audit has been carried out by our assurance unit and there has been a massive improvement-cum-enforcement of safety.

For the Benin DISCO, an additional 350km network (approximately the distance between Benin and Lagos) has been added, though that is nothing compared to the task ahead, but appreciable transformation will not happen overnight. New injection power stations have been completed, 18 new power transformers and 389 distribution transformers have been delivered.

It is instructive to note that the transformer is not power and never helps when available power is insufficient. For example, if an area was getting six hours of power supply daily before a nearby neighbourhood gets a new transformer, the power is shared such that the six hours reduces to three or four hours, worsening the situation. So, the actual problem is limited supply. The

present infrastructure at the Benin DISCO can perform three to five times better than it is doing today and the GENCOs can achieve one and a half times to three times more without extra infrastructure, but both will not be significant unless transmission at least doubles.

Q *Would it not be better to get funding from the Ministry of Finance rather than the CBN? This is because the latter has no standing in international circles and can never be a member of The Paris or London Club unlike the former and any funding from the CBN cannot be rescheduled or have any kind of bearing as collateral.*

A When it comes to third party in today's market, the first thing the fund providers want to see is if the system can sustain itself. So, whether it is through the OECD (Organisation for Economic Cooperation and Development), Sovereign Wealth Fund or Ministry of Finance, no one is willing to take that guarantee because it is clear today that the cash flow is insufficient. Primarily, the cash flow should work and while this is happening, the CBN can step in to help balance the system in the short-term. The Debt Management Office (DMO) and Ministry of Finance have joined the conversation for a long-term intervention.

The whole chain needs to become more effective so as to reduce the burden on distribution; let there be a market that can stand with the support of the government but not subsidy. Subsidy will not happen.

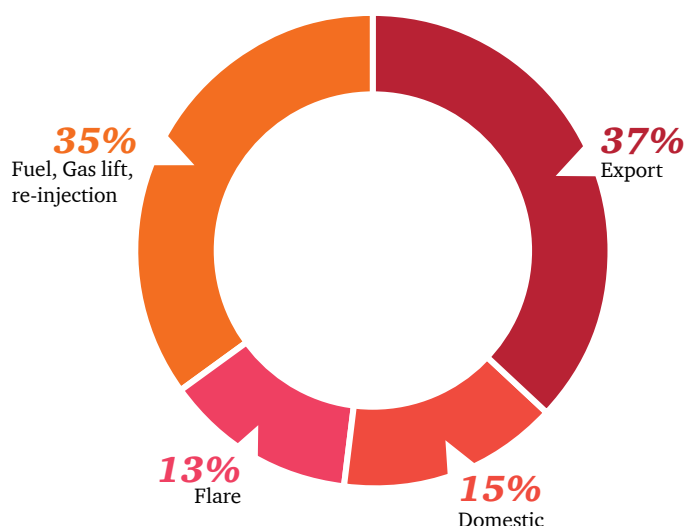
Q *You said that about 50% of consumers do not pay their electricity bills and many of the delinquent consumers are government ministries, barracks, etc. How do you plan to deal with this?*

A It is easier to sort these Ministries, Departments and Agencies (MDAs) out because we have communicated the issue to the government and it is doing its best to handle the problem. Nevertheless, this action will not ultimately solve the problem but only reduce the enormity.

