

# NIGERIAN NATIONAL PETROLEUM CORPORATION



## PROPOSED 40" X 614KM AJAOKUTA-KADUNA-KANO GAS PIPELINE AND STATIONS

### OUTLINE BUSINESS CASE



ALPINE

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## LIST OF ABBREVIATIONS & ACRONYMS

AG	Associated Gas
AGI	Above Ground Installations
AKK	Ajaokuta – Kaduna – Kano
AMB	A.M. Best’s Assessment of Economic, Political & Financial Risks
BT	Build and Transfer
BOT	Build, Operate and Transfer
Bscfd	Billion standard cubic feet per day
BVS	Block Valve Station
CAP	Calabar – Ajaokuta Pipeline
CAPEX	Capital Expenditures
CBN	Central Bank of Nigeria
CS	Compressor Station
CH <sub>4</sub>	Methane
CRT	Country Risk Tier
DFBOT	Design, Finance, Build, Operate and Transfer
DFI	Development Finance Institution
DPR	Department of Petroleum Resources
DSCR	Debt Service Coverage Ratio
ECA	Export Credit Agency
EGP	Early Gas Phase
EIA	Environmental Impact Assessment
ELPS	Escravos Lagos Pipeline System
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction



FEED	Front End Engineering and Design
E&P	Exploration and Production
EPCC	Engineering, Procurement, Construction and Commissioning
EPCIC	Engineering, Procurement, Construction, Installation and Commissioning
FAT	Factory Acceptance Test
FCT	Federal Capital Territory
FDF	Federal Department of Forestry
FEED	Front-End-Engineering Design
FMoEnv	Federal Ministry of Environment
FORMECU	Wildlife, Forestry Monitoring Evaluation and Coordinating Unit
FGN	Federal Government of Nigeria
FRIN	Forestry Research Institute of Nigeria
Genco	Electricity Power Generating Companies
GIS	Geographic Information System
HSE	Health, Safety and Environment
IOC	International Oil Companies
IPS	Intermediate Pigging Station
IRR	Internal Rate of Return
IMF	International Monetary Fund
IPP	Independent Power Producer
LBV	Line Break Valve
LIBOR	London Interbank Offer Rate
LLCR	Loan Life Coverage Ratio
LNG	Liquefied Natural Gas
MDA	Ministry, Departments and Agencies
mmcf	Million standard cubic feet

Mmscfd	Million standard cubic feet per day
Mn	Million
MoF	Ministry of Finance
NGL	Natural Gas Liquids
NGMP	Nigerian Gas Master Plan
NIPP	National Integrated Power Project
NNPC	Nigeria National Petroleum Corporation
NPV	Net Present Value
NAG	Non-Associated Gas
NAICOM	National Insurance Commission
NTB	NNPC Tenders Board
NDT	Non-Destructive Testing
OB/OB	Obiafu/Obrikom
OB3	Obiafu/Obrikom to Oben
OBC	Outline Business Case
OPEX	Operating Expenditures
PPMC	Pipelines and Products Marketing Company
PRG	Partial Risk Guarantee
PRMS	Pressure Reduction and Metering Station
PSC	Production Sharing Contract
psig	Pounds per square inch gauge
2P	Proved and Probable Reserves
3P	Proven, Probably and Possible Reserves
PAP	Project Affected Persons
ROW	Right of Way
tscf	Trillion standard cubic feet

tscfd	Trillion standard cubic feet per day
WAGP	West Africa Gas Pipeline
QIT	Qua Iboe Terminal
SCADA	Supervisory Control And Data Acquisition
SIA	Social Impact Assessment
TNGP	Trans-Nigerian Gas Pipeline
TSG	Terminal Gas Stations
TSGP	Trans-Saharan Gas Pipeline

## EXECUTIVE SUMMARY

### 1. Preamble

The purpose of the information assembled in this Outline Business Case (OBC) is to justify the development of the Ajaokuta-Kaduna-Kano (AKK) Gas Pipeline and stations through the Build and Transfer (BT) public private partnership model, with the Contractor Financing option; and present all the relevant information to enable the Nigerian National Petroleum Corporation (NNPC) and relevant regulatory institutions make an informed decision on whether to proceed with the project.

### 2. Project Title

The title of the project is: *The development of Ajaokuta-Kaduna-Kano (AKK) Gas Pipeline.*

### 3. Project Proponent

The Project Proponent is NNPC.

### 4. Project Description

The project involves the construction and operation a 614km Ajaokuta-Abuja-Kaduna-Kano 40” Natural Gas Pipeline Project. The proposed pipeline will be supplied with pipeline quality gas sourced from various gas gathering projects in the southern part of Nigeria, at a minimum pressure of 1,000 pounds per square inch gauge (psig) at the Ajaokuta tie-in, and delivered to Kano also at a minimum pressure of 1,000 psig. NNPC intends to route the AKK pipeline through the major existing right of (ROW) of the Pipelines and Products Marketing Company (PPMC's) crude oil/product pipeline to Kaduna, although some pipeline routes will be on completely new alignments. The states that bestride the pipeline corridor are Kogi, Federal Capital Territory (FCT Abuja), Niger, Kaduna and Kano States. Based on the choice pipeline route, the pipeline will cross seven major rivers and ten major roads.

### 5. Project Justification

Nigeria is a gas surplus nation, with gas reserve estimate of 188tscf. The gas reserves comprise 99tscf of associated gas (AG) and 86tscf of non-associated gas (NAG). In the last 40 years and since the start of active petroleum activities in Nigeria, about 23tscf of gas have been produced. The commercial demand of gas is about 0.33tscf of associated gas per year. LNG exports currently account for 40% of the quantity, while domestic users led by the power sector account for 60%.

Despite Nigeria's natural gas endowment, the country has remained a mono-cultural economy, dependent on the export of crude petroleum for over 90% of its export earnings<sup>1</sup>. Associated and non-associated gas produced in the country has historically been flared for no other reasons than inadequate gas infrastructure, inappropriate/unrealistic pricing of gas, low level of industrialization, and inadequate consumptive capacities.

It is rather ironically that about 60% of associated gas is flared in a country where only 40% of Nigerians have access to electricity<sup>2</sup>, while supply shortages are responsible for causing a 3% decrease in economic growth per year<sup>3</sup>. Nigeria has vast reserves of petroleum and natural gas, and the potential to be one of Africa's richest nations. However, reliable power supply remains a challenge. With a

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<sup>1</sup> CBN

<sup>2</sup> Director-general of the Nigerian Energy Commission

<sup>3</sup> Renaissance Capital

population of 182.2million and GDP of \$486.60 bn at Q12017<sup>4</sup>, electricity generating capacity stands at slightly above 3,500 MW. The average per capita electricity usage is 125 kWh, easily one of the lowest in the world. To put this into context, Kenya has a population of 40.05 million, a GDP of \$64.4bn, average per-capita usage of 171 kWh, and installed capacity of 2299 MW. An even starker contrast is South Africa, with a population of 54.95 million and GDP of \$360 billion, which has installed capacity of 40,000 MW and 4229 kWh per capita by 2015. Considering the deplorable energy situation in the country, the government plans to ensure that gas significantly contribute to power sector target of generating 25,387MW by 2020. The plan includes an approval of competitive gas pricing and domestic supply obligations. One of the medium-term interventions is the development of major domestic gas transmission systems from the South to the North. The proposed gas transmission lines will take dry gas through Akwa Ibom/Calabar facilities to Ajaokuta, Abuja, Kaduna and Kano. The line will also serve the South-East States of Anambra, Abia, Ebonyi, Enugu and Imo.

The long-term target of the project is to supply gas to Europe through the Trans-Saharan Gas Pipeline (TSGP) project. The TSGP upon completion, will provides a “golden opportunity for Nigeria to exploit her gas potentials and utilize its gas resources to enable her earn as much revenue from it as it is earning from oil. This will enable Nigeria meets her nagging domestic gas utilization; eliminate gas flaring and in the long run help the country meet global greenhouse gases/climate change policy requirements”.

Given the above scenario, there is a clear need for Nigeria to quickly harness its vast gas resources to

- (a) increase its electricity generation;
- (b) jumpstart its comatose industries;
- (c) increase domestic use of gas;
- (d) Export.

The proposed Ajaokuta-Abuja-Kaduna-Kano Gas Pipeline (Phase I) Project construction and operation is a further step within the government policy as it will help guarantee supplies network in the North and South of Nigeria and as well as reduce environmental impact associated with gas flaring.

## 6. Approach and Methodology

The methodologies use in the development of this OBC report and the tasks involved, include the establishment of the policy context based on which the project was conceived and the business needs for the project. The needs analysis is a high-level review of the project’s commercial rationale, and analysis of the demand for and desirability of the project. A technical scoping, describing the key technical parameters envisioned for the project was conducted. This was followed by a quantifiable cost and benefit analysis, employing such tools of analyses as breakeven, payback period, net present value, and sensitivity analysis. This study was further extended to cover environmental, economic and social issues, options, and risk analysis.

The first phase of the assignment involved carrying out interviews with key NNPC personnel with responsibility for the development of AKK Pipeline Project, and the review of relevant documents.

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<sup>4</sup> Source: Nigerian Bureau of Statistics

## 7. Brief Description of Scope of Work

The scope of work includes engineering, procurement, construction, installation, testing and commissioning of a 40" x 614km class 600# pipeline system from Ajaokuta to Kano with associated intermediate and terminal facilities to supply natural gas to off-takers at Abuja, Kaduna and Kano.

**Table 1: Scope of Work**

S/N	Pipeline Segment/TGS	Diameter/Length
1	Ajaokuta MS/TGS - Abuja PS	40" x 200Km
2	Ajaokuta TGS	
3	Abuja PS - Kaduna TGS	40" x 193Km
4	Abuja TGS	
5	Kaduna TGS - Zaria PS	40" x 97Km
6	Kaduna TGS	
7	Zaria PS - Kano TGS	40" x 124Km
8	Kano TGS	

The execution of the project was originally anticipated to take Three (3) Years, however alternative means of reducing the project execution were considered and the new estimated construction period is Two (2) Years.

Budget Provision/funding for the Project: 100% Contractor Financing Model.

## 8. Project Cost

The proposed AKK Pipeline project to be executed in three lots will involve the following costs:

	Lot 1	Lot 2	Lot 3	Total
EPC Lump Sum Cost*	727,250,000	710,150,000	988,500,000	2,425,900,000
Provisional Sum (15%)**	109,087,500	106,522,500	148,275,000	363,885,000
Project Management Consultancy ***				121,295,000
<b>TOTAL</b>				<b>2,911,080,000</b>

\* EPC Lump Sum Cost excludes Total Debt Service Payments over the repayment period

\*\* Provisional Sum includes SCADA Integration and all appurtenances

\*\*\*Project Management Consultancy \*\*

## 9. Project Finance & Delivery

According to NNPC the financing and governance structure for the project would require the EPC Contractors to raise adequate funds to finance the AKK project to meet up with the project execution

schedule. The terms of repayment such as tenor, cost of finance, and fees to be agreed with NNPC will be contained in a Contract Financing Agreement to be executed by the Project Financier (EPC Contractor) and the Project Sponsor (NNPC).

## 10. Project Profitability & Commercial Viability

### *Profitability*

The projected financial statements shown in the appendices reveal a comfortable profitability profile in the 15 year period covered by the projections. The Project's EBIT is \$302 million for the 1<sup>st</sup> Year of operations and with an average \$503 million during the years projected. It is expected that the upwards trend of the EBIT will continue way beyond Year 15 covered by this analysis.

A projected financial summary of the projects including key ratios is presented in Table 2.

### *Cash flow Projection*

The project is expected to receive inflows of \$1,303.92 million and \$1,601.09 million from the EPC Contractors during the first two construction years. From the 1<sup>st</sup> Year of operations (2020), net cash flows (NCF) are expected to fluctuate during the first four (4) years of operations after facility related repayments and increase on an upward slop from year five (5) for the rest of the years reviewed. The NCF is projected to be positive peaking at \$301.29 million by the Year 15.

The expected Debt Service Coverage Ratio (DSCR) requirement for the project is 1.00x. From Year 2 of operations, the DSCR of the project will rise steadily from 0.98x to 1.82x by Year-15. The average DSCR for the entire review period stood at 1.46x.

Details of the projected cash flows for the period covered are attached as Appendix 4 to this report.

### *Payback period*

The period required for the project to return the full amount of \$2,911 million Contractor financing and associated obligations are 8 and 8.25 years using the project pre-tax and post-tax profits respectively.

### *Net Present Value and Internal Rate of Return*

The pre-tax net cash flow of the project, discounted at a cost of capital of 10%, 12.5% and 15% are respectively \$2.436billion, \$01.664billion, and \$1.074 billion while the post-tax net cash flow of the project, discounted at a cost of capital of 10%, 12.5% and 15% were \$2.164 million, \$1.453 billion, and \$0.908million respectively. The determination of the cost of capital at which the project will break even (Internal Rate of Return) was not necessary as the project has no equity contribution.

### **Sensitivity Analysis Breakeven Analysis**

The project was assessed to be fully bankable in all scenarios including best, base and worst cases; with a summary of the main elements of these cases analyses from the Project Economic Model tabulated below:

Project Summary	Rate (%)	Base Case		Worst Case		Best Case	
		Project-pretax (US\$'mm)	Project-Post-tax (US\$'mm)	Project-pretax (US\$'mm)	Project-Post-tax (US\$'mm)	Project-pretax (US\$'mm)	Project-Post-tax (US\$'mm)
NPV	10	2,436.97	2,164.57	2,108.46	1,885.10	2,545.69	2,293.67
	12.50	1,664.65	1,453.89	1,389.36	1,214.17	1,708.83	1,584.62
	15	1,074.73	908.84	840.63	702.00	1,193.97	1,038.77
Payback Period		8	8.25	8.5	8.75	7.75	8

All the assumptions relating to this sensitivity analysis is shown in the Appendix to this report.

### 11. Project Delivery and Management

For accounting purposes and to ensure transparency and control, NNPC will open a Project Disbursement Account (PDA). The EPC Contractor must fund the PDA to cover any work scope approved by NNPC within a specific period. The bank will be given a standing mandate to sweep, within a stipulated time, any deposited amount by the Contractor into the AKK Project Construction Account.

Any AKK Project Construction Account will be under the joint control of both NNPC and the Contractor and will be the source of payment for the AKK Project execution works. The repayment of the principal sum will commence upon satisfactory completion and delivery of the AKK project to the Project Sponsor. A schedule of debt repayment (including interest amount) will be negotiated and agreed (six-month LIBOR + Margin) by both NNPC and the Contractor based on terms to be included in the Contract Financing Agreement.

### 12. Risk Analysis & Allocation

Any project typically faces several risks throughout the project period. Risks associated with the projects relate to development, construction and operations. There is the added country specific risk and residual risks. These risks have been identified, classified, analyzed and allocated to the parties in the best position to mitigate them. Options for mitigation have also been identified and a preliminary but comprehensive risk register developed and will be proactively monitored, reviewed and updated for the AKK Pipeline Project. This segment of the OBC documents the risk analysis of the pipeline project and covers commercial, technical, HSE, political, legal, market, schedule and pipeline operational risks.

The schedule showing the project's risk management and allocation is attached as Appendix 3 of this OBC.

### 13. Policy and Regulatory Framework

Until the recent promulgation of the Petroleum Drilling and Production Regulations (PDPR), a subsidiary legislation made pursuant to the Petroleum Act of 1990, there has not been any specific legal, statutory or organizational framework for the exploitation and production ("development") of natural gas reserves in Nigeria. Prior to this development, Nigeria gas exploration and production was governed principally by the Petroleum Act and its subsidiary legislations (as amended) Cap 35 Laws of



the Federation of Nigeria (LFN) 2004. There was, therefore, no separate or distinct license for the exploration and production of natural gas. This was conducted under an Oil Prospecting License (OPL) or an Oil Mining Lease (OML) along with exploration and production of crude. With this development, the PDPR regulates in detail natural gas exploration and production activities.

The Nigerian Gas Masterplan provides the policy framework for gas pricing, domestic reserve obligation and the gas infrastructure blueprint. The National Gas Supply and Pricing Regulations came into force in 2007. This Regulation establishes the Department of Gas and Domestic Gas Aggregator. It also prescribes penalties for non-compliance. The details of the policy, institutional, legal, and regulatory frameworks have been presented in the main OBC report.

#### **14. Value for Money Assessment**

NNPC's in-house estimate of the EPC cost of delivering the AKK pipeline is \$2.74 bn, whereas the Build and Transfer cost through Contractor financing is \$2.911 bn. However, NNPC in-house estimate does not include the cost of financing, which is estimated at \$2.38 bn (detailed in the financial analysis). An addition of the later amount to NNPC's in-house estimate brings the EPC delivery cost to \$5.12 bn. Clearly there is a distinct cost advantage of using the Build and Transfer cost through Contractor financing to deliver the project. Without accounting for the financing cost, the direct delivery of the project will be preferred to the PPP option.

Indeed, public-private cost comparisons are inherently tricky. To start with, government cost accounting systems and methods are generally so opaque and convoluted that public managers cannot accurately identify the "all-in" costs of providing a service. Some costs are paid directly out of an MDA's budget, while many others—such as debt service, risk management, legal, payroll, IT and other administrative functions—are paid out of some other MDA's budget. If those "extra" costs aren't captured along with the direct agency spending, any cost allocation at the service level will be understated. Even within an MDA's budget, many costs may be borne by the headquarter office that should be allocated to specific service units, facilities, and the like in a proper accounting scheme. Throw in the tendency of government analysts to look for creative ways to make their public sector colleagues look more competitive than they really are, and there's ample reason to at least question public-private cost comparison studies undertaken by government. Besides there is the practice in the public sector of spreading available capital budgets thinly over several projects with the results there is a perpetual cost and time budget overrun.

#### **15. Environmental Impact Assessment**

No desirable economic activity comes without diseconomies and adverse impact on the environment. The attendant increase in economic activities will always involve a disruption of the natural habitat and eco-system. The noise level will increase, the weather change, the air and underground water polluted, amongst other diseconomies.

Some of the mitigating measures being proposed by the project sponsor NNPC, for containing the adverse impact of the project consist of providing some basic infrastructure such as electricity and water supply, access roads, primary health center, and giving concessions to the host community in employment, award of contracts, scholarships and training programmes. Other measures include regularly liaising with the host communities on programmes of action before problems arise, carrying the local communities along throughout lifespan of the project. These are in addition to establishment of such permanent monitoring and intervention departments with responsibility for Community Relations, Waste Management and Social Management plan.

## 16. Options Analysis

Four major development options were considered for the delivery of the proposed Ajaokuta-Abuja-Kaduna-Kano gas pipeline (Phase I) project including Implement Project Option; Delay Project Option; No Project Option; and Partnership with the private sector. Several PPP procurement methods are possible in the delivery of AKK Pipeline Project. These are the BT, BOT and DFBOT.

An analysis of the various options evaluated, recommends a BT with Contractor Financing option for the AKK Pipeline Project primarily because it exhibited better Value for Money than the other options through reduced procurement, development and management costs, reduced procurement risks, shorter lead-in times, improved quality and added value from training and local employment. As it were, NNPC lacked the funds to undertake the project. In addition, the BT option relieves NNPC the immediate burden of the huge initial outlay for the development while still vesting the operation and maintenance of this important infrastructure asset on NNPC.

The likely benefits of the BT option are:

- (a) Increased efficiency in the execution of the pipeline project;
- (b) Reduced risk for the public sector, by transferring part of the risk to the Contractors;
- (c) The private partners will execute the project more rapidly because of the incentive to maximize returns on investment;
- (d) Frees NNPC' scarce resources for deployment to other critical uses;
- (e) Reduced development and infrastructure budget for NNPC.

## 17. Implementation Recommendations

The project implementation schedule was originally planned to be Thirty-Six (36) months. In addition to segmenting the scope into three separate Lots, and awarding the development of the three Lots to three separate EPC Contractors. This development necessitated compressing the implementation schedule to Twenty-Four (24) months.

The compression of the schedule was informed by the need to fast-track the project. Other reasons including:

- It reduces dependence on a single contractor and enhances competition.
- A faster overall completion schedule resulting from parallel processing of the construction in segments will result in early revenue generation and shorter payback period.
- Considering that this is a priority and strategic developmental project, early completion and commissioning will be beneficial to the Nigerian Economy (e.g. through gas to power, and gas based industries).
- Segmentation is also an advantage by allowing for local resources such as Nigerian financial institutions and suppliers to participate and benefit from the project.

The use of multiple Contractors naturally carries interface risks for NNPC which will need to be addressed and properly managed, but this risk can be mitigated through use of a well-designed interface plan and careful project management. It may also have a price impact although this is likely to be marginal, given that the pipeline segments are still significant and as such, economies of scale still apply.

## 18. Conclusion

The project is technically feasible and commercially viable, with a very strong liquidity position, sufficient to repay the principal and interest and still leave enough to adequately compensate the promoters.

A projected financial summary of the projects including key ratios is presented in Table 2 below:

Table 2: 15-Year Projected Financial Summary Including Key Ratios

Cash Flow Summary (US\$mm)	Aug-2018	Aug-2019	Aug-2020	Aug-2021	Aug-2022	Aug-2023	Aug-2024	Aug-2025	Aug-2026	Aug-2027	Aug-2028	Aug-2029	Aug-2030	Aug-2031	Aug-2032
Annual Gas Throughput (mmscf)	-	-	1,367,010	1,791,067	1,825,000	1,825,000	1,830,000	1,825,000	1,825,000	1,825,000	1,830,000	1,825,000	1,825,000	1,825,000	1,830,000
Average daily throughput (mmscf/day)	-	-	4,722	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Average gas tariff (US\$/mmscf)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Cash Flows															
Net Revenues	-	-	1,049.86	1,375.54	1,401.60	1,401.60	1,405.44	1,401.60	1,401.60	1,401.60	1,405.44	1,401.60	1,401.60	1,401.60	1,405.44
Operating Expenses	-	-	(534.01)	(705.48)	(729.16)	(740.69)	(744.44)	(740.85)	(739.62)	(736.50)	(738.38)	(746.41)	(749.49)	(748.72)	(750.59)
EBITDA	-	-	515.86	670.06	672.44	660.91	661.00	660.75	661.98	665.10	667.06	655.19	652.11	652.88	654.85
Taxes Paid	-	-	-	-	-	(24.52)	(42.01)	(42.09)	(42.37)	(42.66)	(41.93)	(41.12)	(41.02)	(41.20)	(41.16)
Working Capital	-	-	(162.78)	(11.44)	(0.74)	(1.10)	0.31	0.07	0.12	0.34	(0.17)	(1.17)	0.20	-	-
<b>Operating Cash Flows</b>	-	-	<b>353.08</b>	<b>658.62</b>	<b>671.70</b>	<b>635.29</b>	<b>619.30</b>	<b>618.72</b>	<b>619.73</b>	<b>622.77</b>	<b>624.96</b>	<b>612.90</b>	<b>611.29</b>	<b>611.68</b>	<b>613.69</b>
<b>Investing Cashflows</b>	<b>(2,085.77)</b>	<b>(1,600.79)</b>	<b>(214.16)</b>	<b>0.00</b>	<b>(0.00)</b>	<b>0.00</b>	<b>(0.00)</b>	<b>(0.00)</b>	<b>(0.00)</b>	<b>0.00</b>	<b>(0.00)</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Financing Cash Flows															
Equity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bank Debt	2,085.77	1,600.79	342.43	8.77	(233.99)	(213.19)	(192.39)	(171.59)	(150.79)	(130.00)	(109.20)	(88.40)	(67.60)	(46.80)	(26.00)
Net Interest Expense	-	-	(128.26)	(288.93)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)	(310.73)
Equity Top Up (DSRA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Financing Cash Flows	2,085.77	1,600.79	214.17	(280.16)	(544.72)	(523.92)	(503.12)	(482.32)	(461.52)	(440.72)	(419.93)	(399.13)	(378.33)	(357.53)	(336.73)
<b>Net Cash Flows</b>	-	<b>(0.00)</b>	<b>353.09</b>	<b>378.46</b>	<b>126.97</b>	<b>111.37</b>	<b>116.18</b>	<b>136.40</b>	<b>158.21</b>	<b>182.05</b>	<b>205.03</b>	<b>213.77</b>	<b>232.96</b>	<b>254.16</b>	<b>276.97</b>
Opening Balance	-	-	(0.00)	353.09	731.55	858.52	969.89	1,086.07	1,222.47	1,380.68	1,562.73	1,767.76	1,981.54	2,214.49	2,468.65
Net Cash Flows	-	(0.00)	353.09	378.46	126.97	111.37	116.18	136.40	158.21	182.05	205.03	213.77	232.96	254.16	276.97
<b>Closing Balance</b>	-	<b>(0.00)</b>	<b>353.09</b>	<b>731.55</b>	<b>858.52</b>	<b>969.89</b>	<b>1,086.07</b>	<b>1,222.47</b>	<b>1,380.68</b>	<b>1,562.73</b>	<b>1,767.76</b>	<b>1,981.54</b>	<b>2,214.49</b>	<b>2,468.65</b>	<b>2,745.62</b>
DSRA Requirement															
6 months Debt Service	-	-	-	274.96	264.56	254.16	243.76	233.36	222.96	212.56	202.16	191.76	181.36	170.96	160.56
Additional DSRA Top Up	<b>0.00</b>														
Period End Debt Service	<b>0</b>	<b>0</b>	<b>0</b>	<b>280,160</b>	<b>269,760</b>	<b>259,361</b>	<b>248,961</b>	<b>238,562</b>	<b>228,162</b>	<b>217,762</b>	<b>207,363</b>	<b>196,963</b>	<b>186,563</b>	<b>176,164</b>	<b>165,764</b>
DSCR Requirement	<b>1.00x</b>														
Project Meet Requirement?	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>1.16</b>	<b>1.25</b>	<b>1.24</b>	<b>1.26</b>	<b>1.31</b>	<b>1.37</b>	<b>1.44</b>	<b>1.52</b>	<b>1.57</b>	<b>1.65</b>	<b>1.75</b>	<b>1.87</b>
Average DSCR	<b>1.46x</b>														
Maximum DSCR	<b>1.89x</b>														

# INTRODUCTION

## Preamble

The purpose of the information assembled in this Outline Business Case (OBC) is to justify the development of Ajaokuta-Kaduna-Kano (AKK) Gas Pipeline and stations through the Build and Transfer (BT) Contractor Financing option; and present all the relevant information to enable the Nigerian National Petroleum Corporation (NNPC) and relevant regulatory institutions make an informed decision on whether to proceed with the project.

## Project Proponent

NNPC is the Project Proponent. The Project Proponent intends to construct and operate a 614km Ajaokuta-Abuja-Kaduna-Kano 40” Natural Gas Pipeline Project. The proposed pipeline will be supplied with pipeline quality gas sourced from various gas gathering projects in the Southern part of Nigeria, at a minimum pressure of 1,000 pounds per square inch gauge (psig) at the Ajaokuta tie-in and delivered to Kano also at a minimum pressure of 1,000 psig. NNPC intends to route the AKK pipeline through the major existing right of way (ROW) of the Pipelines and Products Marketing Company (PPMC’s) crude oil/product Pipeline to Kaduna, although some pipeline routes will be on completely new alignments. The States that besride the pipeline corridor are Kogi, Federal Capital Territory (FCT Abuja), Niger, Kaduna and Kano States. Based on the choice pipeline route, the pipeline will cross seven major rivers and ten major roads.

## Project Background

Natural gas, used commercially as fuel for centuries in China and over 180 years in the United States, is produced from underground accumulations of the gas. Although most natural gas consists largely of methane (CH<sub>4</sub>) and other light hydrocarbons, the actual composition of gas varies from field to field. Whereas the production, processing and distribution of natural gas have made significant contribution to the economies of most countries endowed with the product, the story has been different for Nigeria.

Historically, much of the associated gas produced in Nigeria has been flared due in part to inadequate critical infrastructures to transport the gas from the oil producing region to consumers. Other impediments include inadequate gas gathering and supply infrastructure, inappropriate/unrealistic pricing of gas, especially for domestic use, low level of industrialization and inadequate consumptive capacities.

Since 1976, however, the focus of the gas industry in Nigeria shifted to the export market in the form of liquefied natural gas (LNG) and pipeline gas. The rising domestic demand for gas, particularly for use by the budding electricity power sector, eventually led to the advent of the Nigerian Gas Master Plan (NGMP) in 1998. The strategy of the NGMP is to leverage the full potential of natural gas within the Nigerian economy whilst contributing to global exports as well. This strategy will require “striking the balance between domestic and export”.

