

ISSUES IN IMPLEMENTING **THE NIGERIAN** GAS MASTER PLAN

 HEINRICH BÖLL STIFTUNG
NIGERIA



CENTRE FOR SOCIAL JUSTICE (CSJ)
(Mainstreaming Social Justice In Public Life)

ISSUES IN IMPLEMENTING THE NIGERIAN GAS MASTER PLAN

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(Mainstreaming Social Justice in Public Life)

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LIST OF ABBREVIATIONS

AKK:	Abuja-Kaduna-Kano
CAA:	Calabar-Ajaokuta-Abuja
CBN:	Central Bank of Nigeria
CPFs:	Central Gas Gathering and Processing Facilities
DGSO:	Domestic Gas Supply Obligation
DPR:	Department of Petroleum Resources
EIA	Environmental Impact Assessment
EGASPIN	Environmental Guidelines and Standards for the Petroleum Industry in Nigeria
ELPS:	Escravos-Lagos Pipelines
EPC:	Engineering, Procurement and Construction
FGN:	Federal Government of Nigeria
GDP:	Gross Domestic Product
GMP:	Gas Master Plan
GOPA:	Geregu, Omotosho, Papatan (Olorunshogo) and Alaoji
GPS:	Gas Pipeline Systems
GSPA:	Gas Sales and Purchase Agreements
IOCs:	International Oil Companies
LPG:	Liquefied Petroleum Gas
MMBT:	Million Metric British Thermal Units
MW:	Megawatts
NEITI:	Nigerian Extractive Industries Transparency Initiative
NERC:	Nigerian Electricity Regulatory Commission
NESREA	National Environmental Standards and Regulations Enforcement Agency
NGC:	Nigeria Gas Company Limited
NGMP:	Nigerian Gas Master Plan

NIPP:	National Independent Power Project
NLNG:	Nigerian Liquefied Natural Gas
NNPC:	Nigerian National Petroleum Corporation
NOSDRA	National Oil Spill Detection and Response Agency
OB3:	Obiafu-Obrikom-Oban
OKLNG:	Olokola Liquefied Natural Gas
OML:	Oil Mining Lease
OPL:	Oil Prospecting Licence
PHCN:	Power Holding Company of Nigeria
PIB:	Petroleum Industry Bill
PPP:	Public-Private Partnership
PSA:	Production Sharing Agreements
RPT:	Rapid Phase Transition
RTPSS:	Real Time Pipeline System Surveillance
Tcf :	Trillion (standard) cubic feet
VRA:	Volta River Authority
WAGP:	West African Gas Pipeline
WAPCo:	West African Portland Cement Company

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FOREWORD

The Nigerian Gas Master Plan (NGMP) has been in circulation for nearly a decade now, and its main selling point, from conceptualization to the various Road-shows, is what its promoters consider the economic benefits to be gained both by potential investors and by the Federal Government of Nigeria (FGN). There is no doubt that these benefits abound, and are demonstrable to anyone interested in exploring them. With no dedicated gas exploration regime, Nigeria boasts of over 187 Trillion standard cubic feet (scf). This is gas that was discovered and proven in the process of exploring for oil. It goes without saying, therefore, that a dedicated gas regime would offer many more benefits than many Nigerians are aware of at present.

The complex, cumbersome and sometimes opaque nature of the oil and gas industry in Nigeria, coupled with bureaucratic bottle-necks, and the absence of political and economic will to summon and invest the kind of resources needed to grow the sector, has made it almost impossible to attain our rightful status in the committee of gas producing and exporting nations. Ironically, Nigeria sits on immense deposits of natural gas, yet remains one of the darkest nations in Africa, with only 4000MW of electricity output to boast of, for a population of over 170 Million people! With the right kind of planning and appropriate investments in the right places, the gas sector in Nigeria should quickly turn around and become the golden egg it was supposed to be, and to contribute significantly to economic growth.

This study of the Gas Master Plan, thus, becomes a timely intervention to hopefully ignite the discussion on Nigeria's gas potentials and what needs to be done to stimulate and strengthen it. This is a debate that Nigerians cannot postpone since it is central to our economic growth going forward. Apart from obvious challenges with the security of pipelines and other facilities, there are concerns that attention is not being paid to other possible and available sources of energy that this nation is blessed with. There are abundant resources for solar, wind and biomass, all of which are known clean energy sources that could be harnessed for alternative use. Furthermore, gas is a fossil fuel that portends grave environmental, health

and livelihood effects on the communities and people that live proximate to the facilities. The NGMP has completely overlooked and discounted these effects from the equation, perhaps for fear of scaring off investors. But that reality does not change, however it is papered over.

The Centre for Social Justice (CSJ) is obviously sticking its neck out and drawing attention to this essential discussion that Nigerians need to engage in. In the light of a new government that promises to do the right thing rather than do “business as usual”, the space has perhaps been created for this issue to be ventilated at the appropriate levels of Government, Business and Civil Society. The benefits that the promoters of the Gas Master Plan have in mind should, even now, become real for investors, the Nigerian State and its entire people.

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Part One

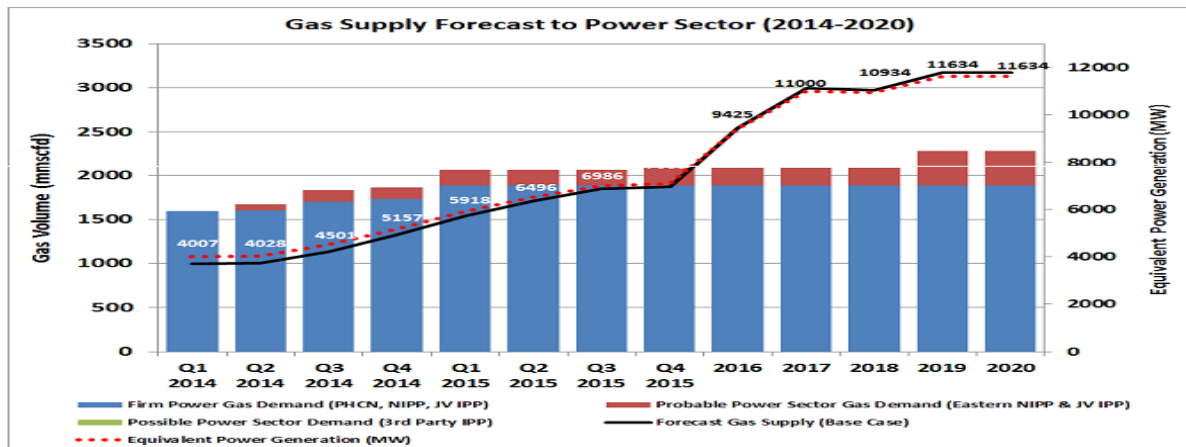
INTRODUCTION

1.1 BACKGROUND

Nigeria has abundant reserves of associated and non-associated gas estimated in excess of 187 Trillion (standard) cubic feet (scf). Though Nigeria is ranked 7th in terms of proven natural gas reserves in the world, geological experts hold the view that more gas can still be found; potentially up to 600 Tcf¹. This is realisable if oil and gas companies deliberately explore for gas as against finding gas while in search for oil. To facilitate gas gathering, processing and utilisation will require favourable development oriented market conditions and policy framework for the gas sector.

For the power sector, over 70% of the power generating plants across Nigeria depend on gas to function² and electricity is so vital for national development. More than 90 million persons (55% of the population) do not have access to grid electricity. Nigeria targets to make reliable electricity available to 75% of the population by 2020 and 100% of the population by 2030³. The demand for gas to produce electricity will therefore increase over the years as shown in Figure 1.

Figure 1: Gas Supply Forecast to Power Sector (2014 – 2020)



Source: David Ige (May 2014); Achievement of the Gas Master Plan: Strategies for a Workshop Roadmap⁴.

¹ Presentation by David Ige - GMD Gas and Power of NNPC on the Nigerian Gas Master Plan Investors Road Show 2008; "Many basins remain untapped and gas discoveries to date are as a result of exploitation of oil and there is significant potential for reserves growth with focused gas exploration".

² According to the Energy Commission of Nigeria, 20 to 30% of current generating input is from hydroelectric power plants. See Appendix 1 to this Study.

³ Energy Commission of Nigeria, 2015: FGN to increase electricity access to 100% by 2030: Leadership Newspaper p.26, March 17, 2015. Also Available on ECN Website: http://www.energy.gov.ng/index.php?option=com_content&view=article&id=125:fg-to-increase-electricity-access-to-100-by-2030&catid=1:latest-news

⁴ This excludes captive power solutions for industrial parks and major industrial projects such as Ogidigben, Eleme Fertilizer and Dangote Fertilizer plants, all of which will need gas to generate power.

The implication of Figure 1 is that, to ensure improved power generation and access to sustainable electricity in Nigeria, the Gas Industry policies and framework must be robust to respond to domestic and international demand for Nigerian gas. From Appendix 1, out of a total 18,088MW of installed capacity in available and planned hydro, coal and gas fired plants, the gas plants will supply 11,563 being 64% of the capacity. But for operational, partially operational and completed plants, gas fired plants will contribute 9,575MW out of 11,815 MW, being 81.04% of the capacity. Evidently, current investments in electricity generation are skewed in favour of gas fired plants and this seems like putting all eggs in one basket in view of the renewable energy potentials available for harnessing in Nigeria. It is imperative to note that, at the current rate of harnessing 5bscf a day, our 187trillion scf will last for 102 years. But the rate of harnessing will increase as the implementation of the Nigerian Gas Master Plan (NGMP) is accelerated. Thus, at 15bscf a day which is triple of the current harnessing capacity, (the rate expected in NGMP), the reserves will last for 34 years.

In the light of the foregoing, the role and importance of natural gas to Nigeria's economic and social development cannot be over emphasised. Gas gathering and utilisation is necessary to curtail environmental challenges associated with gas flares and the use of other traditional fossil fuels. It is also relevant for the expansion of the revenue base of the economy in the light of dwindling oil prices.

On the other hand, the renewable energy potentials of Nigeria are intimidating. According to the Energy Commission of Nigeria, large hydro-power can generate 11,250MW and the solar radiation is 3.5-7kmh/m²/day and solar sources can provide up to 30,000MW of electricity. Wind coverage at 10metres height is 2-4m² annually. Nigeria also produces a lot of animal waste – 61million tonnes per year and crop residue of 83million tonnes per year which can be used for energy generation. Investment in renewable energy is low and renewable energy contributes less than 5% to the overall energy mix in Nigeria.

Currently, the Nigerian gas-to-electricity project has over 1,000km of pipelines. For an electricity revolution based mainly on gas, Nigeria will need about 10,000km of gas pipeline infrastructure⁵ as well as adequate security measures to curb the menace of gas pipeline vandalisation. The questions arising from the gas to power proposal include the following: Who will be investing all the needed finances? Is the domestic gas price attractive to encourage investors to invest in gas exploration and pipeline expansion? Will the extant enabling policies ensure returns on investment? How sustainable is the available gas reserves to meet the needs of future generations? If realisable, will the expansion of the gas pipelines infrastructure guarantee sustainable and accessible power to all Nigerians especially those in the off-grid communities?

⁵ Heinrich Boll Stiftung, Nigeria: Renewable Energy- Power for All. www.greendealnigeria.org 2015

1.2 BRIEF OVERVIEW OF THE LEGAL AND POLICY FRAMEWORK

1.2.1 Extant Framework

The Constitution of the Federal Republic of Nigeria 1999⁶ as the *grund norm* and the Petroleum Act⁷ vests the ownership of petroleum and gas resources in the Federal Government. By law, the Minister of Petroleum Resources must give consent to any prospecting, exploration, production and distribution of petroleum and natural gas. By virtue of the powers vested in the Minister under the Petroleum Act, the Minister enacted the Petroleum Drilling and Production Regulations which provides the detailed regulation for natural gas exploration and production activities. Oil Prospecting Licence (OPL)⁸ and Oil Mining Lease (OML)⁹ are issued by the Minister to companies working solely or in joint venture with NNPC. Production Sharing Agreements (PSAs) are issued where the investor provides funds and bears interests on the funds, in addition to bearing the risks of operating costs and risks required to carry out petroleum operations and therefore have an economic interest in the development of crude oil and natural gas discovered.

The relevant environmental laws include the Environmental Impact Assessment Act¹⁰ (EIA) and the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act. The National Oil Spill Detection and Response Agency (NOSDRA) Act and the Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) give details of the environmental pre-requisites for the industry and serve also as regulatory instruments for day to day oil and gas field operations. The Oil Pipelines Act¹¹ regulates the granting of licences to establish oil and related pipelines and it is supplemented by the Oil and Gas Pipelines Regulations made under it. The Nigerian Gas Company Limited (NGC), established in 1988 as a subsidiary of the Nigerian National Petroleum Corporation (NNPC) is charged with the responsibility of developing an efficient gas industry to fully serve Nigeria's energy and industrial feedstock needs through an integrated gas pipeline network and also to export natural gas and its derivatives to the West African Sub-region¹².