Understanding and overcoming Nigerian gas-to-power challenges

by Mr Bolaji Osunsanya, Managing Director, Oando Gas and Power

Gas production by utilisation



Source: PwC Power Advisory

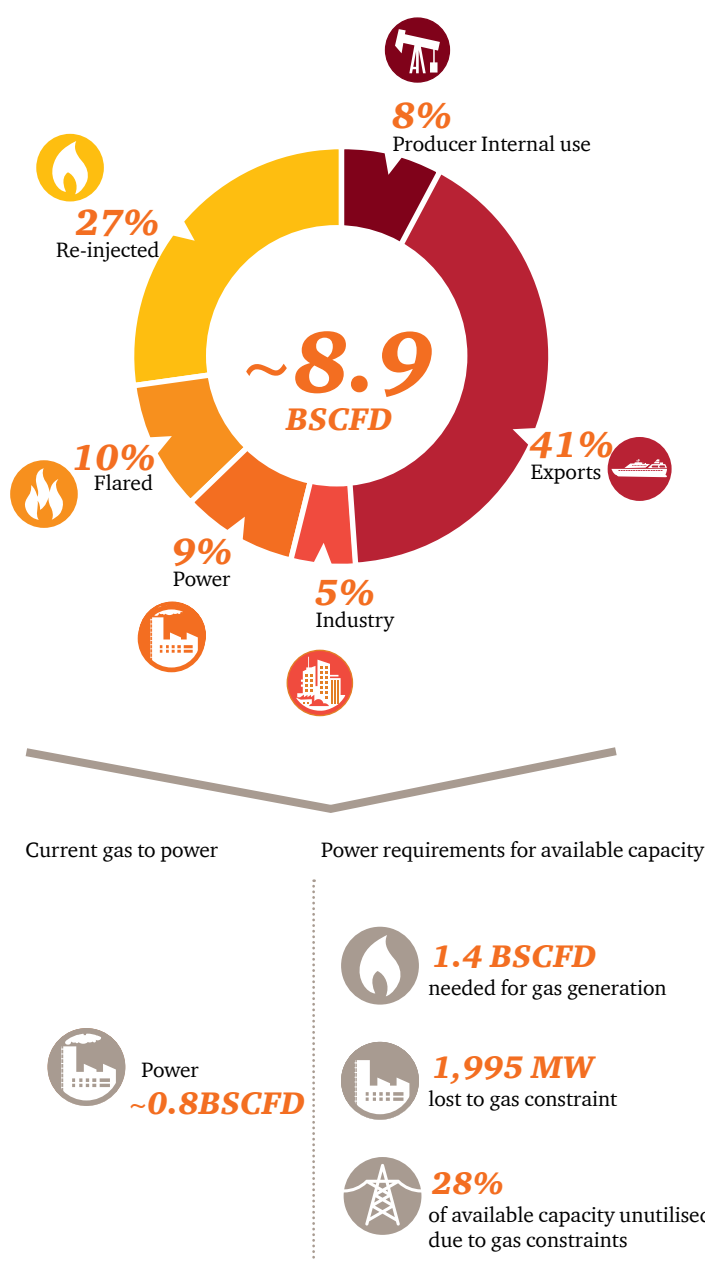
Electricity generation, transmission and distribution

Nigeria has about 13 Giga-Watts (GW) of electricity generating capacity, out of which only about 25% is available and operational due to gas constraints. Again, about 7% of the operational generation is lost across the transmission network. In general, there is a transmission capacity of 5GW, wherein close to 90% of transmitted power reaches electricity consumers through the Distribution Companies [DISCOs]; but these distributors encounter collection and commercial losses since less than 50% of electricity consumers pay for the power they consume.

Innovative Public-Private Partnership (PPP) models should be employed to reverse the underperformance in the transmission sub-sector due to the exclusion of TCN from private sector participation. Undoubtedly, the infrastructure necessary for transmission will be developed if that sub-sector is opened up for private sector financing.

Currently, natural gas accounts for more than 80% of Nigeria's generating fuel needs and given the present gas-to-power policy, this is likely to become a trend. About 30% increase in available generation is possible if the gas constraints are resolved. This is because the gas provided today is sufficient at the existing levels of dispatch and unlike the common impression that gas is at the root of epileptic power supply, the real challenge is that distribution and transmission capacities must increase significantly to warrant further gas supplies.

Nigeria's gas demand and utilisation for power



Source: Nigeria Power Baseline Report, VP FRN 2015

Natural gas: Nigeria, in relation to African and global trends

Natural gas is a global energy source of choice, which is set to become the leading fossil fuel by 2030 and is expected to replace oil by 2040. Its increased demand in the power and industrial sectors will continue to engender the growth and development of the resource.

Currently, Nigeria ranks as the 8th largest country in terms of reserves and 13th largest producer, accounting for about 20% of Africa's production. Owing to the state of electricity supply in the country, Nigeria must prioritise domestic use, thereby restricting her Liquefied Natural Gas (LNG) and export aims.

Gas consumption rather than reserve base, is fundamental to economic growth and development. Countries that consume ample volumes of gas significantly meet their energy needs thereby recording economic development as demonstrated by their high GDP per capita. In comparison with other developing countries, the usage of gas in Nigeria is noticeably small, partly contributing to Nigeria's economic adversity and resulting in her low GDP per capita. Therefore, an increase in gas consumption in Nigeria will not only meet her energy needs, but also culminate in a higher GDP.

Identified drawbacks and suggested remedies

Nigeria currently exports more than a third of her production with 15% domestic consumption; almost 50% of production is wasted, a situation that needs to be redressed. This calls for the calculated reallocation of gas for the domestic market, particularly to the power sector and the continued application of proper sanctions and penalties to discourage gas flaring.