The focus of the NGMP is to provide

- (a) gas to power;
- (b) gas based industrialization and, increased use of gas for vehicular purposes;
- (c) selective high value export through additional export through LNG projects and regional gas pipelines.

Over the last 2 years, the country has attained an annual growth rate of 20% in domestic gas consumption.

To date, over 1000km of major gas pipelines have been laid and commissioned by NNPC, and an additional 470km is presently under construction whilst a further 1400km is at the project development phase. Construction will commence by Q3 2017.

Nigeria major pipeline system includes: Escravos-Lagos Pipeline System (ELPS) for supplies to the Western parts of the country and to Oban-Ajaokuta pipeline, which is the back bone for supplies to the North and Alakiri -Obigbo-Ikot Abasi for the Eastern trunk. With these efforts at up-scaling the gas infrastructure base, the country is likely to have an expanded supply capacity and utilization.

A distinct outcome of this aggressive gas infrastructure development is that the country has been able to harness and utilize gas which had, hitherto, remained inaccessible and largely flared. Consequently, gas flaring, which consumed about 35% of the country's gas production, has dropped from a peak of 2250 mmcf/d few years ago to about 750 mmcf/d or 8% of total gas production presently.<sup>5</sup> Was this trend to continue, Nigeria will be able to achieve the Zero-Routine Flaring ahead of World-Bank set target date of 2030.

Concomitant to the expansion of gas infrastructures is the increasing emphasis on commercial framework for gas supply. Gas pricing has been adjusted to export parity with legacy debt owed by the various sectors to gas suppliers being paid off through an intervention fund arranged by the Central Bank of Nigeria (CBN). Gas supply agreements are currently being effected with terms that assure bankability. The World Bank Partial Risk Guarantee (PRG) is being introduced to provide securitization of gas revenues. These interventions are boosting confidence in the gas sector.

Domestic gas supply capacity is growing at an aggressive rate, having significantly increased from 500mmcf/d in 2006, to about 2000mmcf/d presently. The electricity power sector currently accounts for a sizable proportion of domestic gas consumption. At the same time, the use of gas in the non-power sectors has been increasing exponentially. Independent and other new players have continued to express interest in the Nigerian gas sector as a result of the improved investment potential of the sector.

Nigeria has an estimated 178 trillion standard cubic feet (tscf) of proven natural gas reserves, making the country one of the top ten natural gas endowments in the world and the largest in Africa. Abundant gas reserves exceed foreseeable needs of the domestic, regional and export markets.

## Project Description

The AKK Gas Pipeline (Phase I) Project constitutes the Phase 1 of the Trans-Nigeria Gas Pipeline (TNGP) Project that is driven by availability of additional gas supplies from Assa Gas Plant, and the need of gas supply to the Northern/Eastern States through Obigbo-Umuahia-Ajaokuta pipeline and Ajaokuta-Kaduna-Kano pipeline.

The project development will involve the following:

- Surveying and clearing the right of way (ROW)
- Hauling and Stringing of Pipe(s)
- Bedding of Pipe(s)
- Welding
- Digging of trench
- Lowering of pipe and backfilling

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<sup>5</sup> EIA Study

- Installation of valves and special fitting and joint coating
- Pipeline crossings on rivers, road, streams and other pipelines
- Non-destructive testing (NDT)

Surveying and ROW preparation will lead to vegetation clearing, loss of biodiversity, and loss of farmlands, crops, habitat and migration of wildlife.

The gas transmissions pipelines will have a diameter of 40" and length of 614km along the route. The pipeline will have three spur lines from the Abuja Node to the Abuja TGS, approximately 13.6km, from Kaduna node to Kaduna TGS approximately 200m and from Kano node to Kano TGS approximately 8.14km; respectively.

The Abuja and Kaduna spurs will be sized for 500 MMscfd each leaving up to 2,250 MMscfd available at Kano for local distribution and export in the future through the Trans-Saharan Gas Pipeline (TSGP) project. The project will be constructed through a Build and Transfer with Contractor Financing, and operated by NNPC on completion.

The pipeline diameter will be as follows;

- From Ajaokuta Tie-In Station to Kano TGS 40" pipelines.
- From Abuja Node to Abuja TGS 2 x 20" pipelines.
- From Kaduna Node to Kaduna TGS 2 x 20" pipelines

The pipe will be supported by three booster compressor stations, each station comprising of two turbo compressor trains in operation with one spare train. Each operating train will normally pump its contents through the pipelines. The spare train will be provided to be lined up to the pipeline in the event of a problem occurring with one of the normally operating trains.

The compressor power requirement will be within the range of standard heavy-duty Frame 5 gas turbines. The Booster Compressor Stations will be of similar design and feature the following process components:

- Incoming pipeline tie-ins
- Slug Catchers
- Pig Receivers
- Turbo compressors Package
- Pig Launchers
- Outgoing pipeline tie-ins

The AKK is the Phase 1 of the NGMP, which was approved in 2008, to guide the commercial exploitation and management of Nigeria's gas sector. The NGMP aims to grow the Nigerian economy with gas through the Project. The proposed pipeline system will process 4 billion standard cubic feet per day (Bscfd) of rich gas from a variety of oil and gas producing areas in three central processing facilities, located according to clusters of gas supply and distribute the sales gas via the nearest gas transmission pipeline system.

As conceived, the TNGP will start from Qua Iboe Terminal (QIT) and Cawthorne Channel, traversing Obigbo, Umuahia, Enugu, Ajaokuta, Abuja, Kaduna and Kano.

The AKK Section of the TNGP is a 40" X 614KM gas pipeline. It originates from Ajaokuta traversing Abuja, Kaduna and terminating at the proposed terminal gas station in Kano. The right of way for the gas

pipeline is planned to run parallel to the existing 16” crude oil and 12” product pipelines wherever possible.

In other to fast track the implementation of the AKK gas pipeline project, NNPC has segmented the project into three (3) separate and distinct lots as summarized below. These lots will be assigned to the three (3) most competitive bidders during the Procurement Phase of project development.

**Table 3: Delineated Work Scope as Approved**

S/N	Segment	Pipeline Segment/TGS	Diameter/Length
1	Lot 1	Ajaokuta MS/TGS - Abuja PS	40” x 200Km
		Abuja IPS - Abuja TGS	24” X 15Km
		Ajaokuta MS/TGS	NA
		Abuja IPS	NA
		Abuja TGS	NA
2	Lot 2	Abuja PS - Kaduna IPS	40” x 193Km
		Kaduna IPS - TGS	24” X 15Km
		Kaduna IPS	NA
		Kaduna TGS	NA
3	Lot 3	Kaduna TGS - Zaria IPS	40” x 97Km
		Zaria IPS	NA
		Zaria IPS - Kano TGS	40” x 124Km
		Kano TGS	NA

**LOT 1: Ajaokuta to Abuja Pipeline**

- (i) Engineering, Procurement, Construction and Commissioning (EPCC) of 40" by 200Km Class 600 pipelines system from Ajaokuta Terminal Gas Station (TGS) to Abuja Intermediate Pigging Station (IPS) with the associated in-line Block Valve Station (“BVS”) and terminal facilities.
- (ii) Engineering, Procurement, Construction, Installation and Commissioning (EPCIC) of Class 600 TGS, Pressure Reduction and Metering Station (PRMS) with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Control Building, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Ajaokuta.
- (iii) EPCIC of Class 600 IPS with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Abuja.



- (iv) EPCIC of Class 600 TGS with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Control Building, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Abuja.
- (v) EPCC of 24" by 20km Class 600 pipelines system from IPS to TGS with the associated traps and tie-in facilities.

### **LOT 2: Abuja - Kaduna Pipeline**

- (i) EPCC of 40" by 193Km Class 600 pipelines system from Abuja IPS to Kaduna IPS with the associated inline BVS and terminal facilities.
- (ii) EPCIC of Class 600 IPS with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Kaduna.
- (iii) EPCC of 24" by 15Km Class 600 pipelines system from Kaduna IPS to TGS with the associated traps and tie-in facilities.
- (iv) EPCIC of Class 600 TGS with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Control Building, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Kaduna.

### **LOT 3: Kaduna – Kano Pipeline**

- (i) EPCC of 40" by 97Km Class 600 pipelines system from Kaduna IPS to Zaria IPS with the associated inline BVS.
- (ii) EPCIC of Class 600 IPS with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Zaria.
- (iii) EPCC of 40" by 124Km Class 600 pipelines system from Zaria IPS to Kano TGS with the associated BVS.
- (iv) EPCIC of Class 600 TGS with associated Civil Works, Instrumentation and Control Facilities, Power and Utilities, Water (Portable and Utilities) system, Control Building, Fire & Gas Detection System, Lightening Protection System, Fire Hydrant System, Cold Vent and Hydrocarbon Liquid Handling System etc. at Kano.

## **Approach and Methodology**

The methodologies used in the development of this Outline Business Case and the tasks involved, include the establishment of the policy context based on which the project was conceived and the business needs for the project. The needs analysis was a high-level review of the project's commercial rationale, and analysis of the demand for and desirability of the project. A technical scoping, describing the key technical parameters envisioned for the project was conducted. This was followed by a quantifiable cost and benefit analysis, employing such tools of analyses as breakeven, payback period, net present value, and sensitivity analysis. This was extended to cover environmental, economic and social issues.

The first phase of the assignment involved carrying out interviews with key NNPC personnel with responsibility for the development of AKK Pipeline Project, and the review of relevant documents. The following documents reviewed provided the background information for this report:

- NNPC Pipeline Bankability Studies

- TSGP Project Feasibility Studies
- The GED, E&P's Gas Committee Final Report
- Environmental Impact Assessment (EIA) Report for the Proposed Ajaokuta-Abuja-Kano (Kano-Katsina Gas Spur Pipeline Project) Phase 2. NNPC had retained the services of AIES to carry out the Environmental Impact Assessment (EIA) study and preparation of Environmental Management Plan (EMP) for the project.
- The International Comparative Legal Guide to: Gas Regulation 2011. A practical cross-border insight into Gas Regulation Work Published by Global Legal Group, in association with Ashurst LLP. Retrieved from [http://www.aalex.com/media/files/Gas11\\_Chapter-25\\_Nigeria\(1\).pdf](http://www.aalex.com/media/files/Gas11_Chapter-25_Nigeria(1).pdf)
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- Maxwell M. Gidado Ph.D. (2009). "Fiscal Provisions for Gas Development and Commercialization under the Petroleum Industry Bill (P.I.B)". Retrieved from <http://www.nials-nigeria.org/journals/Maxwell%20M%20Gidadibus.pdf>.

## NEEDS ANALYSIS & PROJECT JUSTIFICATION

### Overview

Endowment with natural gas has been a major driver of economic growth in most countries. Indeed, the production, processing and distribution of natural gas have been a major contributor to the gross domestic product (GDP) of countries such as UK, Netherlands, Russia, Qatar, Australia and Indonesia. As natural gas has to be extracted from the ground in enough volume to be economically viable, the industry is by nature large-scale, employing thousands, generating millions of dollars in associated revenues and tax income. Gas producing countries have reaped enormous economic benefits from their gas industries, particularly in the following areas:

- Employment transformation from “old” industries such as coal and steel to “new” high-tech natural gas extraction and innovative appliances;
- Local source of natural gas can act as a catalyst to other industries such as chemicals, driving wider economic growth;
- Wider job creation in the industry itself from upstream exploration & production (E&P) companies, midstream processing and pipeline transportation companies, downstream local distribution companies, suppliers and onsite construction service providers, natural gas pipeline construction and manufacturers of field machinery and equipment; to the industry’s supporting arms focusing on HSE law, human resources, public relations and many other aspects;
- Taxation of profits from gas production

In Nigeria, domestic consumption and export of gas are only just picking up, following a long period of relative lull. Due to a combination of factors including inadequate gas transport, gathering and distribution stations, together with inappropriate/unrealistic pricing of gas, the level of domestic industrialization, and local consumptive capacities, gas utilization has been low. Before 1976, a sizable proportion of Nigeria’s gas, estimated at over 60% of the daily gas production was flared, accounting for over 20% of the total daily flaring of gas globally, and amounting to annual losses of over US \$2billion dollars revenue to the country. From 1976, however, the focus of the gas industry in Nigeria shifted to the export market in the form of LNG and pipeline gas.

The NGMP launched in 1998 refocussed the country’s gas strategy to providing

- (a) gas to power;
- (b) gas based industrialization and, increased use of gas for vehicular use;
- (c) selective high value export through additional export via LNG projects and regional gas pipelines.

Over the last 2 years, the country has attained an annual growth rate of 20% in domestic gas consumption. Gas infrastructure development has been aggressive and the country has been able to harness and utilize gas which was hitherto inaccessible and flared. Consequently, gas flaring has dropped from a peak of 2250mmscfd or 35% of total gas production few years ago to about 750mmscfd or 8% of total gas production presently.

### Project Components

The project primary components are; pipeline system and valves, Tie-In/Scraper Launcher Station, Intermediate Scraper Receiver / Launcher Stations in Abuja and Kaduna with check valves, pig launchers and receivers and TGS in Abuja, Kaduna and Kano respectively.

## Project Sustainability

The proposed project is envisaged to be economically sustainable in view of the fact that natural gas that was traditionally flared at oil extraction sites for years has increasingly been recognized as an enormous income generating resource for Nigeria and now being captured for processing and sale both locally and internationally.

Economically, the project is sustainable because after successful completion, not much financial outlay will be required to sustain gas transmission. The FGN (Federal Government of Nigeria) has already approved new gas pricing and domestic supply obligation regulations. These regulations will ensure financial sustainability of the project as gas will be sold to customers: power plants, fertilizer industries, and for domestic use, etc., and profits accrued from the sales of the natural resources to maintain and operate the project.

## Project Justification

Nigeria is a gas surplus nation, with gas reserve estimate of 188tscf, comprising 102tscf of associated gas (AG) and 86tscf of non-associated gas (NAG). In the last 40 years, since the start of active petroleum activities in Nigeria, about 23tscf of gas have been produced. The commercial demand of gas is about 0.33tscf of associated gas per year, which stands at about 1000mmscfd. LNG exports currently account for 40% of the quantity, while domestic users led by the power sector account for 60%.

Despite this endowment, Nigeria has remained a mono-cultural economy, dependent on the export of crude petroleum for over 90% of its export earnings<sup>6</sup>. Associated and non-associated gas, which the country has in abundance, has historically been flared for no other reasons than inadequate critical infrastructures gas infrastructure, inappropriate/unrealistic pricing of gas, low level of industrialization and inadequate consumptive capacities.

Rank	Country	Total (million kWh / year)	per Capita (kWh/year)	Date
1	China	5,523,000	4,074	2014
2	United States of America	3,913,000	12,271	2014
3	Russia	1,065,000	7,475	2014
4	India	973,000	787	2014
5	Japan	934,000	7,348	2014
19	South Africa	212,000	4,382	2014
23	Egypt	143,000	1,646	2014
47	Algeria	49,000	1,262	2014
67	Nigeria	24,000	135	2014

*Figure 1: Average per Capita Electricity Usage*

It is rather ironically that about 60% of associated gas is flared in a country where only 40% of Nigerians have access to electricity<sup>7</sup>, while supply shortages are responsible for causing a 3% decrease in economic growth per year<sup>8</sup>. Nigeria has vast reserves of petroleum and natural gas, and the potential to be one of Africa's richest nations. However, reliable power supply remains a challenge. With a population of

<sup>6</sup> CBN

<sup>7</sup> Director-general of the Nigerian Energy Commission, Abubakar Sanni Sambo

<sup>8</sup> Renaissance Capital

182.2million and estimated GDP of \$486.60 bn at Q12017<sup>9</sup>, electricity generating capacity stands at slightly above 3500 MW. The average per capita electricity usage is 125 kWh. To put this into context, Kenya has a population of 40.05million, a GDP of \$64.4bn, average per-capita usage of 171 kWh, and installed capacity of 2299 MW. An even starker contrast is South Africa, with a population of 54.95 million and GDP of \$360 billion, which has installed capacity of 40,000 MW and 4229kWh per capita. Considering the deplorable energy situation in the country, the government plans to ensure that gas significantly contribute to power sector target of generating 25,387MW by 2020. The plan includes an approval of a new gas pricing and domestic supply obligations regulation including short-term, medium-term and long term gas supply targets. One of the medium-term major domestic gas transmission systems is the first South - North gas transmission line that will take dry gas through Akwa Ibom/Calabar facilities to Ajaokuta, Abuja, Kaduna and Kano. The line will also serve the south-east states of Anambra, Abia, Ebonyi, Enugu and Imo.

The long-term target of the project is to supply gas to Europe through the TSGP. The TSGP will provide a "golden opportunity for Nigeria to exploit her gas potentials and utilize its gas resources to enable her earn as much revenue from it as it is earning from oil. This project will enable Nigeria meet her nagging domestic gas utilization; eliminate gas flaring and in the long run help the country meet global greenhouse gases/climate change policy requirements".

Given the above scenario, there is a clear need for Nigeria to quickly harness its vast gas resources to

- (a) increase its electricity generation;
- (b) jumpstart its comatose industries;
- (c) increase domestic use of gas;
- (d) Export.

The proposed Ajaokuta-Abuja-Kaduna-Kano Gas Pipeline (Phase I) Project construction and operation is a further step within the government policy as it will help guarantee supplies network in the North and South of Nigeria and as well as reduce environmental impact associated with gas flaring.

## Project Benefit

In line with the experience of other gas producing countries, Nigeria has the potential of have reaping enormous economic benefits from their gas industries, particularly in employment generation; as a catalyst to diversification into petrochemicals and other industries; wider job creation in the industry itself from upstream, midstream (gas transportation), and downstream local distribution companies; and taxation of profits and of gas production. In particular, the project will open-up opportunities for construction of power plants in the north of the country and generally improve the power situation of the country. It is also expected to encourage the use of gas by existing cement, fertilizer and steel factories in the project area and stimulate the construction of new ones. The project will additionally expand the gas supply system in the North of the country to meet the growing gas and energy demands in the region. The project will open up new areas of opportunities in the project area thereby reducing gas flaring (by improving environmental and safety standards).

Specific sectors of the economy that will benefit directly for the project includes:

1. **Power Sector:** About 300mmscfd of gas goes into production of 65% of Nigeria's 111Kw/cap of electricity. It is anticipated that Nigeria's power needs will grow at an estimated 2.5% every 10

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<sup>9</sup> Source: Nigerian Bureau of Statistics

years. Hence, it is expected that gas consumption by Nigeria Power Sector could potentially increase to 1,350 and 1,380mmscfd by 2010 and 2020 respectively.

The project will open-up opportunities for construction of power plants in the north and generally improve the power situation of the country.

2. **Cement Sector:** Nigeria imports approximately 5% of her 6 million tons of cement per year requirements, the nation is the highest user of cement in Sub-Sahara Africa. It is anticipated that at 7% annual growth rate, cement imports can be eliminated by 2018. This will involve conversion of existing plants and addition of new ones, with projected gas utilization increase from the current 28mmscfd to about 300mmscfd by 2020.

The project will encourage the use of gas by existing cement factories in the project area and construction of new ones.

3. **Fertilizer Sector:** Nigeria with 13Kg/ha application has a total fertilizer consumption of about 800,000 metric tons per year and an anticipated growth rate of about 6-7% per annum. The project will encourage the construction of fertilizer plants in the project area, which will expand farming activities and reduce Nigeria food imports.
4. **Steel Sector:** Nigeria's steel demand currently stands at about 0.4 million tons per annum compared with the less than 1% capacity utilization of installed capacity of about 2.3 million tons per annum. Full recovery of the steel sector is expected to account for gas utilization increase from 0.2mmscfd (2002) to 130mmscfd by 2020. It is expected that this project will encourage investment in the construction of steel plants in the north.
5. **Export and Other Projects:** Other anticipated and planned key growth sectors are projected to involve gas utilization increase from the current 100mmscfd to 410mmscfd by 2020. Industry experts predict that export - oriented projects could grow to about 4000mmscfd by 2020. The expected revenue from export through the TSGP will greatly improve the country's economy and project Nigeria to the competitive international gas market presently dominated by Qatar and Russia.

## POLICY, REGULATORY & INSTITUTIONAL FRAMEWOK

### Overview

Until the recent promulgation of the Petroleum Drilling and Production Regulations (PDPR), a subsidiary legislation made pursuant to the Petroleum Act of 1990, there has not been any specific legal, statutory or organizational framework for the exploitation and production ("development") of natural gas reserves in Nigeria. Prior to this development, Nigeria gas exploration and production was governed principally by the Petroleum Act and its subsidiary legislations (as amended) Cap 35 Laws of the Federation of Nigeria (LFN) 2004. There was, therefore, no separate or distinct license for the exploration and production of natural gas. This was conducted under an Oil Prospecting License (OPL) or an Oil Mining Lease (OML) along with exploration and production of crude. With this development, the PDPR regulates in detail natural gas exploration and production activities.

### Policy Framework

The Nigerian Government in its bid to become a major international player in the international gas market as well as boosting the domestic market and realize maximum revenue possible from gas initiated the NGMP. The three components of the NGMP are:

1. The Gas Pricing Policy, which provides a framework for the minimum price that any purchaser of gas can be charged;
2. The Domestic Reserve Obligation, which aims to ensure the availability of gas for domestic consumption in order to stimulate economic growth; and
3. The Gas Infrastructure Blueprint, which provides for the establishment of a network of gas hubs which would ultimately reduce the cost of supplying gas from Nigeria.

The components of the master plan are aimed at addressing issues that have plagued the domestic gas market as well as leveraging gas for the economic growth of the country.

The proper legal, regulatory and policy framework for ensuring the achievement of the objectives NGMP are still pending. The two major bills that could go a long way in aiding the realization of the master plan's objectives are:

- the Downstream Gas Bill and
- the Gas Fiscal Reform Bill.

While the Downstream Gas Bill is for an Act to provide for the regulatory regime for the downstream gas sector, including open access principles and when passed into law will lead to the creation of a regulatory commission and establish a gas regulator to oversee investments and operations of the domestic gas sector; the Gas Fiscal Reform Bill intends to remove the consolidation of gas investment with oil and provide for non-discriminatory fiscal regime for all upstream players. Together, these bills have the potential of boosting the domestic gas sector when they are enacted into laws by the National Assembly.

Another policy that impacts on the NGMP is the National Domestic Gas Supply and Pricing Policy. This policy aims to fully bring the gas sector in line with the economic growth aspiration of the nation by providing solutions to the issue of gas pricing; addressing domestic gas supply availability in a manner that delicately balances the need for domestic economic growth and revenue generation from export. Additionally, the regulation will also implement an approach for the gas sector that enables full participation of all gas suppliers in the country in a way that ensures sustained gas supply to the domestic market.

The National Gas Supply and Pricing Regulations came into force in 2007. This Regulation establishes the Department of Gas and Domestic Gas Aggregator. It also prescribes the procedure for gas supply obligation and the penalties of the payment of \$3.5 per mcf, a restriction on exportation or both as decided by the Minister for Petroleum Resources for noncompliance with the supply obligation. It also prescribes penalties for non-compliance.

## Ownership

The Constitution of the Federal Republic of Nigeria 1999 vests the Federal Government with title over all petroleum, which includes gas, under or upon any land in Nigeria, its territorial waters and its exclusive economic zone. Some specific legislation that emphasizes this fact includes:

- S.44(3) Constitution of the Federal Republic of Nigeria 1999
- S.1 Petroleum Act Cap 350, LFN 1990
- Exclusive Legislative powers in respect of matters listed in Part 1, Second Schedule of the 1999 Constitution vested in the National Assembly
- Natural Gas expressly listed at item 39

Section 1 (1) of the Petroleum Act vests the entire ownership and control of petroleum, which includes natural gas, in the State.

## Natural Gas Production

In Nigeria, there are no gas-specific concessions granted for gas production as natural gas production is undertaken under:

- Production Sharing Contracts
- Oil Mining Leases

The rights to win and carry away petroleum, including natural gas, in Nigeria are granted to investors by the Minister through the Oil Prospecting License (OPL) and the Oil Mining Lease (OML). An OPL or OML is held by companies either in joint venture with NNPC or as a sole risk operation. Since the early nineties, the government has shown preference for PSCs, which allow investors to bear exploration and production risks in return for cost oil and part of profit oil. The PSCs do not however grant investors a right to gas. Under PSCs, investors may only develop gas reserves and shares in gas produced under a gas development agreement, to be agreed between NNPC and respective investors.

By virtue of paragraph 35 (b) (i) of the First Schedule of the Petroleum Act, the government has the right to take associated gas produced by the licensee or lessee free of cost at the flare or at an agreed cost and without payment of royalty. This, under the OPL and the OML, disposal or transfer of gas development rights may only be done with the consent of the Minister.

The term/duration and the scope of rights differ according to the respective license. An Oil Exploration License (OEL) has a one year term; it terminates on the 31st of December following the date of the grant, and can be renewed for one further year. An Oil Prospecting License (OPL) has duration of not more than five years including any renewals, while an OML has duration of not more than 20 years. The rights conferred by these licenses are slightly different. An OEL confers a non-exclusive right to explore for petroleum, while for both an OPL and OML an exclusive right to explore, carry away and dispose of petroleum.

The State participates through NNPC in the exploration and production by entering into joint ventures with private investors, and lately, by signing PSCs with contractors. The joint venture and PSC structure



entitles the State to share in production. During exploration and production, several permits are to be obtained from the DPR and the FMoEnv. The work obligations have to be approved by the DPR. Safety standards and environmental permits for the different stages of operation are obtainable from the DPR and the FMoEnv respectively.

## Gas Flaring

The following laws and regulations guide gas flaring in Nigeria.

- Mandatory Utilisation of Associated Gas - Regulation 42
- Petroleum (Drilling & Production) Regulations
- Associated Gas Re-Injection Act, Cap 26 LFN 1990
- Flare Penalty - S.3(2) Associated Gas Re-Injection Act
- Flare-out Policy: S.3(1) Associated Gas Re-Injection Act as amended.

## Tariff Structure & Price Regulation

Parties are free to determine the terms upon which natural gas is to be transported. However, the government has fixed the tariff for the transportation of gas to government-owned power plants. In this respect, the Minister for Petroleum Resources or his nominee is granted Power to regulate price of Natural Gas.

## Gas Transmission

The transportation pipelines, gas-processing facilities and other associated infrastructure are currently owned by individual upstream gas producers and are dedicated to their respective operations. In order to enable flexible deployment of gas to domestic and export markets, the Ministry of Petroleum Resources has developed a NGMP Infrastructure Blueprint. This includes a network of gas hubs, which will comprise of secondary gas-gathering facilities from designated nodes of the upstream gas producers to a network of gas processing facilities, where gas will be processed to a national specification and evacuated via transmission pipelines. Under this framework, transportation pipelines, from the wellheads to the designated nodes, will be owned and operated by the gas producers, while pipelines for the transportation of gas from the designated nodes to the transmission pipelines will be owned and operated by the hub operator. The Oil Pipelines Act, 1956 and the Petroleum Act regulates the construction, operation and maintenance of gas pipelines and associated infrastructure. These laws are implemented by the DPR, a department under the Ministry of Petroleum Resources .

The governmental authorizations required are a permit to survey a route for a proposed gas pipeline and an oil pipeline license, both issued under the Oil Pipelines Act 1990. The oil pipeline license confers on the holder the right to construct, maintain and operate a gas pipeline. It also confers the right to construct, maintain and operate installations that are ancillary to the construction, maintenance and operation of such pipeline, such as pumping stations, storage tanks and loading terminals. A license to construct and operate a refinery issued under the Petroleum Act is required to construct and operate gas-processing facilities. An environmental impact assessment approved by the FMoEnv is required for the construction and operation of any natural gas transportation and storage facilities.

By virtue of the Land Use Act, 1978, the use of land for the construction of gas pipelines constitutes an overriding public interest for which the government may compulsorily acquire land. Such acquisition is subject to the payment of compensation to the owner/occupier of the land. The right to use land for the purposes of a gas pipeline is inherent in the grant of an oil pipeline license as the license confers on the

holder the right to enter upon, take possession of, or use a strip of land of such width as may be specified in the license upon the route specified in the license.

Any person that requires access to a gas pipeline may make an application to the Minister who would consider the application in consultation with the applicant and the owner of the pipeline. The Minister would grant the application if he is satisfied that the pipeline can conveniently convey the substance which the applicant desires to convey. The terms and conditions of access are to be determined by agreement between the parties and failing such agreement, will be determined by the Minister. The Minister may impose such requirements as he thinks necessary for the purpose of securing the access right of the applicant and regulating the access charge.