In terms of revenue generation to the Federation Account, the gas regime is as follows¹³:

Royalties for offshore fields is 5% and for onshore fields is 7% of the natural gas production. Taxes include the Petroleum Profits Tax of 85% on chargeable profits from exploration and production; the Companies Income Tax of 30% on the total profits of a company derived from gas supply and distribution; education tax of 2% on the profits of all Nigerian companies; and the Niger Delta Development

⁶ S. 44 (3) of the Constitution.

⁷ Cap. P10, Laws of the Federation of Nigeria, 2004.

⁸ By S. 6 of the Petroleum Act, OPL is given for a period not exceeding five years including the periods of renewal.

⁹ By S.10 of the Petroleum Act, the term of an oil lease shall not exceed 20 years.

¹⁰ Cap. E12, Laws of the Federation of Nigeria 2004.

¹¹ Cap.07, Laws of the Federation 2014.

¹² <http://www.nnpcgroup.com/nnpbusiness/subsidiaries/ngc.aspx>

¹³ *The International Legal Guide to Gas Regulation 2011*; Chapter 25 on Nigeria

Commission levy of 3% of the total annual budget of any oil-producing company operating offshore and onshore in the Niger Delta area. Gas processing companies are also subject to this tax. Royalty and petroleum profits tax are not applicable to gas transferred from a natural gas liquid facility to a gas-to-liquid facility.

The electricity industry is governed by the Electric Power Sector Reform Act 2005. The latest policy instrument is the Nigerian Gas Master Plan which will be reviewed in subsequent parts of this Study.

1.2.2 Proposed Gas Framework in the PIB

The PIB is an ambitious piece of proposed legislation that seeks to cover the entire field of the oil and gas industry. The objectives include the optimization of domestic gas supplies especially for the power sector, liberalizing the downstream sector; creating effective regulatory agencies and introducing transparency and openness in the administration of petroleum resources. It seeks to establish a National Gas Company; Domestic Gas Supply Obligations to be determined by the Inspectorate in accordance with the NGMP and the needs of the domestic gas market is imposed on lessees, subject to the pain of punishment in the event of failure to adhere to the obligations. Provisions are made for gas export which requires a gas export license.

It imposes gas flaring penalties and makes it mandatory for all lessees to install such measurement equipment as ordered by the Inspectorate to measure the amount of gas flared. A license or lease for the production of off-shore or onshore oil and gas shall not be approved unless it is accompanied by a satisfactory plan for the utilisation or reinjection of natural gas.

The Down Stream Petroleum Regulatory Agency (Agency) is authorised to issue a transport pipeline owner license and the owner of the license is to *inter alia* operate and maintain economical, safe and reliable transportation infrastructure taking into account any strategic plans that may be formulated by the Agency; manage supply shortfalls and where feasible, meet requests of customers for transportation above official volumes; provide third party access to the transportation network; ensure equitable and transparent access to the transportation network and establish and publish terms of access to the network. It is also to develop a network code in line with guidelines for the network code by the Agency. The bill establishes a gas supplier license and the general duties, rights of a gas supplier and conditions applicable to a supply license. On the other hand, a gas distribution license confers exclusive right to own and operate a gas distribution system within a local distribution zone. It spells out the duties and rights as well as conditions applicable to a gas distribution licensee.

The Agency is to establish the guidelines for network code governing the operations of the downstream gas network. The Minister will be charged with issuing regulations relating to the wholesale market for gas. The bill firmly establishes third party access to gas pipelines and networks. Gas pricing principles are established in the bill and they are disaggregated into the component elements of the supply chain including wholesale, distribution, transportation and supply. Prices are to be cost reflective with

a reasonable rate of return to encourage further investments. The tariff structure is to be published. Transitional pricing arrangements, consumer protection and public service obligations are also included in the bill. Abuse of market power is outlawed while the ultimate goal is to establish a competitive market.

However the PIB has been stalled in the 7th and 8th National Assembly owing to conflicting interests of the FGN, IOCs and Nigeria's geo-politics. The disagreement between the FGN and the IOCs on the new fiscal regime is a major issue. The IOCs see the fiscal regime as a disincentive to investment.

Part Two

GAS INFRASTRUCTURE IN NIGERIA

2.1 EXISTING INFRASTRUCTURE

According to the Nigerian Gas Association¹⁴, existing Gas Pipeline Systems (GPS) operated by Nigerian Gas Company are as detailed in Box 1.

Box 1: Existing Gas Pipeline Systems

1. The Aladja GPS which supplies the Delta Steel Company, Aladja
2. The Oben-Ajaojuta-Geregu GPS, which will form the backbone of the future Northern GPS; supplies gas to Ajaokuta Steel Company, Dangote's Obajana Cement Company and PHCN Geregu Power Plant.
3. The Sapele GPS which supplies gas to the power station at Ogorodo, Sapele
4. The Imo Rivers-Aba GPS for Gas supply to the International Glass Industry Limited, Patterson Zochonis, Aba Textile Mills and Aba Equitable Industry.
5. The Obigbo North-Afam GPS caters for the power station at Afam.
6. The Alakiri to Onne GPS for supply of gas to NOTORE Chemicals (formerly National Fertiliser Company-NAFCON) for fertiliser production.
7. The Alakiri-Obigbo North-Ikot Abasi GPS for gas supplies to Rusal Industries (former Aluminium Smelting Company of Nigeria – ALSCON) plant in Ikot Abasi.
8. The Escravos – Lagos Pipeline (ELP) GPS supplies gas to Egbim Power station. Subsequent spur lines from the ELP supply the West African Portland Cement Plants at Shagamu and Ewekoro, PZ Industries at Ikorodu, City Gate in Ikeja Lagos, PHCN Delta IV at Ughelli and Warri Refining and Petrochemical Company.
9. The Ibafo-Ikeja GPS supplies gas to Ikeja City Gate from where Gaslink distributes to the Lagos Industrial Area (LIA).
10. The Ikeja-Ilupeju-Apapa GPS operated by Gaslink for gas supplies to greater Lagos Industrial Area.
11. Ajaokuta- Generegu GPS which supplies gas to Geregu Power Plant.
12. Ajaokuta-Obajana GPs which supplies gas to Dangote's Obajana Cement Plant

All these facilities comprises of over 1,250kilometers of pipelines ranging from 4” to 36” in diameter with total installed capacity of 2.5billion standard cubic feet of gas per day (bscf/d), 16 Compressor Stations and 24 Metering Stations. The Facilities represents an asset base of more than N21billion.

Source: <http://www.nnpcgroup.com/nnpcbuisiness/subsidiaries/ngc.aspx>

From the same report in Box 1, the NGC has other ongoing projects which are geared towards improving the utilisation of Nigeria's natural gas resource and creating investment opportunities for entrepreneurs. Among these are **the Escravos-Lagos Pipelines (ELPS) Expansion Project**; this is an ongoing gas pipeline expansion project which involves Engineering, Procurement and Construction (EPC) works for the ELPS. The intention is to expand the existing capacity of the ELPS from the

¹⁴ *“Insights into the Nigeria's Gas Revolution”* in *Nigerian Gas*; A Journal of the Nigerian Gas Association (NGA). 2013. NGA is the most influential and independent non-profit organisation for effectively advancing the role of Nigerian natural gas as the preferred energy source in Nigeria while serving as the platform for championing the development of the gas industry in Nigeria.

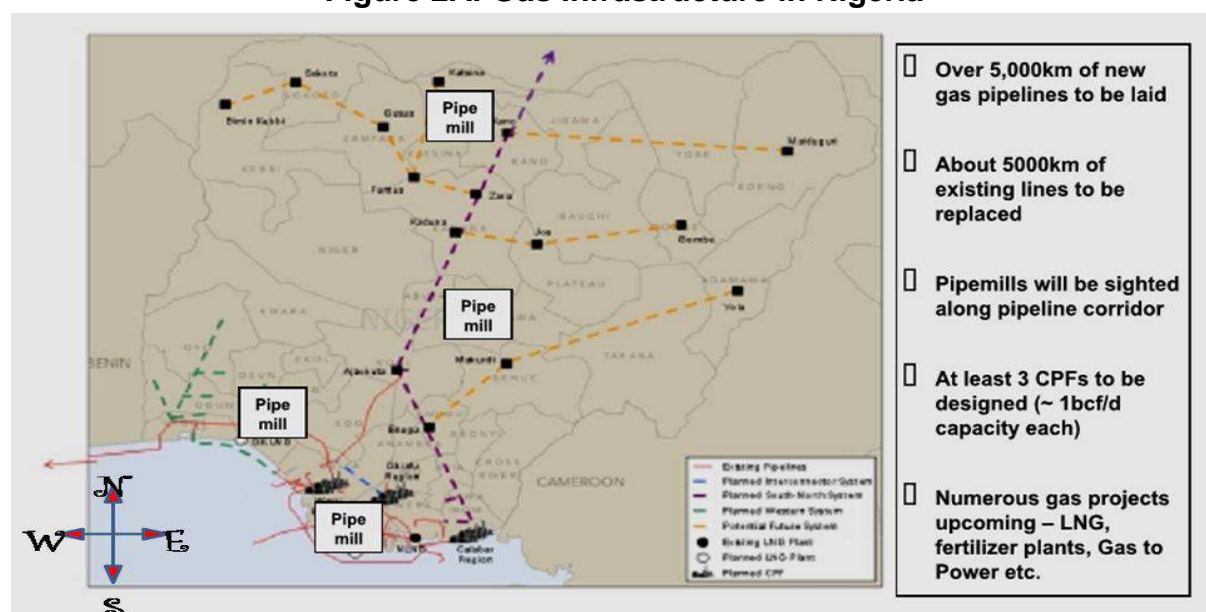
1.100mmscf/d to 2.200mmscf/d to accommodate more gas on the EPLS to meet the increasing demand. Also, there is the Geregu, Omotosho, Papatan (Olorunshogo) and Alaoji **GOPA Projects**. NNPC through NGC embarks on certain categories of projects on behalf of the Federal Government. The GOPA project is one of such. The GOPA projects are gas supply projects to power plants at Geregu, Omotosho, Papalanto (Olorunshogo) and Alaoji. The **Gas Supply Project to the Abeokuta City Gate** according to the NGC has been completed while the construction of the spur lines to connect gas to the eight (8) commercial customers in the axis with whom NGC signed Gas Sales and Purchase Agreements (GSPAs) are about to commence. NGC supplies gas to the Olorunshogo National Independent Power Plant (NIPP) while the projects for the supply of gas to the Alaoji and Sapele NIPPs are ongoing.

The **West African Gas Pipeline (WAGP) Project** supplies gas from producing fields in Nigeria through the NGC ELPS and WAPCo's pipelines to Volta River Authority (VRA) in Accra, Ghana and industries in Togo and Benin Republics. The project includes supply of initial volume of 133mmscf/d to peak at 470mmscf/d in future. The project has been commissioned and is currently supplying gas to VRA while the spur lines to Togo and Benin Republic have been completed. The long term plan is to extend this pipeline to Dakar (Senegal) and to make natural gas available to the whole region.

2.2 PLANNED INFRASTRUCTURE

Under the **Trans-Nigeria Pipeline Project**, NGC plans to integrate all gas transmission systems in the country. It is planned that extension of the system would be made to far northern states including the industrial city of Kano. The resulting highly interconnected system is expected to provide full flexibility and better management of supply and demand throughout the country. The backbone of these future supplies will be the three proposed major pipeline projects namely the Obiafu-Obrikom-Oban (OB3), Calabar-Ajaokuta-Abuja (CAA) and Abuja-Kaduna-Kano (AKK) pipeline projects. Figures 2A and 2B show the Gas Infrastructure Plan in Nigeria.

Figure 2A: Gas Infrastructure in Nigeria



The foregoing suggests that massive investments will be required to build gas infrastructure across the country¹⁵.

The former Minister of Power, Chinedu Nebo at the Nigerian Oil and Gas Conference 2015¹⁶ suggested that to ensure wider gas distribution to the northern part of Nigeria, natural gas can be liquefied¹⁷ for easy transportation via truck/tanks/vessels to the plant stations and then regasified¹⁸ to its gaseous state and used. The challenge of this technique is that once liquefied, it must be maintained at a low temperature of -163°C as LNG undergoes a rapid transition to vapour especially if spilled on water. Also, considering that the volume of the LNG instantly expands 600 times, any default in the refrigeration or in the regasification process, the result is a physical explosion called Rapid Phase Transition (RPT). The storage, transportation and re-gasification of LNG poses a hazard for structures and people potentially exposed. This risk is carefully considered in the design of the LNG carriers since most of the LNG is transported around the globe by dedicated vessels¹⁹.