A vibrant midstream segment should emerge to take advantage of the falling prices of equipment and excess global assets to create a tolling arrangement for processing and gathering of currently flared sites. For instance, a liquefaction plant, a floating storage and re-gasification unit

(FSRU) and other equipment that can take gas to the market should be sourced and there ought to be simple sites that can support the embedded generation goals of the DISCOs. In other words, the electricity sector provides a natural hedge for the demand-supply imbalance.

In regions with disconnected infrastructure, upstream gas suppliers exist today that are unable to furnish the domestic market and have rather chosen to re-inject. To overcome this, commercially acceptable mechanisms that make supply possible must be devised so that stranded quantities of gas can get to the market.

About 50% of gas reserves in Nigeria is Associated Petroleum Gas (APG), a by-product of crude oil production. This means that there are approximately equal volumes of both associated and non-associated gas with the latter manifesting in small-to-medium and sometimes stranded fields. It is time for the creation of enabling fiscal terms for specifically exploring non-associated gas and this should be allowed to thrive within a regulatory framework.

The speedy execution and delivery of the following infrastructure have become crucial and inevitable:

- i. the Lagos-Escravos pipeline;
- ii. The Oben-Obiafu-Obrikom (OB3) interconnection pipeline, which will link the East to the West;
- iii. the gas processing facility for the Northern Offshore pipeline system, where there is already enough wet gas that can be processed for marketing. It is instructive to know that the quantity of gas in that facility can produce more than 1,200MW of electricity;
- iv. the offshore to Qua-Iboe Terminal (QIT);
- v. QIT-Ajaokuta to Kano (AKK) line which will enable the evacuation of gas to the Northern market.

Other challenges in the Gas Industry

The problems here include:

Supply

The demand for gas is affected by the preference for oil, poor funding of the joint ventures, absence of commercial terms for gas in the production sharing contracts plus the lack of clarity and standardisation of the fiscal terms. In that regard this is in addition to inter-fuel competition occasioned by the fall in the price of crude oil.

Processing, transportation and distribution

The large gas reserves remain unexplored and this is fuelled by limited foreign funding caused by insecurity and policy inconsistency. For the gas market, revenue securitisation and counterpart equality have been limited to bankable agreements, when it is not supposed to be so. Investments can only increase with the right cost-reflective pricing structure.

Mixed blessings

It is noteworthy that some policies and regulations have contributed to the resolution of a number of challenges. For example, the required institutions and the supporting blueprints and legislations – the infrastructure blueprint and the template for gas supply agreements – have been put in place, but should become wholly bankable. Better coordination and faster implementation are still required.

Today, the generation sub-sector enjoys considerable independence in the value chain, kudos to the forerunners. Yet generation which is seemingly the simplest to implement, is caught in the middle of a weak transmission network and a poor commercial market structure. There are good incentives if a prospective investor wishes to go into generation after that investor addresses these three uncertainties: Can we dispatch? Can we get gas? Who is paying for the dispatch? Predictably, these concerns are not for the faint-hearted.



Image

Recommendations for closing the gas-to-power gap

- i. A new commercial structure which will guide key gas and electricity transmission infrastructure has to be promoted; it must be a PPP model that will encourage entrants into the fold. Gas specific bid rounds to develop and produce marginal discoveries for the domestic market have to be embarked upon.
- ii. Swap arrangements which will immediately release currently re-injected but available gas molecules into the market have to be defined.
- iii. It is vital to reinforce the commercial framework, particularly in the power sector.
- iv. Power should be realistically priced; it is through cost-reflective tariffs that the cost of generation will be recovered and investments made in new large-scale generation and transmission projects.
- v. All ongoing gas-based infrastructure which will make gas available in the market should be completed.
- vi. The implementation of the Nigerian Gas Master Plan ought to be more aggressively pursued.
- vii. Government backed instruments like simple guarantees, letters of credit and partial risk guarantees are essential for the management of vital electricity infrastructure.
- viii. The National Electricity Regulatory Commission (NERC), which regulates the industry must refrain from policy somersaults whilst the government should further strengthen the Commission to perform the role of a competent and firm overseer.
- ix. The maintenance and management of infrastructure and investments must become a priority so as to forestall the partial or overall collapse of the system.

Q & A Session

Q *Gas flaring is caused by unattractive gas prices at the Nigeria Liquefied Natural Gas (NLNG) Company. Much as the government increased gas prices recently, what are the plans for gas prices to become attractive in the international market and how does this affect the Generation Companies [GENCOs] based on the foreign exchange rate?*

A The argument should not always be for an upward review of prices, but for a pricing mechanism which ensures that the local or domestic use is prioritised. Here, one cannot recommend a figure. The domestic gas price must be superior to the alternative such that it is acceptable to both the buyer and seller; a cost-reflective price that is superior to the next alternative.

