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The Changing Role of Natural Gas in Nigeria

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Summary

Nigeria is endowed with substantial amounts of energy resources, and it has been making large profits from their export. However, windfall revenues have also been affecting the Government's responsiveness and accountability, and they have brought it into collusive relationship with international oil and gas companies operating in the country. A skewed distribution of petroleum resources costs and benefits, as well as the dependence on exports exposing the public finances to volatility in the international markets have represented further major issues. As a result, in spite of the resource abundance, energy access and power generation still represent urgent issues for action in the country. Solid biomass accounts for 74% of the primary energy consumption, while the electrification rate stands at 34% in rural areas. Active power plants are mainly gas-fired, but they face capacity, maintenance, and financial constraints. While historically natural gas has been disregarded or flared into the atmosphere because it was considered a by-product of oil due to lacking market conditions and processing capacity, today the development of a domestic market for natural gas is seen as a key priority to guarantee energy security and boost industrial development in Nigeria. A more efficient and equitable governance of the sector and management of export revenues can play a major role in this sense. In this context, this paper highlights the main current issues and underpins key policy conditions for this transition to take place in Nigeria

Keywords: Nigeria, Natural Gas, Domestic Energy Development, Government Policy, Resource Governance

JEL Classification: Q32, Q41, Q48

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The Changing Role of Natural Gas in Nigeria

A policy outlook for energy security and sustainable development

Giovanni Occhiali[1], Giacomo Falchetta[2]

23rd February 2018

Abstract

Nigeria is endowed with substantial amounts of energy resources, and it has been making large profits from their export. However, windfall revenues have also been affecting the Government's responsiveness and accountability, and they have brought it into collusive relationship with international oil and gas companies operating in the country. A skewed distribution of petroleum resources costs and benefits, as well as the dependence on exports exposing the public finances to volatility in the international markets have represented further major issues. As a result, in spite of the resource abundance, energy access and power generation still represent urgent issues for action in the country. Solid biomass accounts for 74% of the primary energy consumption, while the electrification rate stands at 34% in rural areas. Active power plants are mainly gas-fired, but they face capacity, maintenance, and financial constraints. While historically natural gas has been disregarded or flared into the atmosphere because it was considered a by-product of oil due to lacking market conditions and processing capacity, today the development of a domestic market for natural gas is seen as a key priority to guarantee energy security and boost industrial development in Nigeria. A more efficient and equitable governance of the sector and management of export revenues can play a major role in this sense. In this context, this paper highlights the main current issues and underpins key policy conditions for this transition to take place in Nigeria.

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1. Introduction

As of 2017, proven natural gas (NG) reserves in Nigeria stand at more than 5 trillion cubic meters (BP 2017), making it the 9th country in the world for NG endowments. Ever since the late 1990s, production has been growing exponentially, peaking at 50 billion cubic meters in 2014 (ibid.). Today, more than half of the extracted quantity is being exported (OPEC 2017), with the oil and gas sectors alone accounting for 12% of the national GDP, as well as for over 90% of export earnings, and 70% of Government revenues (Export.gov 2016). Of the 3,941 MW of operative electricity capacity in the country in 2015 (Ley et al./GIZ 2015), 86% consists of gas turbines and allow granting access to 61% of the population (IEA 2017). The figure, as in most of Sub-Saharan Africa, is unequally distributed across the country: it stands at 86% in cities and at only 34% in rural areas. Nigeria is in fact a low-income country, with a per capita GDP of US$2,671 (World Bank 2017) and a population of around 190 million people. Notably, the latter is expected to more than double by 2050, reaching 410 million under a medium fertility scenario (UN Population Division 2017).

The IEA (2017) has outlined that in order to guarantee electricity access to such a large and ever-increasing population, energy development plans in Nigeria will need to draw massively not only on modern renewable energy but also, increasingly, on NG domestic reserves. For decades, oil companies have disregarded the latter as a by-product of oil (so-called 'associated gas') or, flared it into the atmosphere with substantial release of carbon dioxide emissions. These contribute to making Nigeria the second CO_2 emitter in Sub-Saharan Africa and the 44th in the world, with 0.25% of global emissions (EDGAR 2017). However, recent governmental efforts suggest a trend change (e.g. National Gas Policy 2017) due to a steep rise of the LNG export market and the recognition of gas-to-power as the most valuable and economically viable technology to electrify the country and boost its productive sectors. Plans to develop the Nigeria's gas pipeline network both domestically and beyond the borders have also been promoted and rendered operational, highlighting the increasing relevance of NG – the cleanest burning fossil fuel, producing half of CO_2 emissions *vis-à-vis* coal to generate the same amount of heat (US EIA 2017) – for the country.

In this context, Section 2 of this paper provides a brief overview of the energy and power sector situation in Nigeria, including the potential for modern renewable energy. Section 3 highlights the *status-quo* of the market for NG in the country, referring to major developments in the policy, market, and institutional setting of the industry throughout the 20th century. A subsection further illustrates the most relevant changes brought about by the 2017 reform of the oil and gas sectors in the country. Section 4 discusses the main issues faced by the country in the development of its gas resources and in the emergence of an inclusive growth. The ultimate aim is that of providing an array of policy-relevant elements to address the question of how NG

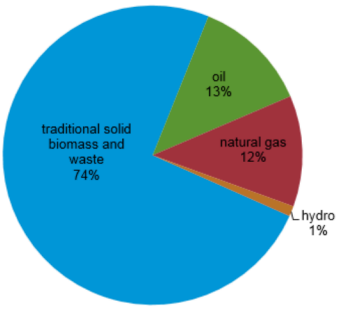
resources could be harnessed effectively so as to empower a sustainable energy development of the country. This discussion is the focus of Section 5.

2. Energy situation in Nigeria

Primary energy mix

In Nigeria, traditional biomass and waste (including fuel wood, charcoal, manure, and crop residues) is employed to satisfy 74% of primary energy consumption (US EIA 2017, Figure 1). Such consumption stems mostly from heating and cooking activities in rural areas, where the national grid has not been developed or connection costs are too prohibitive for households. The IEA (2017) reports that as of today 74 million people (more than one third of the population) are in this critical situation, and it has been estimated that indoor air pollution from biomass combustion contributed to the death of 64,586 people in 2016 only (IHME 2017).

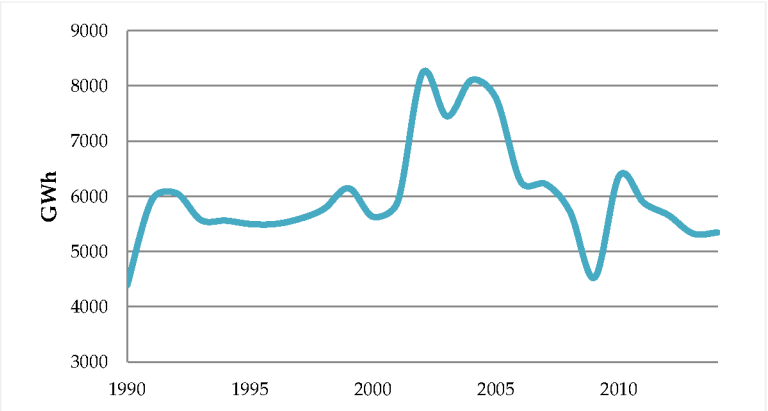
Figure 1: Primary energy mix of Nigeria



Source: US EIA (2017)

The remaining 26% of the primary mix is derived from oil, gas, and three large hydropower dams (the output and of which has been declining with respect to the early 2000s, Figure 2).

Figure 2: Electricity – total hydropower production

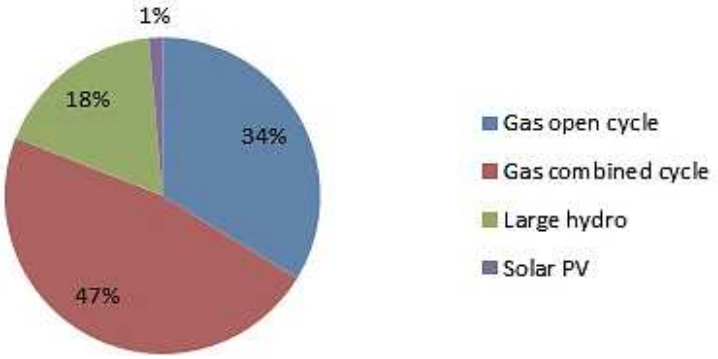


Source: Author's elaboration on UNDATA (2014)

Electrification rates and power mix

According to the World Bank's RISE (Banerjee et al. 2017), around 80% of the electricity generation capacity is NG-fired (with a prevalence of combined-cycle turbines), with the remaining being provided by large hydropower stations (17.6%) and solar PV plants (1.4%) (Figure 3). Total capacity stands at 16,040 MW. However, available capacity is reduced to 6,840 MW, and effective capacity consist of only 3,941 MW (Ley et al./GIZ 2015). The former difference stems from power plant issues, with maintenance and recovery required in many sites, water shortages, and breakdowns representing further roadblocks; the latter discrepancy is instead due to electricity grid capacity constraints and gas shortages, with pipelined quantities having been insufficient to exploit the whole installed generation capacity. Notably, Nigeria generates the equivalent power of one 40W light bulb per person (per capita power consumption stands at 151 kWh per year, PwC 2016), one of the lowest levels in the world (Lagos Chamber of Commerce and Industry 2016).