There is also an export oriented plan to build the **Trans-Saharan Pipeline** to service the European Gas Market. Preliminary agreements have been signed with Algeria in October 2001 for a project that would seek to connect the Nigerian gas fields with that of Algeria, to the European market. Budgetary provisions have been made for this project in the 2009 federal budget. But this project seems to have been on the drawing boards for too long and has been labelled a *workshop or conference project*.

¹⁵ Media reports also indicate that Africa's richest man, Alhaji Dangote plans \$2.5bn investment for a 550 kilometre gas pipeline running from the Niger Delta to Lagos.

¹⁶ Held in Abuja from 16th to 19th March 2015.

¹⁷ Natural Gas is liquefied to facilitate its transportation as its volume reduces by 600 times from its gaseous state. To be liquefied, the natural gas needs to be cooled down to -163 degrees Celsius to condensate into a liquid which is colourless, odorless, non-corrosive and non-toxic. It is then called Liquefied Natural (LNG) and characterized as a cryogenic liquid.

¹⁸ Regasification is the physical process by which LNG is heated to return to its gaseous state. In practice, the regasification is performed in gradually warming the gas back up to a temperature of over 0°C. It is done under high pressures of 60 to 100 bar, usually in a series of seawater percolation heat exchangers - the most energy efficient technique when water of the right quality is available.

¹⁹ 2b1st Consulting: One day-One Word, "Regasification". Accessed Online 27/05/2015: <http://www.2b1stconsulting.com/regasification/>

Part Three

GAS FLARING - OPPORTUNITY COSTS AND VANDALISATION

3.1 GAS FLARING

Gas flaring poses economic, health, environment and other challenges and opportunity costs. Gas flares emphasise the aphorism that Nigeria is rich in energy resources but poor in energy supply. The Associated Gas Re-Injection Act was made as an Act²⁰ to compel every company producing oil and gas in Nigeria to submit preliminary programmes for gas re-injection and detailed plans for implementation of gas re-injection. It made it illegal after the set date to flare gas without the permission of the Minister of Petroleum. It set a deadline of January 1, 1984 for the stoppage of gas flares. The target to stop gas flares moved from 1984 to 2008 and 2011. But gas is still being flared up to date. This section will review the challenges, the loss and the costs incurred.

3.1.1 Economic Loss

Nigeria flares about 1.2billion cubic feet (bcf/d) of gas a day, which could fuel about; 7000MW of efficient thermal electric power, over 1,400 agro-processing facilities, 350 textile plants, 70 fertilizer plants with opportunities for creating over one million jobs²¹. This amount of gas flare represents 12.5% of all globally flared gas, which is 68% of the associated gas produced or 51% of the total gas production²². According to the African Energy Outlook for 2014, as at 2012, Nigeria flared about 17bcm on the average, slightly more than its annual consumption. However, gas flaring in other West African producing countries has remained around 12bcm per year.

In 2014, Nigeria lost about \$1billion as oil companies operating in the country flared a large proportion of the gas produced from January to September 2014. According to data from the NNPC, about 295 billion standard cubic feet of natural gas was flared in the nine-month period. International oil companies and indigenous players burnt a total of 43.7billion scf in January, 50.1 billion scf in February and 38.3 billion scf in March. In April, 22.3 billion scf of gas was flared; 19.7 billion scf in May and 23 billion scf was wasted in June. In July, 29.1 billion scf was flared; 39.1 billion scf in August; 29.5 billion in September; and 44.37 billion in November. These estimates of gas flares are based on information supplied by IOCs and not independently computed by

²⁰ Cap. A25, laws of the Federation of Nigeria, 2004.

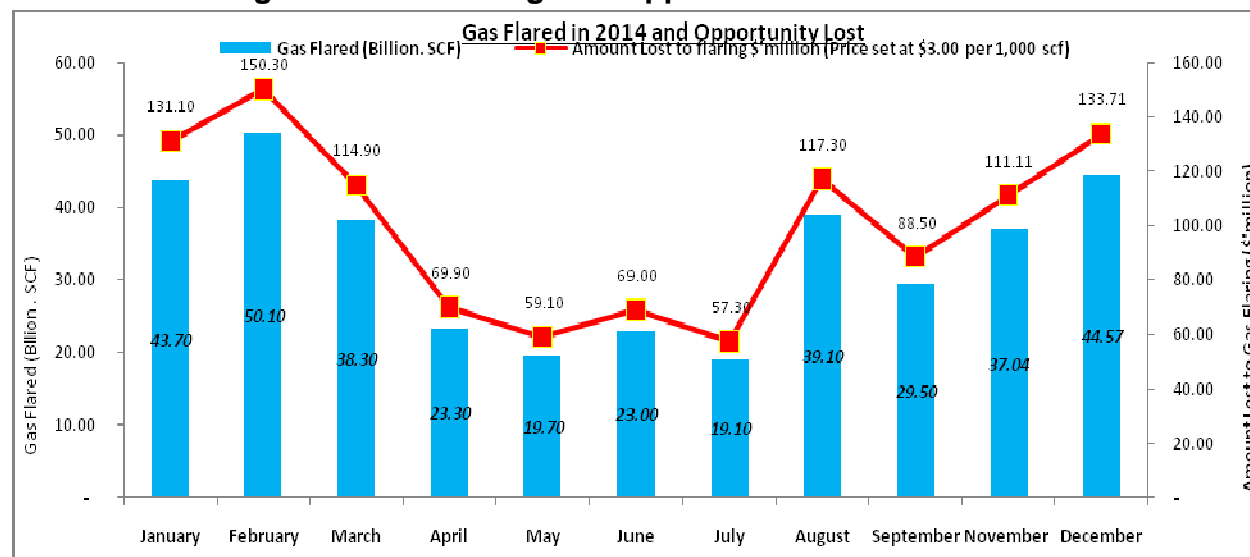
²¹ Paper presented by the Group Managing Director Oilserv Ltd, Mr Emeka Okwuosa – “*Natural Gas Development in Nigeria*” at the Petroleum Technology Association of Nigeria’s Forum in Houston Texas 2015; reported in The Guardian Newspaper of May 19, 2015.

²² Centre for Energy Economics: Bureau of Economic Geology, Jackson School of Geoscience. University of Texas in Austin: “*Gas Monetization in Nigeria*”

the regulatory agencies. So, the likelihood is that they are understated so as to avoid due penalties.

Figure 3 shows Nigeria's gas flare losses in 2014.

Figure 3: Gas Flaring and Opportunities Lost in 2014



Source: Nigerian National Petroleum Corporation, NNPC's Monthly Petroleum Information for December 2014

In December 2014, Nigeria lost \$133.716 million, about N26.743 billion to gas flaring as oil and gas companies in the country flared 20.11 per cent of their total gas production. This is according to the NNPC's Monthly Petroleum Information for December 2014. Specifically, the oil and gas companies produced 221.634 billion scf of gas, utilised 183.78 billion scf and flared 44.573 billion scf. The Nigerian Gas Company (NGC) put the average price of gas at \$3 per unit of 1,000 scf, translating, therefore, to \$133.716 million (N26.743 billion) for 44.573 billion scf flared, and \$551.346 million (N110.27 billion) for 183.783 billion scf utilised²³.

If 1.2 billion scf flared per day has the potential to generate up to 7000MW of electricity, the aggregate gas flared for 2014; about 376.41 billion scf can translate into 21.97GW, in addition to its inputs in agro processing, textile plants, fertiliser plants, and the number of jobs created from the multiplier effect. Operators in the oil industry are resisting the payment of gas flare penalties meant to discourage gas flaring. According to the report of the Petroleum Revenue Special Task Force led by Nuhu Ribadu:

The Minister issued a directive which was signed on 15 August 2011 increasing the gas penalty fee from N10.00 to \$3.50. However, the oil companies have failed to comply with the directive and have continued to flare gas without compliance with the new rate as communicated in the Ministers directive. Using the DPR gas flare information (irrespective of the inherent errors arising per the factors earlier stated)

²³ Other estimates of losses from gas flaring in Nigeria can be found in www.gasflaretracker.ng

to compute the potential revenues for the relevant years at the rate of \$3.50 per scf is \$4.1 billion versus the \$177 million computed by the DPR using the N10 per scf.

The operators have continued to flare gas at the rate of N10 per scf and records at the DPR reveal that none of the companies paid any gas penalty fee in 2012 and the DPR chose to look away. Thus, what would have been a source of revenue to Government for continued gas flaring has not been realised.

3.1.2 Specific Health Hazards

According to Ikoro (2003)²⁴, the emissions from gas flaring contain smoke, soot, smog and other acidic particles which constitute serious health hazards mostly in the form of respiratory track diseases. The presence of carbon and traces of nitrogen and sulfur in natural gas leads to the production of various oxides and sulphides. When these chemicals are inhaled through flaring, it settles in nostrils down to the lungs as thick carbon monoxide, which blocks the passage of oxygenated blood to the heart of human beings and animals. The oxides and sulfides in hydro-carbon with gaseous chemicals when flared combine with water in the atmosphere to form various types of corrosive acids such as nitric and sulfurous acids that irritates the human skin and prevent plants chlorophyll from functioning. This also leads to cancer of the skin and corrodes galvanized roofing sheets around oil and gas production zones.

3.1.3 Environmental Hazards

Every year, around 140 billion cubic meters of natural gas produced together with oil is wastefully burnt or flared at thousands of oil fields around the world. This results in more than 300 million tons of carbon dioxide being emitted into the atmosphere – equivalent to emissions from approximately 77 million cars. According to the Nigerian Minister of Environment, oil and gas companies are pumping nearly 17 million tonnes of carbon dioxide emissions into the atmosphere yearly which endangers human health and environment.

Other environmental hazards associated with gas flaring include; increased environmental temperature, heat-wave and global warming. These environmentally degrading conditions dehydrate surroundings, habitats, eco-system, food chains, nitrogen cycle, oxygen cycle, flora and fauna, animals and vegetations and thereby cause their actual deaths or poor yields of environmental resources. Gaseous acids like cadmium, benzene and calcium also pollutes streams, natural water ways like swamps, creeks, ponds, including arable farm lands, rivers, soil nutrients and thereby kill fishes, aquatic animals and plants and starve human beings of sources of clean water.

The re-injection of natural gas would also be harmful, if the injected gas escapes to the earth surface and when it ignites, the result is wild fire and pollution, including

²⁴ Ikoro, N. J. (2003); *The Socio-Economic Implications Of Gas Flaring in Nigeria* published by Du-France Communications, 23 Captain Amangala Street, Opposite Police Headquarters. Yenagoa, Bayelsa State. Branch Office: 29 Ikwerre Road, Mile I, Diobu, P.O. Box 12256 Port-Harcourt, Rivers State, Nigeria.

destruction of lives and property; seismic activities lead to permanent damage of farmlands and buildings. In the current global food shortage, rising water levels, floods, erosion, rising warm temperatures and other adverse effects, gas flaring should be stopped as penalties for flares have not discouraged continued flares.

3.2 THE CHALLENGE OF VANDALISATION

This statement by David Ige captures the challenge of gas pipelines vandalism²⁵.

We have hundreds of kilometres of these pipelines across the federation and in thousands of kilometres with a total of about 5000kilometres located in terrains that you cannot work in them because they are almost all in swampy terrains where you cannot patrol 24 hours and with the extent of the vandalism, you require a whole combination of strategies but no amount of strategy can mitigate a social irresponsible behaviour and I think there has to be a strong social re-engineering and then it is complimented by security because it is impossible to patrol every kilometre of pipeline and what we find out is that when we put security here, they go the next parts of the pipeline.

The spokesperson of NNPC, Mr Ohi Alegbe in a press statement in Abuja on Wednesday 4th February 2015, noted that none of NNPC's gas pipelines had been able to run two straight days without being brought down. He said that there appeared to be a syndicate behind the economic sabotage. Alegbe stated that most of the power plants, including those in Calabar, Alaoji, Omoku and Olorunsogo had been connected to gas but all the efforts of the Federal Government to construct unprecedented massive gas pipeline infrastructure were being sabotaged by pipeline vandals²⁶. Also, according to the Special Adviser to the Minister of Power on Gas to Power, Mr. Frank Edozien, Nigeria's power sector consumes at least 900mscf of gas daily for electricity supply across the country. However, meeting this demand has been seriously threatened by the activities of pipeline vandals. The National Mirror newspaper recalls that in order to curb vandalism of oil and gas infrastructure, the Federal Government at a point had set aside \$1bn for the implementation of a comprehensive pipeline monitoring system and also restructured its inter-ministerial committee on gas-to power²⁷.