Q *Is there the possibility of separating the prices of domestic from exported gas; a situation where the government can provide some short-term subsidy for domestic gas producers to enable them support the entire process for now?*

A Gas prices should not be subjected to a subsidy where the commodity faces imminent politicisation. Again, efficiency is driven by that transparent interchange. The price of gas should only be affected by global trends and the capacity of the market that wants to mop it up or the alternative market, which exists worldwide.

Q *Could you enlighten us some more on how you think the commercial swap arrangements will work?*

A The gas aggregation companies and the Ministry of Petroleum Resources should work on a commercial construct that can handle a situation where people in the hinterland of Nigeria have gas that cannot get to the market. The Gas Aggregation Company of Nigeria (GACN) as the aggregator today, must play a vital role in the mechanics. In the past, this was left to the International Oil Companies to discuss amongst themselves, but an intermediary is required to steer the conversations for profitable results.

Q *In your view, what do you think has happened to the Petroleum Industry Bill (PIB)? Don't you think we have moved from where we had it in the past?*

A In my opinion, it is counterproductive to believe that one document can resolve all the anomalies in a critical sector like the oil and gas. The bill is weighed down by its attempt to fix all the problems in that sector.

There are parts of the bill that are no-brainers – the institutional arrangements and the regulation of the institutions. Practitioners have no problem with those because they limit and control the discretion of individuals, separating functions appropriately.

The contentious parts of the bill are the positions of the fiscal terms. If the fiscal terms were separated from the bill, there is a 60% chance that the bill will be passed into law, providing governance for the industry. This is against the position of the Exploration and Production (E & P) Practitioners, who argue that the bill cannot form a regulatory framework in the sector if the terms that will govern the fiscal aspects are not known since these are long-term investments. A way to overcome that is to have intermittent laws whilst the ministry works with stakeholders to fashion out regulations.

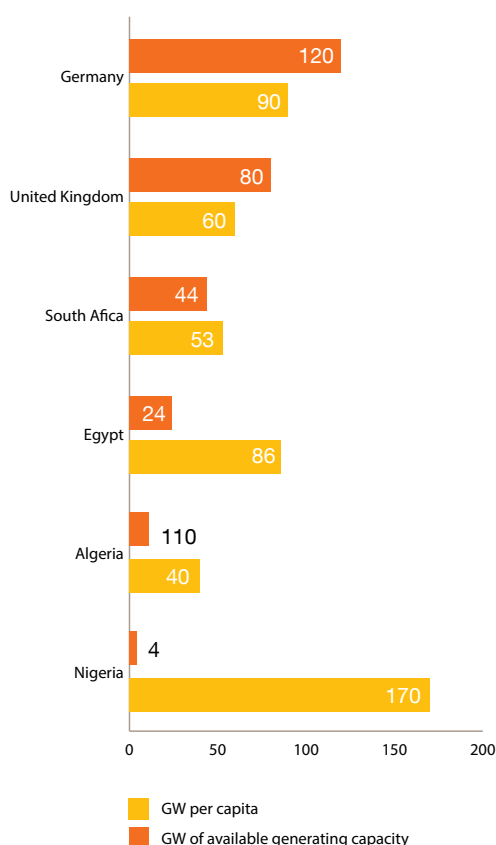
Attracting and retaining investments in the Nigerian power and gas sectors

by Mr Akinwale Omoboriowo II, Chief Executive Officer, Genesis Energy Group

Current realities

The average access rate of electricity in Africa is a little over 20%, whilst in the United Kingdom for instance, there is over 5,000 Kilo Watt-Hour (KWH) per capita electricity consumption.