Figure 3: Electricity generation mix of Nigeria



Source: World Bank-RISE (2017)

Besides being quantity-constrained, power in Nigeria is also unreliable, with prolonged localised blackouts and outages representing the norm (Sunday 2009), and substantial economic losses involved, including the increase of prices of consumer goods and services (Airoboman et al. 2016). A World Bank study (2015) claims that the absolute number of power outages in firms in an average month in Nigeria stood at 32.8 in 2014, and their average length was of almost 6 hours. To tackle this and other issues, the Federal Government of Nigeria has declared its intention to increase electricity generation from the current effective 4 GW to 40 GW by 2020 (Shell 2017). To do so, it will need to rely on all its domestic energy resources, and chiefly NG and modern renewables, as well as on massive foreign infrastructure investments.

Fossil fuel reserves

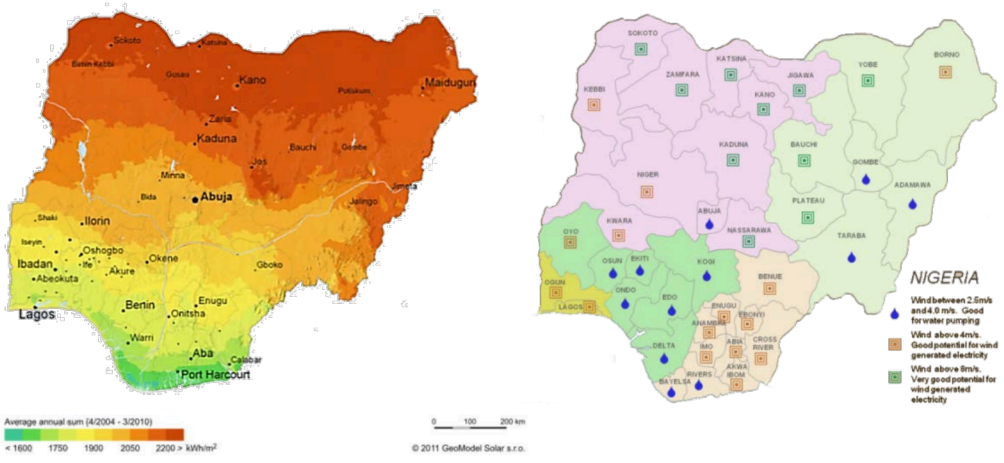
Nigeria is a resource-rich country. It is endowed with large reserves of both crude oil and NG, at 37.05 billion barrels and 5.475 bcm, respectively (ENI 2017). Even coal endowments are substantial, standing at 379 short tons (BP 2017). BP (ibid.) estimates that at today's levels of

extraction, currently proved reserves of gas and oil would run out by year 2070. In all likelihood, such predictions are prone to be altered by an array of factors, including new discoveries and efficiency improvements in consumption. In any case, the imperative for a gas-based energy development in coordination with other renewable sources so as to leapfrog a coal and oil dependence is even stronger, with a quickly increasing population and pressing international climate change concerns.

Modern renewable energy potential

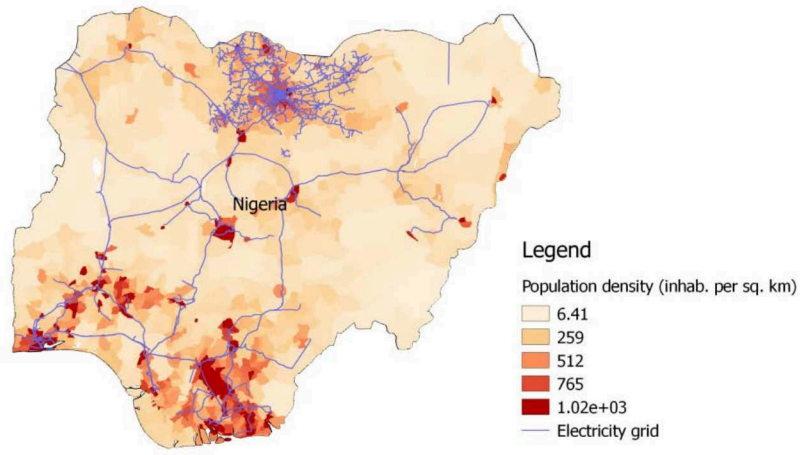
Today renewables (excluding hydropower, which accounts for 16% of the mix) represent a negligible share of the installed power capacity. However, with 1.4GW of utility-scale solar PPAs signed and targets for 8.1GW of small-scale solar, Nigeria is not lacking in solar ambition (Climatescope 2017). The governmental plan is that renewables reach a share of 30% by 2030. Renewable energy endowments are also favourable to the country's current geography and demographic distribution (Figures 4-5-6). The Niger delta, in the South, is the area were the bulk of the largest cities including Lagos are scattered, as well as the main industrial and oil and gas extractive region. Fossil fuel endowments, as well as transmission pipelines, refineries, gasification units, and power plants are all located in the region. On the other hand, the rural North is poorer, less densely populated, and affected by deindustrialization and lack of investment in agriculture and infrastructure. Here, electrification rates are substantially lower and the electricity transmission and distribution grid leaves large areas out of the Kano metropolitan area unserved (Figure 6).

Figures 4-5: Solar and wind potential in Nigeria (Global horizontal irradiation and wind speed)



Source: Author's elaboration on Solargis (2011); Nigerian Meteorological Agency

Figure 6: Population density and the electricity grid of Nigeria



Source: Author's elaboration on CIESIN (2015) and World Bank-Ardene (2017)

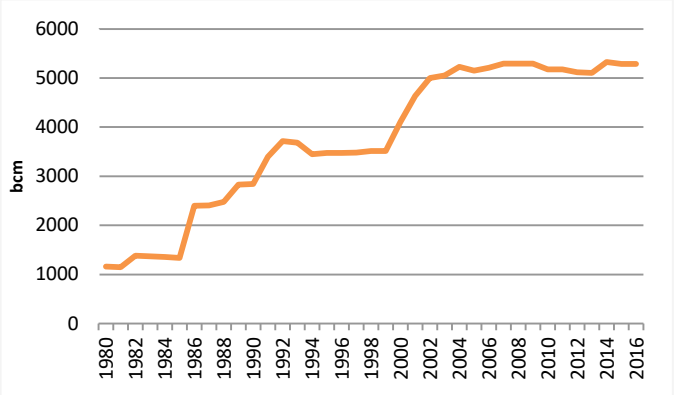
In this context, is remarkable that northern Nigeria receives an average global horizontal irradiation of more than 2,000 kWh/m², potentially enabling the deployment of both large CSP plants and off-grid PV in rural areas. The same applies to wind potential which, as seen in Figure 5, is high in the central part of Northern Nigeria and offers the opportunity for the future to develop wind farms and guarantee power independency.

3. The role of natural gas

3.1. Outlook: production, export, and gas-to-power

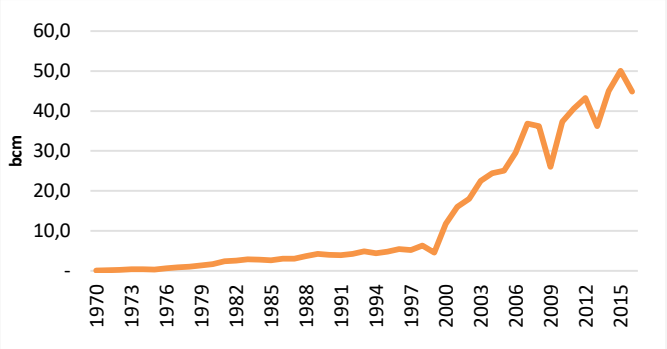
Since the first decade of the 20th century, when oil explorations were performed for the first time in Nigeria, oil has been the prevalent energy resource for export and energy development of the country, while NG has represented for decades by-product, incidentally discovered during oil exploration. To provide empirical evidence of this claim, it is relevant to report that in 2000 the share of gas flared was still over 50% of total production, with the figure having declined in the last decade but still being around 10% (Oil and Gas Industry Report 2015), with substantial missed revenue. However, it is a fact that in the last decades, and in particular in light of the 2017 oil and gas sectors reform, policies and context have hinted to a trend change. Major gas reserves have been discovered and production has been developed substantially in the last two decades (Figures 7 and 8). More undiscovered fields are speculated. The reasons underlying this trend include the expanding international market and improving technology for liquefied natural gas (LNG), but also NG's potential to increase domestic and industrial power supply, raise living standards and support sustainable economic growth and diversification in Nigeria. At the current extraction path, around 100 more years of operations in the NG sector are guaranteed if no further reserves are found, which is however unlikely. Also note that currently only about 25% of proven reserves are being produced or are under development (Shell 2017).

Figure 7: Natural Gas Proven Reserves in Nigeria, 1980-2016 (bcm)



Source: BP Statistical Review of World Energy 2017

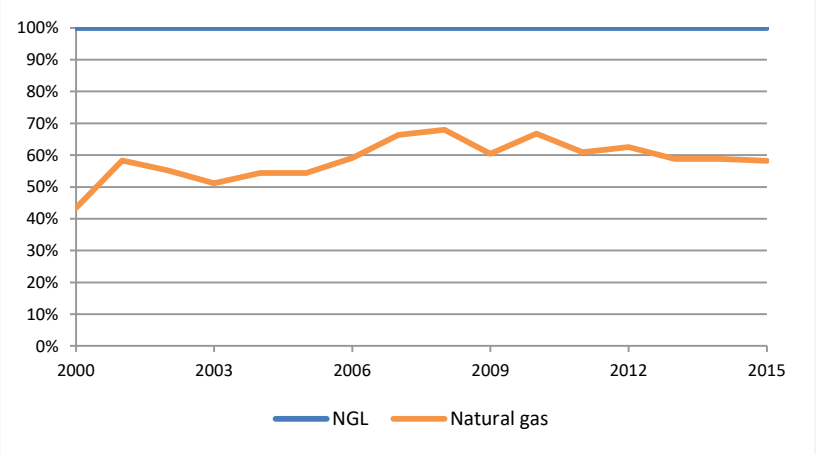
Figure 8: Natural Gas Production in Nigeria, 1970-2016 (bcm)



Source: BP Statistical Review of World Energy 2017

NG exports have been systematically representing over half of the domestic production in the last 15 years (Figure 9). Furthermore, internal gas prices are held below international levels and payment risk and institutional obstacles have determined little incentive to increase production to meet domestic requirements to supply power (African Development Bank 2017).