The former Group Managing Director of NNPC, Mr. Andrew Yakubu revealed that about 480 metric million standard cubic feet of gas supply per day, mmsf/d, an equivalent of 1600 megawatts (MW) of power was lost to pipeline vandalism in the year 2014. Yakubu explained that about 20 different ruptured points were discovered on the Escravos-Warri, a section of the ELPS, with various magnitudes of damage. After the initial assessment, the cost of repair was pegged at about N200m, but multiple damages discovered later brought the cost to about N800m. Data obtained

²⁵ Director, Gas to Power in NNPC in Daily Independent Newspaper of February 3, 2015.

²⁶ News Agency of Nigeria; Punch Newspaper 4 February, 2015 – "Nigeria loses N535million to Pipeline Vandalism – NNPC")

²⁷ National Mirror, December 23, 2014. "Pipeline Vandalism threatens Gas, Power Supply"

from NNPC between 1999 and 2009 showed that out of the 16,083 pipeline breaks/incidents, vandalism accounted for 15,685 breaks, that is about 97.5 %²⁸. The record also showed that the worst hit was System 2E/2EX, which conveys products from the Port Harcourt Refinery to Aba-Enugu-Makurdi depots onwards to Yola-Enugu-Auchi. The System 2E/2EX pipeline network witnessed 8,105 breaks within a 10 year period, which cost the corporation about N78.15bn in product losses and pipeline repairs. Also, the System 2B, Arepo, which carries products from the Atlas Cove-Mosimi- Satellite-Ibadan-Ilorin depots, recorded 2,440 breaks during the period under review, leading to a loss of over N73.6bn in products and pipeline repairs, while the System 2A product pipeline route, which conveys products from Warri-Benin-Suleja/Ore depots witnessed about 3,259 cases. Also, between August and October 2012, the NNPC confirmed over 774 break points, from Atlas Cove to Ilorin depot. According to the Corporation, 181 break points were discovered between Atlas Cove and Mosimi depot; 421 ruptured points were recorded from Mosimi to Ibadan, while 50 vandalised points were recorded from Mosimi to Ore. A total of 122 break points were discovered between Ibadan and Ilorin depots.

The vandals seem to be unable to distinguish between crude oil, condensate or refined petroleum products pipelines from the gas transporting pipelines. This is relevant to underscore the fact that beyond vandalism, there is criminal entrepreneurship in Nigeria's oil. The theft of gas, if it exists at all, must be very small in extent due largely to the chemical composition of gas and difficulty associated with storage. Whereas crude oil, condensate and refined petroleum products are easy to convey and store, gas is not. While vandalism may be an expression of frustration or discontent or anger at the government and oil companies, this criminal enterprise with its international linkages is purely for gain and seems to have backing in the higher rungs of Nigeria's political ladder. Most of the crude oil loot is exchanged in international waters for dollars and arms²⁹. Further, the fact that there are virtually no fatalities when the gas pipelines are vandalised suggests that the vandalisation is the handiwork of persons very knowledgeable about the pipelines and gas transportation. This creates a suspicion around the experts and bureaucrats who commissioned the construction and repairs of these pipelines.

Clearly, vandalism is a threat that will affect the realisation of the gas to power policy. But there are reports indicating that some companies have been given contracts to secure the pipelines. The exact terms of reference and the details of the assignment given to the companies are not in the public domain for Nigerians to determine whether they are rendering the services paid for by the treasury. However, since the assumption of office by President Muhammadu Buhari, the contracts have been revoked.

²⁸ Pipeline Vandalism Threatens Gas Power Supply; National Mirror of December 23, 2014

²⁹ Online dialogue with Fr. Edward Obi, (MSP, Ph.D) of the Gas Alert for Sustainable Initiative.

Part Four

THE GAS INDUSTRY: NIGERIAN GAS MASTER PLAN

4.1 BASIC FRAMEWORK

Despite being rich in oil and gas resources, Nigeria suffers from significant under-capacity in electricity generation, with frequent power outages driving consumers towards large-scale use of expensive back-up generation. The Nigerian gas industry is characterised by opaqueness, oligopolistic tendencies, inadequate infrastructure and investments, regulatory capture and politicalisation of policy implementation³⁰. Low investment in gas infrastructure over the years has continued to hamper the development of the huge natural gas reserves in the country for domestic consumption, particularly for power generation. The International Energy Agency, in its special report entitled: 'Africa Energy Outlook', said a critical uncertainty for Nigeria's gas supply outlook was its inability to stimulate significant production of non-associated gas.

"Huge resources exist, sufficient to cover both domestic demand and exports. Production of non-associated gas increases in our projection period, but it is gradual. Exploiting this resource requires a change in focus by the upstream sector and, importantly, the government to establish a framework to incentivise the necessary large-scale capital investment," IEA (2014)

Figure 4 shows the vision of the NGMP as a vision to attain full market status with willing buyers and willing sellers.

Figure 4: The Nigerian Gas Master Plan: 4 Step to Full Market Driven Domestic Gas Sector



Source: Achievement of the NGMP: Strategies for Workable Roadmap by Dr David Ige; Group Managing Director, Gas and Power NNPC

³⁰ Tade Oyewunmi (Senior Counsel, Energy Group). The Nigerian Gas Industry: Policy, Law and Regulatory Developments.

To improve gas supplies will generally require a stable, attractive investment climate and the development of a bankable commercial structure in Nigeria's gas sector, which includes price reforms, improvements in regulatory arrangements, a re-definition of the role of public companies in the gas sector and an alternative to the current NNPC joint venture financing model. It is on this note that the NGMP was developed³¹. As part of Nigeria's resolve to become a major player in the international gas market as well as to lay a solid framework for gas infrastructure expansion within the domestic market, the NGMP was approved in February 2008. The Federal Government introduced the NGMP to provide a holistic framework for the development of gas in Nigeria. The NGMP aims to create a structure that will enable Nigeria to leverage on the multiplier effect of gas on the economy, consolidate Nigeria's position in the high value export markets, and manage the gas asset for national energy security.

The NGMP seeks to fully exploit the potential in gas for accelerated economic development in pursuit of the 10% of GDP growth aspiration with a concurrent focus on a viable domestic, regional and other export markets; competitively position Nigerian gas in terms of cost competitiveness and scalability of capacity; improve gas infrastructure, attract new players into the value chain and ensure commerciality for all investments³². The NGMP is designed to ensure that synergies are maximised and gas infrastructure developments are aligned to deliver the economic aspirations of Nigeria³³.

There are two investment categories; the first is 3 central gas gathering and processing facilities (CPFs) at:

- ❖ Warri Delta Warri/Forcados Area
- ❖ Obiafu (North Port Harcourt)
- ❖ Akwalbom/Calabar Area

The second is 3 gas pipeline transmission systems, including compressor stations:

- ❖ 1200km South-North Line³⁴
- ❖ 700km Western System with 200km offshore extension³⁵
- ❖ 200km Interconnector System³⁶

³¹ However, this Study was unable to get a copy of any comprehensive document containing the NGMP, bits and pieces of the Gas Master Plan are available from presentations made by various industry sources on the subject matter especially from the NNPC.

³² David Ige, *op cit*.

³³ Extracted from: "Gas Utilisation in Nigeria: Nigerian Gas Master Plan" by The Advocate Energy & Natural Resources Group

³⁴ The first South-North Gas Transmission Line will transport dry gas from the Akwa Ibom/Calabar processing facility to Ajaokuta, Abuja, Kano and Katsina. The line will serve the Eastern States of Anambra, Abia, Ebonyi, Enugu and Imo and also convey gas for the proposed Trans-Sahara Gas Project.

³⁵ The Western System comprising the existing Escravos Lagos Pipeline System (ELPS) and a new offshore extension to Lagos with provisions for a spur extension to the OKLNG plant.

³⁶ An inter-connector that links the Eastern Gas Reserves Centre with the 2 transmission systems above.

Concessions for these franchise areas are to be awarded to investors upon bids. These CPFs will be the major gas hubs where wet gas from gas fields will be treated and processed. LPG and condensate will be extracted at these facilities and the dry gas fed into a network of gas transmission lines. The delineated 3 franchise areas around the CPFs will be licensed to pre-qualified investors who will be allowed to develop, own and operate the hub infrastructure on a regulated open access basis. This will prevent proliferation of gas facilities with attendant cost impacts. The scope of investments will include gas gathering lines, network of compressor stations, gas treatment and LPG extraction facilities and LPG primary storage tanks. Plants will be operated as tolling facilities for third party gas, while they can also access and purchase third party wet gas.

The shortlisted core investors for the Nigerian Gas Sector are Gazprom of Russia, British Gas of Britain, Centrica of Britain, EoN Rhugas of German, Statoil Hydro of Norway, Shell-Anglo Dutch and Chevron-USA. Others include Spanish Gas Natural and UnionFenosa, Gail of India, Thailand's PTT, Korean Kogas, Oando and Sahara Energy of Nigeria as well as Global Energy/Hanover of Nigeria and USA. But there is paucity of information on what these shortlisted companies have so far done after the shortlist.

Beyond the investments expected from the private sector, Government has over the period 2009 to 2015 made the following provisions in the federal budget as shown in Table 1.

Table 1: Provisions for the Gas Sector in the Federal Budget: 2009-2015

2009 (N)	2010 (N)	2011 (N)	2012 (N)
23,495,400,000	15,272,375,056	3,554,632,434	2,764,934,537
2013	2014	2015	Total
3,819,313,090	1,660,077,790	507,082,884	51,073,813,791.00

Source: Approved Budgets from the Budget Office of the Federation

Beyond financing and technical issues, awareness of the goals and details of NGMP is low outside the small enclave of oil and gas technocrats. For such an important national policy that will touch the lives and income of the population through the gas to power, commercial and industry initiatives, it should have been popularised by government through engagement with various stakeholder groups. Also, the idea of creating vehicles to tap resources from small and medium scale investors would be necessary to avoid over-reliance on the proverbial foreign investors who do not have a developmental, but strictly profit agenda.

4.2 GAS PRICING POLICY

Government recognised that the current pricing of gas encouraged export rather than local utilisation for national development. It therefore introduced reforms under the National Domestic Gas Supply and Pricing Regulations, 2008, which segmented the market into three for the purposes of pricing. The details of the segmentation are as shown in Box 2.

Box 2: Gas Market Segmentation

Strategic Domestic Sector: This refers to the Power Sector that has the most significant direct multiplier effect on the economy (supplying power to the national grid, rather than power for captive use). The strategic intent is to facilitate and ensure low cost gas access to the Power Sector in order to spur rapid economic growth. Other examples may include Compressed Natural Gas (CNG) for transportation or any other sector that the Honourable Minister for Energy may from time to time consider applicable.

Strategic Industrial Sector: This refers to domestic industries that utilise gas as feedstock in the production of value added products that are primarily destined for export or consumed locally. Strategically, these sectors offer the potential to diversify Nigeria's gas related export portfolio whilst ensuring that value is added to Nigerian gas before it is exported. The process of value addition ensures industrialisation, job creation etc. Typical projects in this group are Methanol, GTL and Fertiliser. For this sector, the strategic intent is to ensure that feedgas price is affordable and predictable in order to ensure competitiveness of the products in international markets in the face of competition from other gas producing countries such as Qatar, Trinidad etc that provide gas at very low prices to buyers.

Commercial Sector: This refers to the sector that deploys gas as fuel as opposed to feedstock. Unlike the two previous classifications, projects in this category are a potential major direct revenue earner for Nigerian gas in view of their capacity to bear high gas prices as the competing alternative fuel is LPFO. In essence, they are less vulnerable to a crude oil based gas pricing. Typical projects are: LNG, CNG, cement and domestic manufacturing industries.