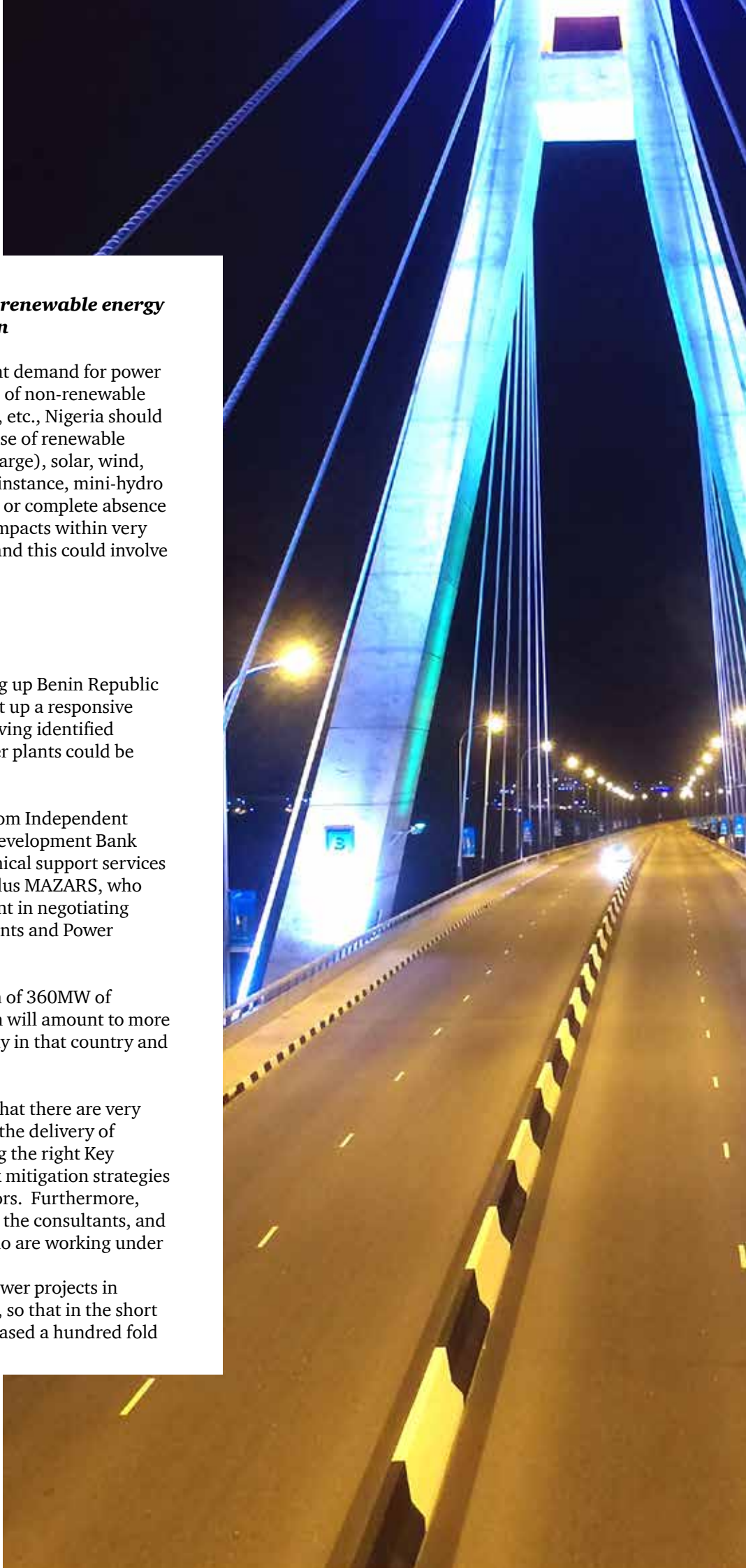
Electricity generation and consumption per capita: Nigerian electricity



Source: PwC Power Advisory

Factors that will aid the attraction and retention of investments in the Nigerian power and gas sectors

Central to this quest is cost-reflective tariffs. Also, bureaucracy and burdensome processes associated with securing investment licences and permits must be simplified in order to remove the unwelcoming encumbrances that scare intending investors. Rather, investor-friendly policies and concessions should be put in place together with transparent laws and an autonomous regulator with measurable Key Performance Indicators (KPIs). Again, continuity mechanisms and the sanctity of contracts must be guaranteed regardless of change in governments. It is imperative to encourage the emergence of mini and micro grids, which can co-exist with large grids. Alternative funding from the Corporate Sustainability and Responsibility (CSR) Departments of Multinational Companies and big corporate organisations are also necessary.



Exploring opportunities through renewable energy technologies for power generation

Owing to the fact that there is an urgent demand for power in Africa coupled with the finite nature of non-renewable sources of energy like natural gas, coal, etc., Nigeria should pursue large-scale investments in the use of renewable energy solutions like hydro (mini and large), solar, wind, geothermal and nuclear energies. For instance, mini-hydro energy can be developed with minimal or complete absence of negative social and environmental impacts within very short periods, say three to six months and this could involve little or no civil construction.

A Case Study

A Case Study of Genesis Energy lighting up Benin Republic shows that the government of Benin set up a responsive process that could attract investors; having identified specific locations where gas-fired power plants could be installed.

