

# Factors Influencing the Optimum Utilization of Natural Gas in Nigeria

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## ABSTRACT

*The objective of the study was to investigate the factors influencing the optimum utilization of natural gas in Nigeria and recommend ways for policy decisions. Using literature review and case studies, the study finding revealed that provision of adequate infrastructure, diversification, liberalization and collaboration in terms of financing and formation of technical partners are some of the critical success factors.*

**Keywords:** Energy transition, Sustainable development, cluster system, economic diversification, Natural gas, liberalization.

## 1.0 Background of study

Nations and industries are encouraged to specialise and concentrate rigorous efforts in their area of strength and advantage in order to be competitive. Without any doubt, Nigeria like other developing countries is an oil and gas producing nation. The Nigerian nation is blessed with abundant oil and gas resources. The abundant natural gas resources which is a by-product of oil exploration that can result in industrialization and economic prosperity for the nation, Nigeria is endowed with abundant Natural Gas; Nigeria's proven gas reserve is placed at 209.5 trillion cubic feet. The natural gas sector holds significant potential. Nigeria has the 7<sup>th</sup> largest reserves in the world with significant scope for growth. The gas quality is high particularly rich in liquid and low in Sulphur. Despite policy initiatives in promoting gas utilization and monetization, the utilization of natural gas has not been fully optimized. The main problem against the optimum utilization of natural gas in the country is the inadequate infrastructure and the huge fund required. As a long-term strategy for the utilization of natural gas in Nigeria, the Federal government of Nigeria has put in place the gas master plan policy framework, this includes the Abuja Kaduna, Kano gas pipeline network among other. There is urgent need to complete the pipeline system in order to supply natural gas to various parts of the country and Europe to generate revenue and also avoid energy crisis as a result of Russian disconnection of natural gas to Europe. The objectives of the study are to:

- Emphasis on the critical need of pipeline infrastructure to enhance the utilization of natural gas as an alternative energy source.
- Discuss the utilization of pipelines cluster system to transform natural gas development
- To identify social, economic, ecological/environmental and political factors that influence the sustainable development of natural gas

- Make recommendation to policy makers in Nigeria to drive the economy for industrial development and sustainability.

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## Research questions

What do policy makers in Nigeria need to know about natural gas development that will produce development support strategies that is socially, economically, environmentally and politically effective for optimum utilization of natural gas in Nigeria?

## 2.0 Literature review

### A. Natural gas : Inevitable Potential Component of Industrial Development in Nigeria.

Natural gas outputs, are not only good sources of energy components but also other industrial raw materials. The gas sector is therefore essential for the development of various industries and highly required for national development in Nigeria. The industries and programs that can emerge from the natural gas utilization include:

- Energy for example Liquidified Natural gas (LNG) and Compressed natural gas (CNG)
- Petrochemical industries
- Fertilizer industries
- Cement industries
- Electric power industry
- Product development and added value

Natural gas do not only provide energy services but also industrial feedstock. The industries and programs that can emerge from the output of natural gas are many. These include energy industry like gas processing companies, electricity power industry, cement industry, fertilizers industry and; and many others. The natural gas will serve as energy transition fuel and decarbonize the energy industry.

There is the need to focus on alternative energy and natural gas can serve this purposes other are especially solar, wind and other renewable energy sources. Solar and wind energies are harvestable and convertible to electrical and heat energy for whatever applications. The natural gas industry, however require regular power supply, water supply and functional infrastructure network to operate efficiently.

### Reason why natural gas is critical path of energy transition

- Natural gas is a reliable, affordable energy source which enables innovation.

- It acts as a bridge ingredient in the hydrogen revolution'
- It is a key tool in the fight against energy poverty for example power generation.
- Along with carbon capture and storage, it can transform the energy sector

### *B. Global Economy, Cluster and Competitiveness: Implications for Natural gas development*

A cluster is a group of companies sharing local resources, using similar technologies and forming linkages and alliances. Clusters consist of dense networks of interrelated firms that arise in a region because of powerful externalities and spill over across the firms within the cluster. Cluster is not a new concept. It started naturally (organic cluster). It is also cultural or geographic in existence. But, natural cluster are traditional and not necessarily innovative. Innovative cluster adds value, improves efficiency and supports a liberalized economy.

Competitiveness and cluster-based initiatives are known to contribute to the world economy via increased production and productivity, reduced cost of unit production of commodities, optimized gain and improved healthy interactions between the various key players in the economic sector. Competitiveness has promoted the global liberalized economy and improved commerce and industry. It should be noted that competitiveness and innovative clusters are relatively new in Nigeria but offer opportunity for a rapid economic growth in the region, especially in the gas sector.