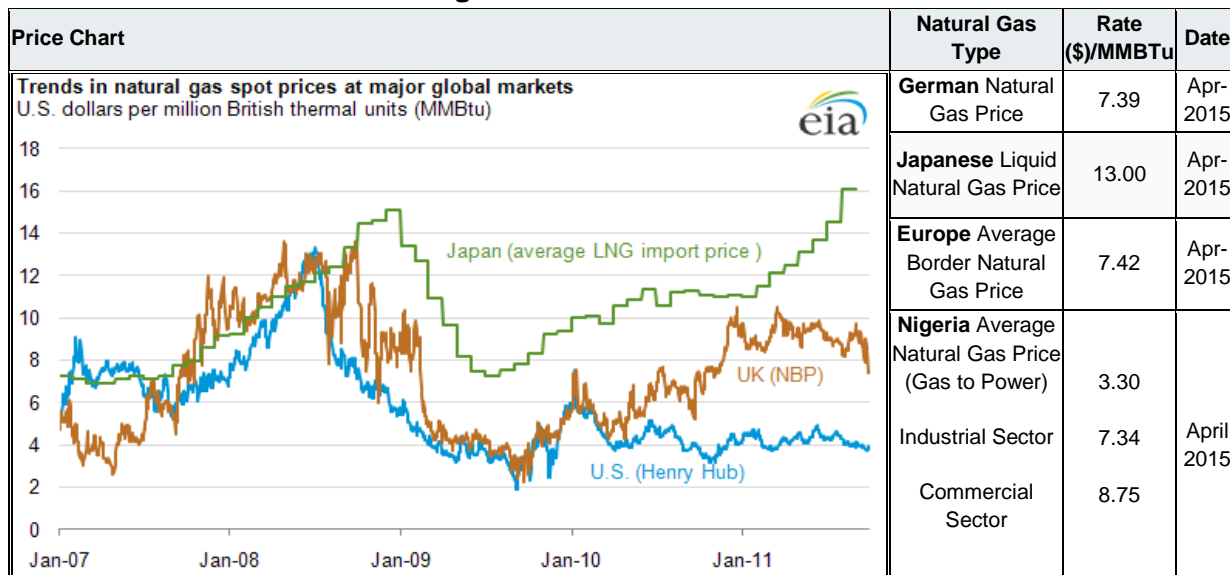
The price of gas will in all cases be indexed to inflation and to end product price. For example, if the end user power tariff changes, the price of gas supply will change accordingly. It is expected that the indexation mechanism to end product price will be determined by gas suppliers and purchasers during the development of their respective Gas Sale and Purchase Agreements

Source: The National Gas Supply and Pricing Policy

In accordance with this framework and to encourage investments in domestic gas facilities, the price of gas-to-power was raised from five cents per mcf to \$1 in 2010. It was further raised to \$1.50 by 2011 and \$2 by the end of 2013, before the latest increment to \$2.5 by NERC in 2015. NERC also made an allowance of 80 cents for transportation bringing the total price to \$3.30 per mcf. This seeks to make the price of gas more cost reflective and encourage gas producers to supply more gas to power generating companies.

The price of natural gas (dollars per million metric British thermal unit – MMBT) shows that Algeria sells gas at \$5.58/mmbt; Singapore - \$3.48/mmbt; Russia - \$7.39/mmbt and Indonesia - \$13.00/mmbt³⁷. Figure 5 gives a comparison of the Nigerian price of gas supplied to power generating companies compared to other markets across the world. Index Mundi (Accessed 8/6/2015)

Figure 5: Natural Gas Prices



Source: EIA, 2015; NERC and Nigerian Gas Association

The details of prices earlier given and Figure 5 above, shows that compared to other countries, Nigeria’s gas to power price is low and does not provide an incentive for domestic gas supply compared to the enormous gains in export³⁸. This was confirmed by the former Minister of Power Prof. Chinedu Nebo who confessed³⁹ that Nigeria’s epileptic power generation could be blamed on gas producers who failed to live up to their supply commitment to the sector. He noted that plans of the President Jonathan administration to generate over 5000 megawatts (MW) of electricity in 2014 and subsequently add more capacity were effectively bungled by the hypocritical approach to meeting the demands of gas power plants by gas producers in the country. He explained that whereas the country produced up to 5bscf of gas per day, producers preferred to export about 4bscf of that and dedicate 1bscf for the domestic market, out of which over 60 per cent are mostly channelled to industrial users. He noted that the gas supply situation did not improve despite the joint intervention of the Nigerian Electricity Regulatory Commission (NERC) and Central Bank of Nigeria (CBN), in which price and transportation of gas to power were reviewed to \$2.50 and transport at \$0.80.

³⁷ Natural Gas - Monthly Price - Commodity Prices - Price Charts, Data, and News – Index Mundi. www.indexmundi.com

³⁸ But, the Group Executive Director, Gas to Power of NNPC, David Ige suggests that export parity would be achieved at a price between \$2-\$2.50 per mmbt and this has already been achieved in gas to power. See *Achievement of the Gas Master Plan: Strategies for a Workable Roadmap*.

³⁹ Thisday Newspaper (1st June, 2015) - Nebo: Gas Producers Thwarted Jonathan's Stable Electricity Programme. Available online: <http://www.thisdaylive.com/articles/nebo-gas-producers-thwarted-jonathans-stable-electricity-programme/210856/>

However, the cost of gas to the industrial and commercial sectors in Nigeria has met the international price of gas and there should be no excuse for preferring to export rather than make the gas available for local needs. But there is an inherent challenge and contradiction between the different price regimes for the domestic power, industrial and commercial sectors. Why would any business with the profit agenda supply gas to the power sector if he can earn more from supplying same to the commercial and industrial sectors? Is it possible to devise a separate fiscal regime in terms of taxes and other fiscals applicable to gas producers who supply to the power sector to incentivise their operations? The early resolution of this challenge will facilitate the realisation of the objectives of the gas to power agenda of government.

But the foregoing price analysis should be pitched against the price at which the feedstock gas is sold to NLNG. According to the report of the Petroleum Revenue Special Task Force led by Nuhu Ribadu:

For Liquefied Natural Gas, the price observed at which the feedstock is sold to NLNG seems too generous, compared to prices obtainable on the international market. The estimated cumulative of the deficit between value obtainable on the international market and what is currently being obtained from NLNG over the 10 year period amounts approximately to \$29bn.

Thus, if there is an insistence on international price for the finished NLNG product, the feedstock should also be sold to the NLNG at international price to balance out the pricing system. Otherwise, it would amount to a clear case of short-changing the Federation Account.

On another note, the pricing policy entailed the establishment of a Gas Aggregation Company of Nigeria Ltd to manage domestic gas supply obligation volumes as the first point of contact for gas buyers and sellers for the domestic market use. The primary aim is to coordinate streamlined process for wholesale gas supply from gas producers to eligible gas purchasers within the country. It has been operational since 2010 and is charged with ensuring balanced growth of all critical sectors of the economy related to gas and facilitates the execution of GSAA and GTA between buyers and sellers and transporters respectively⁴⁰.

A surprising dimension to government's policy to encourage the domestic use of gas is the imposition of Value Added Tax (VAT) on domestic LPG while exempting imported LPG from VAT. This is obviously a contradictory policy which should be discontinued.

4.3 DOMESTIC GAS SUPPLY OBLIGATION

The Domestic Gas Supply Obligation (DGSO) is an attempt to convert the rich gas resource profile of Nigeria into gas availability for domestic use. It empowers the

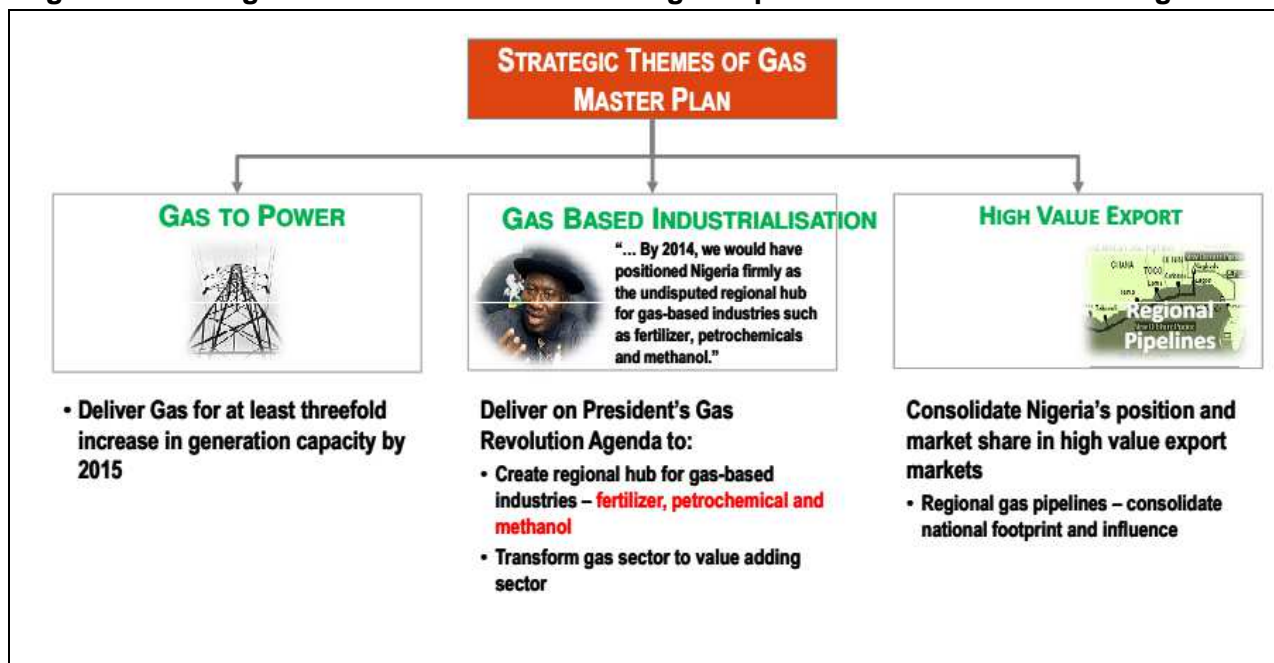
⁴⁰ David Ige, *op cit.*

Minister of Petroleum Resources to stipulate the requisite amount of gas for domestic use periodically for a period lasting about 5-7 years. This should be done by taking into consideration government's aspirations for the domestic economy to guarantee that adequate gas resources are made available for the power sector, industrialisation and other domestic users. The operators are under the pain of punishment to comply with the obligation or face a penalty of \$3.5/mcf for gas under supplied, restricted export or both as the Minister may decide. The Regulations also seek the establishment of a Department of Gas within the Ministry of Petroleum Resources that will oversee the execution of this regulation in concert with the Department of Petroleum Resources⁴¹.

The challenge for DGSO is the fact that major investors in gas gathering and processing are IOCs that have overseas contracts to supply gas at rates higher than the domestic market can pay. Resolving the social responsibility obligations of the DGSO with the market reality of profits is a task facing the industry regulators. However, progress has been made incrementally considering that gas supply to the power sector increased from 620mmcf/d in 2011 to 980mmcf/d by 2013.

The DGSO is anchored on the three themes shown in Figure 6.

Figure 6: The Nigerian Gas Master Plan: Strategic Aspiration for Natural Gas in Nigeria



Source: Achievement of the GMP: Strategies for Workable Roadmap by Dr David Ige; Group Managing Director, Gas and Power NNPC

Has the Domestic Gas Supply Obligation achieved its objectives? This will be examined in the concluding part of this Study.

⁴¹ The Department has already been established.

Part Five

FISCAL ISSUES IN GAS INFRASTRUCTURE AND REFORMS

This part of the Study will review the sources of funds for financing the NGMP and the projected revenue sources. It will also review ongoing implementation issues related to finances, commercial framework, cost of projects and implementation of recommendations of committees in the gas sector.

5.1 COST OF IMPLEMENTING THE NGMP

The implementation of the NGMP will require human, financial, technological and information resources. It appears that the NGMP is a framework that has not been costed. There are various estimates as to the financial outlays required. According to the former Permanent Secretary, Ministry of Petroleum Resources, Sheik Goni, about \$25bn investments in gas processing, transmission and downstream utilisation is required⁴². However, according to an Industry Expert, Vice President and Head, Energy and Natural Resources, FBN Capital, Mrs. Rolake Akinkugbe, she estimated that the total financial outlay required by Nigeria to develop her gas facilities for efficient delivery of commercial gas to consumers nationwide is \$20 billion⁴³. This Study will assume that the investment required is the upper figure of \$25bn. However, the above figures seem to exclude the cost of gas exploration and harvesting by oil and gas companies.

Two broad categories of investors are needed; the first is the investors for pipeline companies whilst the second is for gas gathering and processing investors. In the second category will be investors with LNG export aspirations; domestic industry operatives in methanol, petrochemicals, private equity investors and pure-play infrastructure investors⁴⁴. There are also investment opportunities in financial services and pipe milling and fabrication yards.

5.2 NIGERIAN ELECTRICITY MARKET STABILISATION FACILITY (NEMSF)

In collaboration with the Ministry of Petroleum Resources and other stakeholders, the Central Bank of Nigeria instituted a N213bn Nigerian Electricity Market Stabilisation Facility. The facility was *inter alia* used to settle legacy gas debts in the power sector. The financial leverage was expected to result in improved power supply as it would

⁴² In his paper titled: “Gas Revolution and its Implementation: Industry and Government Perspectives” delivered at the first Nigerian Gas Association Business Forum 2011 in Lagos. The \$25bn figure is collaborated by George Osahon, Director of the DPR at a seminar organised by the Nigeria-South Africa Chamber of Commerce in November 2013.

⁴³ In her presentation ‘Global Gas Outlook and Implications for Nigeria,’ at the Offshore Technology Conference in Houston, Texas, United States of America on May 6, 2015. See National Mirror newspaper; May, 6th 2015 - Nigeria Needs \$20bn for Gas Infrastructure.

⁴⁴ David Ige, *op.cit.*

provide more confidence to gas suppliers to improve their supplies to the electricity market. The facility offset the N36.9bn legacy debt owed to gas suppliers by the power sector under the defunct Power Holding Company of Nigeria (PHCN). The balance was disbursed to generation and distribution companies, for the development of the industry and improvement of services.