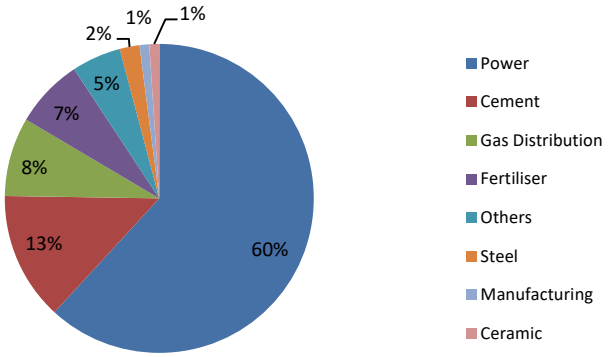
Figure 9: Share of exports over production, 1970-2016 (bcm)



Source: IEA World Energy Statistics 2017

Figure 10 below shows the sectorial shares of domestic gas utilisation in 2015. It is clear that while the power sector absorbs the bulk (around 16 bcm, by crossing BP and IEA 2017 data) of the extracted NG which is not devoted to exports, the cement and fertiliser sectors represent the majority of the industrial direct use share, while direct gas distribution only accounts for 8% of the total figure.

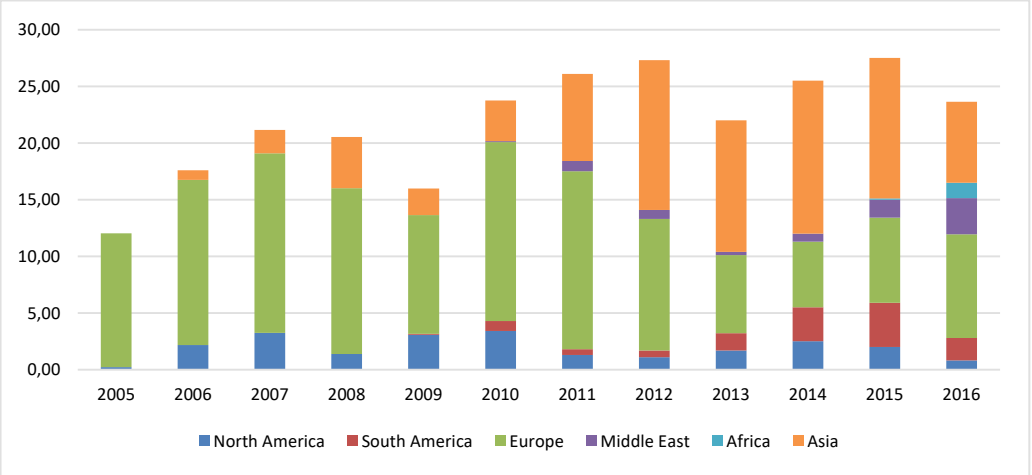
Figure 10: Domestic Gas Utilisation in 2015



Source: United Capital 2017

Current LNG processing capacity (taking place at Bonny Island liquefaction plant, and with a second gasification plant under construction) is substantial, representing 7% of global production in 2016 (Shell 2017), and being entirely devoted to exports. Figure 11 below shows different trends of the LNG exports market over the last 10 years. An oscillating but overall increasing production volume in witnessed, with a peak at 27 bcm in 2015. Also, the changing shares of imports across different continents are observed, with Asia, the Middle East and Africa having bought greater quantities in the last 5 years, and Europe and North America having shrunk their imports.

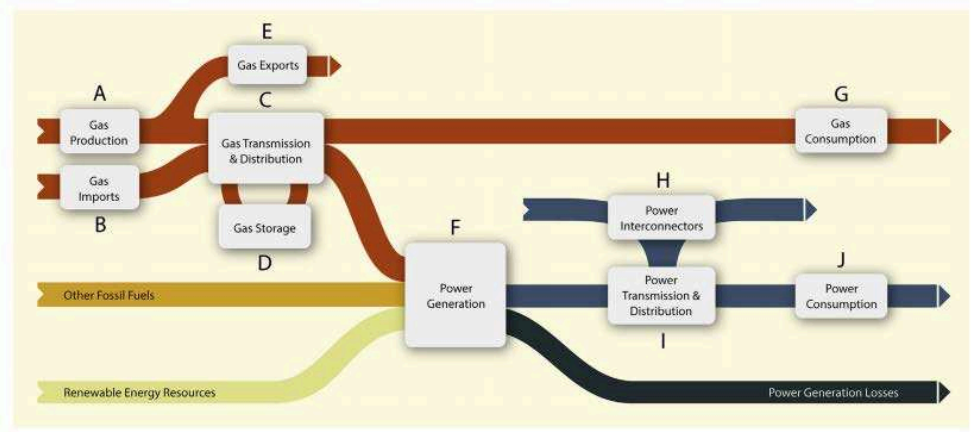
Figure 11: NLNG exports and destination by continent (bcm), 2005-2016



Sources: BP Statistical Review of World Energy, from 2005 to 2017

In spite of the NG abundance and its potential for gas-to-power plants, a significant gap between domestic demand and supply of electricity is persisting in Nigeria. A weakly diversified power sector, limited technological know-how, an inadequate infrastructure, lack of energy efficiency practices and infrastructure maintenance, as well as of enforcement of regulations, and attacks on energy infrastructure all contribute to the challenges the gas-power value chain face (Figure 12 for a schematic representation of its components). This, as evidenced in Akuru & Okoro (2014), contributes to recurrent power shortcuts and outages which have been shown to exert a major impact not only on domestic SMEs performance, but also with the recent trends of big companies closing or relocating from Nigeria.

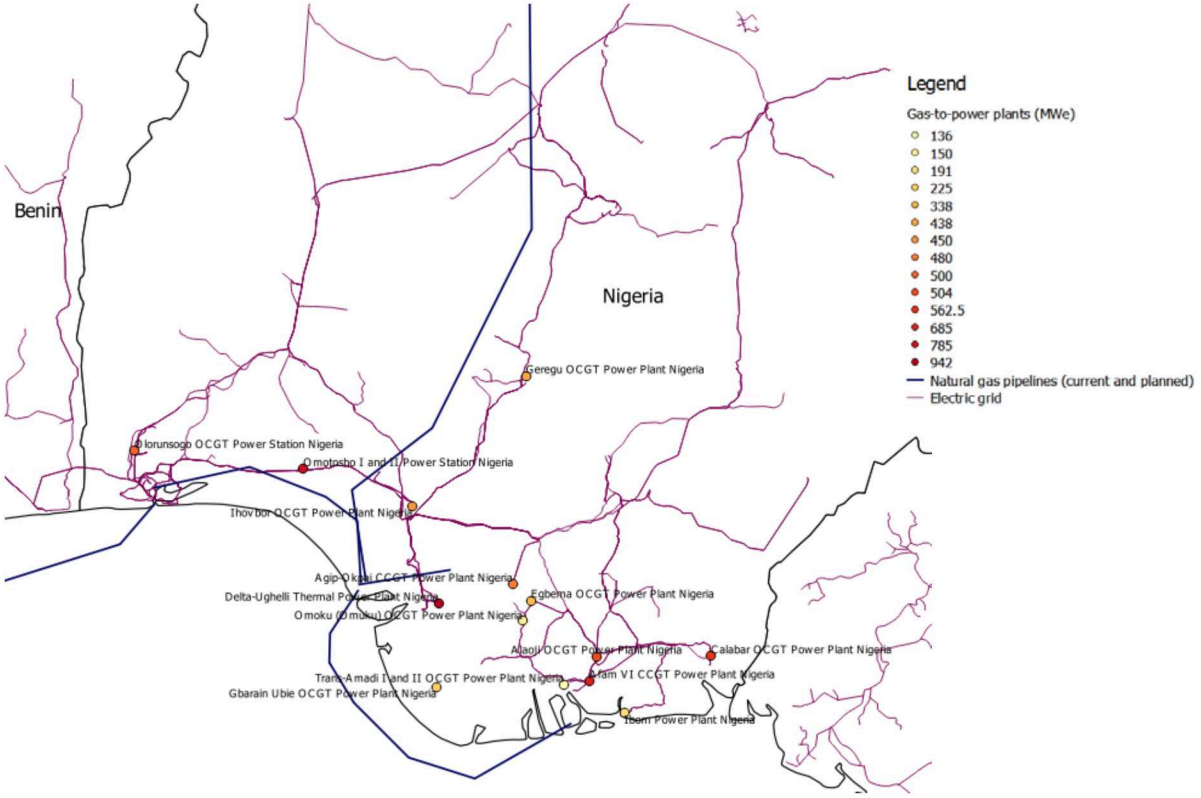
Figure 12: A gas-to-power supply chain



Source: Peng and Poudineh (2016)

Gas-to-power plants represent the bulk of the electricity generation, with 6,407 MWe of installed potential across 14 plants (Figure 13), and 3 large plants accounting for 1,237 MWe currently under construction. However, several plants are unable to work at full capacity due to electric grid limitations or temporary gas supply disruptions (see Table 1 for a comprehensive overview).