Adewumi (2012) reiterated that the possibility of Nigeria's gain in competitiveness and cluster-based initiatives could be a mirage because of some inherent socio-political factors which include lack of political stability, lack of stable policies, wasteful and over dependence cultures, poor infrastructures for industrial development (especially electricity and road) and weak linkage among the players of innovative clusters, to mention a few. He concluded that the reality of Nigeria benefiting from the gains of competitiveness and innovative clusters hangs on the sincerity and good will of the Government, re-orientation of the masses and adequate planning and policies.

Adewumi (2011) emphasized that innovative clusters and the concept of triple helix are essential tools for socio-economic development of any nation. Their applications to natural gas pipeline cluster development can translate a nation to a liberalized economy, and promote competitiveness and rapid industrialization. Investments on the development of natural gas, especially in Niger Delta to refined products of high quality must sharply increase in order to promote economic growth. This shall provide a diversified economy and protect nations from relying only on petroleum resources as the major source of income and remove nations, like Nigeria, from the category of single commodity exporting country that relies heavily on crude petroleum as major source of foreign exchange.

### *C. Liberalization/deregulation*

The underdeveloped gas industry in Nigerian petroleum downstream is a major factor hampering sustainable development in the nation. Ibibia (2002) opined that One vital ingredient that will aid the development of the downstream sector is economic liberalization or privatization. Privatization or liberalization aims to reduce the barriers to investment entry and encourages competition to reallocate resources more efficiently. This movement towards an investor-friendly international economic order has become noticeable in the agenda of international economic negotiation. It has taken on a variety of forms which can be described by the following: deregulation, decontrol, de-monopolization, de-bureaucratization, de-centralization, investment promotion, privatization, and commercialization as well as globalization

### *D. Economic diversification:*

Economic diversification is generally taken as the process in which a growing range of economic output produced. According to Kwanashie (2012) economic diversification is essential in the sustainable management of petroleum resources like natural gas, since it enables a State to develop and utilise industrial activities required for the extraction of non-renewable petroleum resources for other industrial activities as put by (Olav, 2009).

Economic diversification helps to develop associated industries, the transfer of skills and technology to increase knowledge and competence in the natural gas industry, the development of technological excellence in the industry and investment in infrastructure and human capital. This is in line with the submission of Ross (2003) that the best solution to oil dependence is diversification. There is inherent potential of natural gas usage as a national catalyst for achieving economic diversification from crude oil and as a transition fuel from fossil of today to the renewable energy of tomorrow.

## **3. Research methodology**

The methodological frame work involved an extensive literature review on natural gas utilization project and a case study of several existing gas pipeline systems especially the Abuja, Kaduna, Kano (AKK project) gas pipeline which links part of the cluster of pipelines system and serves as one of the drivers of infrastructure for transporting natural gas. Natural gas is a strategic asset and a transition fuel that will bring about sustainable development in Nigeria. The research methodology is also based on deductive logical reasoning combining qualitative and explanatory case studies.

## **4. Result and discussion**

According to Dickson (2010) cheap energy supply is the greatest stimulus for industrialization. Hence investment, diversification, deregulation and creation of regional power supply companies are needed for

energy supply bottle neck. In order to diversify its revenue base and reduce the huge wastage of valuable resources and degradation of the environment, as a result of flaring of natural gas Government, NNPC is vigorously pursuing various gas utilisation projects with the joint venture partners. The associated gas that hitherto was being flared is now harnessed to achieve these objectives. A number of gas utilization projects have been completed, commissioned and in operation, while several other are in various stages of execution.

### Natural Gas based Projects in Nigeria

Nigerian National Petroleum Corporation (NNPC) and other major Exploration and Production (E & P) operators are currently embarking on several gas utilization projects. The major existing and future projects are:

#### Escravos- Lagos Pipeline (ELP)

The ELP which was commissioned in 1988, supplies gas to Power Holding Company Nigeria (PHCN) in Egbin Powe plant near Lagos. Spur lines from the ELP supply the West African Portland Cement Company (WAPCO) Plant at Shagamu and Ewekoro, PHCN Delta IV at Ughelli and Warri refinery and petrochemical company (WRPC) at Warri in Delta state

#### The West African Gas Pipeline (NNPC/SHELL/CHEVRON JV) Project (WAGP)

The West Africa Gas pipeline project was designed to meet the energy needs and other needs of Ghana, Togo and Benin by utilizing Nigeria abundant natural gas reserve. A feasibility report done by PLE of German, has confirmed that the Onshore/offshore, a continuation of ELP from Alagbado to Ghana, is the least cost option for the project. NNPC through its subsidiary NGC, has a participating interest of 25%, with other sponsors being Ghana National Petroleum Corporation, Chevron, shell, Societe Beninoise du Gas, and Societe Togolaise du gas. The long-term plan is to extend this pipeline to Dakar, Senegal, on order to make Nigerian gas available to the entire subregion. The WAPCo pipeline is seen today by Economists as a catalyst for clean economic growth, a tool for environmental benefit, and a cornerstone for regional integration. WAGP (2005).