5.3 COST OF GAS PIPELINES AND OTHER INFRASTRUCTURE

The construction cost of developing natural gas pipelines and infrastructure⁴⁵ vary between US\$800,000 per km to US\$2 million per km (for large diameter projects over rugged terrains). Examples are: the 24 inch Yucatan Peninsula Gas Pipelines completed in 1999 and running 432 miles from the Mexican State of Tabasco to power plants in the Yucatan province cost US\$266 million. The 460km line completed in 1996, from La Mora in Argentina to Santiago in Chile cost US\$360m. The 3,700 km pipeline from Bolivia to Sao Paulo in Brazil cost US\$1.8bn. If we take an average cost of \$1m for each kilometre and 2300 kilometres of pipelines earlier identified, pipelines will require about \$2.3bn.

The Trans-Mediterranean (Transmed) is a 2,475km-long natural gas pipeline built to transport natural gas from Algeria to Italy via Tunisia and Sicily. Built in 1983, it is the longest international gas pipeline system and has the capacity to deliver 30.2bcm/y (billion cubic metres per annum) of natural gas. The Transmed Pipeline consists of a total of nine compressor stations including one in the Algerian section, three in the Tunisian section, one in Sicily and four in the Italian section. The Algerian and Tunisian sections feature two parallel lines of 48inches diameter. The Sicilian section comprises two lines of 20inch diameter. The Italian section consists of two lines of 42 inches and 48inches diameter respectively. The total cost of the Trans-Mediterranean project was \$6.25bn⁴⁶.

The Maghreb–Europe Gas Pipeline came on stream on 1 November 1996 and it was commissioned on November 9, 1996. The pipeline is 1,620 kilometres long and it cost US\$2.3 billion. It was built by Bechtel and Saipem. The pipeline consists of five sections. The pipeline's Algerian, Moroccan and Andalusian sections are 48inches (1,200 mm) in diameter; the link to Portugal through Extremadura is 28inches (710 mm)/32inches (810 mm) in diameter; and the underwater sections consist of two 22-inch (560 mm) lines. An initial capacity of the pipeline was 8.6 billion cubic meters (bcm) of natural gas per year, which was later expanded to 12 bcm⁴⁷.

⁴⁵ Sweet Crude Report (7 April, 2014): Developing gas pipeline infrastructure in Nigeria: Who is responsible? Available Online: <http://www.sweetcrudereports.com/2014/04/07/developing-gas-pipeline-infrastructure-in-nigeria-who-is-responsible/>. Some part of the section is taken from Sweet Crude Reports.

⁴⁶ Source: By Christopher E. Smith in *Oil and Gas Journal: Worldwide Pipeline Construction: Crude, products plans push 2013 construction sharply higher* (02/04/2013)

⁴⁷ Source: http://en.wikipedia.org/wiki/Maghreb%E2%80%93Europe_Gas_Pipeline

Sweet Crude Reports notes that the Nigerian power sector will perform efficiently only to the extent that it has a secure supply of natural gas. Considering the high cost of natural gas pipelines, it wondered: Should the responsibility fall on the International Oil Companies (IOCs), or the Federal Government of Nigeria (FGN), or a Public-Private Partnership (PPP) arrangement? The magnitude of costs involved may preclude the PPP- type option. So why have the IOCs not placed a higher priority on investments in natural gas infrastructure?

A number of plausible reasons include; Gas infrastructure development generally costs substantially more than oil development (4-30 times as much) and takes much longer time. Gas infrastructure investments may leave international investors more exposed to politically-inspired violence or generally to the risk of expropriation. Most importantly, the IOCs may be averse to investments in gas infrastructure because gas is sold in a local market rather than an international market (except LNG). Thus, investments in gas infrastructure are likely to be regulated by a national government as public utilities. This may result in a relatively low rate of return and income generation in local currencies. So, the IOCs would rather invest in LNG projects.

On the contrary, governments derive revenue from the sale of natural gas to domestic industries. For governments holding significant shares in some end-user plants, it also derives revenue from value-added associated with the export of the finished products. Governments and its citizens also benefit from increases in employment and the multiplier effects on their countries' economies that come from increases in natural gas development. For example, a major project such as LNG, methanol or fertilizer plants mobilizes local labor for construction work and can create local businesses to provide services to the new projects (material suppliers, engineering contractors, hotels, restaurants, transport services, etc). Natural gas utilization for power generation can effectively transform a country and put it on the path of industrial revolution, social and economic stability.

Sweet Crude Reports conclude that international financial institutions are currently sympathetic to funding such green projects and it may not be difficult for Nigeria to get a facility for the development of the gas pipelines.

5.4 COST AND REVENUE FLOW OF LIQUEFIED NATURAL GAS PLANTS AND ASSOCIATED INFRASTRUCTURE

The cost of the Nigerian NLNG project will be used in this Study. The base project which is Trains 1 and 2 cost \$3.6bn. Train 3 including additional tankage cost \$1.8bn while Trains 4 and 5 cost \$2.2bn. On the other hand, Train 6 cost \$1.748bn. Thus, total expenditure to date on the LNG plants is \$9.348bn excluding the cost for the procurement of ships. Procurement of ships and tankers cost over \$2.327bn since

inception bringing the total core costs to about \$11.675bn. NNPC holds 49% interest for Nigeria while Shell holds 25.6%, Total LNG Nigeria Ltd 15% and Eni 10.4%.

Government is also planning LNG Plants for Brass at \$3.5bn, Olokola at \$7bn and a third Party LNG⁴⁸. They are all under evaluation. But the evaluation has taken a rather long time which questions the wisdom of the undue delay. To replicate the Bonny LNG type of project for a total core investment of \$11.6bn over a period of 5 years with contributions from other stakeholders will not be beyond the financial capacity of the Federal Government. Alternatively, the shares of such company can be floated on relevant stock exchanges to get the required equity financing.

Available information indicates that Nigeria earned over \$24bn as revenue and dividends from the operations of the NLNG over its fifteen year lifespan; \$13bn was earned as dividends, while \$11 billion was revenue from the sale of feed gas⁴⁹. The recent 2014 corporate income and education tax paid by NLNG to the Federation Account amounting to \$1.6bn shows that LNG investments are profitable⁵⁰. This is just the tax and not the dividend. For an investment of \$11.6bn to yield a yearly tax return of \$1.6bn signposts that LNG investment can become another source of revenue to the federation beyond oil rents. To finance the development of new trains in the Bonny NLNG and the new facilities proposed for Olokola and Brass, it may be imperative to ring-fence the income accruing from the Bonny NLNG and use same as a contribution to the construction cost of the new facilities.

The Final Investment Decision (FID) in Train 7 of Bonny LNG was due in 2008. However, the FID in Train 7 of the Bonny LNG and the Olokola and Brass LNGs have been delayed by a number of reasons. Following the decline in crude oil prices, the international price of gas is also declining and is expected to decline further by 2017. Also, there have been more discoveries of oil and gas in many new countries which makes gas more easily available. The competition is getting stiffer as more countries such as Australia and Qatar have grown their LNG output while Nigerian seems to stagnate. The growth of LNG output in these countries means that they are getting a larger share of the market. The fiscal governance and regulatory uncertainty associated with the non passage of the PIB including the upstream funding of gas projects further makes it difficult for investors to commit to large investment decisions of the LNG dimension⁵¹. This is further compounded by growing security and vandalism challenges. Thus, core investors, being the IOCs have pulled out of the

⁴⁸ There are conflicting reports on the cost of these LNGs with Olokola LNG put at \$10bn and Brass LNG at \$15bn: See Punch Newspaper of March 23 2014 at page

⁴⁹ Daily Independent Newspaper, March 25 2014 quoting the Managing Director, NLNG, Babs Omotowa.

⁵⁰ The NLNG Company has been on a tax holiday and just recently started paying tax in 2014.

⁵¹ IOCs are moving to Angola, Gabon, Ghana, and Australia's Sakhalin Island which is currently one of the best places for Liquefied Natural Gas (LNG) investment.

Brass and Olokola LNG projects. Recent development in renewable energy as an input into the world energy source may have also contributed to the project delays⁵².

Further, in gas gathering and utilisation projects, the choice of the technology, contributes to the determination of the cost. There is a world of difference between clean and environmentally friendly technology and old technology associated with producing health and environmental degrading toxic chemicals. For instance, in the process of gas dehydration, Ethylene Glycol (EG) has been the chemical of choice since the 1960s because of its water absorbing properties. In the process of regeneration after the first use, heat energy is added and the EG reacts with salts and it can also react with other substances as well, which may have accompanied the wet gas from the earth. Here a special group of aromatic compounds come to mind with an exceptionally reactive end group. They include phenol, benzene, toluene and xylene which have very dangerous effects on human health. However, there is a tested technology that does not require the use of EG in the process of gas dehydration and purification which is being used in Afam Gas Plant which feeds Afam Power Station⁵³.

Therefore, in the choice of the technology for gas gathering and processing, the Full Life Cycle Cost that indicates not only the initial capital expenditure but also the operational expenditure from conception to final removal of the facilities when the lifespan is exhausted and the cost of mitigating the health and environmental challenges posed by the operations should be adopted. It is therefore more economic in the long run to invest in available clean technology (which may seem more expensive at the initial time) than to be saddled with the burden of disposing toxic wastes and mitigating human and environmental challenges later⁵⁴.

5.5 REAL TIME MONITORING OF PIPELINES

As at 2011, the Permanent Secretary, Ministry of Petroleum Resources⁵⁵ stated that government was implementing the Real Time Pipeline System Surveillance (RTPSS) Project, which is aimed at detecting, locating and quantifying pipeline leaks in real time and thereby preventing severe loss of lives and property in the event of pipeline ruptures.

⁵² "Historical LNG importers are now self-sufficient, becoming exporters and competing with suppliers. For example, the United States and Canada have approved six LNG projects worth 25 per cent of the current global demand. China and the US are potentially the biggest shale gas exporters, with Argentina and Mexico not far behind and the proven shale gas reserves are 7,299 trillion cubic feet" Managing director of the NLNG on the need to speed up investment decisions on LNG Plants. See Punch Newspaper of March 23, 2014

⁵³ *Environmental Consequences of the use of Ethylene Glycol in the Processing of Natural Gas in Nigeria*; Briefing paper prepared for Nigeria Delta Catholic Bishops by Father Edward Obi, February 2010.

⁵⁴ Supra

⁵⁵ Sheik Goni said this in a paper titled: "Gas Revolution and its Implementation: Industry and Government Perspectives" delivered at the first Nigerian Gas Association Business Forum 2011 in Lagos.

This project is now 85 percent completed for the gas system and 50 percent completed for the liquid system. The RTPSS for the gas system is expected to be commissioned in October 2011 while the one for the liquid line would be commissioned by the 1st quarter of 2012. The Ministry is also implementing the project aimed at monitoring in real time the facilities, production and operations of the industry. Presently we are able to see in real time oil and gas production and delivery activities in some of the petroleum installations in Nigeria. This project is intended to enable the monitoring of operations in especially remote locations and to facilitate quick response in the event of system failures.

Table 2 below shows the resources that have been appropriated in the federal budget between 2009 and 2014 for RTPSS.