Figure 13: Gas power plants, electricity grid, and natural gas pipelines (current and planned) in the Niger Delta



Sources: Author's elaboration on DIVA-GIS/GADM, Global energy observatory (2017), Enipedia, Ardene-World Bank (2017)

Table 1: Gas-to-power stations in Nigeria

Name	Design capacity	Status	Type	Construction/EPC Contractor
Afam VI	685 MWe	Operating fully	Combined cycle	Shell Petroleum Development Company of Nigeria Limited
Rusal Alscon	534 MWe	Operating fully	Open cycle	Rusal
Alaoji	504 MWe	Operating fully	Open cycle	Rockson Engineering Limited, Burns and McDonnell
Agip-Okpai	480 MWe	Operating fully	Combined cycle	Alstom, Sadelmi, Saipem
Geregu	438 MWe	Operating fully	Open cycle	Siemens. SDEM Erectors Nigeria
Egbema	338 MWe	Operating fully	Open cycle	Rockson Engineering Limited
Omoku	150 MWe	Operating fully	Open cycle	Rockson Engineering Limited
Delta-Ughelli Thermal Power Plant	942 MWe	Operating partially	Sub-critical thermal	-
Omotosho I and II	785 MWe	Operating partially	Open cycle	Chinese private investor &
Afam IV-V	724 MWe	Operating partially	Open cycle	Governemnt
Olorunsogo OCGT	500 MWe	Operating	Open cycle	Chinese private

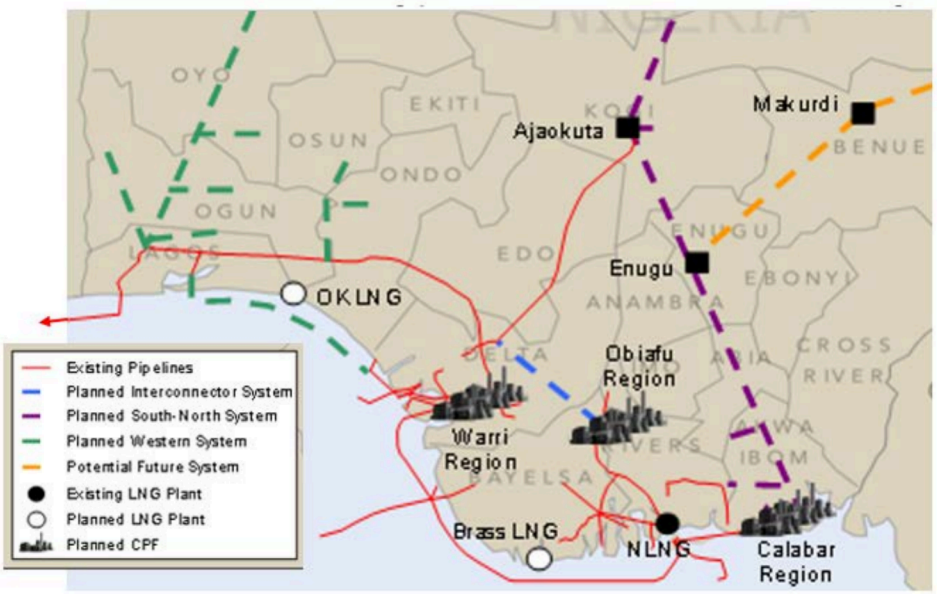
Ibom	191 MWe	partially Operating	Open cycle	investor Ibom Power Company Limited (IPC)
Trans-Amadi I and II	136 MWe	Operating partially	Open cycle	Rockson Engineering Limited
Calabar	562.5 MWe	Under construction	Open cycle	Government
Ihovbor	450 MWe	Under construction	Open cycle	Marubeni Engineering West Africa Limited
Gbarain Ubie	225 MWe	Under construction	Open cycle	Rockson Engineering Limited

Sources: Global energy observatory 2017

Referring to the figures found in Aluko (2015), if Nigeria aims at reaching a per capita electricity generation level similar to that of South Africa, Sub-Saharan Africa's wealthiest country, it needs to increase its generation from the current 4 GW to 120 GW. For instance, a power mix relying for 80% on gas requires at least about 0.85 bcm/day of gas for delivery for electricity, if the 120 GW is to be reached. That figure is six times the present aggregate production rate of 0.14 bcf/day, of which only around one tenth is currently devoted to electricity generation. In turn, this implies that Nigeria would need to produce 8.5 bcm/day, a sixtyfold increase.

Concerning NG domestic transportation and exports abroad, the Niger Delta region has a local pipeline network which is being developed and is today connecting all the gas thermal plant, as well as an interconnection to supply Benin, Togo, and Ghana (Figure 14). Three further interconnections, a second LNG plant, and three central processing facilities (CPF) are planned or under development.

Figure 14: Existing and planned gas pipelines, LNG plants, and central processing facilities



Source: Aluko (2015)

3.2. Main issues and challenges for the sector

An array of issues[3] are affecting the gas sector in Nigeria, and in turn the potential domestic energy and economic development. Behind the poor outcomes of the country *vis-à-vis* the abundance of energy resources, the literature (Osuoka 2007; Agbiboa 2012; Donwa et al. 2015; Agbiboa 2014) refers to the conventional factors of institutional quality, corruption, lack of capacity, as well as rentier behaviour. With reference to these findings, here we focus on four issues that we value of greatest importance: *(i)* a poor regulatory oversight and ineffective policy implementation; *(ii)* the dependence of the Government on oil revenues; *(iii)* the pricing mechanism for the domestic gas supply and the mandatory volume to be delivered; *(iv)* the insecurity situation in the Niger Delta.

Poor regulatory oversight and ineffective policy implementation

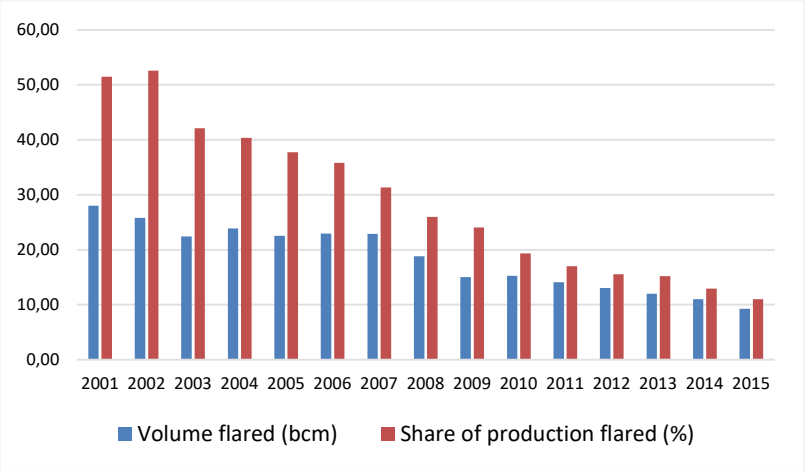
The first set of issues is connected with the overlap between political and commercial considerations which has for long being implicit in the institutional structure of the petroleum sector in the country. The NNPC (National Nigerian Petroleum Corporation) has been perceived by most actors in the industry not as a commercial entity but as an extension of the Federal Government given that the Ministry of Petroleum acts as the chairman of its board. Following the acquisition of participation interest by the NNPC in all oil and gas projects of the country in the 1970s, a relevant share of exploration and production activities in Nigeria are carried out as joint ventures. This has effectively led to a situation in which the regulator is supervising itself. Numerous negative consequences have emerged from this particular arrangement through the years, from insufficient investments in – theoretically compulsory – gas gathering and distribution infrastructure to incentives to corruption and irregular behaviour which has marked the sector.

Nowhere becomes the issue clearer than when looking at the situation of gas flaring. Despite numerous attempts to put an end to the phenomenon (the first deadline was set for the 1st January 1984), more than 10% of the gas produced is still flared nowadays, and according to different sources this figure could instead be as high as 20% (Figure 15). The longstanding problem in tackling the issue is strongly connected to the fact that the NNPC joint-ventures have been amongst the top flaring facilities in the country, so that the NNPC should have been imposing fines against itself. The company inability to face its share of the cost of development of gas-gathering and re-injection facilities in fields operated through joint-ventures has also been often quoted amongst the main obstacle towards a more complete domestic exploitation of gas resources. Similar points can also be made for the Nigerian Gas Company Limited, the

[3] For a better understanding of the underlying causes refer to Sections 3.3-4 and to the Annex, which review the history of the oil and gas sectors in Nigeria, their institutional structure, and the current reforms they are undergoing.

company tasked to market gas in the country, which is led by the head of the Department for Petroleum Resources, the gas market regulator, resulting in comparable issues. It has to be noted that, as discussed later, the 2017 Petroleum Industry Governance Bill should finally bring the overlap between regulator and regulated to an end by subtracting the regulatory function from the NNPC and transforming it into a purely commercial company. Also consider that, as discussed in Peng and Poudineh (2017), it is in the smallest fields (which are also the large majority of the 183 gas producing fields in the country) that flaring is still a major issue due to the absence of infrastructure for channelling or reinjecting gas.

Figure 15: Gas flared, absolute volumes and percentage of production.