The government accepted proposals from Independent Power Plants (IPPs), and the African Development Bank (AfDB) provided the government technical support services for the engagement of Allen & Overy plus MAZARS, who are advisers to the Beninese government in negotiating investment grade Concession Agreements and Power Purchase Agreements.

Genesis is set to complete the provision of 360MW of electricity to Benin by June 2016 which will amount to more than double the current effective supply in that country and over 30% of the total country demand.

The inherent facts in the case study is that there are very strong agreements from conception to the delivery of the project with the government setting the right Key Performance Indicators (KPIs) and risk mitigation strategies to attract capable private sector investors. Furthermore, the government stepped back allowing the consultants, and AfDB, to hire competent companies who are working under very strict timeliness.

Such measures should be applied to power projects in Nigeria for effectiveness and efficiency, so that in the short term, power generation will have increased a hundred fold or more.



Q & A Session

- Q** *I work with the Niger Delta Partnership Initiative, a \$9 million-dollar fund. Like you rightly pointed out, alternative sources of funding are important and within the International Oil Companies (IOCs) Core CSR or Social Investments, many such funds exist, though speaking specifically from the Chevron perspective. The problem with funding potential mini-grids is that after extensive research on the political economy, analyses and feasibility studies, the NERC regulation does not specifically define what constitutes a mini or micro-grid and how it should be regulated.*
- A** The IEDN regulation does not define a mini-grid in specific terms, but refers to a mini-grid operation. A mini-grid operator can carry on outside a DISCO, but requires the consent of the DISCO before setting up the mini-grid utility service. Also the APSL Act allows the operation of a micro-grid without licence as far as the operator does not distribute more than 100KW.
- Q** *Can you address the sanctity of Power Purchase Agreements (PPAs) to pricing? For instance, today gas is 12 Kobo per KWH, but tomorrow reduces to 8 kobo per KWH and the government argues that it wants to pay 8 instead of 12 kobo. How can that be handled? Secondly, why are the power companies not putting their balance sheets as guarantees behind their projects given that the Nigeria Bulk Electricity Trading Plc (NBET) is not capitalised enough to provide guarantees for all the IPPs?*
- A** A reasonable rating will be obtained today if the NBET is rated since it is a credible organisation that does not have delinquent liabilities unlike its predecessor, the PHCN. However, since it is not capitalised enough, the investors have to ascertain whether they will rather not play in the generation end of the business. At Genesis, we look at the balance sheet of the DISCO supported by their banks, take on the measured risks with suitable guarantees from their banks.

Improving power delivery across the generation, transmission and distribution value chain

Mr James Olotu, Managing Director, Niger Delta Power Holding Company (NDPHC), represented by Mr Sanusi Garba, Executive Director, NDPHC

Comparative Analysis

Nigeria's average generation capacity stands at 4,200MW against 42,090MW by Eskom of South Africa. Ethiopia is building for export, 10,000MW of hydropower as opposed to 4,700MW by Nigeria's National Integrated Power Project (NIPP). The Democratic Republic of Congo is undertaking a 40,000MW Grand Inga for Africa. In a record of 5 years, while at war, Sudan built 1,250MW – the Merowe Hydropower Dam. The Mambilla Power Project was commissioned in 2003 at about the same time that Sudan began the Merowe Dam, but the endless pursuit of Mambilla's realisation continues.

Landmark achievements in the Power Sector

There are a number of landmark achievements in the power sector, including:

- The successful November 2013 privatisation of the Distribution and Generation Companies, DISCOs and GENCOs respectively
- The establishment of the National Electricity Regulatory Commission, NERC, which regulates the power sector
- The setting-up of the Nigerian Bulk Electricity Trading (NBET) Plc, a creditworthy off-taker
- The creation of the National Electricity Liability Management Company– NELMCO – and risk mitigation instruments for Power Purchase Agreements (PPAs) and Gas Sales and Aggregation Agreements (GSAAs)
- The development of the Multi-Year Tariff Order (MYTO) model
- The institutionalisation of contracts – Power Purchase Agreements (PPAs), GSAAs, etc.
- The creation of the Nigerian Electricity Management Service Authority (NEMSA), a technical regulation institution

Challenges in the Electricity Industry

After signing a Memorandum of Understanding with the government, the bureaucracy that prospective investors pass through from the NERC to NBET to the gas application companies results in a “merry-go-round” for them; most times, they lose interest in the business. Another daunting challenge is the lack of access to development (or long-term) financing. Acts of vandalism of transmission infrastructure is another setback.

The debts owed the generating companies have to be settled so they do not become insolvent. For example, the market is indebted to the NDPHC to the tune of seventy-five billion Naira (N75 billion).