Table 2: Federal Budget Investments in Real Time Pipeline System Surveillance: 2009-2014

2009			
MDA	Code	Line Item	Amount (Millions of Naira)
Department for Petroleum Resources	050060220130000	INSTRUMENTS FOR GAS PIPELINE SYSTEM SURVEILLANCE (REAL TIME)	812,000,000
	050060220180000	PIPELINE NETWORK MONITORING FACILITIES	125,000,000
	050060220200000	INSTRUMENTS ON PIPELINE & PIPELINE NETWORK OPERATIONS MANAGEMENT.	50,000,000
	050060220220000	REAL-TIME MONITORING OF GAS FACILITIES, PRODUCTION AND OPERATIONS	1,054,500,000
2010			
Department for Petroleum Resources	05006021072000	INSTRUMENTS FOR GAS PIPELINE SYSTEM SURVEILLANCE (REAL TIME)	1,175,000,000
	05006021102000	INSTRUMENTS ON PIPELINE & PIPELINE NETWORK OPERATIONS MANAGEMENT.	75,000,000
	05006021132000	REAL-TIME MONITORING OF GAS FACILITIES, PRODUCTION AND OPERATIONS	1,150,000,000
2011			
Department for Petroleum Resources	23020118	REAL TIME MONITORING OF GAS FACILITIES, PRODUCTION AND OPERATIONS BAYELSA	414,356,129
	23020118	INSTRUMENTS FOR GAS PIPELINE SYSTEM SURVEILLANCE (REAL TIME DELTA)	409,481,351
2012			
Department for Petroleum Resources	23020118	REAL TIME MONITORING OF GAS FACILITIES, PRODUCTION AND OPERATIONS; SOUTH - SOUTH BAYELSA	350,000,000

		INSTRUMENTS FOR GAS PIPELINE SYSTEM SURVEILLANCE (REAL TIME); SOUTH - SOUTH DELTA	400,000,000
2013			
Department for Petroleum Resources	23020118	REAL TIME MONITORING OF GAS FACILITIES, PRODUCTION AND OPERATIONS	250,000,000
	23020118	INSTRUMENT FOR GAS PIPELINE SURVEILLANCE (REAL TIME)	300,000,000
2014			
Department for Petroleum Resources	DPR02003814	REAL TIME GAS PIPELINE SYSTEM SURVEILLANCE ONGOING	110,000,000
Total			N6.675bn

Source: Approved Budgets from the Budget office of the Federation

From Table 2, a total sum of N6.675bn has been appropriated for the RTPSS. Considering the rate of vandalism of gas pipelines and other oil infrastructure, more investments will be required as the industry expands. However, if the surveillance system is functional and effective, it should have prevented some of the vandalism or reduced its effects to a minimum. The investments so far do not appear to have guaranteed value for money in reducing the vandalism. However, the escalated use of technology such as drones to monitor and maintain surveillance on the pipelines should be considered by government and the private sector as well as making the local communities real stakeholders in the pipeline projects. The drone technology will provide real time opportunities to intervene and curb vandalism while a sense of ownership by local communities will ensure greater safety of the pipelines. It is also imperative the government strengthens the Nigerian Security and Civil Defence Corps (NSCDC) to carry out its statutory mandate which includes the protection of oil and gas pipelines.

5.6 APPLICABLE FISCAL TERMS

The first is the issue of ownership of non associated gas which seems not to have been resolved by the NGMP. It has been stated that:

The Gas Master Plan in itself is chaotic. It has not addressed the issue of ownership and that is why the non-associated gas has not been fully exploited, even though it is the bigger endowment. Incidentally, no oil company will invest heavily to exploit this non-associated gas, because at the moment the Nigerian Gas Company (NGC), a subsidiary of the NNPC still regard that as an exclusive property of the Federal Government. So, the issue of ownership of non-associated gas has to be addressed first before the country can derive maximum benefit from its non-associated gas endowment⁵⁶.

⁵⁶ Mr. Olugbenga Adesanya, an Energy Economist and Environmental Accountant in an interview granted to the *Economy Magazine*, July 1 2014.

This challenge needs to be resolved for the NGMP to yield the desired dividends. Box 3 shows the applicable fiscal terms and anticipated legislative additions.

Box 3: Applicable Fiscal Terms and Anticipated Legislative Additions

CITA Incentives: Decree 18, 1998 and decree 30 of 1999 provides for Initial Tax Free Period of three years renewable for two more years. The alternative to the initial tax free period is an additional Investment Tax Allowance of 35% which shall not reduce the value of the assets. Such a company shall not be entitled to the ITA of 15%.

Accelerated Capital Allowance after the tax free period as follows: An annual allowance of 90% with 10% retention for investment in plant and machinery: An additional investment allowance of 15% which shall not reduce the value of the asset.

Tax free dividend during the tax free period where: the investment for the business was in foreign currency: or the introduction of imported plant and machinery during the period was not less than 30% of the equity share capital of the company. Interest payable on loan obtained with prior approval of the Minister for a gas project shall be deductible. The tax free period of a company shall start on the day the company commences production as certified by the Ministry of Petroleum Resources. Gas utilization under CITA is defined as: *“the marketing and distribution of natural gas for commercial purpose and includes power plant, liquefied natural gas, gas to liquid plant, fertilizer plant, gas transmission and distribution pipeline”*.

No anticipated changes in CITA and there will be a Downstream Gas Bill which will provide for regulatory framework for Downstream activities including open access principles; establishes the Gas Regulator and Regulator to determine reasonable return for common use facilities e.g. pipeline, CPF.

A Gas Fiscal Reform Bill which removes consolidation of Gas investment with oil and provides for a non discriminatory fiscal regime for all upstream Gas players.

Source: David Ige: The Nigerian Gas Master Plan Investors Road Show 2008

Box 3's applicable fiscal terms show that the incentives for gas investments are quite generous and should ordinarily attract local and foreign investment interest. But whether this is comparable to incentives offered by other gas producing nations is not clear, especially when country risk ratings are taken into consideration⁵⁷. However, the second aspect of the provisions in the Box which is about anticipated legislative changes do not give much comfort to investors since it is still legislation in the works and as such, suggests regulatory uncertainty. There is no information as to whether the Bill has been submitted to the legislature and the time the legislature will approve the Bill. However, the proposed changes seem to have been captured in the PIB.

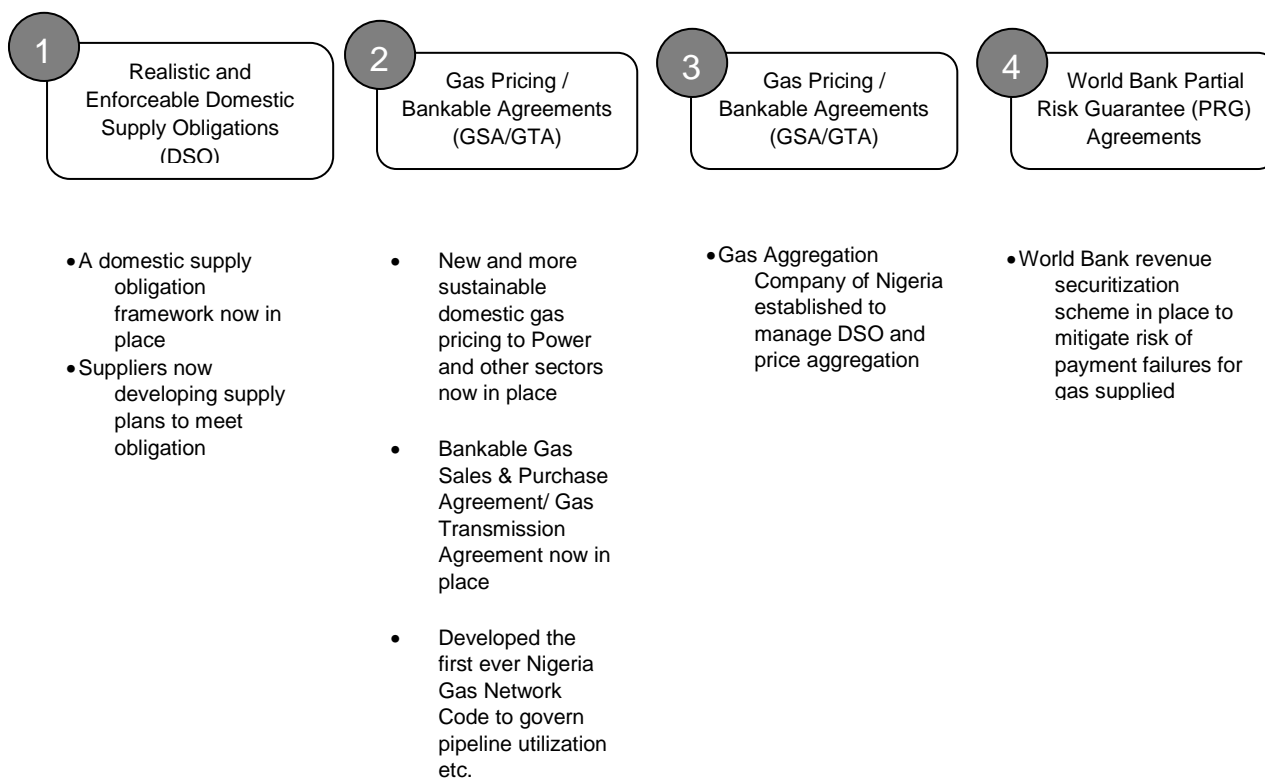
5.7 SUSTAINABLE COMMERCIAL FRAMEWORK

This Framework below gives an update on the status of four focus areas of the gas to power agenda.

⁵⁷ See [http://www.ey.com/Publication/vwLUAssets/EY-Global-oil-and-gas-tax-guide-2014/\\$FILE/EY-Global-oil-and-gas-tax-guide-2014.pdf](http://www.ey.com/Publication/vwLUAssets/EY-Global-oil-and-gas-tax-guide-2014/$FILE/EY-Global-oil-and-gas-tax-guide-2014.pdf).

Framework 1: Status Update on 4 Focus Areas:

Bankable contractual framework for gas supply and appropriate revenue securitization for gas purchased. This has been reasonably successful



The impression given by the above Framework is one of a gas to power industry that is becoming matured and sustainable. It looks too good to be true. This raises the poser: If all these are in place, what again is delaying the outcome in terms of increased supply of gas to the power sector which will lead to more megawatts of electricity available to homes, offices and industry? This Framework does not tally with the challenges of gas to power earlier raised by the former Minister for Power, Chinedu Nebo. It does not also tally with the continued challenges of accessing gas facing the electricity generating companies. Alternatively, since this Framework has been developed, it has not started working as planned.

Part Six

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Nigeria is rich in natural gas and has the potential of increasing its reserves beyond the present 187trillion scf if more resources are invested in gas exploration. The bulk of Nigeria's investments in new electricity generating capacity is in gas fired plants and the demand for gas is increasing geometrically against the background of slow increases in gas available to the domestic market. At the current rate of harnessing 5bscf a day, our 187trillion scf will last for 102 years. But the rate of harnessing will increase as the implementation of the NGMP is accelerated. Thus, at 15bscf a day which is triple of the current harnessing capacity, the reserves will last for 34 years. Nigeria is blessed with abundant sources of renewable energy including solar, wind, hydro, biomass but renewable energy contributes less than 5% to extant energy mix. Investments in renewable energy are low compared to other sources of energy.

The relevant extant laws governing the oil and gas industry include the Constitution of the Federal Republic of Nigeria 1999, the Petroleum Act and the Oil Pipelines Act and these are supplemented by various subsidiary laws/regulations including the Oil and Gas Pipelines Regulations. The applicable environmental laws include the Environmental Impact Assessment Act (EIA), the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, the National Oil Spill Detection and Response Agency (NOSDRA) Act and the Environmental Guidelines and Standards for the Petroleum Industry (EGASPIN). The proposed PIB makes elaborate regulations for growth and liberalisation of the gas industry. Unfortunately, the PIB has not been passed into law in over eight years since it was presented to the legislature.

Existing gas infrastructure is insufficient to meet gas demands from the electricity industry, commercial customers, industry and exports needs, hence the need for investments in new pipelines and other gas gathering, processing and storage infrastructure. Gas flaring leads to economic, health and environmental losses. The economic loss from gas flaring was in excess of \$1bn in 2014 and the political will to halt gas flaring seems to be lacking.

Vandalism is a threat that will affect the realisation of the gas to power policy. But there are reports indicating that some companies have been given contracts to secure the pipelines. The exact terms of reference and the details of the assignment of the companies are not in the public domain for Nigerians to determine whether they are rendering the services paid for by the treasury.

The NGMP is designed against the background of the huge demand for gas and low investments in the sector over the years. It is a four step plan that takes gas gathering,

processing and utilisation from ground zero through kick-starting viable domestic market to attaining full commerciality in the domestic market; attain full liquidity in the sector and finally attain full market driven status. However, Nigeria progress appears to be in between Steps 1 and 2 in seven years of implementing the NGMP. We have not attained full commerciality in domestic gas prices towards export parity and although we have a DGSO, it has not been successful in making gas available for domestic use. The PIB that should anchor all these reforms is stuck in the politics of the National Assembly and will start its journey *de-novo* in the 8th National Assembly. The delay in the passage of the bill has introduced uncertainty in the policy and legal framework of the industry leading to postponements and delays in decisions in oil and gas investments. The commercial papers to guide the gas sector seem to have been put in place but the investments are progressing rather slowly.

There are two key investment categories in gas gathering and processing and gas pipeline transmissions systems. The scope of investments will include gas gathering lines, network of compressor stations, gas treatment and LPG extraction facilities and LPG primary storage tanks. Some core investors have been shortlisted for key investments. Beyond electricity generation, the NGMP promised that by 2014, Nigeria would have been positioned firmly as the undisputable regional hub for gas based industries such as fertiliser, petrochemicals and methanol. But this is yet to happen.