Source: Oil and Gas Industry Report 2015

Dependence of the Government on oil revenues

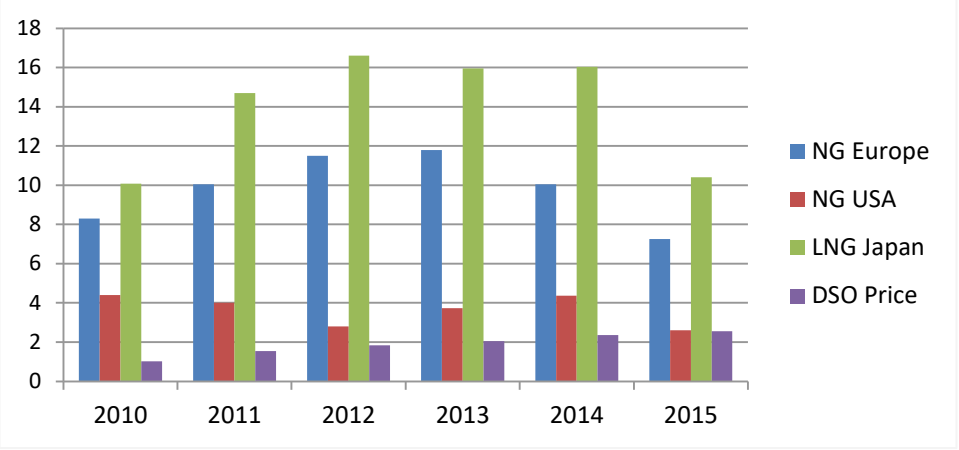
The dependence of the Nigerian Federal Government on oil and gas industry for revenues and foreign exchange has often been seen as another major obstacle for effective reforms of the petroleum sector. A first effect is that it renders the economy volatile to international oil prices. The compound annual growth rate between 2011 and 2014 was of +5.3% (PwC 2016); in 2015, when oil prices started dropping (and subsequently reached a minimum of US$ 29.46 in January 2016, with a decline greater than 70% vis-à-vis 2008 levels), the economy halted its growth and eventually fell in a recession in 2016, when a -1.5% GDP change was recorded. This also resulted in the unemployment rate also growing from 6% in 2011 to 18.8% in 2017 (NBER Nigeria 2017). The Nigerian economy has indeed undergone very little diversification, so that the Government is unlikely to enact reforms which might hinder oil production, even in the short run. In fact, the overall approach to the oil and gas industry seems to have always been the maximisation of revenues at all time, with all other consideration taking the back seats and only lip-service being paid to sustainable resource management. Every issue potentially affecting oil and gas extraction has been treated has a threat to the survival of the state, at time leading to government interferences with the judiciary. The political nature of decisions regarding the oil and gas sector is also evident in another peculiarity of the Nigerian

institutional setting. The National Environmental Standards and Regulations Enforcement Agency, the body responsible for enforcing all environmental laws in Nigeria, does not have power over the petroleum sector. The latter is instead monitored by the Department of Petroleum Resources. Given the track record of the industry in the country, the decision to only give partial oversight of oil spills to the Federal Ministry of the Environment is highly questionable.

Domestic Supply Obligation

Political interferences have also been experienced with regard to the quantity and price for the gas directed towards the domestic market. The 2008 Natural Gas Master Plan introduced a Domestic Supply Obligation for all oil and gas companies in term of both volume to be delivered and price of delivery. Since it was first determined in 2010, this price has constantly been lower than that price would be obtained in international market (see Figure 16) and sometimes did not even reflect the true cost of supply. This has resulted in continuous under-delivery of gas by all companies operating in the country, with none of them delivering the agreed amount until 2013 (see Figure 17). Although this should have resulted in relevant fines and an export ban for all of them, the previously quoted dependence of the Government on oil and revenues led once again to a disapplication of regulation. This institutional arrangement for the domestic market has made gas-shortages a common occurrence in Nigeria over the last several years, leading to unutilised generation capacity (2.7 GW in August 2016) in a country in which power outages are endemic. An evolution towards a market-oriented price structure would be welcomed by most gas-to-power operators, who are the main domestic users. From the point of view of domestic gas use, the decrease of international prices over the last couple of years can then be seen as a positive development: the closure of the price-gap should eventually lead to more resources being directed to the national markets.

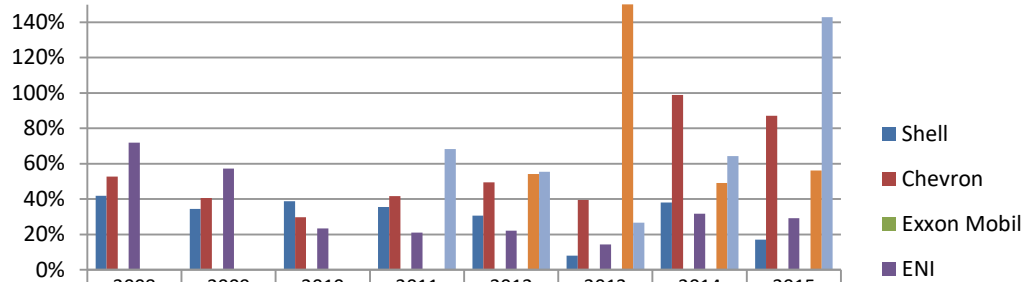
Figure 16: Average gas price in export market and domestic supply obligation price ($/Mbtu).



Sources: World Bank Commodity Pink Sheet 2013 to 2016, United Capital 2017

Moreover, the historical non-viability of domestic commercial utilisation of gas has severely discouraged investments in gas projects by most companies, who do not see returns on their investment guaranteed by the current market-structure. This has locked underground a relevant share of Nigerian gas, that is non-associated gas: almost 60% of the gas produced in Nigeria today is associated (see Figure 18). Associated gas is usually present at a low pressure, and hence requires compressing facilities to be present before been sent through the transmission network, leading the cost of delivery to the point of use up to 4-times higher than non-associated gas. Given that the location of most gas-to-power projects in Nigeria has been determined with more attention to political relevance of constituencies than to the cost of getting gas to the site, is not surprising that the old Power Holding Company of Nigeria had a long history of under-payment (and the new generating companies are rapidly building a similar reputation). The implicit assumptions in the Nigerian power system that it is better to transport gas than electricity over long distances and that gas will always be available on the generation site have been proven wrong multiple times. Given the current level of domestic gas price, private companies cannot be expected to embark on investment in infrastructure of the level required to upgrade the transmission network to a suitable standard for power generation (US$ 1.5-2 billion between 2014 and 2019). A better solution would be to site any new gas-fired generation unit near to a non-associated gas field while providing clear and favourable fiscal terms so to bring them to productive use.

Figure 17: Share of domestic supply obligation volume delivered by major oil companies



	2008	2009	2010	2011	2012	2013	2014	2015
Shell	41,81%	34,45%	38,86%	35,47%	30,69%	8,04%	38,07%	17,11%
Chevron	52,71%	40,66%	29,79%	41,61%	49,38%	39,54%	98,80%	87,20%
Exxon Mobil	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
ENI	71,84%	57,32%	23,37%	21,09%	22,06%	14,36%	31,67%	29,12%
Total	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
NPDC	0,00%	0,00%	0,00%	0,00%	54,17%	267,50%	49,14%	56,25%
Pan Ocean	0,00%	0,00%	0,00%	68,31%	55,38%	26,75%	64,30%	142,90%

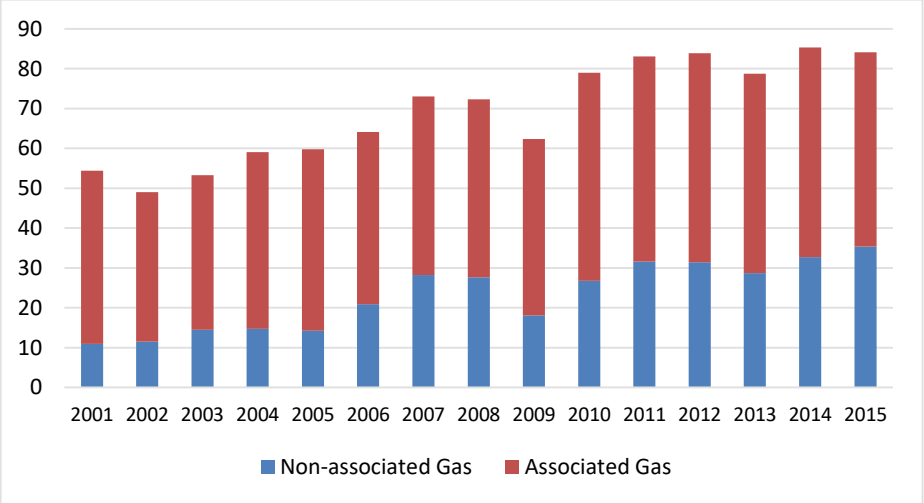
Source: Oil and Gas Industry Report 2015

Situation in the Niger Delta

Finally, it must be noted that the geographical distribution of gas reserves in the country also plays a role in hindering investments in gas transmission infrastructure. Most gas deposits are situated in the Niger Delta, an area which mainly comprises swamps, creeks, marshlands and

water bodies, not the ideal terrains on which to construct gas facilities. This region also has a long history of conflict strongly connected with the development of the petroleum industry, which is seen by most inhabitants as responsible for the degradation of the ecosystems on which their lives depend upon. If the grievances of the Niger Delta community were mostly ignored during the military regimes era and the country was suspended from the commonwealth in 1995 after 9 environmental activists were hanged for asking more regional autonomy. Since the return to democratic rules there have been substantial increase in attention to the plight of local communities, with the Federal Government, the NNPC and all oil majors increasing their spending on infrastructure and human development projects. However, this has led to only a partial improvement on the situation on the ground. Acts of vandalism towards pipeline infrastructure still hinder the functioning of the industry in the region in a serious way. For example, Shell had to close down one of its main gas-gathering facility for almost a year and a half between 2008 and 2009, first for repairing damages due to vandalism and then for security reasons. The situation is unlikely to improve (there were 60 vandalised pipelines in January 2017 alone) as long as the political grievances of the population of the Niger Delta remains unsolved: many highly motivated armed groups continuing a low-level insurrection which has proved highly profitable for those involved.