The transportation pipelines are currently not interconnected. However, upon the implementation of the gas infrastructure blue print, it is expected that transportation pipelines will be interconnected

The laws relating to gas transmission in Nigeria include:

- (a) Oil Pipelines Act Cap 338 LFN 1990: The same provisions relating to oil also apply to gas under this law. The law also governs the licensing regime for the construction and operation of gas pipelines. Additionally, the law regulates the permit to survey pipeline route and Oil Pipeline Licence (OPL)
- (b) Oil & Gas Pipelines Regulations 1995: This legislation detailed regulations for the design, construction & maintenance of Gas Pipelines.

By virtue of S.18 Oil Pipelines Act, access to the pipeline network is through negotiations directly with the Pipeline owner through such instruments as the Transmission Agreement (NGC, Producers, End-user) and Gas Supply Agreement (NGC & Producer).

## **Environmental Protection**

Every pipeline project such as the AKK Pipeline project requires an Environmental Clearance from Federal Ministry of Environment in line with EIA Act No. 86 of 1992 of Federal Government of Nigeria and DPR approval. The request for FMoEnv clearance is usually premised on an EIA, in line with the Environmental Impact Assessment Sectoral Guidelines for Oil and Gas Industry projects of the Federal Ministry of Environment, Environmental Guidelines and Standards for Petroleum Industry in Nigeria (EGASPIN) Revised Edition 2002 of the Department of Petroleum Resources (DPR).

## **The Fiscal Regime**

The principal legislation is the Petroleum Profits Tax Act (PPTA) Cap 338 LFN 1990, which provides for

- 65.75% during first 5 years of Production
- 85% after 5 years upon amortisation of pre-production expenses

The PPTA rates have been a disincentive to gas utilization. To encourage better utilization of natural gas in Nigeria, the Federal government introduced the following incentives regime.

- Associated Gas Fiscal Utilisation Incentives 1992 (AGUFI)
- Associated Gas Framework Agreement 1994 (AGFA)
- Project-Specific Legislation: LNG (FIGA) Decree, MOBIL OSO Condensate Project Decree
- Budget Speeches 1996-1999

### ***Current Regime for Gas Utilization***

- Finance (Miscellaneous Taxations Provisions) Decree No. 18 1998

- Finance (Miscellaneous Taxations Provisions) (No.2) Decree No.19 of 1998
- Finance (Miscellaneous Taxation Provisions) Decree No. 30 of 1999
- Finance (Miscellaneous Taxation Provisions) Decree No. 18 of 1998
  - 3 year tax holiday renewable for further 2 years period
  - Tax-free dividends during tax holiday
  - Accelerated Capital Allowances for investment in Plant & Machinery
  - VAT exemptions for Plant and equipment purchased for gas utilisation in downstream Petroleum operations
  - Investment for the separation of crude oil and gas into useable products will be part of the oil field development
  - CAPEX or transmission equipment will be treated as part of oil CAPEX
  - CAPEX and OPEX will be treated under the PPPA & MOU incentives
- Finance (Misc. Tax Prov.) (No.2) Decree No. 19 of 1998
  - interest payable on any loan obtained for a gas project will be a tax deductible if prior approval of the Minister of Finance is granted
- Finance ( Misc. Tax Prov.) Decree No. 30 Of 1999
  - Royalty and tax exemptions for gas transfer from NGL to GTL facilities
  - CAPEX for GTL projects now allowable against crude oil income
  - All incentives for Associated Gas Production now applicable to non-associated Gas

### **Natural Gas Utilization Regulatory Oversight**

The Minister for Petroleum Resources granted powers to control and regulate activities in the Petroleum Sector. These powers are largely exercised by the DPR using a regime of consents & approvals. The DPR regulates gas activities in Nigeria. The Department of Gas, established under the National Gas Supply and Pricing Regulations, is expected to ensure the availability of gas supply to the domestic market.

The Federal agencies involved in “Gas-to-Electricity” Projects:

- Ministry of Power, Works and Housing
- Nigerian Electricity Regulatory Commission
- Ministry of the Environment
- Ministry of Finance
- Nigerian Communications Commission
- Nigerian Investment Promotions Commission

## **Government Enablers**

### **Investment incentives in Nigeria**

The federal government of Nigeria has developed a package of incentives for investments in various sectors of the economy, including natural gas. These incentives are designed to:

- Create an enabling environment that is conducive to the growth and development of industries;
- Encourage the inflow of foreign direct investment (FDI);
- Shield existing investments from unfair competition; and
- Stimulate the expansion of domestic production capacity;

Additional, the Nigerian Investment Promotion Council (NIPC) has been strengthened to enable it serve as a one-stop office for clearing all the requirements for investment in the country. Some of the enablers including:

- A new visa policy to enable genuine foreign investors to procure entry visa to Nigeria within 48hours
- Replacement of existing "expatriate quota" requirement for foreign nationals working in Nigeria is in the process of being replaced with "work permit" administered by the NIPC.
- **Pioneer status:** A concession to pioneer companies located in economically disadvantaged areas, providing a tax holiday period of five to seven years. These industries must be considered by the government, to be beneficial to the country's economy and in the interest of the public. Companies that are involved in local raw material development; local value added; labour intensive processing; export oriented activities; in-plant training; are also qualified for additional concessions.
- **Tax relief for research and development (R&D):** Up to 120% of expenses on R&D are tax deductible provided that such R&D activities are carried out in Nigeria and are connected with businesses to which allowances are granted. the result of such research could be patented and protected in accordance with internationally accepted industrial property rights.
- **Local raw materials utilisation:** 30% tax concession for five years to industries that attain minimum local raw materials utilisation as follows:- - agro 80% - agro allied 70% - engineering 65% - chemical 60% - petro-chemical 70%.
- **Labour intensive mode of production:** 15% tax concession for five years. The rate is graduated in such a way that an industry employing one thousand persons or more will enjoy 15% tax concession while an industry employing one hundred will enjoy only 6%, while those employing two hundred will enjoy 7%, and so on.
- **Local value added:** 10% tax concession for five years. This applies essentially to engineering industries, while some finished imported products serve as inputs. This is aimed at encouraging local fabrication rather than the mere assembly of completely knocked down parts.
- **In-plant training:** 2% tax concession for five years, of the cost of the facilities for training.
- **Infrastructure:** 20% of the cost of providing basic infrastructures such as roads, water, electricity, where they do not exist, is tax deductible once and for all.
- **Abolition of excise duty:** All excise duties were abolished with effect from the 1st of January, 1999.
- **Import duty rebate:** A 25% import duty rebate was introduced in 1995 to ameliorate the adverse effect of inflation and to ensure increase in capacity utilisation in the manufacturing sector. Investors are however, advised to ascertain the current operative figures at the time of making an investment, because these concessions have undergone some amendments in the past few years.
- **Re-investment allowance:** This incentive is given to manufacturing companies that incur capital expenditure for purposes of approved expansion of production capacity; modernisation of production facilities; diversification into related products. It is aimed at encouraging reinvestment of profits.

- **Investment tax allowance:** Under this scheme, a company would enjoy generous tax allowance in respect of qualifying capital expenditure incurred within five years from the date of the approval of the project.
- **Investment guarantees/effective protection:** Transferability of funds section 24 of NIPC decree provides that a foreign investor in an enterprise will be guaranteed unconditional transferability of funds through an authorised dealer in freely convertible currency of:
  - Dividends or profit (net of taxes) attributable to the investment;
  - Payments in respect of loan servicing where a foreign loan has been obtained;
  - Remittance of proceeds (net of all taxes) and other obligations in the event of a sale or liquidation of the enterprise or
  - Any interest attributable to the investment.
  - Guarantees against expropriation
- **Nationalization:** By the provision of section 25 of the same NIPC decree, no enterprise will be nationalised or expropriated by any government of the federation, unless the acquisition is in the national interest or for public purpose; and no person who owns either wholly or in part, the capital of any enterprise will be compelled by law to surrender his interest in the capital to any other person. These can only be done under a law that makes provision for:
  - Payments of fair and adequate compensation; and
  - Right of access to the courts for the determination of the investor's interest or right and the amount of compensation to which he is entitled.

In addition to all these safeguards, the Nigerian government is prepared to enter into investment protection agreement with foreign enterprises wishing to invest in Nigeria.

### *Investment in the Oil & Gas Sector*

The following fiscal incentives have been approved by the government in the gas production phase:

- Tax rate under petroleum profit tax (PPT) act to be at the same rate as company tax which is currently at 30%;
- Capital allowance at the rate of 20% per annum in the first 4 years, 19% in the 5th year and the remaining 1% in the books;
- investment tax credit at the current rate of 5%;
- royalty at the rate of 7% on shore and 5% offshore.
- gas transmission and distribution
- capital allowance as in production phase;
- tax rate as in production phase;
- tax holiday under pioneer status.

### **LNG projects**

- applicable tax rate under PPT is 45%;
- capital allowance is 33% per annum On-sight-straight-line basis in the first three years with 1% remaining in the books;
- investment tax credit of 10%;

- Royalty of 7% on shore, 5% offshore tax deductible.
- gas exploitation (upstream operations)
- all investments necessary to separate oil from gas from the reserves into suitable products is considered part of the oil field development;
- capital investment facilities to deliver associated gas in usable form at utilisation or transfer points will be treated for fiscal purposes as part of the capital investment for oil development;
- Capital allowances, operating expenses and basis for assessment will be subjected to the provisions of the PPTA and the revised memorandum of understanding (MOU).
- gas utilisation (downstream operations)

The incentives for encouragement of exploitation and utilization of associated gas for commercial purpose include:

- an initial tax free period of three years renewable for an additional two years;
- 15% investment capital allowance which will not reduce the value of the asset;
- all fiscal incentives under the gas utilisation down-stream operations in 1997 are to be extended to industrial projects that use gas in power plants, gas to liquid plants, fertiliser plants and gas distribution/transmission plants;
- the initial tax holiday is to extend from three to five years;
- gas is transferred at 0% PPT and 0% royalty;
- investment capital allowance is increased from 5% to 15%;
- interest on loans for gas projects is to be tax deductible provided that prior approval was obtained from the federal ministry of finance before taking the loan;
- all dividends distributed during the tax holiday will not be taxed.

### **Energy sector**

All areas of investment in this sector are considered to be pioneer product or industry. As a result, there is a tax holiday of 5 to 7 years for investments in the sector.

There has been a deregulation of this sector resulting in the emergence of independent power producers (IPP) that will soon start operation in Nigeria.

## ANALYSIS OF GAS MARKET IN NIGERIA

### Overview

As at 31<sup>st</sup> December 2016, the proved and probable reserve (2P) of Nigeria's gas was about 188tscf<sup>10</sup>, making it the 9th largest gas reserves in the world. Additionally, Nigeria has a relatively high possible (3P) reserves base of about 75tscf, together with a potential for the development of additional undiscovered gas reserves currently estimated at about 600tscf by US geological survey. The gas resources, located largely in the Niger Delta region of the country, are characterized by high quality, rich in natural gas liquids (NGLs), and low in impurities. Ironically, the Nigerian gas sector is still relatively undeveloped, with relatively low levels of domestic utilization despite this potential.

Going by history, much of the associated gas produced in Nigeria has been flared due to the absence of adequate critical infrastructures to transport the gas from the oil producing region to consumers. Since 1976, however, the focus of the gas industry in Nigeria shifted to the export market in the form of LNG and pipeline gas. This was followed by the development of the NGMP in 1998.

The NGMP's strategy is to leverage the full potential of natural gas within the Nigerian economy whilst contributing to global exports as well through – “striking the balance between domestic consumption and export”.

The thrust of the NGMP is to provide

- (a) gas to power;
- (b) gas based industrialization;
- (c) increased use of gas for vehicular use;
- (d) selective high value export through additional export via LNG projects and regional gas pipelines.

Over the last 2 years, the country has attained an annual growth rate of 20% in domestic gas consumption.

Additional to shift in emphasis towards domestic gas consumption, the NGMP provided the policy frameworks for the:

- Domestic Supply Obligation (DSO) Regulation - DSO in place to jumpstart gas availability in the short-term and ensure reform through the future legislations
- Commercial Framework Reform - Bankable commercial framework reforms in pricing and revenue securitization to enable sustainable investment in gas supply and
- Scalable Gas Infrastructure Blueprint - National Blueprint for backbone gas pipeline and processing infrastructure that will enable flexibility in supply delivery.

To date over 1000km of major gas pipelines have been laid and commissioned, an additional 470km is presently under construction phase whilst a further 1400km is at the project development. With the effort in infrastructure development, we would have expanded supply capacity and also establish an integrated gas pipeline infrastructure grid across the entire country.

### Summary of Gas Resource/Reserves

Table 4 below highlights the summary of 2P and 3P gas reserves for the JVs/PSCs, NPDC and ten key Indigenous and Marginal gas producers that the committee engaged within the assigned schedule.

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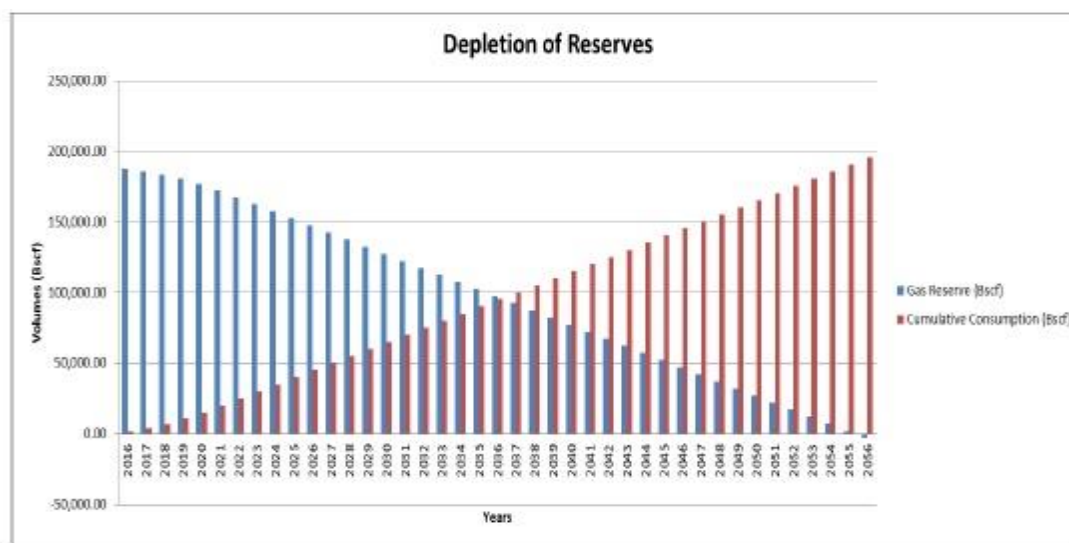
<sup>10</sup> Statistical Review of World Energy 2016 -BP Petroleum

Table 4: Summary of Gas Resources/Reserves on Company Basis (2P &amp; 3P)

SUMMARY OF JVs/PSCs, NPDC and Ten Key Indigenous/Marginal Field Operators Gas Reserves AS @ 1.1.2015							
S/n	Company	2P Reserves (Bscf) - AG+NAG	Committed	Future commitment	Un-committed	P3 Reserves (Bscf) -AG + NAG	Remarks
1	SPDC JV	62,166	24,500	14,085	23,581	18,627	2P RESERVES CONSTITUTES ABOUT 40% OF THE OVERALL GAS RESERVES IN THE TABLE
2	MPN JV	14,300	3,300	-	11,000	17,695	
3	CNL JV	26,800	7,683	6,851	12,266	9,300	
4	TEPNG JV	5,578	9,987	6,782	(11,191)	652	BOTH JV/PSC COMPANIES DO NOT HAVE SUFFICIENT RESERVES TO SUPPORT THEIR BASE LOAD COMMITMENT. THEIR P3 RESERVES DO NOT SHOW ANY SIGNIFICANT UP-SIDE
5	NAOC JV	10,889	12,600	7,500	(9,211)	2,763	
6	POOC JV	800	201	-	599	79	
<b>JV SUB-TOTAL</b>		<b>120,533</b>	<b>58,271</b>	<b>35,218</b>	<b>27,044</b>	<b>49,116</b>	
1	SNEPCo	17,248	270	-	16,978	4,051	THE REPORTED RESERVE IS INCLUSIVE OF THE UNITIZED FIELDS IN OML 129/135 (NNWA-DORO, BOLIA-CHOTA)
2	EEPNL	2,999	-	-	2,999	7,478	SIGNIFICANT P3 RESERVE. MIGRATION TO 2P REQUIRED.
3	TUPNI	1,458	-	-	1,458	244	
4	ADDAX PSC	4,894	-	-	-	1,621	THIS IS 100% OWNED BY NNPC WITH ADDAX AS CONTRACTOR
5	POOC PSC	191	-	-	191	-	
6	STARDEEP/AGBAMI	998	-	-	998	1,161	
7	NAE	700	-	-	700	-	
<b>PSC SUB-TOTAL</b>		<b>28,487</b>	<b>270</b>	<b>-</b>	<b>23,324</b>	<b>14,555</b>	
8	NPDC	13,367	5,293	4,020	4,054	3,396	
9	KEY INDIGENOUS COMPANIES	18,347	-	-	18,347	6,345	These companies includes the following - Erosin, Sunlink, Oando, First E&P, Frontier, Newcross, Waltersmith, Mazi-Pula, Yinka Falawajo and Pitar
<b>TOTAL</b>		<b>*180,734</b>	<b>63,834</b>	<b>39,238</b>	<b>72,769</b>	<b>73,412</b>	

\*181TSCF is the total 2P gas reserves of the gas producers engaged by the Committee. The difference of about 7tscf between the 2P National Gas Reserves of 188tscf as at 01-01-2015) and the reserves of 181tscf in the above table is that of the remaining Indigenous/Marginal gas producers the Committee did not engaged within the assigned schedule.





**Figure 2: Depletion of Gas Reserves**

The depletion plot above shows that with the current level of 2P National reserves of 188tscf, if we do not implement the plans/activities to migrate 3P (Table 4) reserves to 2P commercial category and also initiate deliberate gas explorations then the current 2P reserves will be fully depleted by 2055 (40 years from 2016) as shown in Figure 2. There is, therefore, the need to increase gas exploration activities way ahead of 2055.

## Total Gas Demand Projection

The gas demand projection for domestic and export markets as shown in the Table 5 and Gas Reserves Depletion Projection as shown in Table 4 is based on the Aggregate Demand projection (GACN and NGC data) and current 2P National Gas Reserves (DPR's annual data book) respectively.

- (i) The total gas demand grows from 6.2bscfd in 2016 to 13bscfd in 2020 and then to 15.0bscfd in 2035 (Table 4 and Figure 3)
- (ii) The demand appears to be relatively constant from 2021 when all the LNGs (except OKLNG that is currently in preservation mode and therefore its RFSU date not determined) are expected to have come on stream; the only increments are from Domestic Commercial Customers as shown in Table 4
- (iii) It is pertinent to note that from 2018, the domestic demand 4,608mmscf/d exceeds the export 3,580mmscf/d (see Table 5) which is mainly as a result of huge increase in power sector gas demand from 2017 to 2018 occasioned by the start-up of new power plants like Egbema NIPP (100mmscf/d), Ebonyi IPP (400mmscf/d), NNPC/ExxonMobil Power (110mmscf/d), Azura Power (122mmscf/d), etc. Several other power plants are also planned for commissioning in 2019 (like Dangote Power -120mmscf/d), etc.), which, justifies the further drastic increase in power sector gas demand from 2018 to 2019.
- (iv) By end of 2020, if all the planned power plants come on stream, as scheduled and perform optimally, the gas volume of 5.27Bscfd will generate about 20,000MW, which exceeds FGN's aspiration to generate 15,000MW within the same time frame (see Table 5)

Table 5: Summary of Gas Demand

Summary (MMscfd) of Gas Demand Projections																				
Year(s)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Commercial	526.23	675.65	813.50	859.73	967.99	1,012.18	1,036.31	1,059.86	1,086.67	1,113.02	1,143.04	1,175.64	1,190.30	1,196.68	1,203.21	1,209.92	1,216.80	1,223.89	1,231.19	1,238.72
WAGP	133.00	146.30	160.93	177.02	194.73	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Power	1,799.00	1,907.00	3,095.00	4,640.75	5,273.65	5,373.65	5,373.65	5,373.65	5,373.65	5,373.65	5,373.65	5,373.65	5,374.65	5,375.65	5,375.65	5,375.65	5,375.65	5,375.65	5,375.65	5,375.65
GBI	154.00	208.00	539.00	673.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00	973.00
Sub-total (Domestic)	2,612.23	2,936.95	4,608.43	6,750.50	7,429.37	7,568.83	7,582.96	7,606.91	7,632.32	7,659.67	7,689.69	7,722.29	7,737.95	7,745.33	7,751.86	7,758.57	7,765.45	7,772.54	7,779.84	7,787.37
LNG (Export)	3,580.45	3,580.45	3,580.45	5,478.96	5,478.96	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30	7,210.30
Total	6,192.68	6,517.39	8,188.87	12,229.46	12,908.32	14,779.13	14,793.26	14,816.81	14,842.61	14,869.97	14,899.99	14,932.59	14,948.25	14,955.63	14,962.16	14,968.86	14,975.75	14,982.84	14,990.14	14,997.67

- By year 2018 domestic demand (4608MMscf/d) exceeds the export (3,580MMscf/d)
- The WAGP figure was escalated from 2017 by 10% and flattened from 200MMscf/d
- The escalation of the commercial customers' volumes was based on performance and advice on expansion
- The gas to power figures were reconciled with GACN figures

- (v) In view of iv above, it is recommended that FGN should plan towards expanding the power transmission networks to accommodate the projected growth in power generation
- (vi) There is the need to review the data in collaboration with GACN on a quarterly basis to accommodate new demands in the industry.

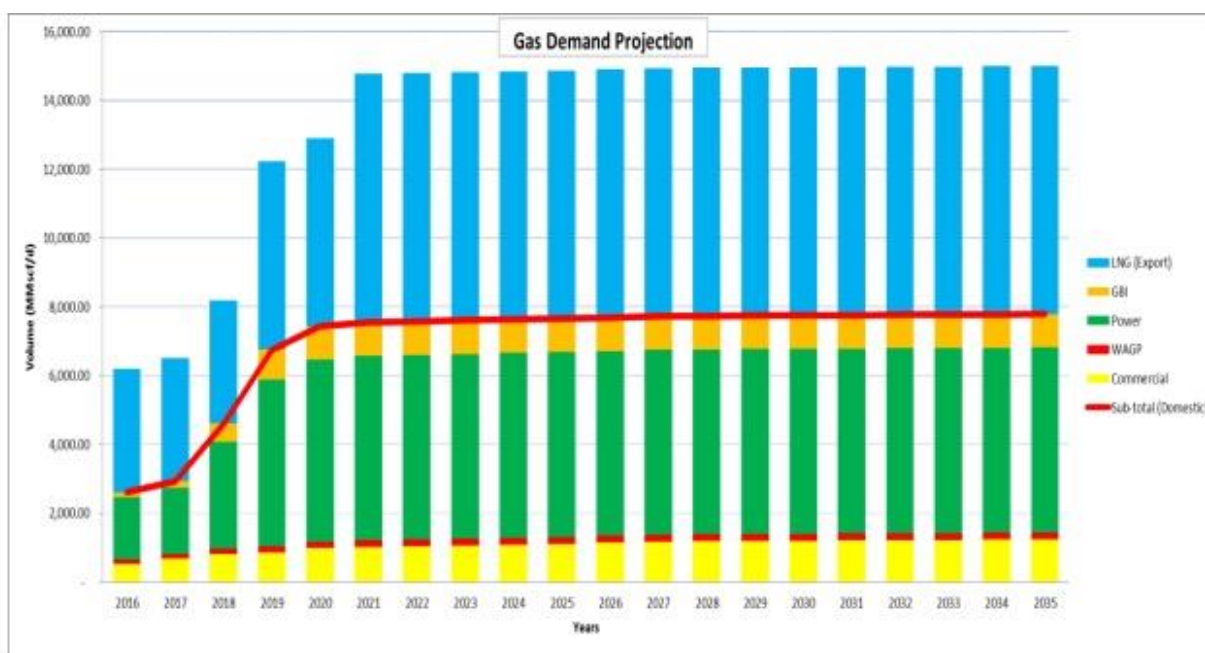


Figure 3: Total Gas Demand Projections

### Off-takers for AKK Pipeline

A detailed analysis of existing potential off-takers from the AKK pipeline as well as planned and potential off-takers: including estimates of what their gas supply requirements over the next 15 years was carried out, including analysis of the following:

- Planned and potential power generation facilities that will be served by the AKK pipeline and any required gas feed pipelines coming off AKK e.g. Gencos, NIPPs and IPPs along and/or in proximity to the AKK route.

- Other planned or potential gas off-takers, including but not limited to fertiliser, petrochemical and agro-allied industries.
- Details of associated projects proposed by some of the Tenderers in their submissions were also captured.

A list of the existing and planned potential off-takers from the AKK pipeline is attached as Appendix 7 of this OBC.

## Gas Supply Projection

A distinct outcome of this aggressive gas infrastructure development is that the country has been able to harness and utilize gas which was hitherto inaccessible and flared. Consequently, gas flaring has dropped from a peak of 2250mmscfd (35% of total gas production) few years ago to about 750mmscfd (8% of total gas production) presently. Was this trend to continue, Nigeria will be able to achieve the Zero-Routine Flaring ahead of World-Bank set target date of 2030.

Concomitant to the expansion of gas infrastructures is the increasing emphasis on commercial framework for gas supply. Gas pricing has been adjusted to export parity with legacy debt owed by the various sectors to gas suppliers being paid off through an intervention fund arranged by the CBN. Gas supply agreements are being made effective with terms that assure bankability. The World Bank PRG is being introduced to provide securitization of gas revenues. These interventions are boosting confidence in the gas sector.

Domestic gas supply capacity is growing at an aggressive rate, having significantly increased from 500mmscfd (2008) to about 2000mmscfd currently. A significant portion of this is going to the power sector with the consumption in the non-power sector also doubling. Independents and other new players continue to show interest in the gas sector as a result of improved investment potential of the sector.

However, the pace of combined domestic and export gas demand still outpaces gas supply development growth, leading to a significant demand/supply gap in the sector. This led to the need for the formation by NNPC of an all-inclusive Exploration & Production (E&P) directorate Gas Committee, to critically identify short, medium and long term gas resources to bridge the huge supply gap. The Committee was saddled with the objective of ensuring a proper coordination of upstream gas supply developments, gas infrastructure projects and downstream gas demand to significantly mitigate the gas demand/supply gap that exists in the Nigerian Gas Sector.

The total gas supply projection below shows that supply to both domestic and export market as at 2015 is 5.5bscfd, which will increase to about 8.2bscfd by 2020 and the Committee foresees a gradual decline in supply by 2024 from 8.4bscfd to 6bscfd by 2035. However, demand appear to surpass supply significantly with a huge shortfall of about 4.7bscfd by 2020 as demand increases to 13bscfd (see Figure 3). There is need for urgent intervention to bridge the foreseen shortfall in supply if NNPC is to achieve the strategic aspiration for gas in Nigeria. The country's strategic aspiration for gas envisages gas delivery to support more than 15GW power generation capacity; position Nigeria as a regional hub for gas based industries including fertilizer, methanol, petrochemical, etc. industries; and consolidate Nigeria's position in global gas export, all of which will grow GDP and stimulate jobs.

NNPC identified a number of synergy opportunities to bridge the envisaged shortfall in supply after engaging the various gas producers. Figure 4 below shows the probable gas supply projection.