Government has introduced a gas pricing policy that segmented the market into three sectors namely the strategic domestic sector referring to the power sector; strategic industrial sector referring to domestic industries that utilise gas as feedstock and the commercials sector referring to the use of gas as fuel as opposed to feedstock. The segmentation also involves segmentation in price with the gas to power leg attracting the least price regime. The price of gas has been indexed to inflation and end product price in a way that is cost reflective and returns reasonable profits to investors. The price of gas to power seems to be lower in Nigeria compared to other countries; but according to the Nigerian Electricity Regulatory Commission, the current cost of gas used for electricity generation is cost reflective with a reasonable rate of return for investments. The CBN in collaboration with NERC under the Nigerian Electricity Market Stabilisation Facility has also paid off the gas legacy debts owed to gas suppliers by the defunct Power Holding Company of Nigeria. However, it appears that the gas feedstock is sold to Nigerian gas producers at a price lower than the international spot market price and this ideally should compensate for lack of international parity in the end product price.

A Domestic Supply Obligation has been imposed on local gas producers. This is geared to ensure the availability of gas to generate power and for local industrial and commercial use. But it seems the DSO has not solved the challenge of availability of gas for the power industry. The DSO is supposed to supply gas for at least three fold increase in generation capacity by 2015. Evidently in 2015, the generation capacity has stagnated and has not even doubled.

The cost of implementing the NGMP is estimated at \$25bn. Two broad categories of investors are needed; the first is the investors for pipeline companies whilst the second is for gas gathering and processing investors. In the second category will be investors with LNG export aspirations; domestic industry operatives in methanol, petrochemicals, private equity investors and pure-play infrastructure investors⁵⁸. There are also investment opportunities in financial services and pipe milling and fabrication yards. The update on the implementation of NGMP shows that bankable contractual framework for gas supply and appropriate revenue securitisation for gas purchased has been put in place. Also, the fiscal terms to get investors into the gas sector are quite generous and should naturally attract investors.

The construction cost of developing natural gas pipelines and infrastructure⁵⁹ vary between US\$800,000 per km to US\$2 million per km (for large diameter projects over rugged terrains). If we take the average cost of \$1m for each kilometre of gas pipeline and 2300 kilometres of pipelines identified under the NGMP will require about \$2.3bn. Due to a number of reasons, mainly the risk of politically inspired violence, vandalism, the risk of expropriation and the long gestation period before the investment becomes profitable, international oil companies are unwilling to invest in gas projects while government and citizens are desirous of gas investments. The Nigerian government can afford to build the pipelines from public resources.

Nigeria and its partners have so far invested \$11.675bn in the LNG Plant in Bonny and associated investments in ships for the six trains of the Bonny Plant. There are also plans for new LNG projects in Brass and Olokola and Train 7 of the Bonny Plant but the evaluation of the investment decisions have been unduly prolonged. Considering new discoveries of gas and investments in other countries, if the final investments decisions are not taken soon, the feasibility of the Nigerian projects in terms of attracting buyers may be reduced. The implication of the foregoing costing details is that Nigeria can afford to build the new LNG plants either from the treasury, public loans and bonds, etc, or in collaboration with private sector operatives. The cost is not beyond the reach of Nigeria. Government has invested a lot of resources in Real Time Monitoring of Pipelines coupled with pipeline security contracts. Thus, continued vandalism of pipelines is unacceptable as the security system must be made to work to secure the pipelines. This brings to the fore the need for new technologies for pipeline protection such as drones and making local host communities actual stakeholders in the pipelines.

The demand for gas in the Nigerian domestic market far outstrips the supply and there is insufficient infrastructure to meet the needs of the market. Beyond financing and technical issues, awareness of the goals and details of NGMP is low outside the small

⁵⁸ David Ige, *op.cit.*

⁵⁹ Sweet Crude Report (7 April, 2014): Developing gas pipeline infrastructure in Nigeria: Who is responsible? Available Online: <http://www.sweetcrudereports.com/2014/04/07/developing-gas-pipeline-infrastructure-in-nigeria-who-is-responsible/>. Some part of the section is taken from Sweet Crude Reports.

enclave of oil and gas technocrats. For such an important national policy that will touch the lives and income of the population through the gas to power, commercial and industry initiatives, it should have been popularised by government through engagement with various stakeholder groups. Also, the idea of creating vehicles to tap resources from small and medium scale investors would be necessary to avoid over-reliance on the proverbial foreign investors who do not have a developmental, but strictly profit agenda.

Finally, Nigeria seems to lack a comprehensive implementable energy policy incorporating all energy segments and sources for national development. Thus, the NGMP should be located within the context of an overall energy policy which promotes the harnessing and use of different energy sources and mainstreams renewable energy.

6.2 RECOMMENDATIONS

Against the background of the foregoing, the Study makes the following recommendations.

- 1.** The Executive arm of Government should represent the PIB to the 8th National Assembly and use the party machinery and public pressure to ensure that the Bill is passed in record time before the end of the 2015 fiscal year. However, the new PIB should take cognisance of the views of industry stakeholders guaranteeing appropriate incentives and returns on investment and also good returns to the public treasury.
- 2.** Considering the bulky nature of the PIB, Government may consider breaking the bill into about four to five different bills for ease of passage. The parts dealing with gas can be isolated and immediately passed into law.
- 3.** Government should consider incentives benchmarked with the incentives offered by other African Gas Producing Nations to encourage investments in gas exploration to increase our reserves.
- 4.** Considering the abundant renewable energy resources available in the country, Government should plan and implement an energy policy that targets a renewable energy contribution of not less than 20% in the next ten years.
- 5.** The NGMP should be properly documented and made available to the public for their input and review and an official report on the progress so far should be available to the public.
- 6.** Government in collaboration with the private sector should create special purpose vehicles to tap resources from small and medium scale Nigerian investors to fund the

NGMP and to avoid over-reliance on the proverbial foreign investors who do not have a developmental, but strictly profit agenda.

7. Funding for NGMP can also come from special and dedicated funds for instance:

- ❖ If the \$18bn unremitted oil funds identified by NEITI is recovered, a part of it may be dedicated to the NGMP.
- ❖ Dedicating and ring-fencing the proceeds of Federation Account dividends and tax from existing Bonny LNG Company to new gas investments.
- ❖ Scrapping of fuel subsidy can yield about N1 trillion a year which FGN in collaboration with states and local governments can dedicate a part of it to the funding of the Master Plan.
- ❖ Recovery of the \$4.1bn gas flare outstanding penalty identified by the Nuhu Ribadu led Petroleum Revenue Special Task Force.
- ❖ Government may also consider dedicated bonds and developmental loans including Diaspora Bonds to fund the Master Plan.
- ❖ FGN can consider guaranteeing loans and bonds for reputable companies to invest in the gas sector. By this arrangement, FGN will only incur contingent liabilities which will not crystallise if the projects are well managed.
- ❖ The Central Bank of Nigeria may consider the establishment of special low cost intervention fund for the Gas Industry.

8. The Final Investment Decisions in respect of the Brass and OK LNG and Train 7 of the Bonny LNG should be speeded up for the projects to proceed to the implementation stage.

9. Government in consultation with industry stakeholders should fix a definite time frame to end flaring of associated gas and fully implement the Gas Re-injection Act. The new rules should include stiff sanctions for default.

10. In accordance with the recommendations of the Ribadu Committee Report, DPR should independently track and record gas production and sales data. The DPR should develop a proper process to independently track and record gas flare figures. This would ensure that there are no losses of revenues due to the Federation Account. It would also provide the important data necessary for reservoir management.

11. To reduce vandalism of gas pipelines and other infrastructure will entail ensuring that:

- ❖ The Real Time Pipeline System Surveillance (RTPSS) Project delivers value for money. The technology should facilitate the tracking down of vandals and their punishment.
- ❖ Policing of the pipelines is increased through new technology and the Nigerian Security and Civil Defence Corps strengthened to perform the statutory duty of pipeline surveillance and protection. The contracts to security contractors for pipeline protection should be revoked.
- ❖ Local host communities are brought on board the reforms with multiple engagement approaches and access to the business value chain to give them a sense of ownership of these facilities.

12. The full implementation of Domestic Gas Supply Obligation should be vigorously pursued and sanctions activated against defaulting firms.

13. The domestic cost of gas should be reviewed to near parity with the international price. However, the price of the gas feedstock should also be benchmarked against international market price of gas feedstock.

14. The disparity in the price of gas for power, commercial and industrial use should be reconsidered as a uniform pricing regime makes more economic and rational sense.

15. The imposition of VAT on domestic LPG should be stopped considering that imported LPG is VAT exempt.

16. The National Assembly should improve its oversight of the Petroleum and Gas Industry and ensure that all funds due to the Federation Account are recovered.

17. Civil Society Organisations should take more than a passing interest in the Oil and Gas Industry and seek to acquire special skills and expertise in analysing the intricacies of the Industry.

Appendix 1

Natural Gas Power Plants in Nigeria

Power station	Community	Type	Capacity	Status	Year completed
AES Barge (IPP)	Egbin	Simple cycle gas turbine	270 MW	Operational	2001
Aba Power Station (IPP)	Aba Abia State	Simple cycle gas turbine	140 MW	Taking off (I quarter 2013)	2012
Afam IV-V Power Station (FGN)	Afam Rivers State	Simple cycle gas turbine	726 MW	Partially Operational	1982 (Afam IV)- 2002 (Afam V)
Afam VI Power Station (IPP)	Afam Rivers State	Combined cycle gas turbine	624 MW	Operational	2009 (Gas turbines) 2010 (Steam turbines)
Alaoji Power Station(NIPP)	Abia state	Combined cycle gas turbine	1074 MW	Partially operational(225MW)	2012-2015
Calabar Power Station(NIPP)	Calabar	Simple cycle gas turbine	561 MW	Under Construction	2014.
Egbema Power Station(NIPP)	Imo State	Simple cycle gas turbine	338 MW	Under Construction	2012-2013
Egbin Thermal Power Station (FGN but Privatized)	Egbin	Gas-fired steam turbine	1320 MW	Partially Operational (994MW)	1985-1986
Geregu I Power Station-Privatized	GereguKogi State	Simple cycle gas turbine	414 MW	Unknown	2007
Geregu II Power Station (NIPP)	GereguKogi State	Simple cycle gas turbine	434 MW	Took off (I quarter 2013)	2012
Ibom Power Station(IPP)	Ikot Abasi	Simple cycle gas turbine	190 MW	Partially Operational (60MW)	2009
Ihovbor Power Station (NIPP)	Benin City	Simple cycle gas turbine	450 MW	Under Construction	2012-2013
Okpai Power Station (IPP)	Okpai	Combined cycle gas turbine	480 MW	Operational	2005
Olorunsogo Power Station	Olorunsogo	Simple cycle gas turbine	336 MW	Partially Operational	2007
Olorunsogo II Power Station (NIPP)	Olorunsogo	Combined cycle gas turbine	675 MW	Partially Operational	2012

Power station	Community	Type	Capacity	Status	Year completed
Omoku Power Station (IPP)	Omoku	Simple cycle gas turbine	150 MW	Operational	2005
Omoku II Power Station (NIPP)	Omoku	Simple cycle gas turbine	225 MW	Under Construction	2013
Omotosho I Power Station (FGN-Privatized)	Omotosho	Simple cycle gas turbine	336 MW	Operational	2005
Omotosho II Power Station (NIPP)	Omotosho	Simple cycle gas turbine	450 MW	Operational fully by NDPHC. Partially operational (375MW) By China Machinery Engineering Corporation	2012
Sapele Power Station-Privatized	Sapele	Gas-fired steam turbine and Simple cycle gas turbine	1020 MW	Partially Operational (135 MW)	1978 – 1981
Sapele Power Station (NIPP)	Sapele	Simple cycle gas turbine	450 MW	Operational	2012
Transcorp Ughelli Power Station (FGN now Privatized)	Ughelli, Delta State	Simple cycle gas turbine	900 MW	Partially Operational (360 MW)	1966-1990

Coal Power Plant in Nigeria (Proposed)

Power station	Community	Type	Capacity	Status	Year completed
Itobe Power Plant	Itobe Kogi State	Circulating Fluidized Bed technology	1200 MW	Planned	2015-2018 (first phase 600 MW)

The Oji River Thermal Power Plant was a coal fired power plant. It is no longer operational.

Hydroelectric Power Plants in Nigeria (In Service)

Hydroelectric station	Type	Capacity (MW)	Year completed
Kainji Power Station	Reservoir	800	1968
Jebba Power Station	Reservoir	540	1985
Shiroro Power Station	Reservoir	600	1990
Zamfara Power Station	Reservoir	100	2012

Hydroelectric Power Plants in Nigeria (Under Construction or Proposed)

Hydroelectric station	Type	Capacity (MW)	Year completed
Kano Power Station	Reservoir	100	2015
Zamfara Power Station	Reservoir	100	2012
Kiri Power Station	Reservoir	35	2016
Mambilla Power Station	Reservoir	3050	2018

Source: Various Reports from Bureau of Public Enterprises, Federal Ministry of Power, Nigerian National Petroleum Corporation, Nigerian Energy Commission (collated on Wikipedia: [List of power stations in Nigeria - Wikipedia, the free encyclopedia](#))