



**NAEE**

NIGERIAN  
ASSOCIATION FOR  
ENERGY ECONOMICS

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## Message from the President

I am pleased to welcome you all to the 5<sup>th</sup> edition of the NAEE Energy Forum, the official newsletter of the Nigerian Association for Energy Economics (NAEE). The NAEE is a professional organisation, an estimable affiliate of International Association for Energy Economics (IAEE), with over 300 members, with the potential to grow its membership to at least 500 by 2019.

NAEE has hosted, consecutively, nine International Conferences on Energy Economics with remarkable attendance by energy professionals from Nigeria and abroad. The 9<sup>th</sup> (2016) NAEE/IAEE International conference, for example, had participants from the academia, and energy policy and regulatory institutions as well as the energy industry. The number of abstracts submitted and papers presented for the concurrent sessions was impressive. Further, NAEE organised the 2016 World Energy Day with participation of energy institutions - energy producers, Petroleum Technology Development Fund (PTDF), the Energy Commission of Nigeria. Six technical papers on Energy Access and the Economy were presented and several goodwill messages were delivered during the celebration.

I would like to bring to your attention, the following conferences of IAEE and its affiliates worldwide. The 10<sup>th</sup> 2017 NAEE/IAEE International Conference with the theme "Energy, Economy & the Environment: The Interplay of Technology, Economics and Public Policy" will hold from 23-26 April 2017. The Conference seeks to discuss innovative ideas in the areas of technology, economics and policy incentives to ensure that energy is effectively harnessed and efficiently used to promote human development and sustainable economic growth without compromising the environment. Further, NAEE members and energy professionals in government, business and academia are encouraged to attend the following IAEE Conferences - The 40<sup>th</sup> IAEE International Conference in Marina Bay Sands, Singapore, 18-21 June 2017; the 15<sup>th</sup> IAEE European Conference in Vienna Austria, 3-6 September 2017; and the 35<sup>th</sup> USAEE/IAEE North American Conference in Houston, TX 5-8 November 2017. For more information on the conferences, please visit IAEE website: [www.iaee.org](http://www.iaee.org).

Let me use this opportunity to offer some perspectives on the current development in the Nigeria energy sector, especially the oil and gas sector. Government cash-call-exit-agreement is a positive development as the provisions for the Joint venture (JV) cash call has been an Achilles Heel in the Federal budget process and performance over the years. Of course, I hasten to suggest the new attempt to fund JV cash call should consider a pseudo-PSC or at best a form of overriding royalty-funding arrangement in order to retain a participatory interest in the JV agreement without the obligation of cash call. What this means for the economic metrics and government take requires a review of the fiscal terms such as royalty rate and capital cost recovery mechanism. Unfortunately, the terms are not made public for proper economic analysis of the implications on industry performance and outlook within the context of Pareto Optimality condition required for the maximisation of society wellbeing using petroleum resource development. To a large extent, some would argue that the new deal, if it is as portrayed in the papers, may be preferred to carry or modify carry agreement. But time will tell!

However, let me resolutely speculate that if the industry reform has been vigorously pursued by the Federal Government, the need to cut the cash-call exit deal to ameliorate the



(Continued on page 2)

cash-call toxin in the Nigerian economy and oil and gas industry performance over the years would have been circumvented. Thus, the need to pass the Petroleum Governance Bill cannot be overemphasised. It is the key, in my opinion, to address the apparent lapses and weaknesses of the Nigeria oil and gas industry governance within the context of global best practices. That the Petroleum Industry Governance Bill has undergone the third reading in the Senate is certainly a welcome development.

Furthermore, the unparalleled volatility in the Forex market in the country, the collapse of crude oil prices, and insecurity of assets in the Niger Delta continue to pose a challenge to managing the cost of petroleum operations in Nigeria. It is my opinion that low oil prices would have offered a comparative advantage to Nigeria's economy, if the country has harnessed the inherent economic potentials in the entire petroleum industry value chain long time ago before now. Interestingly, the potential to grow the economy using oil and gas is still there to grab. The Government of Nigeria just needs to spread its net wider for competent technocrats with good grasp of the challenges and opportunities to pilot the economy accordingly using the oil and gas industry as an intermediate sector. Further, a nation that sidelines its academia for political expediency suffers perpetual economic hardship with an overwhelming misery index trend - high unemployment, low economic growth and development, and a high inflation rate. It is not about appointment of academia into political offices; rather it is about engaging academia to independently and unbiasedly review government economic policy agenda. History has shown that political appointees from academia tend to underperform, perhaps because of the selection process, but very rarely do they fail as technocrats advising Government.