Challenges regarding gas supply

Lack of effective GSAAAs is a problem because the finance to make effective demand is lacking. The National Integrated Power Project (NIPP) owes about N16 billion in gas supplies that is yet to be settled. This indebtedness then becomes a good excuse for lack of investment by the gas suppliers.

Another challenge is the sub-standard quality, resulting mainly from condensates at the power plants; especially those towards the end of the pipelines. Vandalism of energy pipelines remains an obstacle.

The Transmission Constraints

The evacuation capacity of the Transmission Company of Nigeria (TCN) Plc, which is currently at 5,400MW, is a major shortcoming aggravated by the inadequate financing of the TCN triggered by its low operating tariff, uncompleted legacy projects and declining budgetary allocation. According to Manitoba Hydro, TCN requires an investment of US\$1.5bn annually over

the next five years to cope with planned increase in generation capacity.

One funding option may involve granting Build-Operate-Transfer (BOT) concessions for commercially viable segments of the transmission grid. TCN may also consider EPC + F Model, in which reputable contractors execute projects based on deferred payment and/or funding from DFIs and Export Credit Agencies. Fortunately, the NDPHC has a plan to re-invest a sum of US\$1.6bn towards addressing the transmission inadequacies.

Short-term interventions for improvement in power delivery

The liquidity problem in the sector must be resolved. All technical hitches at the transmission-distribution interface must be removed. It is vital to reinforce and expand the distribution infrastructure to take up more power from the system.

The enforcement of relevant grid and distribution codes (like the green code) plus the exercise of discipline by players in the market is crucial. All distribution projects executed by the NIPP have to be energised. It is also essential to complete ongoing NIPP power plants in their last phases like the 225MW Gbarain plant that was scheduled to be finished by the first quarter of 2016.

Medium-term mediations for improving power delivery

The completion of important transmission projects for the elimination of stranded generation by the TCN and NDPHC is necessary. The completion of gas infrastructure projects by the NGC/IOCs should be given the requisite attention.

The execution of bankable GSAAAs for improved gas supply is important. It is equally imperative for the NDPHC to complete the Omoku and Egbema power plants no later than the last quarter of 2016. The recovery of lost generation capacity at

the inherited power plants should not be ignored.

Long-term actions for improving power delivery

These include the resolution of the transmission challenge; completion of Load Demand Study and Least Cost System Expansion Plan and the competitive procurement of new generation capacity, diversification of generation mix – large hydro power plants, coal, etc. Others are the deployment of renewable energies at utility scale and new generation capacity under NIPP Phase II, plus the development of nuclear energy.

Q & A Session

Q *Why are some of the power plants built far away from gas supply?*

A The NIPP was an emergency intervention programme, which suffered funding problems; for two years, there were no funds. A committee was formed which was made up of officials of the Nigerian Investment Promotion Commission (NIPC), Transmission Company of Nigeria (TCN) and other stakeholders with a view to identifying possible locations for the power plants. In a situation where it was convenient to evacuate power when gas was not there, the gas infrastructure was bundled along with the project and it is pertinent to state that the challenge of gas today is more commercial than infrastructure. If the project had been implemented as originally conceived, the story would have been different today.

Q *Were the distribution assets built intentionally or as part of measures to evacuate power from your asset?*

A The original intention was to increase generation capacity; then people and organisations advised the government to increase transmission and distribution as well.

Q *What is the solution to the poor engagement between power generators and the NCC since some power plants suffer bureaucracy with the Transmission Company of Nigeria?*

A The NIPP has to be treated as a business because the power plants need money for maintenance; in a short while (say in the next one year) the plants are going to transit to new owners and they cannot be handed over in a poor state.

Q *How are you going to treat the cost overruns on the NIPP plants?*

A There is a valuation of these assets, not the actual costs. When PPA agreements are signed, they will reflect the value already put on the equipment.

Conclusion

The 820MW of output generated by the Niger Delta Power Holding Company (NDPHC) lies idle whilst the National Integrated Power Project (NIPP) has an estimated 65% of idle capacity. Furthermore, the stalled Mambilla Power Project (which commenced in 2003) is yet to deliver.

Conversely, in Sudan, which was embroiled in a civil war, the Merowe Dam was started and completed in five years. Closer to home, the Joint Venture Integrated Power Projects (the Shell Petroleum Development Company – SPDC – and AGIP) exhibit world-class availability of 70 to 85% as opposed to 40% accessibility by the inherited PHCN plants.