Figure 18: Associated and Non-Associated Gas, volumes of production (bcm).



Source: National Gas Policy Consultation Draft, 2016

3.3. Pre-2017 reform institutional structure

Ministry of Petroleum Resources: Governmental branch charged with the formulation and implementation of policy regarding the petroleum sector and with its general management, it also issues licenses to operators engaged with any activity in the sector. It is tasked with collecting technical, commercial and economic data about the sector and to ensure the compliance of all operators with regulations and legislations of the sector.

Department of Petroleum Resources (DPR): A sub-unit of the Ministry of Petroleum Resources, it sets the standard for the control of the industry and monitors the operation of all exploration and production companies in Nigeria, certifying the conformity to technical and safety regulations. It is also tasked with ensuring the full development of Nigeria oil and gas resources (maintaining records of reserves, production and exports) as well as guaranteeing the protection of both public and private investments. Moreover, it processes all applications from actors seeking involvement in the oil and gas sector, setting the prerequisites for registration requirements and bid submission on behalf of the Ministry for Petroleum Resources, as well as advising the latter on technical and policy matters.

Petroleum Product Pricing Regulatory Agency: An agency created in 2003 to overview the process of liberalisation of downstream petroleum markets, it determines the pricing policies of petroleum products and regulates their supply and distribution, operating to moderate price volatility while ensure reasonable returns to operators and preventing collusion and restrictive market practices.

Nigerian National Petroleum Corporation (NNPC): Headquartered in Abuja, the company (formerly known as Nigerian National Oil Company) acquired majority interests in all oil ventures in Nigeria through the 1970s and it is the representative of the Nigerian Federal State interest in the petroleum sector. It is comprised of six directorates (Engineering and Technology, Refineries and Petrochemicals, Commercial and Investments, Exploration and Production, Finance and Accounts, Corporate and Legal Services). It has ten subsidiary companies, two joint ventures and about ten affiliated companies.

Nigerian Liquefied Natural Gas Company (NLNG): An incorporated joint venture between the NNPC (49%), Shell (25.6%), Total (15%) and Agip (10.4%), became operative 1999 and represents the biggest gas utilisation project in Nigeria to this date. The Bonny Island NLNG plant currently has six operational trains (it started with two in 1999), is responsible for all the liquefaction of non-associated and associated gas in Nigeria and is capable of producing 22 metric tons per annum (mtpa) of LNG, 4 mtpa of LPG and 2.4 mtpa of condensate. The Company is responsible for the totality of Nigerian LNG exports, which represented 7.2% of world LNG export in 2016, making Nigeria the 4th biggest LNG exporter in the world.

Nigerian Gas Company Limited: A subsidiary company of the NNPC, the NGC was formed in 1988 from its Gas Division and it is responsible for the development of the transmission, distribution and marketing of gas in Nigeria, with a particular focus on availability of gas for power generation and as industrial feedstock. In order to achieve these goals, it is also tasked with the maintenance and management of the two unintegrated pipeline network of the country: the Alakiri-Ogibo-Ikot Abasi Pipeline (also known as the Eastern Network) and the

Escravos-Lagos Pipeline System (the Western Network). The NGC also manages the dedicated pipeline infrastructure owned by the Nigerian Liquefied Natural Gas Company, and it is further tasked with the participation in international gas markets, especially in West Africa.

Western Africa Gas Pipeline Company Limited: Owner of the Western Africa Gas Pipeline connecting the Escravos region to Benin, Togo and Ghana, the company is a consortium of Chevron (36.7%), NNPC (25%) Shell (18%), The Volta River Authority of Ghana (16.3%), Societé Togolaise de Gaz (2%) and Societé Beninoise De Gaz (2%). The nameplate capacity of the pipeline is 170 MMcf/d, although the effective throughput is around a third of its capacity.

3.4. National Gas Policy (NGP) 2017

Given the strong impact that the National Gas Policy (NGP) 2017 is aimed to exert on the gas sector in Nigeria, this short section highlights in greater detail the major actions put forward with the bill. The NGP 2017 is part of the Petroleum Industry Governance Bill, a comprehensive law meant to regulate the entire sphere of the industry and amend the previous existing oil and gas legislation. The bill seeks to establish a framework for the creation of commercially-oriented and profit-driven petroleum entities, to ensure value addition and internationalisation of the petroleum industry, through the creation of efficient and effective governing institutions with clear and separate roles for the petroleum industry (Banwo & Ighodalo 2017). In particular, NGP represent a new attempt to respond to the issues of the sector that were illustrated in detail Section 3.2, including:

- the unsuccessful Gas Master Plan (GMP 2008), which was aimed at attracting the needed private sector investment for building critical infrastructure and developing a mature domestic gas market by the target-year of 2015;
- the Government's resolve of achieving its policy goals for the gas sector under the MPR's 7 Big Wins initiative;
- the Economic Recovery and Growth Plan (ERGP 2017–2020).

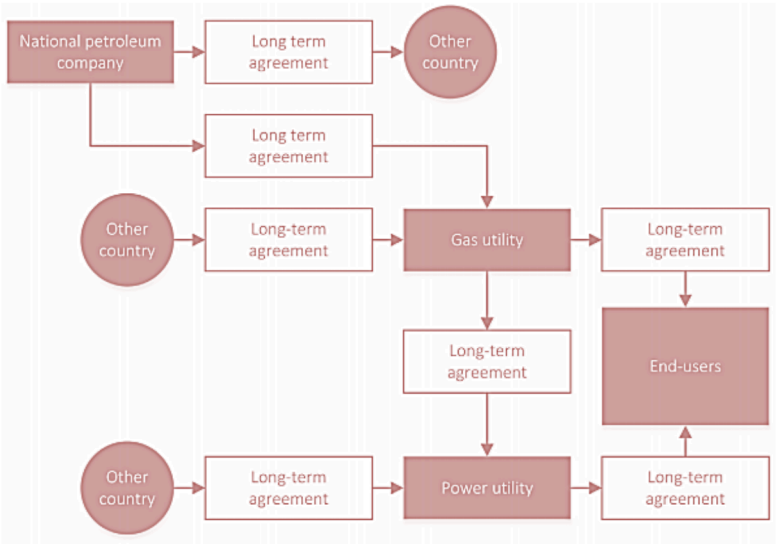
The NGP sets the goals, strategies and an implementation plan for establishing a framework that will drive the institutional, legal, regulatory and commercial reforms necessary for attracting investment into the gas sector. Overall, the policy aims to define and set the framework necessary to move Nigeria from being a crude oil export-based economy to becoming an attractive gas-fired industrial economy supported by the efficient recycling of revenues from O&G exports. The pivotal measures include:

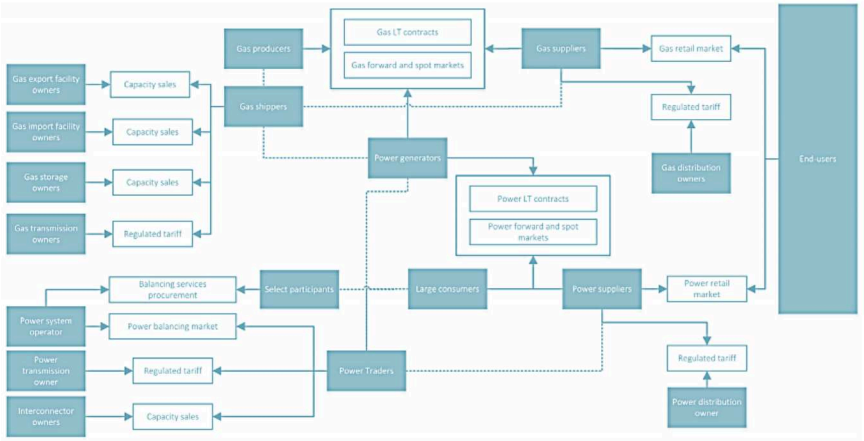
- the separation of the roles and responsibilities of the government and the private sector;

- the legal separation of upstream and midstream levels, and of the segmentation and legal separation of the gas value chain in upstream/midstream/downstream to separate infrastructure ownership and operations and gas trading parties, as well as the fiscal treatment;
- the provision of favourable conditions for new entrants/investors and a competitive playing field;
- the establishment of a single regulatory authority;
- measures to encourage a project-based approach rather than a centrally-planned top-down approach for domestic gas development;
- the creation of a more favourable environment for investors;
- the establishment of stronger linkages between the gas sector and the electric power and other energy-intensive sectors.

In the context of the domestic energy development of the country, the policy is to be seen in an inclusive framework of structure, infrastructure, market, and regulatory interdependence between the electricity and gas sectors, as shown in Peng and Poudineh (2016). Figures 19-20 picture two ideal types for the gas-to-power supply chain, and represent the current situation, i.e. one of centralisation, with all the roadblocks found at different stages, and the desired one for energy development in the context of Nigeria, i.e. one where the value-chain in split between a large number of independent parties, and multiple private actors are in the market and guarantee competition and efficiency, respectively.