Finally, I would like to express my sincere appreciation to the Immediate Past President of NAEE, Professor Adeola Adenikinju, the Vice President Conferences and Publications, Dr. Hassan Mahmud, all the NAEE Council members, and the entire NAEE Conference Organising Committee for the success of the 2016 International Conference. I must specifically mention the role played by NAEE Treasurer, Lady Priscilla Ekpe, for her tenacity at the 2<sup>nd</sup> World Energy Day Celebration. We are particularly indebted to PTDF and the Petroleum Products Pricing Regulatory Agency (PPPRA) for providing, majorly, the sponsorship required for the 2016 World Energy Day Celebration. I wish to also acknowledge the efforts and hardwork of the NAEE Administrative Secretary, Mrs. Bukola Elchin, the Editor Dr. Balkisu Saidu, and the Editorial Team for the NAEE Energy Forum. My appreciation also goes to the authors of articles in this edition of the NAEE newsletter. It is my hope that the articles in this NAEE newsletter are valuable to all our readers.

Cheers

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## NAEE Mission Statement

### Mission Statement

The Association is a nationwide nonprofit organization with a membership drawn from business, government, the academia and other professionals and a mission to advance the understanding and application of economics across all facets of energy development and use, including theory, business, public policy, and environmental consideration.

### To this end, the Association:

- \* Provides a forum for the exchange of ideas, advancement and professional experiences in energy economics;
- \* Promotes the development and education of energy professionals;
- \* Fosters an improved understanding of energy economics and energy related issues by all interested parties; and
- \* Provides a forum for contribution to national discourse on energy policy issues in Nigeria.







April, 2017

## Editor's Note

Welcome to the fifth edition of the NAEF Energy Forum, the official Newsletter of the Nigerian Association for Energy Economics (NAEF). This edition of the Forum is coming to you at a time when our Association is set to host its tenth Annual International Conference. The Association, which now boasts of the largest ensemble of professionals in the oil, gas and power sectors in Nigeria, has for the last decade remained the leading think tank devoted to the study of energy matters and the provision of information, ideas and advice to the industry and Government through its programmes, conferences and publications.

Members may recall that, in the last two editions of the Forum, our focus had been on navigating the difficult terrain of low crude oil prices in the international oil market, inadequate electricity supply and heavy dependence on a single source of revenue by the Government. This year, the impact of those and many other happenings have, as accurately predicted, brought about economic decline in many areas of the economy, plunging the country into recession. With the problems of the industry, nay the country, fully illuminated, members of the Forum have rededicated themselves to unveiling pragmatic approaches that will, in the immediate and in the long run, ensure smooth operations of the energy industry in Nigeria.

Professor Adeola Adenikinju revisits the question of the role of value chain in energy. Focusing on the oil, gas and power sectors of the economy, he stressed the importance of integration, horizontally and vertically, along the energy value chain for the generation of incremental value in the sectors. The paper concretely established the symbiotic, albeit facultative, relationship between energy and economic development. In his paper, Ado Ahmed, explores the cost of delay in the diversification of Nigeria's economy, a situation that has exposed the country to fiscal crisis. He finds that the overdependence of Nigeria on oil and gas has hindered its development in other sectors of the economy. The author advocates for immediate shift in policy, whereby the energy sector will be private sector driven, with Government retaining the role of regulator, designing and implementing policies and schemes that will ensure accelerated and uninhibited growth of the sector.

Olanrele Iyabo and Adeola Adenikinju, using the full sample VAR Rolling Impulse Response (RIR) Model, analyses the connection between steady electricity generation and economic growth in Nigeria. The findings of the authors, on the impact of the former on the latter, are as illuminating as they are astonishing.

Emmanuel Charles responds to the call for ideas to solve the recurring instability of supply in the electricity sector in Nigeria. Drawing from the historical experiences of the electricity supply industry, the author proposes strategies, covering the whole value chain of the industry; implementation of which, he believes, would resolve, permanently, the hitherto un-ending problems of the sector.