It can, therefore, be inferred that some of the project development and transmission problems in the power sector are traceable to the public sector management of the system. General perception is that convenience and political expediency rather than best practice led to the construction of power plants far away from gas plants; a decision that has increased the scope of targets for vandals. The incidence of sabotage would be minimised as the needed surveillance will be less resource intensive due to shorter distances between the power and gas plants

To improve performance across the power value chain, a number of key recommendations were enumerated for the relevant authorities to consider:

- In cases where it is proved that contracts were inflated, the appropriate course of action should be a downward review of such contracts to match present realities. The CBN is also encouraged to release the remaining bail-out loans, so that the DISCOs will commence the metering of their customers to bring an end to the era of over billing caused by estimated billings.
- The power distribution sector should devise ways to attract private equity and venture capital funds so as to accelerate the execution of ongoing and proposed projects.
- To ensure all ongoing gas and power infrastructure plans are completed on time and to budget; competent companies must be

engaged to oversee the implementation of projects. The government should give due consideration to other models of the transmission sub-sector in order to improve efficiency in power distribution.

- Nigeria's gas reserves can sufficiently guarantee stable power supply if properly harnessed. However, a mix of tactical actions and strategic planning have to be made to enable Nigeria attain power sufficiency; and possibly have residual power to export within a decade.
- Swap arrangements and the implementation of the Gas Master Plan will give more impetus to the search for improved electricity. The general consensus from stakeholders is that government-backed instruments and regulation will yield a more robust sector.
- Vandalism of gas pipelines and transmission infrastructure can be prevented by building proposed power plants close to gas infrastructure or investments in disruptive logistical solutions for the transportation of gas from source to where it is required.
- The Ministry of Power should develop an effective communication strategy, that will clearly articulate the benefits of cost-reflective tariffs. Further education will be required for electricity consumers to realise that power, like every commodity, has to be appropriately priced for players in the power sector to generate the revenue required for more investments that will culminate in constant power supply.
- DISCOs should studiously consider the use of data analytics to proactively identify opportunities to stop energy theft, minimise leakages curb, procurement malpractices, ultimately enhancing and sustaining cash generation. This value flows upwards through the power value chain (including generation and transmission) with the enhanced industry data-driven insight setting the stage for improved oversight, growth and regulation.

Finally, all stakeholders under the stewardship of the government across the power value chain, must work in concert to positively contribute towards the end goal of stable and sustainable electricity supply for Nigeria.

Glossary

AfDB	African Development Bank
AKK	Ajaokuta-Kano
APG	Associated Petroleum Gas
APSL	Arco Pipeline Solutions Ltd
BOT	Build-Operate-Transfer
BSCFD	Billion Standard Cubic Feet per Day
CapEx	Capital Expenditure
CSR	Corporate Sustainability and Responsibility
DFIs	Direct Foreign Investment
DisCos	Distribution Companies
DMO	Debt Management Office
E & P	Exploration and Production
EPC	Engineering Procurement Construction
FSRU	Floating Storage and Regasification Unit
GACN	Gas Aggregation Company of Nigeria
GDP	Gross Domestic Product
GenCos	Generating Companies
GSAAs	Gas Sales and Aggregation Agreement
GW	Giga-Watt
ICT	Information and Communication Technology
IEDN	Independent Electricity Distribution Networks
IOCs	International Oil Companies
KPIs	Key Performance Indicators
KWH	Kilo-Watt-Hour
LNG	Liquefied Natural Gas
MDAs	Ministries, Departments and Agencies
MW	Mega-Watt
MYTO	Multi-Year Tariff Order
NBET	Nigerian Bulk Electricity Trading Company
NCC	National Control Centre, Operator of the Nigerian Electricity Market (ONEM)
NDPHC	Niger Delta Power Holding Company
NELMCO	The Nigerian Electricity Liability Management Company
NEMSA	Nigerian Electricity Management Service Authority
NERC	National Electricity Regulatory Commission
NESI	Nigeria's Electricity Supply Industry
NGC	Nigerian Gas Company
NIPC	Nigerian Investment Promotion Council
NIPP	National Integrated Power Project
NLNG	Nigeria Liquefied Natural Gas Company
OB3	Oben-Obiafu-Obrikom
OECD	Organisation for Economic Cooperation and Development
PHCN	Power Holding Company of Nigeria
PIB	Petroleum Industry Bill
PPAs	Power Purchase Agreements
PPPs	Public-Private Partnerships
Q & A	Questions and Answers
QIT	Qua-Iboe Terminal
SPDC	The Shell Petroleum Development Company of Nigeria
TCN	Transmission Company of Nigeria

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