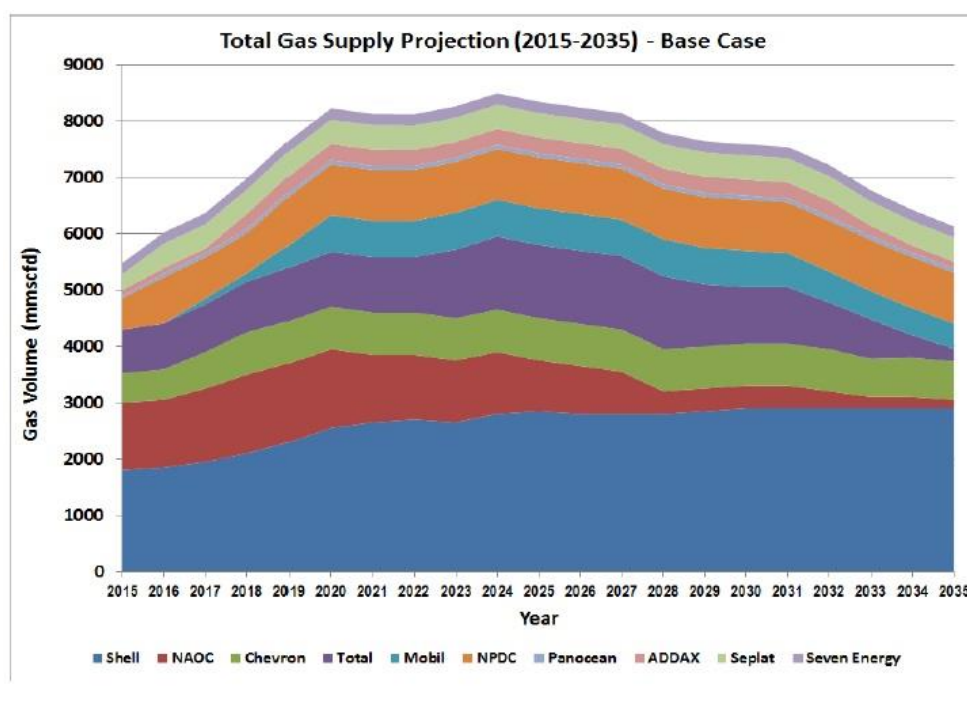


Figure 4: Total Gas Supply Projections - Base Case

\*181TSCF is the total 2P gas reserves of the gas producers engaged by NNPC. The difference of about 7TSCF between the 2P National Gas Reserves of 188TSCF (01-01-2015) and the reserves of 181TSCF in the above table is that of the remaining Indigenous/Marginal gas producers the Committee did not engage within the assigned schedule.

## Gas Supply Projects and Sources

A detailed analysis of all current, ongoing and planned sources of gas supply that could ultimately provide gas to NGPTC Gas Network (which would include the AKK pipeline) has been undertaken by NNPC. NNPC believes these synergistic opportunities when pursued and matured, will not only drive development costs down but will in addition under-pin the development of hitherto stranded big-bang gas assets held by the majors and other relatively smaller ones that belong to the indigenous/marginal field players in the industry.

It is noteworthy that the Indigenous/Marginal field players are growing and will soon become very strong force in the domestic gas sector particularly with the ongoing of divestment of onshore/swamp assets by the IOCs. In fact, the Committee observed from the engagements the eagerness and willingness of the Indigenous/Marginal field operators to collaborate with NNPC in any synergy opportunities to have their hitherto stranded (or otherwise flared) gas fields developed for monetization. NNPC within the available time engaged 12 key Indigenous companies and identified more quick-win synergy opportunities to enable effective gas resource management and development.

Although the National 2P Gas reserves witnessed a marginal percent (3%) growth from 183tscf at end 2013 to 188tscf at end 2014 (reference DPR data book) occasioned mainly by reserves additions from SPDC's OML-35 (Okpokunou field) and OML-28 (Koroama field), the NNPC committee observed that the following major factors amongst others have grossly impeded the growth and effective management of the gas business particularly in the domestic sector:

- (1) **Absence of PSC Gas Fiscal Terms:** The existing PSC fields accounts for over 28,000bscf of gas (AG + NAG), which cannot be developed and monetized, as there are no modalities for cost recovery in

the PSC agreements.

- (2) **Unitized Fields/Unitization Agreements:** Currently, there is about 30,000bscf of gas reserve (AG + NAG) locked within several JV and PSC Unit Areas as these developments cannot progress without executed Unitization Agreements (Unitized Unit Operating Agreement) between the respective Unit Partners. It is pertinent to note that only four UUOA (Samabri/Biseni), Belema/Belema (SPDC/CNL), Assa North/Ohaji South (SPDC/CNL), Amenam/Kponou (TEPNG/MPNU) have been successfully executed in the Nigerian Oil and Gas Industry.
- (3) **Non-Compliance to DSO:** A review of DSO performance by the Committee indicated that gross under-performance by most of the IOCs could be attributed to the price regime for the domestic market. Although there are stipulated penalties for default; they appear not effective.
  - (i) Section 2 Introduction
  - (ii) GED's Gas Committee Final Report 2-4
- (4) **Lack of Robust Domestic Gas Evacuation Infrastructure/Network:** There are several gas development projects that could not deliver gas to the domestic market due to the absence of adequate/robust domestic gas infrastructures.
- (5) **Power Generation and Evacuation Challenges:** Currently, the Electricity Generating Companies (Gencos) cannot fully utilize all the Gas produced because of challenges on the Transmission Company of Nigeria (TCN) as well as the Distribution networks with the Discos. Really the National Grid can hardly wheel more than 5,500MW and the distribution infrastructures can hardly also distribute same to customers. This grossly impacts on the reliability of gas offtake from the Gencos.

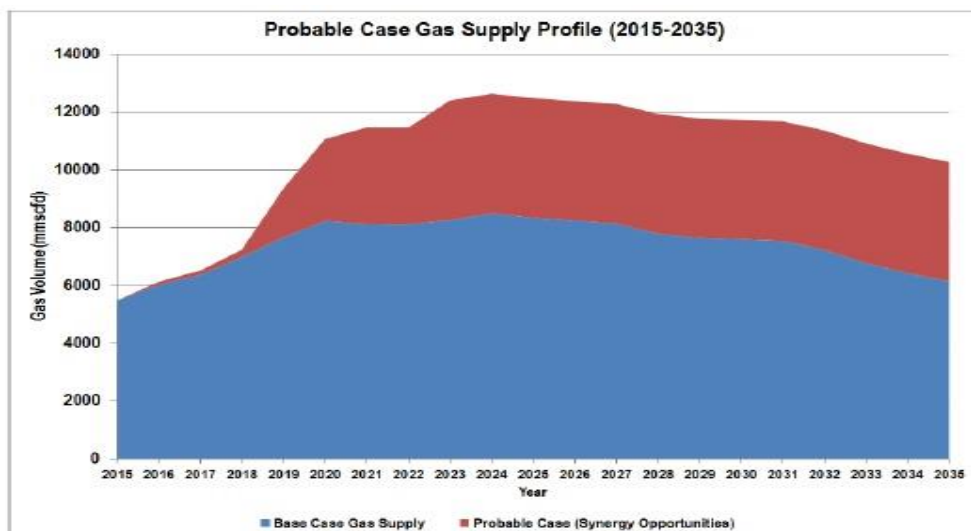
## Gas Demand Vs Supply Gap

The total gas demand below shows a significant increase in demand from 2017 to 2020. Beyond 2016 (by 2020), demand is expected to grow significantly from about 6.2bscfd in 2016 to 13bscfd by 2020, ramping up to about 15bscfd by 2021. Medium term gas demand is projected to grow rapidly to about 139bscfd by 2020 - supporting a modest 20GW of power, 10mtpa of Urea, 1.2 MTPA of Methanol, 980mmcfd to manufacturing companies, NLNG T1-6 extension, NLNG T7 and Brass LNG.

However, based on all currently known gas supply projects, total gas supply projection as shown above is forecasted to grow to 8.2bscfd by 2020 from 6bscfd in 2016 and we see a gradual decline in supply from 2024 to 6bscfd by 2035 (see Figure 4). This implies an imminent shortfall of 4.7bscfd (about 31 tscf reserves) by 2020 and 6.6bscfd (about 44 tscf reserves) by 2021 as demand grows to 15bscfd.

To avert medium term gas supply crisis, at least 31tscf of reserves must be set aside now for accelerated development, this led to NNPC delving into strategic opportunities to foster synergy amongst the key gas producers and indigenous companies for targeted accelerated cluster development to significantly bridge the foreseen shortfall in gas supply. The Committee was able to identify some strategic opportunities to bridge

the foreseen shortfall from 4.7bscfd to 1.8bscfd in 2020 and from 6.6bscfd to 3.3bscfd by



2021.

## Summary

According to the NNPC Report of November 2015 (GED, E&P's Gas Committee: Final Report), the total gas demand is expected to grow from 6.2Bscf/d in 2016 to 13.0Bscf/d in 2020 and further to 15.0Bscf/d in 2035. The gas supply to both domestic and export market as at 2016 on the other hand, based on the "Base Case Scenario" was 5.8bscfd. It is expected that projected supply will increase to about 8.2bscfd by 2020, with a further gradual decline by 2024 from 8.4bscfd to 6.0bscfd by 2035. As a result, demand surpasses supply significantly with a consequent supply shortfall of about 4.7bscfd by 2020 when demand increases to 13bscfd. There is therefore need for urgent intervention to bridge the foreseen shortfall in supply if we are to achieve our Gas strategic aspiration in Nigeria, that is to, deliver gas to support minimum of 15,000 MW power generation capacity by 2030, position Nigeria as a regional hub for gas based industries (Fertilizer, Methanol, Petrochemical, etc.) and consolidate Nigeria position in global gas export business.

The gas reserves depletion plot shows that the current level of 2P National reserves of 188Tscf will be fully depleted by 2055 (40 years from 2016), if we do not implement the plans/activities to migrate the relatively huge 3P reserves to 2P commercial category and initiate deliberate exploration for gas exploration - "Do Nothing Scenario". There is, therefore, the need to increase gas exploration activities way ahead of 2055.

The Committee has identified and presented several opportunities for synergy which when pursued and matured will not only bridge the foreseen shortfall in supply thereby enabling the nation to meet its aspiration of delivering gas to support 15,000MW power generation but will also lead to lower cost of development and delivering gas projects and in addition under-pin the development of hitherto stranded relatively smaller gas assets owned by indigenous/marginal field players in the country.

The report highlighted the key challenges impeding gas development and growth particularly in the domestic sector while also recommending mitigation measures for these challenges.

## TECHNICAL FEASIBILITY

### Overview

Natural gas is known to be associated gas produced from underground accumulations, the composition of which varies from field to field. Most natural gas consists largely of methane (CH<sub>4</sub>) and other light hydrocarbons. Natural gas has been commercially used as fuel for 180 years in America and for centuries in China. The production, processing and distribution of natural gas have become an important segment of many countries' economy and a major factor in the world markets.

Nigeria has an estimated 188 trillion cubic feet (tscf) of proven natural gas reserves, making the country one of the top nine natural gas endowments in the world and the largest in Africa. Abundant gas reserves exceed foreseeable needs of the domestic, regional and export markets. Due to limited gas distribution infrastructure, Nigeria today flares about 2.6 bcf/d of gas, representing 12.5% of all globally flared gas and the balance of the current production is utilized for power generation, export projects and other domestic uses.

The impediments to natural gas development in Nigeria include among others; inadequate gas gathering and supply infrastructure, inappropriate/ unrealistic pricing of gas, especially for domestic use, low level of industrialization and inadequate consumptive capacities.

There is presently no national gas distribution system, but gas pipelines do link Lagos with Benin City, Ajaokuta, Escravos and fields in the Warri River region. Pipelines link Aba with the fields in the Port Harcourt region and Bonny Island. Links also exist between the Ngo/Ima and Oso offshore gas fields and Bonny Island and the Qua Ibo terminal.

Nigeria major pipeline system includes: Escravos-Lagos trunk pipeline (LP) for supplies to the western parts of the country and to Oban-Ajaokuta pipeline, which is the back bone for supplies to the North and Alakiri-Obigbo-Ikot Abasi for the Eastern trunk.

The Federal Government of Nigeria in 2008 approved new gas pricing and domestic supply obligation regulations that include short-term, medium-term and long term gas supply targets.

A combination of new government incentives and pressure from the FMOEnv to end flaring, coupled with rising domestic industrial demand for gas have now encouraged operators to go into gas projects.

### Project Description

The Ajaokuta-Abuja-Kaduna-Kano Gas Pipeline (Phase I) Project is the Phase 1 of the Trans-Nigeria Gas Pipeline Project that is driven by availability of additional gas supplies from Assa Gas Plant and the need of gas supply to the Northern / Eastern States through Obigbo-Umuahia-Ajaokuta pipeline and Ajaokuta-Kaduna-Kano pipeline. This project is taking place against the backdrop of the new gas pricing and domestic supply context in Nigeria.

The feed gas into the pipeline system is expected to be 3,500 MMscfd of dehydrated wet gas sourced from various gas gathering projects in the Southern region. Hydrocarbon liquids from this process will be further processed at Ajaokuta to produce liquefied petroleum gas (LPG) while the remaining will be transported through the pipeline to serve as feed stock for power and new petrochemical facilities in planned for Abuja, Kaduna, Kano and Katsina.

The project development will involve the following:

- Surveying and clearing the right of way

- Hauling and Stringing of Pipe(s)
- Bedding of Pipe(s)
- Welding
- Digging of trench
- Lowering of pipe and backfilling
- Installation of valves and special fitting and joint coating
- Pipeline crossings on rivers, road, streams and other Pipelines
- Non-destructive testing

Surveying and right-of-way preparation will lead to vegetation clearing, loss of biodiversity, and loss of farmlands, crops, habitat and migration of wildlife. Removal of vegetation will further expose the soil to excessive weather conditions and soil erosion. Measures to ameliorate the ecological impact includes use of existing routes for survey, use of existing ROW during construction and avoidance of excessive land take and bush clearing.

NNPC will enforce no- hunting ban during bush cleaning restriction of clearing within the ROW habitats

### **Laying procedure**

The pipes will be offloaded along the ROW using wood sleepers with rubber pads or bags filled with sawdust, soft earth or sand to hold the line pipes on the ground. The line pipes will be strung in such a way that there is access for personnel and equipment using side booms and excavators. The strung line pipes will then be inspected to ensure that they align properly according to specification and then closed with endcaps. The procedures for laying the pipelines include the following:

- All pipe laying operations will be in accordance with The American Society of Mechanical Engineers (ASME B31.8), and the DPR P- 1P “Guidelines and Procedures for the Design, Construction, Operation and Maintenance of Oil and Gas Pipeline Systems in Nigeria - 2007”.
- The depth of which the pipeline would be laid is 1.5m for dry, swampy & rocky terrain, and 2m for railway and road crossings
- To reduce the overall impact on the environment, all pipeline road/railway and river crossings will be by thrust boring and Horizontal Directional Drilling (HDD) method respectively.
- The HDD method involves drilling a pilot hole under the water body and banks and then enlarging the hole through successive reaming until the hole is large enough to accommodate a prefabricated segment of pipe. Throughout the process of drilling and enlarging the hole, a drilling mud will be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and keep the hole open.

While this drilling is in progress, the line pipe sections will be strung out on the far side of the crossing for welding. Once welded, the joints are X-rayed, coated, hydrostatically tested, and then placed on rollers or padded skids in preparation for being pulled through the drilled-out hole.

### **Segmentation and testing**

Upon completion of the pipe-laying, the pipeline will be tested in segments. Test lengths will not be less than 1000 meters or as long as practicable and locations of test points will be set out in the Test Plan. The



test plan will also take account of the location of suitable water supplies and disposal facilities and allowable elevation difference.

The procedure will involve isolating the pipe segment with valves/ test manifolds, filling the line with water, applying pressure to 125% of the maximum allowable operating pressure (MAOP) for that pipeline and then maintaining that pressure for a period of 8 hours. The pipelines will be designed with the maximum allowable operating pressure of 1000 psig and class location. Each valve will be checked for fluid by-pass by visual, audible or remote means.

The water used in hydrostatic testing will be drawn from the local river, stream within the pipeline ROW or may be taken from municipal supplies and trucked to the site. The source to be used however depends on the location of the pipeline. Water for hydrostatic testing could be obtained from surface water sources through specific agreements with communities and in accordance with Federal, State, and Local regulations.

Where leaks are present, the leaks will be repaired and the section of pipe retested until specifications are met. Once a test section successfully passes the hydrostatic test, the water will be tested prior to discharge to the environment. Discharge will be to a designated point in accordance with the test plan to be provided and will be controlled to ensure that all parameters meet the applicable discharge limit of DPR and FMoEnv respectively.

The total volume of water required for hydro-testing of the entire length of 614km is estimated at 523,189m<sup>3</sup> if there are no failures, based on the standard 852.1m<sup>3</sup>/km.

### **Treatment of the internal profile and external part of the pipe**

The inner profile is treated by a process called pigging while the outer part of the pipe is factory coated with polyvinyl chloride (PVC) and so no further treatment will be required. No chemical would be used during the construction and commissioning of the pipe except fusion-bond epoxy (RISERCLAD®, USA) which will be used in coatings for field joints. Prior to application, the coating crew will thoroughly clean the bare pipe with a power wire brush or a sandblast machine to remove any dirt, mill scale, or debris

The project will be operated with emphasis on operational safety efficiency and flexibility with a view to providing industrial standard, remote supervision and control.

The project development has been scheduled from conceptualization to completion and commissioning. The project's pipeline has a life span is 25years.

### **Pipeline Route Selection**

The final route of the proposed pipeline has been determined and it is, in a large part, the same alignment with the existing PPMC pipeline route. New route will be taken where settlements and development have encroached on the existing route. The route selection was undertaken in two phases by a multi-disciplinary team.

The first phase identified potential pipeline routing corridor options. Several alternatives were identified and subjected to coarse evaluation to determine which of them had serious technical, financial or socio-economic constraints likely to compromise their desirability.

Two major options:

- Alternative 1 passing through towns while avoiding difficult terrain;

- Alternative 2, avoiding major towns and passing through existing ROW were chosen for the further analysis.

The second phase further evaluated the two selected routes options using fine screening methodology after which Alternative 2 above was chosen as the preferred option.

## Pipeline Design

Pipeline will be designed in accordance with requirements of ASME B 31.8. Pipeline wall thickness will be calculated using design factor of 0.72, 0.6, 0.5 and 0.4 for class- 1, -2, -3, -4 respectively. Higher wall thickness will be used at all river crossings and lined canals considering a design factor equal to 0.60 as against 0.72 to be considered for other locations.

At cased crossings, higher wall thickness pipes may be used based on the requirement of concerned authorities. The pipeline will withstand all installation, testing and operating loads. All necessary calculations will be carried out to verify structural integrity and stability of the pipeline for the combined effect of pressure, temperature, bending (elastic), soil/pipe interaction, external loads and other environmental parameters, as applicable during all phases of work from installation to operation.

Allowable stress limit will be as per ASME B 31.8. Such calculations will include, but are not limited to following:

- Buoyancy control and stability analysis for pipeline section to be installed in areas subjected to flooding. Unless specified, specific gravity of installation in such area will be at least 1.2.
- Stress analysis at crossing of major rivers, rail and highway etc.
- Pipeline expansion and its effect on station piping (above ground/below ground).
- Upheaval buckling analysis, if necessary

Pipeline will also be checked for adequacy against anticipated earthquake loading and any special measures such as increase in wall thickness/grade/select backfill etc. as required to ensure safety and integrity of the pipeline system will be implemented.

Mainline will be provided with pigging facilities suitable for handling all types of pigs including intelligent pigs.

## Station Piping

Station piping to be provided at dispatch terminal/receipt terminal, intermediate stations, LBV stations will be designed in accordance with ASME B 31.8 and utility piping to be provided at these locations will be designed in accordance with the provisions of ASME B 31.3.

All piping will be designed for combined effects of pressure, weight and temperature during operating conditions without over stressing the piping, valves or equipment. All piping will be adequately supported, guided or anchored so as to prevent undue vibration, deflection or loads on connected equipment such as pumps, filters, meters etc.

Pipeline and its appurtenances will be provided with carbon steel materials suitable for the intended service, as detailed in subsequent paragraphs.

Line pipe will conform to API 5L. Additional dimensional, NDT and other requirements over and above API 5L, will be identified considering the construction, quality control and other aspects. Type of line pipe to be used will be Longitudinal Submerged Arc Welding (LSAW). The line pipe material grade will be API 5L, Grade X-70 for 40 inch main pipelines and 24 inch spurlines.

All line materials including scraper traps, flow tees, insulating joints, ball valves, plug valves, globe valves, check valves, pig signallers, flanges and fittings will be carbon steel suitable for the service conditions and will be compatible with the line pipe material.

### **External Corrosion Coating**

Pipeline to be installed below ground must be protected against external corrosion by a combination of high integrity externally applied coatings and permanent impressed cathodic protection system subjected to NNPC approval. Externally applied coating will be three layers side extruded polyethylene coating with a minimum thickness of 2.5 mm.

All above ground piping and structures will be painted to prevent atmospheric corrosion. The painting of above ground piping and structures will be as per specifications. The painting will be suitable for normal corrosive environment as defined in Painting Specification for all stations and terminals.

### **Insulating Joints**

Insulating joints will be provided to electrically isolate the buried pipeline from above ground pipeline. Insulating joints will be monolithic type and will allow smooth passage of pigs. Insulating joints will be installed in above ground portion of the pipeline, immediately after the buried/aboveground transition at the scraper stations.

In addition, Insulating Joints will be provided on both sides of river crossings where pipeline is installed by HDD technique. Wherever pressure/ temperature transmitters are used on cathodically protected pipeline, the same will be electrically isolated by providing insulating fittings/ flanges.

### **Pipeline Burial**

The pipeline will be buried normally at a depth of 1.5 meter below natural ground level except river/ rail/ road/ canal crossings where minimum cover will be as given below or as per the requirements of statutory/local authorities, whichever is more stringent. Increased cover will be provided at critical locations and crossings.

### **Pipe Wall Thickness**

Pipe wall thickness calculations will be carried out in compliance with ASME B 31.8 and a corrosion allowance of 3.0 mm will be added to the calculated thickness. Pipe thickness will be checked and revised as required to minimize the number of field hydro-testing sections, considering combined testing of pipes. In addition, the selected thickness will also be checked to ensure that the diameter to thickness (d/t) ratio does not exceed 96, to avoid damage to pipe during handling and transportation.

Additional requirement of higher wall thickness, if required, as per seismic analysis in the specific areas will be provided. For buried pipeline, the adequacy of the selected pipe thickness will be checked against soil load, self-weight, content weight for installation, shutdown, operating and design conditions. The deflection will be permitted maximum 5% of outside diameter. The vertical stability against floatation will be checked with a factor of safety 1.2.

### **Scraper Stations**

Scraper traps will be provided at the Dispatch, Booster Stations, and Receiving Terminals. The scraper traps will be capable of handling intelligent pigs and other cleaning pigs. The launching and receiving barrels will be designed in accordance with the requirements of ASME B 31.8 and its end closure will be designed and fabricated according to ASME Section VIII, Div.1.

Adequate arrangements for launching, retraction, handling and lifting of cleaning and instrumented pigs will be provided at the scraper stations. Traps will be accessible by walkway/road for movement of equipment, pigs, etc. These stations will be provided with access road from the nearest metalled road.

Corrosion resistant coating will be provided on the pipeline up to a minimum length of 500 mm after it comes aboveground / before it gets buried underground at terminals and scraper stations.

The diameter of barrel of the launcher will be two nominal pipe sizes larger than the pipeline size and the diameter of the barrel of the receiver will be three nominal sizes larger than the pipeline nominal size. Centre line elevation of scraper trap will be at suitable height from grade level. Suitable arrangements will be provided for handling and lifting of pigs.

The piping system at the terminals and intermediate stations will be designed to have sufficient flexibility to prevent pressure and thermal expansion or contraction from causing excessive stresses on the connected equipment. Installation of anchor block in the underground pipeline is not permitted. If required adequate length of trench in approaches to stations will be provided with a select backfill to ensure flexibility.

### **Line Break Valve Stations**

Line Break Valve Station will be provided along pipeline route for isolating sections of pipeline as per ASME B 31.8 for:

- Limiting the hazard and damage from accidental discharge from pipeline system.
- Facilitating maintenance of pipeline system and
- Complying with the requirements of applicable codes.

The location of line break valves will be as per the requirements of applicable codes taking consideration of terrain features, requirement of safety and operation etc.

Line Break Valve on the main pipeline will be ball valves of full bore type, to allow smooth passage of cleaning and intelligent pigs.

Pipeline Line Break Valve will be motor operated and with butt welding ends.

Valve will be installed buried/pit and provided with a stem extension in such a way that the centre of actuator is at approximately 1.0 m above the finished ground level. Valve surface will be provided with corrosion protection coating. Valve body vent and drain lines will be extended and terminated above ground.

The valve stations will be located at a readily accessible location such as near road and will be provided with an access road from the nearest all weather metalled road. The facilities within valve station will be secured by a chain link fence enclosure with gate. The location of valve station will be clear of overhead power lines.

The provisions of remote operated feature will be as per the operation and control philosophy to be adopted for the project. At locations, where valve stations are combined with CP/Repeater stations, the safe distance and statutory clearance as per standard will be followed.

### **General HSE of Operation**

NNPC is committed to sound environmental performance as its foundation in the company's integrated policy statement on Health, Safety and Environment. NNPC recognizes the development of an effective environmental protection plan as a way of facilitating better achievement and demonstration of sound environmental performance.

To this end, NNPC will

- Integrate environmental issues fully into all project construction and implementation
- Ensure compliance with existing National and International best practices along with NNPC HSE policy
- Rationalize and streamline environmental activities to add value in efficiency and effectiveness
- Achieve, enhance and demonstrate sound environmental performance built around the principle of continuous improvement
- Encourage and achieve the highest environmental and socio-economic performance and response from individual employees and contractors throughout her projects
- Provide the standards for overall planning, operations, audit and reviews.
- Enable management to establish environmental priorities for all her projects.

### **Project Schedule**

The project implementation schedule was originally planned to be Thirty-Six (36) months. In addition to segmenting the scope into three separate Lots, and awarding the development of the three Lots to three separate EPC Contractors. This development necessitated compressing the implementation schedule to Twenty Four (24) months. The compression of the schedule was informed by the need to fast-track the project.

The segmentation into Three (3) Lots was also informed by the need to address the inherent risk in awarding the development of a critical national infrastructure to a single EPC Contractor.

## RISK ANALYSIS AND ALLOCATION

### Overview

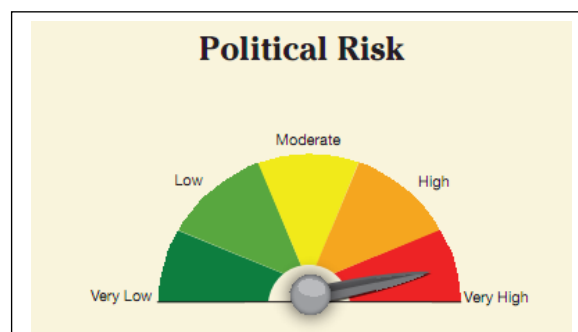
The Project involves the development of AKK Gas Pipeline and stations through the Build and Transfer option with EPC Contractor Financing. NNPC, the Project Proponents will be responsible for Operations and Maintenance after construction. According to the proposed financing and governance structure, the project would require the EPC Contractor to raise adequate funds to finance the AKK project to meet up with the project execution schedule. The tenor, cost of finance, and fees will be agreed with NNPC and executed through a Contract Financing Agreement to be executed by the Project Financier (EPC Contractor) and the Project Sponsor. The project is part of the interventions necessary to operationalize the objective of NGMP, particularly to ensure the availability of gas for domestic consumption in order to stimulate economic growth the country.

### Identification and Categorization

Any project typically faces several risks throughout the project period. Risks associated with the projects relate to development, construction and operations. There is the added country specific risk and residual risks. These risks have been identified, classified, analyzed and allocated to the parties in the best position to mitigate them. Options for mitigation have also been identified and a preliminary but comprehensive risk register developed and will be proactively monitored, reviewed and updated for the AKK Pipeline Project. This segment of the OBC documents the risk analysis of the pipeline project and covers commercial, technical, HSE, political, legal, market, schedule and pipeline operational risks.

#### Country Specific Risks

A country specific risk derives from an assessment of a country's ability to effectively implement monetary policy, implement fiscal policy, overall quality of the business environment, ease of doing business, flexibility of the labor market, including a company's ability to hire and fire employees, and degree of stability in a government. It also includes an assessment of the degree of social stability including human development and political rights, the degree of stability in the region, and the transparency and level of corruption in the legal system.



According to AMB Country Risk Report (October 2016), Nigeria, a CRT-5 country, exhibits high economic risk and very high political and financial system risk. Violence and corruption weigh heavily on Nigeria's ability to grow and increase the wealth and well-being of the population. A prolonged period of low oil prices, unorthodox monetary policies, high levels of corruption and lower oil production due to militant attacks have significantly slowed economic growth in Nigeria. Gross domestic product (GDP) growth was -0.51% in Q1 2017, with medium term growth in the range of 0.5% and 2.0%. The majority of countries in Sub-Saharan Africa are categorized as CRT-5, with the exceptions being South Africa at CRT-3 and Mauritius at CRT-.

#### Economic Risk: High

Nigeria continues to face a difficult internal and external operating environment due to low oil prices, capital outflows, high unemployment, a lack of hard currency exchange and fuel shortages. The oil and gas industry account for approximately 70% of government revenues and approximately 90% of the country's

exports. Lower oil prices have had a significantly negative impact on the country's current account and foreign exchange reserves balances. Lower than expected oil production has largely been as a result of militants bombing pipelines. The government has discontinued paying monthly stipends to the groups which has restarted the attacks. Daily oil production fell from 2.2 million to 1.3 million barrels since the start of the attacks, although it has increase to an average of 1.8 million barrels in Q1 2017.