#### Trans-Saharan Pipeline (NNPC/SHELL/CHEVRON JV)

Nigeria underlined its determination to penetrate the European gas market when it signed preliminary agreements with Algeria in October 2001 on a planned Trans-Saharan Pipeline running through the North African country. The project would seek to connect the Nigerian gas field with that of Algeria, to the European market.

#### Case study of Abuja Kaduna, Kano (AKK) pipeline project and sustainable development in Nigeria

Ajaokuta- Abuja Kaduna pipeline

The project will extend the existing Oben\_ Ajaokuta pipeline to supply to Power Holding Company Nigeria (PHCN) at Geregu, Abuja and Kaduna, NAFCON 111 at Izom in Niger Delta states and various industrial customers in Kaduna. The pipeline will be the backbone of the national grid, linking Kaduna and other Northern cities to the gas fields in the southern part of Nigeria.

#### Social issues

The pipeline project would create prosperity through massive job opportunities and guarantee peace for the country, it would revamp about 232 industries. The project has been on the drawing for 30 years and the dream was to have gas delivered to Europe across the Trans Sahara route (NNPC news June /July 2021). However, with the Russian-Ukraine war and impending energy crisis, there is the urgent need to fast track this project in order to ameliorate the impending energy crisis in Europe in addition to creating prosperity through massive employment opportunities for Nigerians.

#### Economic issues

The AKK project would also lead to the development of three Independent Power plants (IPP) in Abuja, Kaduna and Kano adding that the IPP would boost electricity supply and promote growth of small and medium scale enterprise in Nigeria. The project would also boost the agricultural, industrial, manufacturing and Power sector for the overall growth of the Nigerian economy.

#### Environmental issues.

The AKK gas pipeline project would also reduce Nigeria carbon foot in line with global quest to arrest global warming and climate change in addition to other on-going gas utilisation program in Niger Delta region of the country.

According to Bello and Dauda (2022): The Nigeria Gas Master Plan (NGMP) was developed in 2008 given that the country intends to be a key player in the international gas business as well as to lay a solid framework for gas infrastructure development within the domestic market. The AKK gas project would serve as gas supply link to other African countries and Europe upon completion.

#### The gas master plan key objective

- Maximizing the multiplier effect of gas in domestic economy
- Optimizing Nigeria and competitiveness in high value export markets
- Assure the long energy (gas) security to Nigeria

Expansion of domestic gas distribution network (NNPC/SHELL/CHEVRON JV)

Several distribution schemes are planned to help promote Nigerian consumption of natural gas. The proposed \$745-million Ajaokuta-Abuja-Kaduna pipeline will deliver gas to central and northern Nigeria, while

the proposed \$552-million, Aba-Enugu-Gboko pipeline will deliver natural gas to portions of eastern Nigeria.

### Synergy for promoting natural gas utilization in Nigeria

A strategic partnership between the investors and other stakeholders on the user of natural gas is critical to the optimum utilization of natural gas in Nigeria. (Humphrey and Adewale, 2016). The formation of such strategic alliance will not only provide a common focal point but will also provide economies of scale for the development of the natural gas market.

The Nigerian National Petroleum Company Ltd has commenced discussion with the United States Finance Corporation and Exim Bank to seek funding for its multi-billion-dollar gas projects. Also, NNPC and Economic Community of West African States (ECOWA) Commission reaffirmed their commitment on the project to provide natural gas to the West-African countries through the Morocco and subsequently Europe.

### 5. Conclusion

The factor influencing the utilization of natural gas are adequate infrastructure, diversification, deregulation, collaboration and funding. The study highlighted the strategies needed for optimization of natural gas in Nigeria. Based on the analysis, the overall findings and conclusions are that the available infrastructure are inadequate. Globalization and liberalized market are the major issues in the present-day world economy. These are the factors that determine the extent of national economies. It is therefore essential that the natural gas companies in Nigeria, Investors and Government key into competitiveness and cluster-based systems in order to enhance their performance. This will hence promote natural gas development in Nigeria rapidly and enlarge the marketing of natural gas products beyond the Nigeria shores. The policies makers in Nigeria should not only promote and implement policies

on competitiveness and cluster-based systems; the operators and investors in natural gas should imbibe same. But, these shall be impossible without adequate infrastructures, collaboration, liberalization and economic diversification.

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