Figures 19-20: Market paradigms of the gas-to-power supply chains





Source: Peng and Poudineh (2016)

4. Policy recommendations

Nigeria is a NG-rich country. While significant steps in the right direction have been taken over the last years through policy reforms and a widening of the market, the country has so far failed to exploit its gas resources to the best of its potential. The recently approved Petroleum Industry Governance Bill might become a positive trendsetter, as it tackles at least one of the major issues affecting the Nigerian gas market, namely the overlap between the commercial and regulatory function of the NNPC, which is responsible of several negative outcomes over the years. An effective implementation of the NGP has the potential to enable large economic gains, including increased government revenues, enhanced gas-powered electricity generation, and diffuse benefits in agriculture, infrastructure, and industries. In the medium-run, in-country capacity must be developed for harnessing gas resources and a guaranteeing a cleaner and healthier environment, particularly in the Niger Delta. This is also likely to enhance the attainment of the country's development targets and reduce inequality. Further work will though need to be directed towards the diversification of the Nigerian economy in order to diminish the dependence of the Federal Government on oil and gas revenues. Another aspect of the market in which changes will be welcomed by most operators is the structure of the domestic supply obligation. Although the decrease in international gas prices has helped closing the gap with the national mandatory one, almost no oil and gas company delivers the agreed upon volumes, affecting gas availability for domestic consumption. Finally, more efforts should be directed towards the socio-economic development of the Delta Region in order to reduce the security concerns which have for long characterised the region of the country where most gas deposits are located.

In order to tackle such issues and reach socio-economic development objectives, we suggest the following policy measures to be considered as a reference and be rendered operational by public authorities in the country:

- Joint funding and operations partnerships between the Federal Government of Nigeria, the Ministry of Petroleum Resources and the industry participants, with the ability to innovate, capacity to deliver major projects, and willingness to take on long term commitments are required to unlock Nigeria's potential in NG.
- Clearing the Government's backlog of unpaid deliveries of both power and gas to customers is a necessary condition for domestic market development. Without the repayment of outstanding gas and power invoice arrears, and securitisation of current and future revenues, private operators are reluctant to commit additional investments to increase domestic gas supply.
- Ambitious electrification targets based on power-to-gas technologies require the opening up of new fields (both for associated and non-associated gas) and of additional gas treatment plants, the development of amore extended pipeline network from fields to LNG plants and to power plants, as well as the monitoring and protection of all pipelines and the electricity grid. This in turn necessitates reforms in the power sector in cooperation between by the Nigerian Electricity Regulatory Commission, the Federal Ministry of Power, Nigeria Bulk Electricity Trading public company, and the Rural Electrification Agency to reduce the key barriers to generating (reducing the 8.6 GW of unutilised capacity installed), transmitting and distributing (almost 1 GW is currently lost, i.e. 20% of the electricity generated) power nationwide.
- The Government of Nigeria is budget-constrained and cannot afford to achieve this by itself, and therefore international investment needs to be attracted to further develop infrastructure along the gas and power value chain. Ensuring a conducive business environment is essential to receive investments and ensure reliable operations. This includes a predictable regulatory, commercial and legal framework across the country and overcoming security challenges, particularly in the Niger Delta, which has experienced an increased risk to personnel and property as well as the disruption to operations.
- Gas pricing must be brought to cost-reflective parity for all users; gas-to-power purchasing agreements be signed and guaranteed; provisions be paid regularly.
- It is important to harness all 'associated' NG and completely stop flaring the remaining 10-20% share. The practice has significant climate, environmental, and security impacts, and it represents a long-lived source of missed revenues and energy generation.
- The development of a domestic market for LNG/LPG could reduce transport cost and the cost of energy in regions not served or underserved by gas pipelines, and it can lead to the growth of industries, of employment and of the national economy. It can also reduce the share of solid biomass in the energy mix, with substantial health and productivity improvements.
- Conversely, also the construction of new NG pipelines to enhance movement of gas from the southern corridor to the North would increase power generation and enable utilization of gas up into the hinterlands.

- The further development of combined-cycle gas turbines *vis-à-vis* the currently operating open-cycle ones is an additional effort with the potential to pay back. The former burn 40% less gas than the latter, and in the long-run are more cost-efficient and less impactful in emissions terms, in spite of the greater upfront investment required.

References

Agbiboa, D. (2014). Under-development in practice: Nigeria and the enduring problem of corruption. Development in Practice, 24(3), 390–404. https://doi.org/10.1080/09614524.2014.899559

Agbiboa, D. E. (2012). Between Corruption and Development: The Political Economy of State Robbery in Nigeria. Journal of Business Ethics, 108(3), 325–345. https://doi.org/10.1007/s10551-011-1093-5

Airoboman, A. E., Amaize, P. A., Ibhaze, A. E., & Ayo, O. O. (2016). Economic Implication of Power Outage in Nigeria: An Industrial Review. International Journal of Applied Engineering Research, 11(7), 4930–4933.

Akuru, U. B., & Okoro, O. I. (2014). Economic implications of constant power outages on SMEs in Nigeria. Journal of Energy in Southern Africa, 25(3), 47–61.

Aluko, B. (2015). SUNDAY MUSINGS: The Case for an Energy Emergency in Nigeria, Again. Retrieved 15 January 2018, from http://www.nigerianmuse.com/20150607041636zg/sections/essays/sunday-musings-the-case-for-an-energy-emergency-in-nigeria-again-by-bolaji-aluko/

Arderne, C., & World Bank. (2017). Africa - Electricity Transmission and Distribution Grid Map. Retrieved from https://energydata.info/dataset/africa-electricity-transmission-and-distribution-2017

Banerjee, S. G., Moreno, F. A., Sinton, J. E., Primiani, T., & Seong, J. (2017). Regulatory indicators for sustainable energy : a global scorecard for policy makers (No. 112828) (pp. 1–264). The World Bank. Retrieved from http://documents.worldbank.org/curated/en/538181487106403375/Regulatory-indicators-for-sustainable-energy-a-global-scorecard-for-policy-makers

Banwo & Ighodalo. (2017). Synopsis Of The 2017 National Gas Policy. Retrieved 15 January 2018, from http://www.banwo-ighodalo.com/resources/synopsis-of-the-2017-national-gas-policy

Bloomberg New Energy Finance. (2017). Climatescope 2017. Bloomberg Finance. Retrieved from http://global-climatescope.org/en/download/reports/climatescope-2017-report-en.pdf

Boundaries without limits - DIVA-GIS. (n.d.). Global Administrative Areas. Retrieved 15 January 2018, from http://www.gadm.org/

BP. (2017). Statistical Review of World Energy 2017. BP. Retrieved from https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

Department of Petroleum Resources. (2015). Oil and Gas Industry Report 2015. Retrieved 15 January 2018, from https://dpr.gov.ng/index/wp-content/uploads/2015/01/2015-Oil-Gas-Industry-Annual-Report.pdf

Donwa, P. A., Mgbame, C. O., & Julius, O. M. (2015). Corruption in the Oil and Gas Industry : Implication for Economic Growth. Nigerian Chapter of Arabian Journal of Business and Management Review, 62(2468), 1–16. https://doi.org/10.12816/0017678

EDGAR. (2017). GHG (CO2, CH4, N2O, F-gases) emission time series 1990-2012 per region/country. Retrieved 24 January 2018, from http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2015&sort=des9

ENI. (2017a, October 29). Volume 1 – World Oil Review 2017. Retrieved 15 January 2018, from https://www.eni.com:443/en_IT/company/fuel-cafe/world-oil-gas-review-eng.page

ENI. (2017b, October 29). Volume 2 – World Gas and Renewables Review 2017. Retrieved 15 January 2018, from https://www.eni.com:443/en_IT/company/fuel-cafe/world-gas-e-renewables-review-2017.page

Enipedia. (n.d.). Oil and Gas Map. Retrieved 15 January 2018, from http://enipedia.tudelft.nl/wiki/Oil_and_Gas_Map#Nigeria

Export.gov. (2016). Nigeria - Executive Summary. Retrieved 15 January 2018, from https://www.export.gov/apex/article2?id=Nigeria-Executive-Summary

Global Energy Observatory. (n.d.). Global Energy Observatory: Information on Global Energy Systems and Infrastructure. Retrieved 15 January 2018, from http://globalenergyobservatory.org/index.php

IEA. (2017). WEO 2017 Special Report: Energy Access Outlook. International Energy Agency. Retrieved from https://www.iea.org/publications/freepublications/publication/weo-2017-special-report-energy-access-outlook.html

Institute for Health Metrics and Evaluation (IHME. (2017). Global Burden of Disease from Household Air Pollution.

Ley, K., Gaines, J., & Ghatikar, A. (2015). The Nigerian Energy Sector: An Overview with a Special Emphasis on Renewable Energy, Energy Efficiency and Rural Electrification. GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). Abuja.

Ministry of Petroleum Resources. National Gas Policy 2017 (2017). Retrieved from http://www.petroleumindustrybill.com/wp-content/uploads/2017/06/National-Gas-Policy-Approved-By-FEC-in-June-2017.pdf

OPEC. (2017). Annual Statistical Bulletin 2017. OPEC. Retrieved from https://asb.opec.org/index.php/pdf-download

Osuoka, A. I. (2007). Oil and Gas Revenues and Development Challenges for the Niger Delta and Nigeria. Retrieved from http://www.un.org/esa/sustdev/sdissues/institutional_arrangements/egm2007/presentations/isaacOsuoka.pdf

Peng, D., & Poudineh, R. (2017). Gas-to-Power Supply Chains in Developing Countries: comparative case studies of Nigeria and Bangladesh. Oxford Institute for Energy Studies. https://doi.org/10.26889/9781784670818

SEDAC - NASA. (2015). Gridded Population of the World (GPW) v4. Retrieved 15 January 2018, from http://sedac.ciesin.columbia.edu/data/collection/gpw-v4

Shell. (2017). Unlocking Nigeria's Potential in Natural Gas. Retrieved 15 January 2018, from http://www.shell.com.ng/media/nigeria-reports-and-publications-briefing-notes/potential-in-natural-gas.html

Solargis. (2011). Free solar resource maps. Retrieved from https://solargis.com/products/maps-and-gis-data/free/download/

Sunday, O. O. (2009). Power outages in the nigeria transmission grid. Research Journal of Applied Sciences, 4(1), 1–9.