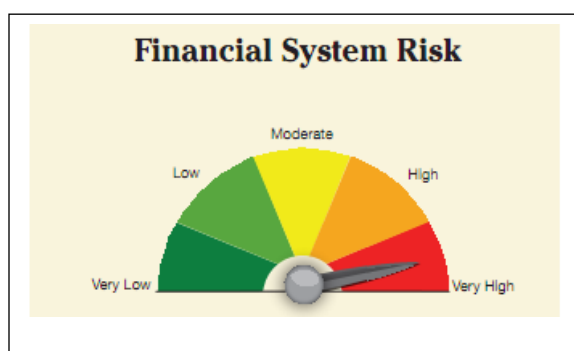
### Political Risk: Very High

The current administration in Nigeria took office in May 2015 on a platform of reducing corruption, increasing economic diversification, creating jobs, improving income inequality and reducing terrorism. Nigeria's challenging economic situation has made it difficult for the government to enact needed structural changes. There are delays in approving the 2017 budget and there will likely be additional delays in implementing its fiscal stimulus plan. The expansionary budget, at 30B USD, will attempt to stimulate the sagging economic growth. High inflation, a depreciating currency, high unemployment levels and fuel/ electricity shortages have the potential to cause political instability through protests. The administration's approval rating has fallen significantly since it took office. While terror attacks from Boko Haram have decreased, the group is still active and responsible for sporadic attacks. The Militant restiveness at the Niger Delta has increased their attacks on major pipelines and other significant energy infrastructure resources. There are also other political risks relating to such situations as:

1. **Events of War:** In the event of war or widespread civil disobedience, the project commercial viability may be adversely affected.
2. **Non-payment and Currency Inconvertibility:** Inability to convert local currency into foreign exchange as well as delays in acquiring foreign exchange caused by the government's actions or failure to act.
3. **Confiscation, Expropriation and Nationalization:** Elimination of ownership, control over, or rights to the asset/investment. "Creeping expropriation," series of acts that over time have an expropriatory effect.
4. **War and Civil Disturbance:** Loss due to the destruction, disappearance, or physical damage to assets caused by politically motivated acts of war or civil disturbance, revolution, insurrection, and coups d'état. Terrorism and sabotage treated selectively.
5. **Breach of Contract:** Breach or repudiation of a contractual agreement with the investor/lenders by the government. Reliant upon a dispute resolution mechanism (e.g., arbitration).

### Financial Systems Risk: Very High

The National Insurance Commission (NAICOM) regulates the Nigerian insurance industry. There is a proposal that a new regulator be put in place to oversee all Nigerian financial sector regulation. Deteriorating economic conditions has led to increased financial sector vulnerabilities including decreased



liquidity and higher borrowing costs. Before moving the naira to a managed float, the government defended the currency which has led to a decrease in foreign exchange reserves. An IMF review of the banking sector revealed increased vulnerabilities, especially for smaller banks, which could cost 0.5% of GDP to recapitalize.

## **Project Specific Risks**

The types of risks are different at each stages of the project. The following risks, identified by the project team, derive from an examination of issues and concerns created from an examination of the project description, work breakdown structure, cost estimate, design and construction schedule, procurement plan, or general risk checklists.

### **Project Development stage**

#### **Land Acquisition**

Delays in land acquisition and in providing an unencumbered right of way for the EPC Contractor can lead to delays in the start of construction resulting in the escalation of project cost. Additionally, the risk of the costs of acquisition not being contained within the estimates provided in the project cost estimates also increases.

Although NNPC intends to route the AKK pipeline through the major existing ROW of the pipelines and PPMC's crude oil/product Pipeline to Kaduna, some pipeline routes will be on completely new alignments. In particular, the pipeline will have three spur lines from the Abuja Node to the Abuja TGS, approximately 13.6km, from Kaduna node.

#### **Delays in Project Development**

During the development phase, the critical activities identified are:

1. Finalization of the project structure
2. Finalization of the contractual framework (Concession Agreement, the EPC Contract, the Support Agreement, and the O&M Agreement)
3. Availability of requisite approvals and clearances
4. Achievement of Financial Close.
5. Delays in project Commissioning.

There are several permissions and approvals required from various government agencies before the EPC Contractor is engaged. The risk exists that the procedure leading to these approvals before the engagement of the EPC Contractor will cause some delay.

Additionally, NNPC will be responsible for the O&M of the project as the EPC Contractor will be handing over the completed project to NNPC after construction. There are a number of operating risks which are discussed below

#### **Construction Period**

##### **Project Completion Risk**

The project completion or contractor's risk refers to the possibility of non-completion of the project within the designated period from the notice to proceed. Any delays in the construction may be expected to result in increased construction costs. Some specific risks in this regard include:



### **Project Cost/Cost overruns**

If the EPC Contractor is a unit rate rather than a fixed Lump Sum Price contractor, there is a possibility of increase in cost as compared with the current estimates.

### **Non-Uniform Design Codes/Issues**

Non-uniformity of design codes are deemed to be medium risk. However, mitigation is comparatively simple. To reduce the likelihood and consequence of occurring it is suggested that an initial high level review of the variances in the design codes discussed in the feasibility study should take place. Subsequent pre-FEED consultation between the EPC Contractors for the three Lots to agree a uniform design code before the award of the FEED should take place. A compromise and agreement in principle should be sought and technical experts allowed to produce a draft uniform design code, if that has not been done already.

### **Operations Period**

#### **Technology**

This pertains to the risk that the project may be either physically inappropriate to handle the projected demand or is inappropriately designed to meet local socio-economic needs. Hence rectification of these design defaults could escalate O&M costs during the operations period.

#### **Regulatory and Administrative**

During the operations phase, the delays and costs associated with complying with regulatory requirements of the government, lenders and multilateral institutions can adversely impact the financial viability of the project. In particular, delays in toll notification will adversely affect cash flows, weakening the project debt service capability and investor's return.

#### **Commercial Risk**

This category comprises various risks that are associated with the underlying economic rationale of the project. The project viability is critically dependent upon realization of demand as projected. Hence, any significant adverse variation from the projections would impair the debt servicing capability of the project.

#### **Operations and Maintenance Risk**

In the event of the O&M costs exceeding the estimates used for the establishment of the financial viability, the residual cash flows for debt/equity would be lower than anticipated thereby affecting project returns.

#### **Contract Volume Risk**

There is high contract volume risk in this project which will have to be mitigated before decision to proceed. The fundamental economics dictate that the pipeline capacity will have to be full for a significant duration of the project. To reduce likelihood and consequence of this occurring, first it will be necessary to engage with possible buyers and achieve serious expressions of interest for capacity of the pipeline. Next, Lenders will want buyers to accept obligations (such as take-or-pay, or capacity charge) which require payment by the buyers in all circumstances. Buyers, however, will not want to pay if gas is not tendered, and will want low take-or-pay thresholds.

The extent to which these positions can be reconciled, and volume risk mitigated to the degree required by Lenders, will depend largely on the appetite for the parties to conclude a deal. If buyers are willing to accept take or pay or capacity charge obligations, volume risk will be deemed to have been mitigated adequately.

## Financial Risk

- **Interest Rate:** The determination of project viability is predicated on the existing interest rate scenario prevailing in the country and LIBOR. A drastic increase in the interest rate scenario may affect the debt servicing capability through project cash flows.
- **Foreign Exchange Exposure Risk:** The AKK Pipeline project has significant foreign exchange exposure. Both the project financing and debt servicing obligations are denominated in US dollars. Without hedging, the project cash flows would be exposed to currency devaluation risk as is currently the case in Nigeria.
- **Inflation risk:** The base transportation tariff of US\$0.8/Mmscfd is expected to be stable over the 15-year period reviewed in this OBC. Therefore, the project revenues and consequently the achievement of the designated rate of return would be adversely affected in case the inflation rate is higher than the assumptions in the financial model.

## Termination Risk

The risk pertains to the possibility of unilateral termination of the concession agreement prior to the achievement of the designated rate of return on frivolous grounds.

## Residual Risks

### Force Majeure

This risk category deals with non-political events of force majeure (Acts of God) such as epidemic, natural disaster, earthquakes, floods during construction and such other events. The impact of these risks on construction and/or project operation could range from minor to severe, say in a case of earthquake, where the damage may be severe enough to render the facilities irreparable.

### Social Risk

This is the risk that civil or political problems may surface as a result of the project, manifesting in boycotts, sabotage, etc. Such disturbances may arise from several different concerns, public objection to imposition of tariffs, public discontent with the environmental impact of civil works or other features of the project. An event similar to the above could impair the ability of the Concessionaire to collect revenue thereby affecting project viability.

### Project Security Issues

Political stresses in the Niger Delta, particularly Bayelsa, Rivers and Delta States are currently manifesting in frequent militant activity targeted at the disruption of oil and gas production and transportation facilities. The underlying causes of militant activity are complex mix of socio-economic factors, tribal rivalry and ethnic conflict which are beyond the scope of this assignment to diagnose. However, should these security issues continue, they will raise serious concerns for potential lenders, sponsors, purchasers, and NGOs.

Incidence of sabotage, blockage and protest is considerably higher for foreign firms bringing in inadequate resource or skills in crisis communications, community development and site security. Strategies to resolve or mitigate Delta security issues and indeed, the security of the pipelines along the pipeline corridor all the way from Ajaokuta to Kano, therefore involve a mixture of consensus building, community development, promotion of indigenous benefits and security in the traditional sense. Thus, local consensus building, to achieve tribal and community acceptance of the AKK Pipeline project along the pipeline corridor, will therefore be necessary. The developers will be required to hold public meetings in all major places along the

route in order to build consensus. The benefits of the project will have to be sold to the local communities during these meetings. Employment of local workers is also encouraged, to the extent possible. Finally, the project sponsors, NNPC may also have to consider tangible development opportunities to maximize the visible project benefits for the local communities.

The schedule showing the project's risk management and allocation is attached as Appendix 3 of this OBC.

## ECONOMIC & FINANCIAL ANALYSIS

### Project CAPEX

The proposed AKK Pipeline project to be executed in three lots will involve the following costs:

	Lot 1	Lot 2	Lot 3	Total
EPC Lump Sum Cost*	727,250,000	710,150,000	988,500,000	2,425,900,000
Provisional Sum**	109,087,500	106,522,500	148,275,000	363,885,000
Project Management Consultancy ***				121,295,000
<b>TOTAL</b>				<b>2,911,080,000</b>

\* EPC Lump Sum Cost exclude Total Debt Service Payments over the repayment period

\*\* Provisional Sum includes SCADA Integration and all appurtenances

\*\*\*Project Management Consultancy \*\*

The 15% Provisional Sum will cover the following:

- Spare parts: Two (2) years operations spare parts and Operational Consumables.
- Factory Acceptance Test (FAT) and Training on Equipment: This covers the transportation, accommodation and feeding of engineers' representatives during FAT of equipment and other materials as well as the training of personnel on the operations of the equipment.
- Custom Duties: This covers the cost of custom duties for line pipes procurement and other Above Ground Installations (AGI) foreign materials.
- Engineers' expenses on detailed design review and construction supervision: This covers the cost of accommodation, transportation and feeding of engineers' representatives during the named activities.
- Contingency: This covers the cost of unforeseen works and additional work scope.
- SCADA Integration and Appurtenances: Provision has been made in the Provisional Sum of Lot 3 to cover the cost of the works. This sum will be administered by NNPC.
- Project Management and Engineering Consultancy Services: Additional provisional sum of 5% has been made in each of the Lots to cover the cost of PMC services (5% of the EPC (Lot 1, 2 & 3) Lump sum Prices has been specifically set aside for the PMC).

### Project Financing and Governance Structure

According to NNPC the financing and governance structure for the project would require the EPC Contractor to raise adequate funds to finance the AKK project to meet up with the project execution schedule. The Terms of repayment such as tenor, cost of finance, and fees to be agreed with NNPC will be contained in a Contract Financing Agreement to be executed by the Project Financier (EPC Contractor) and the Project Sponsor (NNPC).

For accounting purposes and in order to ensure transparency and control, NNPC will open a Project Disbursement Account (PDA). The Contractor must fund the PDA to cover any work scope approved by NNPC within a specific period. The bank will be given a standing mandate to sweep, within a stipulated time, any deposited amount by the Contractor into the AKK Project Construction Account.

Any AKK Project Construction Account will be under the joint control of both NNPC and the Contractor and will be the source of payment for the AKK Project execution works. The repayment of the principal sum will commence upon satisfactory completion and delivery of the AKK project to the Project Sponsor. A schedule of debt repayment (including interest amount) will be negotiated and agreed (six-month LIBOR + Margin) by both NNPC and the Contractor based on terms to be included in the Contract Financing Agreement.

## Loan Repayment

NNPC disclosed that the primary source of debt servicing (principal and interest) will be the gas transmission tariff from the entire NNPC gas pipeline network in Nigeria. NNPC further disclosed that interest element on debt during construction will be serviced from the existing cash flow of NNPC gas transmission pipeline network while Debt Service Reserve Account (DSRA) cover will be negotiated and agreed by both parties in the Contract Financing Agreement.

As additional guarantee or comfort to the contractor, NNPC will establish a Securitization Account to be adequately funded to cover a minimum of 6-month advance repayment of principal and interest. NNPC stated that drawdown from the Securitization Account will be executed only if there is insufficient amount in the DSRA to service the debt within an agreed drawdown period. NNPC will on annual basis secure sufficient funds from the Federation Budget to cover a full year debt repayment plus interest due to the Contractor to fund the securitization account.

## Revenue Projections

The revenues expected from the project, derive mainly from the gas transmission tariff from the entire NNPC gas pipelines in the country. According to the income projections revealed in the Income Statement (Appendix 5), delivery of gas through the pipeline will commence in 2020 after the construction period of 24 months. The expected maximum capacity for gas throughput is 5000mmscfd. It is expected that the gas throughput for the first year will be at 3380mmscfd. At 365 days per annum, this throughput amounts to 903,577 annual gas throughputs in the first year of operation. It is projected that gas throughput will gradually grow to 4354mmscfd or 87% of capacity by Year-15. Average Gas tariff is expected to be stable at \$0.80/Mmscfd.

With this projected throughput, revenues are expected to rise from \$1.093 billion in Year-1 of operations to \$1.464 billion by Year-15 when the debt obligation to the Contractor would have been fully liquidated.

## Fixed and Variable Operating Costs

The fixed operating cost is 2% of \$0.8 per Mmscfd of gas. The variable operating cost on the other hand is 35% of \$0.8 per Mmscfd of gas and comprises personnel costs, repairs and maintenance, power and electricity, and sundry expenses estimated at about \$534 million in Year 1, and rising to peak at \$750.6 by Year-15.

### Profitability

The projected financial statements shown in the appendices reveal a comfortable profitability profile in the 15 year period covered by the projections. The Project's EBIT is \$302 million for the 1<sup>st</sup> Year of operations

and with an average \$503 million during the years projected. It is expected that the upwards trend of the EBIT will continue way beyond Year 15 covered by this analysis.

A projected financial summary of the projects including key ratios is presented in Table 2 above.

### Cash flow Projection

The project is expected to receive inflows of \$1,303.92 million and \$1,601.09 million from the EPC Contractors during the first two construction years. From the 1<sup>st</sup> Year of operations (2020), net cash flows (NCF) are expected to fluctuate during the first four (4) years of operations after facility related repayments and increase on an upward slop from year five (5) for the rest of the years reviewed. The NCF is projected to be positive peaking at \$301.29 million by the Year 15.

The expected Debt Service Coverage Ratio (DSCR) requirement for the project is 1.00x. From Year 2 of operations, the DSCR of the project will rise steadily from 0.98x to 1.82x by Year-15. The average DSCR for the entire review period stood at 1.46x.

Details of the projected cash flows for the period covered are attached as Appendix 4 to this report.

### Payback period

The period required for the project to return the full amount of \$2,911 million Contractor financing and associated obligations are 8and 8.25 years using the project pre-tax and post-tax profits respectively.

### Net Present Value and Internal Rate of Return

The pre-tax net cash flow of the project, discounted at a cost of capital of 10%, 12.5% and 15% are respectively \$2.436billion, \$01.664billion, and \$1.074 billion while the post-tax net cash flow of the project, discounted at a cost of capital of 10%, 12.5% and 15% were \$2.164 million, \$1.453 billion, and \$0.908million respectively. The determination of the cost of capital at which the project will break even (Internal Rate of Return) was not necessary as the project has no equity contribution.

### Sensitivity Analysis

The project was assessed to be fully bankable in all scenarios including best, base and worst cases; with a summary of the main elements of these cases analyses from the updated Project Economic Model tabulated below:

#### Summary of Sensitivity Analysis

Project Summary	Rate	Base Case	Worst Case	Best Case
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	(%)	Project-pretax (US\$'mm)	Project-Post-tax (US\$'mm)	Project-pretax (US\$'mm)	Project-Post-tax (US\$'mm)	Project-pretax (US\$'mm)	Project-Post-tax (US\$'mm)
NPV	10	2,436.97	2,164.57	2,108.46	1,885.10	2,545.69	2,293.67
	12.50	1,664.65	1,453.89	1,389.36	1,214.17	1,708.83	1,584.62
	15	1,074.73	908.84	840.63	702.00	1,193.97	1,038.77
Payback Period		8	8.25	8.5	8.75	7.75	8

All the assumptions relating to this sensitivity analysis is shown in the Appendix to this report.

## OPTIONS ANALYSIS & FINANCING

### Overview

In Nigeria, government has always been the sole financier of projects of this nature, and has often taken responsibility for implementation, operations and maintenance as well. The national fiscal budgets have therefore been the principal sources of financing for infrastructure. Usually, public authorities such as NNPC will spread its budgetary resources thinly over a large number of important infrastructure projects such as the AKK Pipeline Project. The result is that very often, the projects are abandoned midway. Where an insignificant proportion of projects that reaches completion stage, this is often at multiples of the original cost. Besides being volatile, project of this nature usually receiving a larger brunt of fiscal retrenchment whenever the government is experiencing financial crises such as is being currently experienced in Nigeria. Moreover, Traditional/conventional Procurement has the greater potential for mismanagement.

### Assessment of Alternative Forms of Procurement

A number of procurement methods are possible in the development of the AKK Pipeline Project. These methods vary depending on the ownership of capital, responsibility of and duration of investments and level of risks and rewards. These include the Traditional/conventional Procurement, partnership with the private sector (PPP), management contracts and joint ventures. While the development of the AKK Pipeline Project is very high on the priority list of the government, NNPC currently lacks the funding to escalate this measure beyond mere conceptualization.

Apart from a faster implementation of projects, and reduction in whole life costs of project that characterize public private partnerships (PPP), the private sector brings into a project better efficiency, innovation and adequate financing to ensure a timely delivery of a project. Additionally, the PPP models offer better risk allocation between public and private sectors, offers better and sustainable incentive. Besides filling the resource gap in infrastructure delivery and operation, there is a growing realization that PPP arrangements have engendered acceleration of infrastructure provision, a faster implementation of projects, and reduced whole life costs of project. In reality, the private sector has a large pool of resources from which they can seek funding, which governments may not have access or the capacity to access, including both local and international financial markets.

### Option Analysis

Four major development options were considered for Proposed Ajaokuta-Abuja-Kaduna-Kano Gas Pipeline (Phase I) Project namely:

- Implement Project Option
- Delay Project Option
- No Project Option
- Partnership with the private sector
  - Build & Transfer (BT) with or without financing
  - Build, Operate and Transfer (BOT)



- Design, Finance, Build, Operate and Transfer (DFBOT)

The Implement Project Option is the option initially proposed by NNPC to carry-out the construction and operations of the pipeline project. This option will guarantee security of a critical national infrastructure, speedy economic development (were ready funding is available), increase revenue generation and eliminate gas flaring among other benefits. While there is, an urgent and overriding need for significant up-scaling of the gas transport, stations and other infrastructure, NNPC currently lacks the resources and funding to escalate this need beyond conceptualization.

The Delay Project Option sanctions the postponement of the project to a future date. This is the option of choice in time of severe economic or political crises, war or resistance to the project by host communities or present unsustainability of the project. As the economic and political atmosphere in Nigeria at present is somewhat conducive, any delay will deny the country the opportunity and benefits associated with the project implementation.

The No Project Option disallows the construction of the pipeline. This scenario will hinder the realization of the FGN dream of improved power supply, affect the expected revenue generation from sale of gas and negatively impact on the expected economic growth of the gas sector in Nigeria and further put to hold the commencement of the independent power plant project. This option was not chosen in view of the above disadvantages.

A number of PPP procurement methods are possible in the delivery of AKK Pipeline Project. These are the BT, BOT and DFBOT.

### **Preferred option**

An analysis of the various options evaluated, recommends a BT with Contractor Financing for the AKK Pipeline Project primarily because NNPC lacked the funds to undertake the project. Thus, while the BT option relieves NNPC the immediately burden of the huge initial outlay for the development, NNPC still retains control of the operation and maintenance of this important infrastructure asset. Additionally, this mode of project delivery is more likely to deliver the best possible value for money for NNPC through reduced procurement, development and management costs, reduced procurement risks, shorter lead-in times, improved quality and added value from training and local employment.

The likely benefits of the preferred project procurement option are:

- Increased efficiency in the execution of the AKK Pipeline project.
- Reducing risk for the public sector, by transferring part of the risk to the Contractors.
- The private partners will execute the project more rapidly because of the incentive to maximize returns on investment.
- Option will free NNPC scarce resources for deployment to other critical uses
- reduced development and infrastructure budget for NNPC

Advantages for the concession company include better management of many construction risks, and possible countering of any adverse effects by benefits during operation.

## Key Project Contract:

- Gas Sale and Aggregation Agreement: This agreement is to be entered into between a gas seller, gas buyer and Gas Aggregation Company of Nigeria (GACN).
- Gas Transportation Agreement: A Gas Transportation Agreement (a “GTA”) is to be entered into between Nigerian Gas Company Limited (NGC) and a gas buyer.
- Engineering Procurement and Construction Contract: This will set out the key terms governing the construction of the pipeline and all associated facilities. The EPC Contract would include the agreed technical specification required, as well as the agreed cost and timeline for delivery of the pipeline and associated facilities. The EPC Contract would also include performance guarantees and liquidated damages, which would become payable in case of delay.
- Services Operation and Maintenance Agreement: This will set out the key terms governing the operation of the pipeline following its completion.
- Gas Securitization Agreement: This agreement is designed to set out the key terms pursuant to which NNPC grant the right to the Project Borrower to access an agreed portion of gas sales to fund financing obligations of the Borrower.
- The option being proposed by NNPC to develop the project is EPC contractor financing mechanism (Build & Transfer) in order to fast-track infrastructure delivery.

## Project Financing and Governance Structure

According to NNPC the financing and governance structure for the project would require the EPC Contractors to raise adequate funds to finance the AKK project to meet up with the project execution schedule. The terms of repayment such as tenor, cost of finance, and fees to be agreed with NNPC will be contained in a Contract Financing Agreement to be executed by the Project Financier (EPC Contractor) and the Project Sponsor (NNPC).

For accounting purposes and in order to ensure transparency and control, NNPC will open a Project Disbursement Account (PDA). The Contractor must fund the PDA to cover any work scope approved by NNPC within a specific period. The bank will be given a standing mandate to sweep, within a stipulated time, any deposited amount by the Contractor into the AKK Project Construction Account.

Any AKK Project Construction Account will be under the joint control of both NNPC and the Contractor and will be the source of payment for the AKK Project execution works. The repayment of the principal sum will commence upon satisfactory completion and delivery of the AKK project to the Project Sponsor. A schedule of debt repayment (including interest amount) will be negotiated and agreed (six-month LIBOR + Margin) by both NNPC and the Contractor based on terms to be included in the Contract Financing Agreement.

NNPC disclosed that the primary source of debt servicing (principal and interest) will be the gas transmission tariff from the entire NNPC gas pipeline network in Nigeria. NNPC further disclosed that interest element on debt during construction will be serviced from the existing cash flow of NNPC gas transmission pipeline network while Debt Service Reserve Account (DSRA) cover will be negotiated and agreed by both parties in the Contract Financing Agreement.

As additional guarantee or comfort to the contractor, NNPC will establish a Securitization Account to be adequately funded to cover a minimum of 6-month advance repayment of principal and interest. NNPC stated that drawdown from the Securitization Account will be executed only if there is insufficient amount

in the DSRA to service the debt within an agreed drawdown period. NNPC will on annual basis secure sufficient funds from the Federation Budget to cover a full year debt repayment plus interest due to the Contractor to fund the securitization account.

## VALUE FOR MONEY ASSESSMENT

### Overview

An OBC is typically used to assess whether it is preferable for a public institution to deliver an infrastructure project either through the PPP option or the more conventional EPC contracting approach (Traditional Procurement). The objective of the assessment is to ascertain whether the PPP option provides better value for money (VfM) to the country in comparison with conventional EPC procurement. A PPP project yields value for money if it results in a net positive gain to society which is greater than that which could be achieved through any alternative procurement route.

A PPP project is said to achieve value for money if it costs less than the best realistic public sector project alternative (often a hypothetical version of the project) which would deliver the same (or very similar) services. This public sector alternative is often referred to as the “public sector comparator” (“PSC”) \*. The key question in assessing value for money is usually whether the greater efficiency of the PPP project is likely to outweigh factors that might make the PPP more costly

### Project Cost Comparison

NNPC had commissioned the ILF to develop an estimate of the EPC contracting cost for the project, benchmarked against previous similar projects using information from the following:

- Estimate for pipeline construction from International Oil Companies (“IOCs”) and world class pipeline construction companies (within and outside Nigeria);
- Guidance from International Federation of Consulting Engineers (FIDIC) Handbook (RED, GREEN etc.);
- Data from TNGP Optimization study developed by ILF;
- Previous NNPC and its subsidiaries’ cost estimates for pipeline projects.

The above data received were subjected to mathematical formulae and simulation software (Monte Carlo simulation) to arrive at the cost estimates as detailed below:

- EPC Cost Estimate: US \$1,946,539,194 (71%);
- Provisional Sum (2-year Spare parts, Customs duties, Contingencies, Engineer’s expenses, etc.): US \$ 796,090,843 (29%);

Table 6 below present a comparison of NNPC cost for delivering the EPC for the AKK project directly and those disclosed by the PPP procurement option.

NNPC’s in-house estimate of the EPC cost of delivering the AKK pipeline is \$2.74 bn, whereas the Build and Transfer cost through Contractor financing is \$2.911 bn. However, NNPC in-house estimate does not include the cost of financing, which is estimated at \$2.38 bn (detailed in the financial analysis). An addition of the later amount to NNPC’s in-house estimate brings the EPC delivery cost to \$5.12 bn. Clearly there is a distinct cost advantage of using the Build and Transfer cost through Contractor financing to deliver the project. Without accounting for the financing cost, the direct delivery of the project will be preferred to the PPP option.

**Table 6: Comparison of Traditional and PPP**

Item of Cost	Traditional Procurement	PPP Procurement
	(USD)	(USD)
EPC Cost Estimate (71%)	1,946,539,194	2,789,785,000*
Provisional Sum (2-year Spare parts, Customs duties, Contingencies, Engineer's expenses, etc.) (29%):	796,090,843	
Transaction and Contract oversight costs (i.e. additional bidding, contracting and monitoring costs in a PPP setting)	121,295,000	121,295,000
Financing costs (i.e. possible added costs due to private sector financing, especially equity financing)	NIL	
<b>TOTAL</b>	<b>2,863,925,037</b>	<b>2,911,080,000</b>

**Note 1:** As the PPP option preferred by NNPC is the Build and Transfer (BT) with Contractor Financing option, where NNPC will retain Operations and Maintenance (O&M) after construction, while making annuity payment to the Contractor.

**Note 2:** The EPC cost under PPP includes 15 year financing cost, which is absent from the In-house cost.

Indeed, public-private cost comparisons are inherently tricky. To start with, government cost accounting systems and methods are generally so opaque and convoluted that public managers cannot accurately identify the "all-in" costs of providing a service. Some costs are paid directly out of an MDA's budget, while many others—such as debt service, risk management, legal, payroll, IT and other administrative functions—are paid out of some other MDA's budget. If those "extra" costs aren't captured along with the direct agency spending, any cost allocation at the service level will be understated. Even within an MDA's budget, many costs may be borne by the headquarter office that should be allocated to specific service units, facilities, and the like in a proper accounting scheme. Throw in the tendency of government analysts to look for creative ways to make their public sector colleagues look more competitive than they really are, and there's ample reason to at least question public-private cost comparison studies undertaken by government. Besides there is the practice in the public sector of spreading available capital budgets thinly over several projects with the results there is a perpetual cost and time budget overrun.

## Other VfM Factors

Apart from the EPC cost of the AKK project, the following factors were also taken into consideration in determining whether the AKK project delivers VfM to Nigeria:

- There is major investment involved, which would benefit from the effective management of risks associated with construction and delivery;
- The private sector has the expertise to design and implement complex projects;
- the public sector is able to define its service needs as outputs that can be written into the PPP contract ensuring effective and accountable delivery of services in the long run;
- Risk allocation between the public and private sectors can be clearly identified and implemented;

- It is possible to estimate on a whole-life basis the long-term costs of providing the assets and services involved;
- The value of the project is sufficiently large to ensure that procurement costs are not disproportionate; and
- The technological aspects of the project are reasonably stable and not susceptible to short-term or obsolescence.

A PPP project or a PPP programme will provide value for money is higher when all or most of the following conditions are met\*. The table below presents a qualitative assessment of the project's VfM attributes.

**Table 7: Assessment of Project's Value-for-Money Attributes**

VfM FACTOR	YES	NO
Major Investment Involved	X	
Private Sector Expertise in Design and Implementation	X	
Clear Definition of Output Requirement	X	
Risk Allocation	X	
Project Sufficiently Large for Economies of Scale in Procurement	X	
Estimate of Whole-Life Cost of Project*		X
Project has Stable Technology	X	

\*This factor was not relevant to the analysis as the Contractor will transfer the project after the EPC stage to NNPC for operations and maintenance.

# ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

## Overview

### Nigeria

Most of Nigeria is relatively low-lying and flat, with about 80% of the land below 600m. Highlands greater than 1,000m are restricted to the Jos Plateau in the north-central region and montane areas in the east. The two broad ecological zones of Nigeria are:

- a mosaic of savannah and wooded savannah, which occupies four-fifths of the land area;
- and forest which constitutes the remainder.

The major vegetation formations in the country are: lowland rain forest, a mosaic of lowland rain forest, woodland and secondary grassland, Sudanian woodlands, plateau and montane vegetation, Sahel vegetation, herbaceous, swamp and aquatic vegetation, and mangrove, most of which have been extensively modified.

### Protected Areas along the Pipeline Route

The construction of new developments in or through officially protected areas can be emotive, depending upon the nature of the protected area and the degree of its protection. Information has therefore been provided on the protected areas that are believed to occur within a 40km wide corridor within which the pipeline will be routed, and along the proposed alternative pipeline routes indicated on the map below. (Some large protected Wetlands of International Importance up to 50km away from pipeline routes have also been included where only the central co-ordinates are known.)

The protected areas have been simply listed below. However, the protection category, importance, threats, management and distance from the pipeline route for all the protected areas are provided in detail in the ESIA report, where the described protected areas have been mapped at 1: 500,000.

In most cases, the pipeline route will either not pass through the protected area or can easily be deviated to avoid it. The lists below are therefore provided for completeness.

It should be noted that the number of protected areas is increasing over time. The information on protected areas will therefore have to be updated at the time of the detailed EIA.

### Protected Areas in Nigeria

The FMoEnv, created in 1999, is federally responsible for coordinating environmental management in Nigeria. The Ministry is divided into several departments and institutes responsible for aspects of natural resource management (including protected areas). The FMoEnv is responsible for the National Parks Service and the Federal Department of Forestry (FDF), which includes the Wildlife, Forestry Monitoring Evaluation and Coordinating Unit (FORMECU) and the Forestry Research Institute of Nigeria (FRIN).

Four categories of protected areas are nationally recognized in Nigeria: National Parks, Game Reserves, Forest Reserves and Sacred Groves. The term 'forest reserve' is used in Nigeria to generally indicate a land use designation and many forest reserves have been highly deforested or managed to produce forest resources. The exact protection status of the Forest Reserves intersected by the finally selected route is an issue that would need to be resolved at the detailed EIA stage.

### Assessment of Potential Environmental Effects & Proposed Mitigation Measures

The potential environmental effects of the AKK have been addressed in two ways:

- Generic issues that relate to the design, construction and operation of the pipeline.
- Specific issues that relate to geographical locations.

The generic issues have largely been dealt with at desk level and in discussion with the engineering specialists. Specific issues have been considered by reference to existing information on biodiversity and Protected Areas, observations made along the route, and/or by local discussions (all within the three countries of the AKK). These two sets of issues have been separately addressed below.

## Generic Issues

In the preliminary EIA, it was appropriate to use a checklist technique to identify the issues, and the potential environmental effects/ problems related to the AKK Pipeline Project as contained in the main report<sup>11</sup> under the headings listed below. Most of these potential problems have then been minimized to the degree possible by sensitive routing and/or by other proposed mitigation measures.

### Project Location

The following are potential problems that are principally related to the location of the pipeline, with the likelihood of being influenced by the details of corridor and route selection. Each has been addressed in detail in the main report.

- Resettlement of Project Affected Families
- Land Acquisition and land values
- Historical, cultural and religious monuments
- Encroachment into important ecosystems
- Agricultural land take
- Interference with utilities and traffic
- Interference with drainage patterns

### Potential for Inadequacies in Project Design

The following are potential problems that should largely be eliminated at the FEED and detailed design stages:

- Interference with utilities, traffic and access
- Discharge of polluting materials in accordance with accepted Discharge Standards
  - Venting
  - Emissions
  - Discharge of pressure test water
  - Process effluent discharges
  - Domestic effluent discharges
- Explosion/fire hazard
- Adequacy of buffer zones
- Interference with drainage patterns
- Erosion hazard
- Aesthetics
- Noise/vibration from plant

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<sup>11</sup> Environmental Impact Assessment (EIA) Report for the Proposed Ajaokuta-Abuja-Kano (Kano-Katsina Gas Spur Pipeline Project) Phase 2. NNPC had retained the services of AIES to carry out the Environmental Impact Assessment (EIA) study and preparation of Environmental Management Plan (EMP) for the project



- Blockage of wildlife migration routes
- Inadequate worker health and safety

### Construction Stage

The most important environmental effects of the pipeline project are likely to be encountered at the construction stage. As inferred above, many potential problems can be 'designed out', and the balance of the many potential construction impacts addressed by mitigation measures. These will need to be applied and enforced through the contractual obligations upon the contractor and by monitoring of control during construction. The potential problems addressed are as follows:

- Silt run-off
- Inadequate construction monitoring (and management)
- Interference with utilities, traffic and access (severance)
- Inadequate erosion control
- Inadequate management of borrow and soil areas
- Worker health and safety during construction
- Flooding hazards due to impairment of drainage
- Blockage of wildlife migration routes

### Operations Stage

With the exception of the compressor stations, the project should have very limited permanent impact on the environment once the pipeline is operational. However, good environmental management will be required to address these residual issues. The following operational issues have been identified and discussed in the main report:

- Operations and Maintenance capabilities
- Spillages
- Monitoring

### Additional Issues

In addition to the above checklist of environmental issues, the following issues are considered to be particularly important with respect to the AKK project and have been discussed in the main report:

- Route Selection
- River Crossings
- Road Crossings
- Construction Camps
- Wastes Derived from Construction and Operation Activities
- Workforce Control
- Crushers and Batches
- Blasting
- Road Transport of Pipe Sections and Other Materials
- Environmental Benefits
- Decommissioning

### Specific Issues

The pipeline route options have been refined during the Environmental and Social Route Reconnaissance fieldwork, in response to the environmental and social issues noted along the way. This refinement has

resulted in the avoidance or minimization of most potential adverse environmental impacts at an early stage in project development. In addition, the reconnaissance aimed to identify route options which should be either avoided or preferred from an environmental and social perspective.

This part of the environmental assessment was undertaken in conjunction with the field engineering team, so that engineering and environmental/social considerations could be integrated.

The assessment and routing reconnaissance was largely an iterative process, and whilst some particularly sensitive areas were designated as "hotspots" requiring further detailed study, most environmental and social issues were mitigated in the field by careful re-routing of the corridors.

The site-specific environmental and social issues that were encountered during the route reconnaissance are described in the main report, along with the results of the further investigation of 'hotspots' where appropriate. The locations in question are identified by reference to latitude and longitude positions, the GPS waypoints recorded at the time, and where possible, their place names.

It should be noted that in Nigeria the movement of the route reconnaissance teams was restricted in certain areas due largely to security issues. Therefore, environmental and social issues in these areas could not be studied in the field.

## Environmental Management Plan at Design

A number of location specific mitigation measures have been elaborated in relation to the potential impacts identified during the study. In addition, the satisfactory development of the AKK project will need a number of generic mitigation measures, many of which are now standard practice in the pipeline construction industry. These mitigation measures, which are summarized below, will form the substance of the Environmental Management Plan (EMP) for the AKK Pipeline Project. This outline will need to be developed into a series of location specific plans at the detailed design stage.

### Route

**Major** - During the course of the feasibility and environmental studies, the routes have been iteratively amended to produce a preferred pipeline corridor ultimately. Restriction to this corridor should be a requirement at the detailed design stage when the exact route will be determined, and the detailed environmental studies conducted.

**Local** - At the same time, the route options have been subject to some local refinement to minimize their impact on agricultural land and other environmental assets such as wetlands. At the detailed design stage, further refinement will be required at local level to achieve the optimum line. The locations and designs of the compressor stations must also be finalized, considering the need to minimize adverse impacts on local ecology, communities and the landscape.

### Land Acquisition

The pipeline design should aim to minimize loss of land value by:

- Avoiding high value land;
- Minimising the area of permanent land-take;
- Restoring land temporarily acquired or disturbed during construction to its previous state.
- Proper procedures must be developed and followed for both temporary and permanent land acquisition, including:
  - The marking and valuation of the required land in consultation with its owners and users and an agreed local land agent or valuation panel.

- The provision of 'land for land' where practicable, the replacement land being of the same quality as the acquired land.
- The option of cash purchase of land, with payment made prior to departure.
- Compensation for loss of crops, trees, wells, buildings, and other assets, in addition to land purchase.
- Compensation of tenants as well as owners of property.
- Compensation of the occupiers of land, regardless of their legal title to it.
- Assistance with moving house where necessary.
- Social support for resettlement where necessary.
- Monitoring of the conditions of resettled people, with funding to address problems as they arise.

## Construction

**Management and Community Liaison** - An Environment, Health & Safety (EHS) Manager will be required for each 'spread', along with one or more Local Liaison Officers capable of communicating in local language(s). It will be their responsibility to communicate with all Affected Persons (APs) before and during construction. The concerns of APs relating to safety, severance, etc. must be acted upon by the erection of fencing, track bypasses, footbridges, temporary water supplies, etc. Nuisances must be anticipated, for example, the damping down of haul roads, the protection of trees, etc. APs must know to whom they can turn if problems arise, and a proper complaint procedure must be established to handle all such issues. This system needs to be sufficiently responsive to address local problems as they arise without awaiting long approval procedures.

**Excavation** - Excavation will be made in a maximum 'working width' of 30m, within which topsoil and sub-soil are separately stacked as berms along the two sides of the working width. It is important that the depth of the surface scrape should be varied according to the actual depth of the topsoil. This is to prevent the 'dilution' of the topsoil, and to ensure that seeds on the surface are provided with the right conditions for germination. Much of the route across the Sahara has very willow topsoil. It should never be assumed that topsoil is non-existent.

It is environmentally preferable not to conduct excavation or any other earth-moving activities during heavy rains. However, it may not be possible to avoid the rainy season in the South of the route altogether. In the areas along the route that are prone rain, particularly in North Central Nigeria, plans must therefore be made before the rainy season, to prevent flooding and erosion during rainfall.

**Soil Disposal** - It is estimated that the pipeline would displace approximately 2,200 m<sup>3</sup> of soil per kilometer. The disposal of soil in desert and mountainous areas will normally be possible by simply spreading it over the working width, but if there is surplus soil it will have to be disposed of in specific sites, identified and approved in consultation with local communities/authorities. It must not be simply tipped down hillsides or into dry river valleys.

Areas of irrigated agriculture will require special attention, in order to maintain existing field levels and slopes. Disposal sites should be relatively easy to find, e.g. former quarries and borrow pits. However, there should be consultation with local communities to determine any potential beneficial uses for the soil, e.g. to create bunds, or modify field levels.

**Backfill Material** - In areas where the trench has to be blasted or cut through rock, the pipe will require bedding and surrounding with fine granular material. This may be sand if a suitable source exists locally, or crushed rock if necessary. The informal winning of sand, for instance, from river beds, will not be allowed

without permission, and any source must be approved in consultation with local communities/authorities. The management of borrowing of soil will be one of the duties of the EHS

**Restoration** - Following backfilling of the pipe trench and the replacement of topsoil, the ground must be graded to recreate the previous levels and slopes; this is particularly important in areas of irrigated agriculture and seasonal flood agriculture. All irrigation channels, drains, and the line, must be reconstructed to their previous condition. Similarly, all berms, embankments, water collecting systems and other surface structures must be reconstructed. The inference from this is that there exists a need for detailed local consultations and the recording of all such assets prior to construction.

The replacement of topsoil should be followed by mechanical treatments to restore the surface to its pre-existing condition. The treatment will depend on the circumstances, but should include work to prevent the formation of a sealed surface, and to encourage surface and groundwater flows, but prevent soil erosion. Suitable restoration techniques are described in the main report.

Natural environments are more difficult to restore than agricultural land, and will require special treatment. The few wood lands traversed cannot be replanted because of potential damage to the pipe, but wetlands and other marginal lands should be restored by replanting /reseeding. In the bare ground of rockfields and sand deserts, the material replaced at the surface should, as far as possible, match the surrounding material in colour and texture for aesthetic reasons.

**Maintenance** - The restored line should be monitored regularly over the first eighteen months, and maintained if necessary to prevent erosion and/or the growth of weed species.

**Emissions, discharges and noise** - Every effort must be made to 'isolate' the working width from surrounding land and communities, so that emissions to atmosphere, effluent discharges, noise and other nuisances do not occur. Examples of control methods have been given in the main report.

**Wastes** -The disposal of all waste must be properly managed. The recognized waste management hierarchy should be applied, as follows: reduce, reuse, recycle, and dispose. However, a word of caution is that potentially hazardous or toxic materials must not be made available for re-use or recycling. These include plastic containers used for oil, anti-freeze, chemicals, and the like, which must be crushed to prevent their subsequent use by local people as containers for drinking water.

Biodegradable wastes such as kitchen waste can be composted, but all potentially toxic or hazardous waste material must be contained.

**Construction Camps and Workforce** - Construction camps will be self-contained temporary accommodation units, which may house about 200 people. All utilities will be independently provided (unless a camp is near to an existing power supply). As temporary units, it is vital that they are completely removed at the end of their life, and do not become the core of informal housing. The burying of waste materials on-site during decommissioning is not a permissible option. IFC standards for emissions, discharges and noise should be applied to the camps, and all waste must be properly managed (see above). Local people can be encouraged to provide the camps with foodstuffs and services (as a benefit of the project), but must not live on site. Occupants of the construction camps must be required to observe a strict Code of Conduct, which must include the prohibition of hunting or the collection of fuelwood and other natural products. The Code must also include guidance on relations with local people, local religions and customs, including the treatment of women. No visitors should be allowed. All occupants of the camps should have medical examinations before and after their period of employment, and medical facilities must be provided for them on-site.

**Health and Safety** - Construction workers must operate under the General Health and Safety Guidelines of the IFC, which must be applied and enforced by the EHS Managers. Safety procedures for blasting must also comply with any local regulations for blasting and the storage & use of explosives.

The mitigation of emissions, discharges and noise during project operation will relate almost entirely to the running of compressor stations and activities carried out therein. For simplicity, it is recommended that the environmental standards contained within the IFC EHS Guidelines for Gas Terminal Systems should be applied to all AKK Pipeline Project plant installations. These standards can then be used for both the specification and the monitoring of AKK Pipeline Project plant and its operations.

#### **Pollutants, Hazardous Materials and Wastes**

All materials in the above categories must be properly contained. That means the storage of such liquids (fuel, oils, acids, etc.) in bunded containments of sufficient volume to retain the entire stored quantity. Acids and alkalis must be kept in separate containments. Compressed gases must be chained in an upright position within locked, fenced compounds. Toxic/hazardous solids must be kept in locked waterproof buildings. All wastes must be disposed of in a safe and environmentally acceptable manner as agreed with any local authorities.

#### **Compressor Stations**

The exact locations, size and staffing levels of compressor stations have yet to be determined. At the detailed design stage, these stations will need to be subject to individual consideration within the detailed EIAs. In addition to the conduct of maintenance activities such as 'pigging', which are referred to above, compressor stations will act as small contained communities. As such, they will need environmental management and control. In the meantime, the IFC EHS Guidelines for Gas Terminal Systems should be applied for the mitigation of impacts arising from all activities at AKK compressor stations.

#### **Health and Safety**

Similarly, the health, safety and occupational hygiene provisions of the above guidelines should be applied to all AKK Pipeline Project operations.

It should also be noted that a range of safety studies will be conducted at the detailed design stage, and the output of these studies will be relevant to the preparation of both the detailed EIA and the EMP. Furthermore, the provisions of the gas pipeline design standard ASME 631.8 will be applied to finally determine the width of buffer zones and the thickness of pipe walls where the pipeline passes through occupied areas.

#### **Management & Monitoring**

Once the AKK Pipeline Project is operational, it will need on-going environmental management and monitoring to identify and mitigate any adverse effects on the environment that might arise. As during the construction period, EHS Managers will have to be appointed for each of the main sections of pipeline, and they will need to have adequate staff to undertake environmental sampling, analysis and reporting activities. The monitoring programme must be elaborated at the detailed EIA stage, and should include details such as locations, frequency, parameters and methods for observation, sampling, analysis and reporting.

### **Environmental Management Plans for Construction and Operation**

The AKK project will need an Environmental Management Plan (EMP), as outlined above, which will act as a complete environmental and social manual for the pipeline system. Each of the construction and operation contractors will then be required to produce 'daughter' EMPs, based on the project EMP. These

contractors' EMPs will have to be very specific documents, giving details of locations, management arrangements, contact details, etc. At the present stage, the preferred pipeline route has been simply expressed as a corridor, the details of which will be developed later, and therefore it is not possible to complete the contractors' EMPs.

At the detailed design/detailed EIA stage, they should be completed in relation to construction, and at a later stage in relation to operation.

The contractors' EMPs should comprise:

- A list of all mitigation measures and their indicators.
- Arrangements for the funding and execution of the mitigation measures.
- Contractors' responsibilities for implementing mitigation measures.
- Arrangements for regular environmental and social monitoring and reporting.
- Any arrangements needed for capacity building in environmental management for the pipeline.
- Arrangements for periodic (annual or biannual) auditing and reporting environmental issues
- Instructions for dealing with archaeological or historic remains (to be appended to construction contract).
- Instructions for dealing with religious and cultural sites or buildings (to be appended to construction contract).
- Health and Safety regulations for both construction and operation (including blasting).
- Code of Practice for construction camps.
- Management responsibilities for environmental and social issues.
- Contact details for responsible environmental and social managers.
- Plans to cope with accidents, emergencies and upset conditions.
- Plans for shutdown and evacuation of compressor stations.
- Plans for decommissioning at the end of the life of the pipeline.

There is a lot of international experience in environmental management for the construction and operation of gas pipelines, which can be drawn upon in preparation of the EMPs. See for example: Environmental Guidelines for the Location, Construction, and Operation of Hydrocarbon Pipelines and Facilities, Ontario Energy Board, Fifth Edition, May 2003. Such guidance should be adapted to the environment and circumstances of the AKK project, but will avoid re-inventing the wheel'.

## Social Issues

An Initial Social Impact Assessment (SIA) was conducted as part of the Preliminary EIA. The approach and methodology of the SIA was guided by international social-economic guidelines.

The SIA was based on primary data collection made during field visits to selected communities and other sites considered of socio-economic importance along the different route options proposed in Nigeria. The results of this survey work were placed into context using secondary data analysis of regional and national social aspects that may influence social behaviour. Site specific issues and social dimensions were discussed in the context of direct and indirect social impacts on different population groups, buildings, infrastructure and livelihoods in the three countries. The study also included a preliminary health impact assessment. Finally, the initial SIA provided an overview of risks and risk mitigation, with a suggested approach for conducting the subsequent full SIA that is linked to social and economic development benefits. Particular attention was given to potential positive and negative impacts on affected communities, with social issue risks and vulnerable groups identified. (Given the high rates of formal unemployment in some places, and

the expectation that pipeline construction would bring job opportunities, it is likely that the project would bring social benefits to population centers that are near the selected pipeline route).

Community surveys were conducted in Nigeria (subject to the constraints on public contact imposed by security requirements in some parts of Nigeria). Consultations were made with government officials, land owners, land users, tenants, local leaders, men and women. Analysis revealed some common features, and several national differences. Nigeria is the world's ninth largest oil exporter and the leader in oil exports from sub-Saharan Africa. Nigeria's society and economy have long been used to the oil industry and its infrastructure. Given the familiarity with pipeline construction in Nigeria, and the benefits the country has received from the export of hydrocarbons, the social climate should be more amenable to the pipeline project in the country. Moreover, with the increasingly stable political context, socio-political and socio-cultural problems should be few.

However, with the underlying threat of the ongoing unrest in Nigeria's North Eastern region, socio-political conflict should be regarded as a significant project risk factor, and security should be paramount in the socio-political considerations of pipeline routing. To a greater or lesser extent, throughout the region socio-economic circumstances are primed for conflict should energy infrastructure be developed without a fully transparent community engagement process, sufficient attention to the social context and the provision for adequate compensation. Even without politically emotive conditions, pipeline construction work that degrades agricultural land may dispose people to conflict. Careful attention should therefore be paid to the potential for disputes and other social stress factors that might cause conflict.

Livelihood impacts are of key importance and therefore the majority of the initial SIA was focused on livelihoods issues. The main potential impacts of the project on livelihoods are:

- the use of scarce resources,
- conflict between relocated persons and host communities,
- soil erosion and/or desertification tendencies due to construction and protection of the RoW further limiting land that can be used for livelihoods,
- pollution of water due to sewage discharge during construction and/or effluents during operation.

These may have significant consequences for the principal livelihoods of agriculture and to a lesser extent fishing, which are dependent upon natural resources. Nonetheless, most respondents stated that, given certain terms of engagement, they would welcome the project and could see benefits for trade and employment, although some concerns were raised in Niger about the use of water. Overall, there was a willingness to cooperate in a transparent consultation process, with few concerns expressed about the risk of communicable diseases such as HIV/AIDs. Most stated that children were already protected from communicable illnesses such as measles, as they had been vaccinated. Communities also stated that risks were low, as they had been educated about the risks of communicable diseases (particularly via HIV/AIDs awareness campaigns by NGOs). In Muslim communities, there are strict access controls on outsiders, which will also reduce the risk of communicable diseases. AKK Pipeline Project planners and Contractors will need to understand and adhere to such cultural rules and norms.

Project planners are also recommended to ensure that construction is undertaken between cropping seasons, so that the cropping pattern is not interrupted and livelihoods damaged. Contractors must limit damage to houses and property due to careless construction, and ensure that external labour does not impact adversely on the well-being of communities by using scarce local resources (namely food, water and fuelwood). Community consultations should be undertaken from an early stage, and until the conclusion of the project, in order to make agreements on access and compensation with Project Affected Persons

(PAPs), rather than local power brokers. Land acquisition and compensation negotiations should be conducted early and in a transparent manner. Employment opportunities for local people, including PAPs, should be actively maximized. Special attention should be paid to sanitation and waste disposal for the construction labour force. During construction, attention should also be paid to the dangers to children, adults and livestock, of the careless handling of equipment, movement of heavy machinery, noise, dust, severance of rights of way, etc. Contractors' health and safety guidelines as defined in their EMPs should be mandatory, backed up by penalty clauses and compensation procedures in case of non-compliance.

To achieve these recommendations, project managers should involve community-based organizations and NGOs with an established presence in affected areas. Such organizations usually have credibility and the confidence of local people, which can be of benefit to project planners. Above all, no construction should begin without the completion of agreed compensation arrangements; for projects, elsewhere this has been one of the most significant causes of grievance, delay and even project failure.

## Conclusions and Recommendations

### Conclusions

It is recognized that there is a worrying degree of social unrest in the North Eastern region. The Government of Nigeria is taking action with respect to the various dissident groups, and hopefully the present unrest in the area will be resolved before AKK Pipeline Project moves to the construction phase. During the same period, it is also to be hoped that personal security in the remainder of Nigeria will improve to the level where the gendarmerie or military will not be necessary to safeguard personnel, often isolated, who will be working in the field on the various pre-construction studies.

For the environmental issues, although a pipeline in construction has a major, but temporary, impact, there are established engineering and construction solutions to mitigate the temporary impact. Following reinstatement, the impact of the pipeline is very small, the major remaining impact being exhaust emissions from gas compression stations, the effects of which will be minimized by improvements in gas combustion in the gas turbine drivers.

### Recommendations

Concerning social unrest in the country, the provision of a safe working environment for all AKK Pipeline Project development phases, from definitional studies, through FEED to handover for operation, should be assured by the government. The alternative to this is the introduction of private armies. To minimize social resistance to the project and its necessary land take for construction, the consultation process should be undertaken as soon as the pipeline route within the present corridor has been narrowed to, say 500 meters width. Consultation should be open and transparent, and supported by comprehensible publicity material, roadshows, village meetings etc. Compensation should be clearly stated and offered, and should represent a fair value for land taken out of agriculture, whether temporarily or permanently. Wherever possible, land should be returned to agriculture following pipeline construction, with necessary restriction on buildings and large economic trees.

No desirable economic activity comes without diseconomies and adverse impact on the environment. The attendant increase in economic activities will always involve a disruption of the natural habitat and ecosystem. The noise level will increase the weather change, the air and underground water polluted, amongst other diseconomies.

Some of the mitigating measures being proposed by the project sponsors, NNPC for containing the adverse



impact of the project consist of providing some basic infrastructure such as electricity and water supply, access roads, primary health center, and giving concessions to the host community in employment, award of contracts, scholarships and training programmes. Other measures include regularly liaising with the host communities on programmes of action before problems arise, carrying the local communities along throughout lifespan of the project. These are in addition to establishment of such permanent monitoring and intervention departments with responsibility for Community Relations, Waste Management and Social Management plan.

## IMPLEMENTATION RECOMMENDATION

### Project Delivery and Management

#### Contract Structure - Build and Transfer

The establishment of the AKK Pipeline project will be Build and Transfer (BT) form of PPP programme. The process of engagement of the private partners will be through open and transparent process. The two parties will agree on a mutually acceptable condition.

#### Contract Monitoring

Monitoring and evaluation of the AKK Pipeline project at an agreed Stage Gates or Milestones for compliance will be undertaken by an independent Consultant appointed by NNPC. Project Advisors need to be retained by NNPC to monitor both construction and operation of the facilities to ensure value for money is achieved. Strategies for improvement of operations and expansion will be mutually agreed upon by the two parties.

#### Project Team and Governance

A project management and governance arrangements that will be sufficiently robust to deliver this project within the timetable would be put in place. The project team structure will be manned by qualified personnel with extensive experience of managing major projects of this nature.

#### Project Governance

According to NNPC the financing and governance structure for the project would require the EPC Contractor to raise adequate funds to finance the AKK project to meet up with the project execution schedule. The Terms of repayment such as tenor, cost of finance, and fees to be agreed with NNPC will be contained in a Contract Financing Agreement to be executed by the Project Financier (EPC Contractor) and the Project Sponsor (NNPC).

For accounting purposes and in order to ensure transparency and control, NNPC will open a Project Disbursement Account (PDA). The Contractor must fund the PDA to cover any work scope approved by NNPC within a specific period. The bank will be given a standing mandate to sweep, within a stipulated time, any deposited amount by the Contractor into the AKK Project Construction Account.

Any AKK Project Construction Account will be under the joint control of both NNPC and the Contractor and will be the source of payment for the AKK Project execution works. The repayment of the principal sum will commence upon satisfactory completion and delivery of the AKK project to the Project Sponsor. A schedule of debt repayment (including interest amount) will be negotiated and agreed (six-month LIBOR + Margin) by both NNPC and the Contractor based on terms to be included in the Contract Financing Agreement.

#### Project Implementation/Contracting Strategy

In order to make up for lost time and optimize the project completion schedule, it was considered expedient to adopt the model of assigning the project execution to multiple EPC Contractors for the following reasons:

- It reduces dependence on a single contractor and enhances competition.
- A faster overall completion schedule resulting from parallel processing of the construction in segments will result in early revenue generation and shorter payback period.