U.S. Energy Information Administration (EIA). (2017). Nigeria's Key Energy Statistics. Retrieved 15 January 2018, from https://www.eia.gov/beta/international/country.cfm?iso=NGA

Ukala, E. (2010). Gas Flaring in Nigeria's Niger Delta: Failed Promises and Reviving Community Voices. Washington and Lee Journal of Energy, Climate, and the Environment, 2(1), 97.

UNDATA. (2017). Energy Statistics Yearbook 2014. United Nations Publications.

United Nations Population Division. (2017). World Population Prospects: The 2017 Revision. Retrieved from https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf

U.S. Energy Information Administration (EIA). (2017). How much carbon dioxide is produced when different fuels are burned? Retrieved 17 January 2018, from https://www.eia.gov/tools/faqs/faq.php?id=73&t=11

World Bank. (2015). Power outages in firms in a typical month. Retrieved 15 January 2018, from https://data.worldbank.org/indicator/IC.ELC.OUTG

World Bank. (2017). World Bank Data. Retrieved 20 November 2017, from https://data.worldbank.org/

Annex: History of oil & gas market and institutions in Nigeria

1908: Exploration activities are stated by a German company, which remained the only player in the market until the braking off of WWI, which lead to the stop of all exploration activities and to the exclusion of all non-British companies from obtaining oil licenses.

1937: Exclusive exploration rights are granted to the Shell-BP Petroleum Development Company of Nigeria.

1956: The oil discovery in Olobiri (todays Bayelsa State) leads to first commercial exploitation of reserves. The "Oil Pipelines Act", regulating the awarding of licenses for construction and maintenance of the pipeline serving the oil fields, is passed.

1958: A ban on exploration activities by non-British companies is lifted, a 50% tax on profit from petroleum operations is introduced.

1960s: Given the increased participation of multinational companies in the Nigerian oil and gas sectors, Nigeria becomes an observer at OPEC in 1964.

1969: The Petroleum Act, still one of the most relevant piece of legislation for the sector today, is passed. Ownership and control of all oil and gas is attributed to the federal state, the validity of licenses already granted is maintained, but new licenses or leases have to be granted only to Nigerian citizens or companies incorporated in Nigeria. Natural gas is seen as a by-product of oil extraction, so that the Act required all companies to submit a feasibility study for the utilisation of the gas present in the area under license not later than 5 years after having started production. However, no fines are imposed for failure to comply, nor there is any explicit mention of a target or cap on flaring activities, which is already becoming an issue.

1971: Nigeria joins OPEC, the Nigerian National Oil Corporation is created with the task of acquiring on behalf of the Government assets and liabilities from foreign oil companies operating in the countries.

1973: An amendment to the Petroleum Act grants the Federal Government of Nigeria the right to harness associated gas "free of cost at the flare or at an agreed cost and without the payment of royalty" with the objective of reducing gas-flaring. Furthermore, an obligation for holders of licenses and leases "to obtain the approval of the Federal Government as to the price at which natural gas produced by the licensee and lessee (and

not taken by the Federal Government) is sold" is introduced. Given the lack of infrastructure for transportation of natural gas from oil wells to storage and processing facilities, the amendment fails to achieve a reduction in the volume of natural gas flared.

1977: The Nigerian National Oil Corporation and the Ministry of Petroleum Resources merge creating the National Nigerian Petroleum Corporation (NNPC), which also acquires regulatory function over the sector.

1979: The NNPC acquires majority (participation) interests in all operations of oil and gas corporations in Nigeria, leading to the creation of a series of joint ventures. The Associate Gas Re-injection Act is promulgated with the overall objective of ending all gas flaring in Nigeria by the 1st of January 1984. All flaring of associated gas without the permission of the Minister of Petroleum is prohibited, with companies violating the provision risking to lose the concession for the field in which the offence is committed. Moreover, they can also be charged for the cost of implementation or completion of the desirable gas re-injection project.

1984: None of the oil companies operating in the country manages to meet the deadline for flaring. The absence of any gas utilisation facility in the country and the inability of the Nigerian Government to sustain its share of the cost (the bulk of oil production happened under joint venture agreements) are quoted as the main reasons. The Associated Gas Re-injection (Continued Flaring of Gas) Regulations is then passed to introduce a series of caveat under which the oil companies are allowed to continue with gas flaring while also introducing a fine for those who continue without meeting any criterion. Once again, the legislation did not achieve any significant reduction in the amount of flaring in country, as more than 55% of the fields in operation meet at least one exempting condition while the fine is too low to make investment in gas re-injection an economically sensible choice.

1990: The Nigerian Liquefied Natural Gas (Fiscal Incentives, Guarantees and Assurances) Act is passed to codify the legal structure for investments in the Liquefied Natural Gas (LNG) sector. The Act introduces a series of fiscal incentives and protects foreign shareholders from unilateral changes in legislation by the Government. The Act achieves at least partially its scope as it is considered functional to the fruitful development of the Nigerian Liquefied Natural Gas Company (NLNG).

1992: The Associated Gas Framework Agreement is passed, setting a 3-years tax holidays for all associated gas utilisation projects, increased to five to seven year in a 1998 revision, while also exempting from taxes both investments in and dividends from these projects. The revised Agreement played a positive role in fostering the development of a series of gas

utilisation projects such as the OSO Condensate Project, the Escravos Gas Project, the Western Africa Gas Pipeline Project and the Belema Gas Injection Project.

1999: The Bonny Island Terminal of the NLNG comes online, the NLNG becomes the biggest gas utilisation project in the country.

2003: The National Energy Policy, explicitly emphasising the role that natural gas must play in the sustainable development and diversification of the Nigerian economy and its energy mix, is promulgated. Another deadline for ending the flaring of associated gas is set for 2008.

2008: The Natural Gas Master Plan is developed to address the low domestic utilisation of gas in Nigeria. The Master Plan divides the national gas market in three categories (power generators; those using gas as feedstock, those using it as a fuel) and establishes the minimum price for each of them as a first step in the creation of a transparent gas market. A domestic supply obligation is introduced for all oil and gas companies, effectively restricting their export of natural gas when they are not capable of delivering a specified volume-target to the national market. The volume-target, meant to insure the availability of enough natural gas for all strategic sectors, is set by the Minister of Energy and revised every five to seven years. The Plan also provides a road map for the development of gathering, transmission and processing infrastructure, the quantity and quality of which has constituted a serious bottleneck. The gas network will be owned and operated by the gas producers from the well-head to a designated node, while the hub operator will be the own and manage it from each nodes to the gathering facilities, including the processing facilities and the transmission lines.

2010: Incorporation of the Gas Aggregation Company Nigeria Limited, acts as an intermediary between large gas buyers and producers to help the negotiation of Gas Sales and Aggregation Agreement.

2013: The World Bank and the Government of Nigeria develop a scheme to hedge producers from non-payment of gas-delivery from state owned power-plant, reducing the risk for companies which might otherwise divert their supply.

2017: The Petroleum Industry Governance Bill, first proposed in 2008 as the Petroleum Industry Bill, is approved by the Senate. The Bill proposes to simplify the Government involvement in the petroleum sector by substituting the existing companies and regulatory agencies with three new entities: the National Petroleum Company, the National Petroleum Assets Management Commission and the Nigeria Petroleum

Regulatory Commission. The National Petroleum Company will substitute both the NNPC and the Nigerian Gas Company Limited thus becoming an integrated oil and gas company operating as any other commercial entity. The Company initial capitalisation should be enough to cover the 5-years average of cash calls for the NNPC joint ventures, with existing NNPC's interests in the latter to be transferred to the new Company, along with those of its subsidiaries. The shares of the new company would be controlled but Federal Ministry of Finance and by the Bureau of Public Enterprises on behalf of the Government. The National Petroleum Assets Management Commission will have the same shareholders and will be responsible for managing the NNPC's investments in gas and oil for which the Government is not obliged to provide funding, including all NNPC's assets from production sharing contracts. The Assets Management Commission will also own and manage all of Nigeria's petroleum assets on behalf of the Government and will be entitled to charge fees based on a percentage of the revenue generated to the latter. Furthermore, it will be tasked to enter into new exploration and petroleum agreements with petroleum companies and to sell crude oil and petroleum derivative produced from the assets managed. The last body created by the Bill is the Nigeria Petroleum Regulatory Commission, substituting both the Department of Petroleum Resources and the Petroleum Products Pricing Regulatory Agency thus becoming the only regulatory agency for the Nigerian oil and gas industries. The Regulatory Commission, in regulating both the technical and commercial aspects of the industry, amongst other things will: issue licenses and leases for both upstream (after bid rounds) and downstream operations; determine the amount of royalties from upstream operations and ensure their payment; determine tariffs and price methodology for third party access to petroleum facilities. Finally, the Bill reiterates the commitment to put an end to gas flaring after a flare-out date to be set by the Minister of Petroleum, who will though maintain the right to issue gas flaring permits of no-longer than 100 days. All facilities should be equipped with flares-metering equipment, all flared gas resources should be categorised and data about flaring activity should be transmitted to the National Petroleum Regulatory Commission. All oil and gas operators flaring gas without permit after the flare-out date will have to pay a fine equal at least to the value of the gas flared. In addition, gas utilisation plans will now be a pre-condition for obtaining an oil production license, and the Commission might reject the application for a license if it is not satisfied by the presented plan.

2018: On January, 17th, the Petroleum Industry Governance Bill is approved also by the House of Representative without amendments to the version approved in 2017 by the Senate. As of February 2018, the presidential promulgation is pending, and in all likelihood the law will soon enter into force.

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