- Considering that this is a priority and strategic developmental project, early completion and commissioning will be beneficial to the Nigerian Economy (e.g. through gas to power, and gas based industries).
- Segmentation is also an advantage by allowing for local resources such as Nigerian financial institutions and suppliers to participate and benefit from the project.

The use of multiple Contractors naturally carries interface risks for NNPC which will need to be addressed and properly managed, but this risk can be mitigated through use of a well-designed interface plan and careful project management. It may also have a price impact although this is likely to be marginal, given that the pipeline segments are still significant and as such, economies of scale still apply.

In addition, from a technical point of view, the gas pipeline is naturally segmented into three (3) segments, with each segment starting and ending at a Terminal Gas Station as shown in the table below.

**Table 8: Segmentation of AKK Gas Pipeline**

LOT	Pipeline Segment	TGS Point Size	Diameter/Length
SEGMENT A	Ajaokuta MS/TGS - Abuja PS	N/A	40" x 200Km
	Ajaokuta TGS	305 x 200m	
SEGMENT B	Abuja PS - Kaduna TGS	N/A	40" x 193Km
	Abuja TGS	305 x 200m	
SEGMENT C	Kaduna TGS - Zaria PS - Kano TGS	N/A	40" x 221Km
	Kano TGS	305 X 200m	
	Kaduna TGS	305 x 200m	

## Project Schedule

The project implementation schedule was originally planned to be Thirty-Six (36) months. In addition to segmenting the scope into three separate Lots, and awarding the development of the three Lots to three separate EPC Contractors. This development necessitated compressing the implementation schedule to Twenty-four (24) months. The compression of the schedule was informed by the need to fast-track the project.

The segmentation into Three (3) Lots was also informed by the need to address the inherent risk in awarding the development of a critical national infrastructure to a single EPC Contractor.

*Table 9: Proposed Project Timetable*

Task	Date
FID	30/07/ 2017
Project Kick Off	30/8/2017
Construction Period	30/8/2017 - 30/08/2019

## CONCLUSION

The project is technically feasible and commercially viable, with a very strong liquidity position, sufficient to repay the principal and interest and still leave enough to adequately compensate the promoters.

This project is expected to be financed through a PPP arrangement whereby a suitably qualified organization, selected through an internationally competitive bidding process, will build and transfer the AKK pipelines to NNPC for eventual operations. The PPP partner is expected to recover his investment, operating and maintenance costs from token user charges.

A projected financial summary of the projects including key ratios is presented in Table 1 above.

## Appendix 1: Profile of Alpine Investments



Alpine Investment Services Limited is a leading Project Facilitation and Project Management, Consulting and Advisory firm.

- The firm has extensive experience with end-to-end realization of large-scale projects, from project conceptualization all the way through to project commissioning; with particular expertise in the Oil & Gas, Power, Infrastructure and Real Estate sectors.
- The leadership of Alpine has longstanding public and private sector experience, including at CEO and board-level, both in Nigeria and internationally, which assists the firm in understanding the needs and requirements of a broad range of clients.
- A deep and extensive network of domestic and international partners.
- Broad relationships, working experience with, and knowledge of local and international specialized technical and professional service providers.
- A highly qualified and technically strong team that combines extensive experience with youth and dynamism.

### Multi-Disciplinary Technical Expertise & Experience

Our team possesses strong technical expertise across a number of areas relevant to the AKK Pipeline Project, including:

- Project Managers with expertise in supervising, coordinating and managing all aspects of large-scale engineering and/or construction projects;
- Highly experienced and qualified Gas Pipeline Engineers, including Mechanical, Civil, Electrical, Instrumentation & Controls and HSE experts;
- Expertise in Structuring, Evaluating and Negotiating complex contracts, including EPC and EPCM Contracts, Project Management Consultancy Contracts, Engineering Services Contracts, Gas Transmission Agreements, Gas Supply Agreements, Power Purchase Agreements, Operation and Maintenance Contracts, Technical Service Agreements and related agreements;
- Risk Management expertise across the range of Project and Process Risks;
- Project Finance and Accounting expertise, including creating and establishing Project Finance and Accounting Reporting & Control mechanisms; Claims Assessment and Verification, Payment and Disbursement structures, and Project Financial Flow Architecture and Payment Systems.

## Project Finance Structuring

- Experience has demonstrated that many technically sound projects fail to materialize due to not being bankable. This means that commercial considerations and appropriate security for providers of finance must be embedded into planning from the conceptualization of a project.
- Alpine has from inception integrated Project Finance Structuring as one of its core capabilities, which enables us to provide added value to our Project Sponsor clients.
- We have deep experience of Project Finance Structuring as applied to various types of Private-Public Partnership arrangements, including Build and Transfer and/or Contractor Financed Projects; as well as Concession Arrangements such as BOT, BOO and IA (Implementation Agreements)
- Given that the proposed approach for the AKK Project in the first instance, is a Build and Transfer model with 100% EPC Project Finance Bank Financing, it is essential to appropriately structure the Project and the associated Financing to optimize value while maintaining flexibility for NNPC.
- The extent of recourse to NNPC is to be minimized (with security to be limited to Project revenue streams and assets in the first instance). Non-recourse structures are a key element of Project Finance structuring, and as such, we will deploy our capabilities and experience to build a robust structure that seeks to minimize recourse to NNPC while arranging any FGN support that will strengthen NNPC's ability to secure and/or improve Financing Terms.
- We have deep expertise in ensuring that the Technical, Legal, Commercial and Financial structures that encompass Projects are such that they work within existing Legislation, Regulation and Policy, while ensuring that they maintain or enhance attractiveness of Projects to potential Equity Investors either at inception or after Project kick-off (if desired by NNPC), to allow for pay-down of some debt principal by replacement with Equity over time to achieve a more optimal capital structure.
- In the case of the AKK Project, this will also allow for Expansion Financing for the Pipeline to come from future cash flows from the Project as opposed to new debt.

## INTRODUCTION TO ALPINE

Alpine is backed by a distinguished board of highly qualified and experienced directors who bring a wealth of local and global expertise.

**Apostle (Dr.) Hayford Alile – Chairman:** is a graduate of Howard University Washington DC in 1968, and also holds an MBA from Rutgers University. He has a corporate career that has spanned over four decades, beginning in the United States, before coming back to Nigeria to help set up the Consultancy Development unit of the Centre for Management Development in Lagos. He was the Director General of the Nigerian Stock Exchange for over a decade, and a founder of the African Stock Exchanges Association. He is a highly respected elder statesman and serves on the board of several organizations and institutions.

**Mohammed Hayatu-deen – CEO:** is a graduate of Ahmadu Bello University and has attended Advanced Management Programs at Harvard Business School, London Business School and INSEAD. He has almost 40 years of experience as an economist, banker and project sponsor and developer. He started his career working in principal investments and project finance at the Northern Nigeria Development Corporation (“NNDC”) –owned by the Northern States of the country- which at the time was Nigeria’s largest industrial holding company, with investments across a range of industries. He rapidly rose to the position of Group Chief Executive of NNDC. He was subsequently appointed to head FSB International Bank- previously the moribund Federal Savings Bank: with a mandate to turnaround and transform the institution into a viable and profitable commercial bank, a task he achieved outstandingly. He was Chairman and CEO of FSB International Bank for 14 years. He has also served on the Board of Directors of numerous companies, including PZ Cussons, Seven-Up Bottling, Capital Alliance, Virgin Nigeria and Inlaks Computers. Mallam Hayatu-deen is also a past Chairman of the Nigerian Economic Summit Group – Nigeria’s leading economic think tank.

**Munis Sobande – Director:** is a graduate of Mechanical Engineering from the University of Wales, Swansea. He worked with Shell Petroleum for 35 years in varying capacities, beginning as a Wells Operations Engineer and rising through the ranks before retiring as Head, Corporate Planning and Economics, Shell Nigeria. During his time at Shell, Munis also worked in Europe, the Middle East and Asia.

**Chief Samuel O Bolarinde – Director:** is a graduate of Industrial Chemistry from John Dalton College in the UK. He also has a Master Degree in Materials Engineering from the University of Surrey. He rose through the ranks at Vitafoam Nigeria Plc (then a Unilever Company) from a trainee manager to CEO in 2002. He retired from the company after over 30 years of service. He is also a past Chairman of the Board of Vitafoam and the recipient of a number of honorary awards

**Ballama Manu – Director:** is a graduate of Accountancy from Ahmadu Bello University, Zaria and holds a Master of Science in Accounting and Finance from the London School of Economics. He started his career at the Bank of the North Limited, then joined New Nigeria Development Company, subsequently working at International Merchant Bank Plc, and as Executive Director at the Nigerian Deposit Insurance Corporation (“NDIC”). He retired from Union Bank Plc after serving as Executive Director for seven years. Ballama also served as the Executive Chairman of the Federal Inland Revenue Service (“FIRS”).

**Henry Okolo – Director:** is a graduate of Accountancy from the University of Nigeria, Nsukka. He is a fellow of both the Chartered Association of Certified Accountants and the Institute of Chartered Accountants of Nigeria He was the Group Managing Director of UTC Nigeria Plc and CEO of Nigeria Aluminum.

**Ike E. Okeke – COO:** is a graduate of Law of the University of Nigeria, Nsukka. He holds a Master Degree in International Law and Diplomacy and is an MBA alumnus of ESUT Business School. He was the head of the Legal Department of FSB International Bank Plc, and has over 20 years of experience in structuring deals across various industries, with a specialization in Oil & Gas.

**China Onyemelukwe: Head of Advisory & Consulting Services Practice:** was most recently Managing Director responsible for Sub-Saharan Africa coverage in the Investment Banking Division (IBD) of Goldman Sachs International. He originally joined Goldman Sachs as Head of Africa in the Securities Division, before moving to IBD. He earlier worked at Merrill Lynch in

New York and London in Energy and Natural Resources. Following Merrill Lynch, he joined an international energy project sponsorship firm as head of Project Development and Management. He subsequently was recruited to return to Nigeria as the pioneer Managing Director/CEO of Zenith Capital in 2006, leaving to join Goldman Sachs in 2011. China began his career in 1986 at Chase Merchant Bank in Nigeria, and has extensive experience in the Oil & Gas, Power and Infrastructure sectors -both globally and in Nigeria- in Project Sponsorship and Execution, Project Transaction Advisory Processes; Bid Evaluation and Negotiation; Contractor and Consultant/Service Provider Selection, and in Project Structuring and Financing. He holds a Bachelor's Degree in Economics & Statistics from the University of Benin; a Masters in International Accounting & Finance with a minor in Petroleum Economics from the London School of Economics in the United Kingdom; and a Master's in Business Administration (MBA) from Harvard Business School in Boston, USA, with a specialization in Project Management, Technology and Operations Management.



## Appendix 2: Assumptions

The following assumptions were made in preparing the projected financial statements in this OBC”

### 1. Key Input parameter

<b>Project Implementation</b>	
Project Kick Off Date	31 <sup>st</sup> August 2017
Implementation Period	24 years
Months in the Year	12 months
Average Days in the month	30 days
Construction Period	24 months
Construction end Date	31 <sup>st</sup> August 2019
Pipeline Capacity (MMscfd)	5000
Gas Price Tariff (US\$/MMscfd)	0.8
Fixed Operating Cost	2% of Capex
Variable Operating Cost(US\$/MMscfd)	0.35
<b>Taxation</b>	
Corporate Tax	30%
Education Tax	2%
<b>Allowances</b>	
Investment Allowance	15%
Annual Allowance	90%
<b>Additional Investment Allowances</b>	
Alternative to Pioneer	35%
In addition to Pioneer	15
Project Equity	0%
<b>Capitalization Uses (US\$)</b>	

Project Expenditure	2,911,080,000
Interest during Construction	609,026,325
Dividend	0%

## 2. Sensitivity Analysis

Scenario	Gas Supply	Gas Price Tariff (US\$/Mmscfd)	Network Charge (% of Revenue)	Fixed Opex (%of Capex)	Variable Opex (US\$/Mmscfd)
Worst Case		0.6	20%	1.5%	0.29
Base Case		0.8	25%	2.0%	0.35
Best Case		1.00	30%	2.5%	0.45

Note: The Base case was used in developing the financial statement.

## 3. Financing Strategy

In addition, the following were used in making the evaluation:

- Contractor financed;
- A 3 years' moratorium on both Interest and Principal expected;
- The Construction loan has a 15 tenor;
- Repayment would commence in Year 4 of the Contract on a semi-annual basis;
- Use of China Export & Credit Insurance Corporate (Sinasure) for Credit Insurance will attract an additional 7% interest per annum, this was Sinasure's indicative premium for Nigeria as at May 15, 2017 ; (Source: SINOSURE Export Special Insurance Underwriting Department Indicative Estimate subject to full project and contract terms & conditions);
- 6 month London Interbank Offered Rate ("LIBOR") rate of 1.42267% per annum as at May 15, 2017 was used (Source: Reuters/BBA);
- The USD Swap Interest Rate Curve (which shows USD Swap interest rates from 6 months to 50 years and is the global benchmark for determining USD interest rates for any institution/country) as at May 15, 2017 was used (Source: Bloomberg);
- The Nigerian FGN USD Eurobond Z-Spread (i.e. the interest rate differential between the Nigerian FGN Eurobond and the USD Swap Curve above) as at May 15, 2017; (Source: Bloomberg) of 5.283% per annum was added to the USD Swap Interest Rate Curve to produce the equivalent Nigerian FGN USD Eurobond interest rate from Six (6) months to Fifteen (15) Years. This is the appropriate interest rate to use for purposes of discounting, as it represents the directly relevant market benchmark for Nigerian FGN USD debt.
- The discount rates thus obtained were used to discount the relevant Debt Service payments for each Six (6) month period during the repayment period.
- The sum of the discounted Debt Service payments equals the Present Value of the Debt Service (Financing Cost) for the AKK Pipeline Project.

**Appendix 3: Risk Identification, Allocation & Mitigation**

RISK CATEGORY	RISK IDENTIFICATION	RISK ALLOCATION	RISK MITIGATION
<b>Country Political, Economic and Country risks</b>	<ul style="list-style-type: none"> <li>• Non-payment and Currency Inconvertibility</li> <li>• Confiscation, Expropriation and Nationalization</li> <li>• War and Civil Disturbance</li> <li>• Breach of Contract</li> </ul>	NNPC	<p>(a) Private Insurers: (i) Subject to availability (“on-cover”, tenor and price) (ii) Events clearly defined; and (iii) Damages easily measured.</p> <p>(b) DFI’s/ECA’s: DFI participation assists in overall project bankability; and ECA’s insure against payment risk under PRI events</p>
<b>Land Acquisition</b>	Title to Land	NNPC	<p>(a) Timely provision of land for construction and installation of facilities and systems should be made a condition precedent to the Contractor Finance/O&amp;M Contract.</p> <p>(b) For delays relating to consents, approvals, clearances, NNPC should grant/secure necessary permissions as early as possible within a specified time.</p> <p>(c) On delay, the concession period should be extended by an equal period.</p>
<b>Delays in Project Development</b>		Private Sector Partner	<p>(a) Arranging finance during the project development phase to ensure timely availability of funds to meet development expenditure.</p> <p>(b) Employing consultants with the correct management skills.</p> <p>(c) Employing lawyers with the requisite expertise soon after the project is conceptualized.</p> <p>(d) Sensitizing government/NNPC to the number, type and timing of government approvals much in the advance of the requirement for the approvals.</p> <p>(e) Incorporating the concerns of the lenders and potential equity investors in project structure and legal documentation prior to</p>

			approaching the market for funds.
<b>Project Completion Risk</b>		Private Sector Partner	<ul style="list-style-type: none"> <li>(a) This risk should be mitigated through a provision under Concession Contract (CC).</li> <li>(b) The CC with the EPC Contractor to include turnkey, fixed price design and construction contract with payments made on reaching certain milestones.</li> <li>(c) Contractor to pay Liquidated Damages for delay during construction.</li> <li>(d) Independent Project Management Company to review and monitor progress.</li> </ul>
<b>Project Cost/Cost overruns</b>		Private Sector Partner	<ul style="list-style-type: none"> <li>(a) The detailed Project Report should be made specifying in detail, the cost estimate for various sub-components of the project on the basis of which the EPC bids should be invited</li> <li>(b) Additionally, adequate contingency provision and insurance cost for unforeseen circumstances should be built onto the project.</li> <li>(c) Strict construction monitoring by the Independent Project Management Company.</li> </ul>
<b>Technology</b>		Private Sector Partner	<ul style="list-style-type: none"> <li>(a) The project has been designed after a comprehensive analysis of the local conditions.</li> <li>(b) The construction supervision will be carried out with strict penalties for non-compliance of the technical design by the Contractor.</li> <li>(c) The cost of rectifying such non-compliance would be borne by the Contractor.</li> <li>(d) The Contractor will provide a performance bond with a validity of 12 months (defects liability period) after project commissioning to take care of any construction lacunae that may be detected during the initial phase of the project operations.</li> </ul>

<b>Regulatory and Administrative</b>	Discriminatory Laws, Right to Build, Approvals, Operating Interfaces	NNPC	<p>(a) Debt service reserves: Maintenance of cash reserves aggregating to one year's debt service reserve requirement for the next year to ensure that any temporary shortfall of revenues due to non-increase of tariffs does not adversely impact debt servicing in the short run.</p> <p>(b) Extension of Concession Period: In the event of chronic delays in the tariff reviews adversely affecting the achievement of the designated return on the project, the Concession Agreement should provide for extension of the concession period till the designated return is achieved.</p>
<b>Commercial Risk</b>	Demand	NNPC	<p>(c) The demand estimates have been made as conservatively as possible. Since actualization of demand in line with estimates is a key economic risk that the project participants would bear.</p> <p>(d) The Concession Agreement should also provide for an extension period of two years each, till designated returns are achieved.</p>
<b>Operations and Maintenance Risk</b>		NNPC	<p>(a) Although NNPC will be responsible for O&amp;M, it is recommended that the selection of O&amp;M operator will be on the basis of a competitive bidding. The selection criteria should take into account of all past record, fiduciary responsibility exhibited in other assignments, financial strength, etc.</p> <p>(b) The O&amp;M Contract should provide for a fixed and a variable fee, which could be based upon the O&amp;M requirements set forth in the Concession Agreement.</p> <p>(c) O&amp;M Contract is a fixed price contract, with the risk of cost overruns to be borne by the O&amp;M Contractor.</p>
<b>Financial Risk</b>			
(a) Interest Rate Risk		EPC Contractor	The project should be financed on an optimal mix of fixed rate and floating rate instruments, to hedge against interest rate movement risk

(b) Foreign Exchange Exposure		EPC Contractor	(a) Tariff adjustment permitted under the Concession Agreement. (b) Foreign debt will be kept to a minimum and swapped with a Naira debt to the extent possible.
(c) Inflation Risk		EPC Contractor	Tariff to be adjusted for inflation during operations as per the formulae given in the Concession Agreement
(d) Gas Supply Risk		NNPC	Tariff to be adjusted for inflation during operations as per the formulae given in the Concession Agreement
(e) Demand Risk		NNPC	Tariff to be adjusted for inflation during operations as per the formulae given in the Concession Agreement
<b>Termination Risk</b>		EPC Contractor /NNPC	Compensation Package should be structured in the case of Termination of the Concession Agreement, with in-built disincentives for any contracting party to seek termination on frivolous grounds.
<b>Force Majeure</b>		EPC Contractor /NNPC	(a) Comprehensive insurance coverage must be put in place for the Concession period. (b) In force Majeure risks of types which are not insurable, the investor should get a yield of a certain percentage on equity on the day of termination
(a) <b>Events of War</b>		EPC Contractor /NNPC	The Concession Agreement should also provide for a relief to each affected party from its respective obligations included payment of Liquidated Damages.
(b) <b>Nationalization or Revocation</b>		Private Sector Partner/NNPC	The Concession Agreement should provide for Termination in case of certain politically motivated events affecting the project. In such a scenario, the compensation payable by government for transfer of project assets should at least be equal to the outstanding dues to the project lenders, thereby fully protecting the lenders.

(c) Social Risk		Private Sector Partner/NNPC	Appropriate insurance package should be designated that provide adequate cover against these risks
(d) Security Risk		Private Sector Partner/NNPC	Appropriate insurance package should be designated that provide adequate cover against these risks

**Appendix 4: 15-Year Projected Cash flow Statement**

US\$'000

Months	12.00														
Period start	31-Aug-17	31-Aug-18	31-Aug-19	31-Aug-20	31-Aug-21	31-Aug-22	31-Aug-23	31-Aug-24	31-Aug-25	31-Aug-26	31-Aug-27	31-Aug-28	31-Aug-29	31-Aug-30	31-Aug-31
Period end	31-Aug-18	31-Aug-19	31-Aug-20	31-Aug-21	31-Aug-22	31-Aug-23	31-Aug-24	31-Aug-25	31-Aug-26	31-Aug-27	31-Aug-28	31-Aug-29	31-Aug-30	31-Aug-31	31-Aug-32
Days in a period	365	365	366	365	365	365	366	365	365	365	366	365	365	365	366
Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032

**Statement of Cash Flows**

Profit Before Tax	-	-	271,645	241,991	222,563	211,035	211,130	210,873	212,102	215,224	217,189	205,317	202,237	203,005	204,977
<b>Add back/(deduct)</b>															
Depreciation	-	-	115,954	139,145	139,145	139,145	139,145	139,145	139,145	139,145	139,145	139,145	139,145	139,145	139,145
net Interest	-	-	128,258	288,927	310,729	310,729	310,729	310,729	310,729	310,729	310,729	310,729	310,729	310,729	310,729
Taxes paid	-	-	-	-	-	(24,519)	(42,015)	(42,088)	(42,368)	(42,662)	(41,929)	(41,120)	(41,020)	(41,196)	(41,157)
	-	-	<b>515,857</b>	<b>670,063</b>	<b>672,437</b>	<b>636,389</b>	<b>618,988</b>	<b>618,659</b>	<b>619,608</b>	<b>622,436</b>	<b>625,134</b>	<b>614,071</b>	<b>611,091</b>	<b>611,683</b>	<b>613,694</b>
Change in working capital															
(Increase)/Decrease in inventory	-	-	(102,464)	(9,082)	(1,484)	(2,196)	619	132	247	672	(347)	(2,344)	391	-	-
(Increase)/Decrease in Trade and Other receivables	-	-	(117,102)	(6,898)	-	-	-	-	-	-	-	-	-	-	-
Increase/(Decrease) in Trade and Other Payables	-	-	56,787	4,541	742	1,098	(309)	(66)	(124)	(336)	174	1,172	(195)	-	-
Change in working capital	-	-	(162,779)	(11,439)	(742)	(1,098)	309	66	124	336	(174)	(1,172)	195	-	-
<b>Net cash generated from operations</b>	-	-	<b>353,078</b>	<b>658,624</b>	<b>671,695</b>	<b>635,291</b>	<b>619,298</b>	<b>618,725</b>	<b>619,732</b>	<b>622,772</b>	<b>624,960</b>	<b>612,900</b>	<b>611,286</b>	<b>611,683</b>	<b>613,694</b>
<b>Investing Cash Flows</b>															
Fixed Asset Acquisition	(2,085,774)	(1,600,793)	(214,162)	0	(0)	0	(0)	(0)	(0)	0	(0)	0	0	0	0
Disposals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Net cash (from)/to Investments</b>	<b>(2,085,774)</b>	<b>(1,600,793)</b>	<b>(214,162)</b>	<b>0</b>	<b>(0)</b>	<b>0</b>	<b>(0)</b>	<b>(0)</b>	<b>(0)</b>	<b>0</b>	<b>(0)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Financing Cash Flows</b>															
Equity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bank Debt	2,085,774	1,600,793	342,427	8,767	(233,992)	(213,193)	(192,393)	(171,594)	(150,795)	(129,996)	(109,196)	(88,397)	(67,598)	(46,798)	(25,999)
Net Interest Expense	-	-	(128,258)	(288,927)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)
Dividends paid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Share Capital (increase)/Release (Restricted Cash)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Net cash flows from/(to) financing</b>	<b>2,085,774</b>	<b>1,600,793</b>	<b>214,162</b>	<b>(280,160)</b>	<b>(544,721)</b>	<b>(523,921)</b>	<b>(503,122)</b>	<b>(482,323)</b>	<b>(461,524)</b>	<b>(440,724)</b>	<b>(419,925)</b>	<b>(399,126)</b>	<b>(378,326)</b>	<b>(357,527)</b>	<b>(336,728)</b>
<b>Net Cash Flows</b>	<b>0</b>	<b>(0)</b>	<b>353,078</b>	<b>378,464</b>	<b>126,974</b>	<b>111,369</b>	<b>116,176</b>	<b>136,402</b>	<b>158,208</b>	<b>182,048</b>	<b>205,035</b>	<b>213,774</b>	<b>232,960</b>	<b>254,156</b>	<b>276,966</b>
Opening Cash and Cash Equivalents	-	0	-	353,078	731,542	858,516	969,886	1,086,062	1,222,463	1,380,671	1,562,719	1,767,754	1,981,528	2,214,487	2,468,643
Net Cash Flows	0	(0)	353,078	378,464	126,974	111,369	116,176	136,402	158,208	182,048	205,035	213,774	232,960	254,156	276,966
<b>Closing cash and cash equivalents</b>	<b>0</b>	<b>-</b>	<b>353,078</b>	<b>731,542</b>	<b>858,516</b>	<b>969,886</b>	<b>1,086,062</b>	<b>1,222,463</b>	<b>1,380,671</b>	<b>1,562,719</b>	<b>1,767,754</b>	<b>1,981,528</b>	<b>2,214,487</b>	<b>2,468,643</b>	<b>2,745,609</b>



## Appendix 5: 15-Year Projected Income Statement

US\$'000	Months	12.00														
	Period start	31-Aug-17	31-Aug-18	31-Aug-19	31-Aug-20	31-Aug-21	31-Aug-22	31-Aug-23	31-Aug-24	31-Aug-25	31-Aug-26	31-Aug-27	31-Aug-28	31-Aug-29	31-Aug-30	31-Aug-31
	Period end	31-Aug-18	31-Aug-19	31-Aug-20	31-Aug-21	31-Aug-22	31-Aug-23	31-Aug-24	31-Aug-25	31-Aug-26	31-Aug-27	31-Aug-28	31-Aug-29	31-Aug-30	31-Aug-31	31-Aug-32
	Days in a period	365	365	366	365	365	365	366	365	365	366	365	365	365	365	366
	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
<b>Income Statement</b>																
Revenues	-	-	1,093,808	1,432,854	1,460,000	1,460,000	1,464,000	1,460,000	1,460,000	1,460,000	1,464,000	1,460,000	1,460,000	1,460,000	1,460,000	1,464,000
Less+: Existing Network Charge	-	-	(43,744)	(57,314)	(58,400)	(58,400)	(58,560)	(58,400)	(58,400)	(58,400)	(58,400)	(58,560)	(58,400)	(58,400)	(58,400)	(58,560)
Less Production Costs	-	-	(478,454)	(638,813)	(662,499)	(674,028)	(677,773)	(674,189)	(672,960)	(669,839)	(671,714)	(679,745)	(682,826)	(682,057)	(683,926)	
Variable Operating Expenses	-	-	(55,553)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	(66,664)	
Fixed Operating Expenses	-	-	(534,007)	(705,476)	(729,163)	(740,692)	(744,437)	(740,853)	(739,624)	(736,502)	(738,377)	(746,409)	(749,490)	(748,721)	(750,590)	
<b>Total Production Costs</b>	-	-														
<b>EBITDA</b>	-	-	<b>515,857</b>	<b>670,063</b>	<b>672,437</b>	<b>660,908</b>	<b>661,003</b>	<b>660,747</b>	<b>661,976</b>	<b>665,098</b>	<b>667,063</b>	<b>655,191</b>	<b>652,110</b>	<b>652,879</b>	<b>654,850</b>	
Less Depreciation and Amortisation	-	-	(115,954)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	(139,145)	
Depreciation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Amortisation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Total D&amp;A</b>	-	-	<b>(115,954)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	<b>(139,145)</b>	
<b>EBIT</b>	-	-	<b>399,903</b>	<b>530,918</b>	<b>533,292</b>	<b>521,764</b>	<b>521,859</b>	<b>521,602</b>	<b>522,831</b>	<b>525,953</b>	<b>527,918</b>	<b>516,046</b>	<b>512,966</b>	<b>513,734</b>	<b>515,705</b>	
Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Interest Expense (cash)	-	-	-	(155,364)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	
Interest expense (accrued)	-	-	(128,258)	(133,563)	-	-	-	-	-	-	-	-	-	-	-	
Commitment Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Annual Maintenance Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Interest Expenses	-	-	(128,258)	(288,927)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	(310,729)	
<b>net Interest</b>	-	-	<b>(128,258)</b>	<b>(288,927)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	<b>(310,729)</b>	
<b>EBT</b>	-	-	<b>271,645</b>	<b>241,991</b>	<b>222,563</b>	<b>211,035</b>	<b>211,130</b>	<b>210,873</b>	<b>212,102</b>	<b>215,224</b>	<b>217,189</b>	<b>205,317</b>	<b>202,237</b>	<b>203,005</b>	<b>204,977</b>	
Income Taxes	-	-	-	-	-	(23,352)	(35,010)	(35,084)	(35,333)	(35,568)	(34,842)	(34,241)	(34,189)	(34,346)	(34,281)	
Education Taxes	-	-	-	-	-	(4,670)	(7,002)	(7,017)	(7,067)	(7,114)	(6,968)	(6,848)	(6,838)	(6,869)	(6,856)	
<b>Corporate taxes</b>	-	-	-	-	-	<b>(28,022)</b>	<b>(42,012)</b>	<b>(42,100)</b>	<b>(42,399)</b>	<b>(42,681)</b>	<b>(41,810)</b>	<b>(41,089)</b>	<b>(41,027)</b>	<b>(41,216)</b>	<b>(41,137)</b>	
<b>Net Income</b>	-	-	<b>271,645</b>	<b>241,991</b>	<b>222,563</b>	<b>183,013</b>	<b>169,117</b>	<b>168,773</b>	<b>169,703</b>	<b>172,543</b>	<b>175,379</b>	<b>164,228</b>	<b>161,210</b>	<b>161,790</b>	<b>163,840</b>	

## Appendix 6: 15-Year Projected Statement of Financial Position

US\$'000	Months	12.00														
	Period start	31-Aug-17	31-Aug-18	31-Aug-19	31-Aug-20	31-Aug-21	31-Aug-22	31-Aug-23	31-Aug-24	31-Aug-25	31-Aug-26	31-Aug-27	31-Aug-28	31-Aug-29	31-Aug-30	31-Aug-31
	Period end	31-Aug-18	31-Aug-19	31-Aug-20	31-Aug-21	31-Aug-22	31-Aug-23	31-Aug-24	31-Aug-25	31-Aug-26	31-Aug-27	31-Aug-28	31-Aug-29	31-Aug-30	31-Aug-31	31-Aug-32
	Days in a period	365	365	366	365	365	365	366	365	365	366	366	365	365	365	366
	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
<b>Statement of Financial Position</b>																
<b>Property Plant and Equipment</b>																
Total Construction in Progress	2,085,774	3,686,567	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction Costs	-	-	2,814,044	2,697,601	2,581,158	2,464,714	2,348,271	2,231,828	2,115,385	1,998,942	1,882,498	1,766,055	1,649,612	1,533,169	1,416,726	
Interest During Construction	-	-	548,624	525,922	503,221	480,519	457,817	435,116	412,414	389,712	367,011	344,309	321,607	298,906	276,204	
Total Property Plant and Equipment	-	-	3,362,668	3,223,523	3,084,378	2,945,233	2,806,089	2,666,944	2,527,799	2,388,654	2,249,509	2,110,364	1,971,219	1,832,074	1,692,929	
<b>Total Fixed Assets</b>	<b>2,085,774</b>	<b>3,686,567</b>	<b>3,362,668</b>	<b>3,223,523</b>	<b>3,084,378</b>	<b>2,945,233</b>	<b>2,806,089</b>	<b>2,666,944</b>	<b>2,527,799</b>	<b>2,388,654</b>	<b>2,249,509</b>	<b>2,110,364</b>	<b>1,971,219</b>	<b>1,832,074</b>	<b>1,692,929</b>	
<b>Current Assets</b>																
Unrestricted	0	-	353,078	456,582	593,956	715,725	842,300	989,102	1,157,709	1,350,157	1,565,591	1,789,765	2,033,124	2,297,679	2,585,045	
Restricted Cash	-	-	-	274,960	264,561	254,161	243,761	233,362	222,962	212,562	202,163	191,763	181,363	170,964	160,564	
Cash	0	-	353,078	731,542	858,516	969,886	1,086,062	1,222,463	1,380,671	1,562,719	1,767,754	1,981,528	2,214,487	2,468,643	2,745,609	
Inventory	-	-	102,464	111,546	113,030	115,227	114,608	114,476	114,228	113,556	113,903	116,247	115,856	115,856	115,856	
Receivables	-	-	117,102	124,000	124,000	124,000	124,000	124,000	124,000	124,000	124,000	124,000	124,000	124,000	124,000	
<b>Total Current Assets</b>	<b>0</b>	<b>-</b>	<b>572,645</b>	<b>967,088</b>	<b>1,095,546</b>	<b>1,209,112</b>	<b>1,324,669</b>	<b>1,460,939</b>	<b>1,618,900</b>	<b>1,800,275</b>	<b>2,005,657</b>	<b>2,221,775</b>	<b>2,454,344</b>	<b>2,708,500</b>	<b>2,985,465</b>	
<b>Total Assets</b>	<b>2,085,774</b>	<b>3,686,567</b>	<b>3,935,313</b>	<b>4,190,612</b>	<b>4,179,925</b>	<b>4,154,346</b>	<b>4,130,758</b>	<b>4,127,883</b>	<b>4,146,698</b>	<b>4,188,929</b>	<b>4,255,166</b>	<b>4,332,139</b>	<b>4,425,563</b>	<b>4,540,574</b>	<b>4,678,395</b>	
<b>Current Liabilities</b>																
Trade and other payables	-	-	56,787	61,328	62,070	63,169	62,859	62,793	62,669	62,333	62,507	63,679	63,483	63,483	63,483	
Short term loans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Taxes Payable	-	-	-	-	-	3,503	3,500	3,512	3,544	3,563	3,445	3,414	3,421	3,441	3,421	
<b>Total Current Liabilities</b>	<b>-</b>	<b>-</b>	<b>56,787</b>	<b>61,328</b>	<b>62,070</b>	<b>66,671</b>	<b>66,359</b>	<b>66,306</b>	<b>66,213</b>	<b>65,897</b>	<b>65,952</b>	<b>67,093</b>	<b>66,905</b>	<b>66,925</b>	<b>66,905</b>	
<b>Long Term Liabilities</b>																
Bank Loan	2,085,774	3,686,567	4,028,994	4,037,761	3,803,769	3,590,576	3,398,183	3,226,589	3,075,794	2,945,798	2,836,602	2,748,205	2,680,607	2,633,809	2,607,810	
Directors' Loan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Total Long Term Liabilities</b>	<b>2,085,774</b>	<b>3,686,567</b>	<b>4,028,994</b>	<b>4,037,761</b>	<b>3,803,769</b>	<b>3,590,576</b>	<b>3,398,183</b>	<b>3,226,589</b>	<b>3,075,794</b>	<b>2,945,798</b>	<b>2,836,602</b>	<b>2,748,205</b>	<b>2,680,607</b>	<b>2,633,809</b>	<b>2,607,810</b>	
<b>Total Liabilities</b>	<b>2,085,774</b>	<b>3,686,567</b>	<b>4,085,781</b>	<b>4,099,089</b>	<b>3,865,839</b>	<b>3,657,247</b>	<b>3,464,542</b>	<b>3,292,894</b>	<b>3,142,007</b>	<b>3,011,695</b>	<b>2,902,553</b>	<b>2,815,297</b>	<b>2,747,512</b>	<b>2,700,733</b>	<b>2,674,715</b>	
<b>Shareholder Equity</b>																
Share Capital	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Share Capital Increase	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Opening Balance	-	-	227,610	467,520	690,826	878,439	1,047,245	1,215,964	1,385,574	1,557,800	1,733,234	1,898,603	2,059,625	2,221,435	2,385,255	
Profit/(loss) for the year	-	-	44,035	46,116	45,374	40,773	41,085	41,139	41,231	41,548	41,493	40,352	40,540	40,520	40,540	
Dividend paid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Retained Earnings	-	-	271,645	513,636	736,200	919,213	1,088,330	1,257,103	1,426,806	1,599,348	1,774,727	1,938,955	2,100,165	2,261,955	2,425,795	
<b>Total Equity</b>	<b>-</b>	<b>-</b>	<b>271,645</b>	<b>513,636</b>	<b>736,200</b>	<b>919,213</b>	<b>1,088,330</b>	<b>1,257,103</b>	<b>1,426,806</b>	<b>1,599,348</b>	<b>1,774,727</b>	<b>1,938,955</b>	<b>2,100,165</b>	<b>2,261,955</b>	<b>2,425,795</b>	
<b>Total Liabilities + Equity</b>	<b>2,085,774</b>	<b>3,686,567</b>	<b>4,357,427</b>	<b>4,612,726</b>	<b>4,602,039</b>	<b>4,576,460</b>	<b>4,552,872</b>	<b>4,549,997</b>	<b>4,568,813</b>	<b>4,611,043</b>	<b>4,677,280</b>	<b>4,754,253</b>	<b>4,847,677</b>	<b>4,962,688</b>	<b>5,100,509</b>	

## Appendix 7: List of Existing and Planned Potential Off-Takers

STATUS	Project Type														
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing	Tower Power Abeokuta	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88
Existing	African Foundries	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Existing	African Refractory	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Existing	Ascl		2.00	5.00	5.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Existing	Dangote Ibese	68.00	68.00	68.00	68.00	69.36	70.75	72.16	73.61	75.08	76.58	78.11	79.67	81.27	82.89
Existing	Falcon	15.00	15.00	16.50	18.15	18.51	18.88	19.26	19.65	20.04	20.44	20.85	21.27	21.69	22.12
Existing	Gaslink	80.00	84.00	88.20	92.61	97.24	102.10	102.10	102.10	102.10	102.10	102.10	102.10	102.10	102.10
Existing	Guinness	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Existing	Obajana	84.00	84.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00
Existing	P.Z - Lagos	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
Existing	Paras Energy	16.80	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
Existing	Phoenix	0.53	0.53	0.53	0.53	0.54	0.55	0.56	0.57	0.59	0.60	0.61	0.62	0.63	0.65
Existing	Phrc (Genesis)	7.31	7.31	14.62	14.62	14.62	14.62	14.62	14.62	14.62	14.62	14.62	14.62	14.62	14.62
Existing	Ringardas	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Existing	Wapco - Ewekoro	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24	26.24
Existing	Wapco - Shagamu	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73
Existing	Wempco	8.00	8.00	8.80	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68	9.68
Existing	West African Ceramics	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	1.71	2.71	3.71	4.71	5.71

Existing	Wrpc	10.00	10.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Existing	Green Gas Yongxing	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Existing	Purechem, Onigbedu	0.61	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82
Existing	Omowood, Ogbere	2.00	2.10	2.21	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32
Existing	Standard Metallurgical, Shagamu	0.58	0.58	0.58	1.50	1.58	1.65	1.74	1.82	1.91	2.01	2.11	2.22	2.33	2.44
Existing	Green Gas (Benin City/Ibafo)	2.50	2.63	2.76	2.89	3.04	3.19	3.35	3.52	3.69	3.88	4.07	4.28	4.49	4.71
Existing	Life Flour Mills, Sapele	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.19	0.20
Existing	Bn Ceramics, Ajaokuta	0.98	1.30	1.35	1.35	1.35	1.35	1.35	1.42	1.49	1.56	1.64	1.72	1.81	1.90
Existing	Midland	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Existing	Metoxide	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Existing	Porcelain Ware	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Existing	Time Ceramics	7.30	7.67	8.05	8.45	8.87	8.87	8.87	8.87	8.87	8.87	8.87	8.87	8.87	8.87
Existing	Innoplast	0.65	0.65	0.72	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Existing	Niger Biscuits	0.27	0.55	0.61	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Existing	Bua International Ltd, Okpella	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Existing	Metafrigue Steel, Ogijo	0.22	0.22	0.24	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Existing	Mix and Bake (Crown Flour), Warri	0.61	0.67	0.73	0.81	0.82	0.84	0.85	0.87	0.89	0.89	0.89	0.89	0.89	0.89
Existing	Shagamu Steel, Ogijo	0.49	0.49	0.54	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Existing	Cng, Bokir (Obajana)	2.64	2.64	2.90	3.19	3.26	3.32	3.39	3.46	3.53	3.60	3.67	3.74	3.82	3.89

Existing	Sng - Agbara-Ota	35.00	36.75	38.59	38.59	38.59	38.59	38.59	38.59	38.59	38.59	38.59	38.59	38.59	38.59
Existing	Edjeba/Ogunu	2.93	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05
Existing	Sng - Aba	2.00	2.00	2.20	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Existing	Spdc - Ph	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Existing	Wagp (N-Gas)	60.00	80.00	100.00	110.00	121.00	133.00	133.00	133.00	133.00	133.00	133.00	133.00	133.00	133.00
Existing	Afam Iv Power Plc	25.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Existing	Afam Vi Power Plc	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00
Existing	Transcorp Power Ughelli	80.00	105.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00
Existing	Egbin Power Plc	150.00	200.00	290.00	290.00	290.00	290.00	290.00	290.00	290.00	290.00	290.00	290.00	290.00	290.00
Existing	Sapele Power Plc	40.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Existing	Geregu Power Plc	60.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00
Existing	Pacific Olorunsogo	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00
Existing	Pacific Power Omotosho	44.00	50.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00
Existing	Ndpnc Olorunsogo	60.00	80.00	100.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
Existing	Ndpnc Omotosho	60.00	80.00	100.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Existing	Ndpnc Sapele	60.00	80.00	100.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Existing	Ndpnc Geregu	60.00	80.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00
Existing	Ndpnc Ihovbor - 500mw Scpp	60.00	80.00	100.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Existing	Ndpnc Alaoji	60.00	80.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Existing	Aes Barge	-	50.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Existing	Delta Steel Company		15.00	40.00	75.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

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Existing	Notore Onne	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Existing	Alscon (Rusal)		20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
	<b>Sub-Total Existing</b>	<b>1,418.26</b>	<b>1,793.39</b>	<b>2,166.43</b>	<b>2,310.74</b>	<b>2,358.84</b>	<b>2,377.79</b>	<b>2,379.92</b>	<b>2,382.18</b>	<b>2,384.48</b>	<b>2,387.83</b>	<b>2,391.24</b>	<b>2,394.70</b>	<b>2,398.23</b>	<b>2,401.82</b>
Firm	Tempo Pulp Paper & Packaging	8.00	9.00	10.00	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Firm	Tempo Starch & Glucose	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Firm	Lbl Gas and Power (Redeem), Ibafo	2.00	4.00	4.40	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84
Firm	Monarch Steel, Ogijo	0.27	0.27	0.30	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Firm	Math Metal (Ogijo)	0.91	1.42	1.56	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
Firm	Metal Recycling (Ogijo)	0.12	0.12	0.13	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Firm	Sonia Foods	0.10	0.13	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Firm	Real Infrastructure	0.21	0.23	0.25	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Firm	Green Fuels	1.75	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Firm	West African Sub-Region (Sundry Customers)	20.00	50.00	100.00	158.50	248.50	278.50	278.50	278.50	278.50	278.50	278.50	278.50	278.50	278.50
Firm	Triumph Power (Ogijo)		3.42	3.76	4.13	4.55	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Firm	Chi Nigeria Limited, Ibafo		0.39	0.43	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Firm	New Global Paper Product, Ibafo		0.90	0.99	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Firm	Contec Global (Ibafo)		3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53
Firm	European Soaps and Detergents, Shagamu Int.		0.29	0.32	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35

Firm	Momas Meters Manufacturing, Ibafo		0.50	0.55	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Firm	Nestle Nig. Plc, Shagamu Interchange		0.54	0.59	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Firm	Gowuz		0.16	0.16	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Firm	Coleman (Ibafo)		0.25	0.28	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Firm	Advanced Int'l Merchant (Aiml) Ltd, Ibafo		0.60	0.66	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Firm	Ranbaxy Pharmaceutical Ltd		0.50	0.55	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Firm	Ajanla Farms Ltd		0.67	0.74	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Firm	Oman Industries Ltd		1.20	1.32	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Firm	Ag Leventis Plc		0.50	0.55	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Firm	Sequoia Nigeria Ltd		2.20	2.42	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
Firm	Uraga Power		1.50	1.65	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82
Firm	Multi-Trex		0.35	0.39	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Firm	Specialty Pulp and Paper		1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78
Firm	Cng Abuja		3.50	3.30	3.85	4.24	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45
Firm	Everest Metal		0.60	0.66	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Firm	Inner Galaxy		0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Firm	Ekha Agro Farm, Ibafo		0.50	0.55	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Firm	Ore Power		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Firm	Dolphin Steel, Ewekoro														

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			15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Firm	Rite Foods, Sagamu-Ijebu-Ode Road		7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60
Firm	Celplas, Sagamu-Ijebu-Ode Road		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Firm	Fradro International Limited		11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Firm	Ossiomo Industrial Park, Benin		25.00	60.00	180.00	185.00	185.00	185.00	185.00	185.00	185.00	185.00	185.00	185.00	185.00
Firm	Dangote Refinery, Lekki		50.00	100.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Firm	Genesis Electricity Calabar			35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Firm	Amber Energy and Power				27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Firm	Sage Gas and Power Ltd				27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Firm	Mbh Power, Lagos		23.00	50.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00	76.00
Firm	Dangote Power, Lagos			100.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Firm	Ndphc Egbema Power			50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Firm	NNPC Power - NNPC Tower Power - 35mw				8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50
Firm	Dangote Fertilizer, Lekki		50.00	100.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
	<b>Sub-Total Firm</b>	<b>33.83</b>	<b>285.10</b>	<b>685.00</b>	<b>1,233.21</b>	<b>1,329.01</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>	<b>1,359.68</b>
Probable	Ava Cement	-	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	16.00	17.00
Probable	Lexcz		0.18	0.50	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67



Probable	Iron Weaver		0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Probable	Lucky Joe Investment Ltd		0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Probable	Metal World Recycling Limited		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Probable	Great Eagle Cement Company Ltd.		1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Probable	Nicen		0.30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Probable	Denna Rossi		6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Probable	Gasland		2.50	2.75	3.03	3.33	3.66	4.03	4.43	4.87	5.36	5.89	6.48	7.13	7.85
Probable	Luxxor Gas (Cng), Ogiyo, Ogun State		5.30	5.83	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41
Probable	International Cement		10.00	10.00	15.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Probable	Eternit, Sapele		0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Probable	Nbtc, Ovwian		0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Probable	Ibadan Gdz (Entec Power)		15.00	16.50	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15
Probable	Onne Ftz		1.85	2.04	2.24	2.46	2.71	2.98	3.28	3.61	3.97	4.36	4.80	5.28	5.81
Probable	Cet Power Onne		1.85	5.00	6.84	6.84	6.84	6.84	6.84	6.84	6.84	6.84	6.84	6.84	6.84
Probable	Cet Power Calabar		4.57	5.03	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53
Probable	Axxon, Warri		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

Probable	Whitestone (Ogijo)		0.60	0.66	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Probable	Ibadan Gdz (Entec Power)		15.00	16.50	18.15	19.06	20.01	21.01	22.06	23.16	24.32	25.54	25.54	25.54	25.54
Probable	Brio Integrated Power Ltd., Agbara		10.00	15.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Probable	Lexcel Energy Abeokuta		7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Probable	Energy Culture, Abeokuta		13.00	20.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Probable	Honeywell Radisson Power		0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Probable	Honeywell Power for Shagamu Ind.		1.13	5.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Probable	Honeywell Hudson Power, Ogun State			45.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00
Probable	Dufil Noodles, Choba/ Greater Port-Harcourt		6.00	8.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Probable	Honeywell Cement Project			30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Probable	Honeywell Methanol Project				80.00	100.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00
Probable	Shagamu IPP		50.00	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Probable	Bresson A.S Nig, Abeokuta		20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Probable	Ikorodu Industrial Power Ltd		35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Probable	Hudson Power, Ogun State		33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Probable	NNPC Power - Onne		12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00

	Power - 45mw Scpp														
Probable	Knox J&L IPP			50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Probable	Zuma Energy, East			50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Probable	NNPC Power Abuja			260.00	260.00	260.00	260.00	260.00	260.00	260.00	260.00	260.00	260.00	260.00	260.00
Probable	NNPC Power Kaduna			100.00	150.00	170.00	170.00	170.00	170.00	170.00	170.00	170.00	170.00	170.00	170.00
Probable	Supertek Nigeria Limited, Ajaokuta			28.00	28.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00
Probable	Bcs Energy, Ajaokuta			50.00	70.00	100.00	140.00	280.00	280.00	280.00	280.00	280.00	280.00	280.00	280.00
Probable	NNPC Power - Ogidibgen Power - 450-1000mw Sc			50.00	70.00	100.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Probable	Caleb - Inland, Lekki			100.00	200.00	265.00	265.00	265.00	265.00	265.00	265.00	265.00	265.00	265.00	265.00
Probable	Kingline Power			80.00	100.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Probable	Royal Power and Energy Limited, Badagry			65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00
Probable	Ebonyi IPP				100.00	200.00	200.00	200.00	400.00	400.00	400.00	400.00	400.00	400.00	400.00
Probable	NNPC Power - Kano Power				112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50
Probable	NNPC Power - Lagos Power				25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Probable	NNPC Power - Nnewi Power				25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Probable	Century Power, East				50.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00
Probable	Yellowstone, Ajaokuta				50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	<b>Sub-Total Probable</b>	-	269.85	1,203.87	2,039.31	2,540.75	2,634.28	2,775.92	2,977.67	2,979.54	2,981.55	2,983.69	2,984.72	2,986.85	2,989.09

	Sub-Total Potential (Firm + Probable)	33.83	554.95	1,888.88	3,272.52	3,869.76	3,993.96	4,135.60	4,337.35	4,339.22	4,341.23	4,343.38	4,344.40	4,346.53	4,348.77
	Grand Total (Existing + Potential)	1,452.08	2,348.34	4,055.31	5,583.27	6,228.60	6,371.75	6,515.52	6,719.52	6,723.71	6,729.06	6,734.61	6,739.10	6,744.76	6,750.59
	Summary	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Existing	1,418.26	1,793.39	2,166.43	2,310.74	2,358.84	2,377.79	2,379.92	2,382.18	2,384.48	2,387.83	2,391.24	2,394.70	2,398.23	2,401.82
	Potential														
	Firm	33.83	285.10	685.00	1,233.21	1,329.01	1,359.68	1,359.68	1,359.68	1,359.68	1,359.68	1,359.68	1,359.68	1,359.68	1,359.68
	Probable		269.85	1,203.87	2,039.31	2,540.75	2,634.28	2,775.92	2,977.67	2,979.54	2,981.55	2,983.69	2,984.72	2,986.85	2,989.09
	Sub-Total Potential (Firm + Probable)	33.83	554.95	1,888.88	3,272.52	3,869.76	3,993.96	4,135.60	4,337.35	4,339.22	4,341.23	4,343.38	4,344.40	4,346.53	4,348.77
	Grand Total (Existing + Potential)	1,452.08	2,348.34	4,055.31	5,583.27	6,228.60	6,371.75	6,515.52	6,719.52	6,723.71	6,729.06	6,734.61	6,739.10	6,744.76	6,750.59
	Current Gas Projections	1,335.88	1,728.10	2,682.40	3,615.03	4,050.70	4,184.65	4,437.33	4,484.65	4,478.95	4,467.70	4,438.75	4,453.75	4,557.25	4,539.25
	Additional Volumes Required to Meet Demand	116.21	620.24	1,372.91	1,968.24	2,177.90	2,187.10	2,078.19	2,234.87	2,244.76	2,261.36	2,295.86	2,285.35	2,187.51	2,211.34

**Appendix 8: List of Existing and Planned Potential Gas Suppliers**

Gas Producer/Fields											
Existing		Plant Capacity	Capacity Utilization	2017	2024	2025	2026	2027	2028	2029	2030
CNL Escravos	75%	680	75%	400	420	420	420	420	420	420	420
NPDC Utorogu	90%	510	90%	250	300	300	300	300	300	300	300
NPDC Ughelli East	90%	90	90%	80	80	80	80	80	80	80	80
NPDC Oredo GHF	90%	100	90%	80	80	80	80	80	80	80	80
Seplat Sapele	90%	120	90%	25	30	30	30	30	30	30	30
Seplat Oben LTS	90%	465	90%	240	250	250	250	250	250	250	250
Pan Ocean Ogharefe	50%	130	50%	25	30	30	30	30	30	30	30
Seplat Oben Compressor	90%	50	90%	15	20	20	20	20	20	20	20
Sapele Compressor	90%	15	90%	6	6	6	6	6	6	6	6
Alakiri	90%		90%	50	50	50	50	50	50	50	50
Obigbo N (NAG)	50%		50%	10	20	20	20	20	20	20	20
Okoloma	50%		50%	15	25	25	25	25	25	25	25
Imo River	50%		50%	5	5	5	5	5	5	5	5
Obigbo N (AGG)	50%		50%	15	20	20	20	20	20	20	20
Cawthorne Channel	90%		90%	10	15	15	15	15	15	15	15
Gas Supply to Alaoji NIPP (SPDC supply)	50%		50%	30	30	30	30	30	30	30	30
Gas Supply to Alaoji NIPP (TEPNG supply)	90%		90%	30	90	90	90	90	90	90	90

Sub-Total Existing				1286	1471	1471	1471	1471	1471	1471	1471
Potential				2017	2024	2025	2026	2027	2028	2029	2030
NPDC Oredo (Add.)	90%	100	90%	60	80	80	80	80	80	80	80
NPDC Odidi	90%	130	90%	40	80	80	80	80	80	80	80
SPDC Escravos Beach	90%		90%	5	5	5	5	5	5	5	5
SPDC Otumara	90%		90%	4	4	4	4	4	4	4	4
NPDC Utorogu NAG 2	75%		75%	100	150	150	150	150	150	150	150
Bonga (Main Gas Diversion from OGGs to ELPS)	75%		75%	111	51	44	41		20	110	110
Seplat Sapele (Add.)	75%		75%	30	35	35	35	35	35	35	35
CNL Makaraba	90%		90%		50	50	50	50	50	50	50
GfD (Erha/Bosi)	50%		50%		300	300	300	300	300	300	300
Forcados Yokri	90%		90%		40	40	40	40	40	40	40
Southern Swamp	90%		90%		120	120	110	120	120	160	140
EGP 3B - Sonam NAG Development	75%		75%		150	150	150	150	150	150	150
Total Obite gas plant	75%		75%		200	200	200	200	200	200	200
Mobil Oso Gas Plant	75%		75%		400	400	400	400	400	400	400
Abiteye NAG Development	75%		75%		20	20	20	10	10	10	10
SEPCOL OML 108 Ph 1	50%		50%		100	100	100	100	100	100	100
SEPCOL OML 108 Ph 2	50%		50%		100	100	100	100	100	100	100
Sirius OML 122	25%		25%		200	200	200	200	200	200	200

Newcross OML 147	25%		25%		120	120	120	120	120	120	120	
<b>Sub-Total Potential</b>	0%		0%		349.5	2205.2	2197.6	2184.6	2144	2164	2294	2274
<b>7 Critical Projects</b>					2017	2024	2025	2026	2027	2028	2029	2030
Assa North-Ohaji South Gas Field Development	75%		75%		500	500	500	500	500	500	500	500
Joint Development of OML 24 (NNPC/NewCross) and OML 18 (NNPC/Eroton) on top of 100MMscf/d already delivered by Alakiri Gas Plant.	75%		75%		300	300	300	300	300	300	300	300
Development of 4 SPDC JV/NAOC JV Unitized Gas Fields (Samabri-Biseni, Akri-Oguta, Ubie-Oshi, and Afuo-Ogbainbiri).	75%		75%		600	600	600	600	600	600	600	600
Cluster Development of NPDC's OML 26, 30 & 42.	75%		75%		600	600	600	600	600	600	600	600
SPDC JV Gas Supply to Brass Fertilizer Company	0%		0%									
Cluster development of OPL 2001, 2002 and 2003 to support the expansion of Seven Energy Uquo Gas Plant	75%		75%		400	400	400	400	400	400	400	400
Cluster Development of Okpokunou/Two West (OML 35/62) (Straddling + Non-Straddling) in Phases. (5/1 Tscf)	75%		75%		600	600	600	600	600	600	600	600
<b>Sub-Total 4 Critical Projects</b>					3000	3000	3000	3000	3000	3000	3000	3000
<b>Tots Potential Projects</b>												
Year					2017	2024	2025	2026	2027	2028	2029	2030
<b>Grand Total</b>					1336	4485	4479	4468	4439	4454	4557	4539