Chukwunonso Ekesiobi, Ude Damian and Kelechi Dimnwobi make the case for the inclusion of nuclear in the energy mix of Nigeria for sustainable solution to the electricity problems facing the nation. The authors enumerate the advantages of nuclear, particularly in the generation of electricity and offer suggestions on ways to ensure seamless and safe use of the energy source.

As an example of models that work in the power sector, the Advisory Power Team (APT) of the Office of the Vice President, Federal Republic of Nigeria, through Funlola Osinube and Lolade Abiola, shares one of its intervention projects in the provision of electricity to off-grid communities, the Solar Home Systems Programme. The project,



which was officially launched by His Excellency, Professor Yemi Osinbajo, SAN, Vice-President, Federal Republic of Nigeria, provides clean, safe and convenient lighting to rural communities.

Away from petroleum and electricity, Ibrahim Abdullahi and Safiyyah Ummu Mohammed examine the various legal and regulatory challenges to the development of solid mineral resources in Nigeria, with particular focus on Sokoto State. The authors outline the mineral riches available in the State and enumerated the legal and regulatory configurations necessary for the optimal exploitation of the resources.

Olubukola Victoria Moronkola provides highlights of the 9<sup>th</sup> NAEF Annual International Conference held 25-26 April 2016 at the Sheraton Hotel, Abuja, Nigeria and the President's message provides information on the up-coming events of the IAEF and NAEF.

I would like to extend my profound appreciation to the contributors to this and our previous editions. Thank you for creating the impactful, excellent and outstanding pieces that have kept us going all these years. As we express our gratitude, we look forward, with anticipation, to what novel ideas you will generate in the years to come.

Submissions of suggestions, views and comments on all aspects of the Newsletter are welcomed. We also welcome articles on any subject of interest to NAEF members for publication in the next edition. Articles should be in English using the MS Word (1997-2007) format and Times New Roman font style font size 12. Text layout should be kept simple, with regular headings, subheadings (where appropriate) and paragraphs. Articles should be in the region of 700-1,500 words; and should include the contributor's name, email address, phone number and affiliation. Pictures may be included in a separate file in JPEG format. Our contact email addresses are: admin@naef.org.ng and balkisaidu@yahoo.co.uk.

We are forever grateful to you for your patronage and wish members every further success that the next ten years and beyond have to offer.

Happy Anniversary!

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DR BALKISU SAIDU

*April 2017*

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April, 2017

# Economic Development in Nigeria: The Role of Value Chain in Energy

Adeola Adenikinju\*

## Introduction

Energy is an important enabler of economic development. Economic development is intricately linked to the amount of energy available to citizens of any country. Therefore, the poor state of the Nigerian economy today cannot be divorced from its corresponding low level of per-capita energy consumption. One way to strengthen the energy-economic development relationship is through understanding of the energy value chain.

Value chain refers to the linkages that exist in a supply process beginning from production to the final transformation to final products that are used by consumers. These processes are integrated and linked such that one part of the process is usually dependent on the previous process. The longer the chain, and the more the separate but interdependent processes are located within a country the greater the value added, particularly in the area of employment generation and overall economic development.

For this discussion, the focus will be on two key subsectors: oil and gas, and the power sector.

## 1. Petroleum (Crude Oil and Natural Gas)

Value chain in the petroleum sector usually begins from the upstream (where exploration and production takes place) to midstream and finally the downstream (where raw materials are transformed into final consumable form for consumers or to be used in further production process). The chain covers exploration – production – transportation – processing – final products – transportation – energy services – consumption covering the four broad areas of upstream – midstream – downstream – consumption.

## 2. Power Sector

For the power sector, the value chain covers generation – transmission – distribution – final product – electricity services.

The relationship between economic development and the energy value chain is very important. Economic development in the concept of inclusive economic growth includes economic growth, employment growth and reduction in poverty or inequality.

A well-designed value chain system promotes development. The various components of the value chain can be located in different parts of the country. This will promote regional integration and dependence. Although, the downside of this is that unrests in one part of the country can cause disruptions of the entire value and supply chain.

Data made available by the National Bureau of Statistics on the structure of the Nigerian economy shows the weak linkage between the energy sector, particularly, the oil sector and the rest of the economy. With the rebasing of the Nigerian economy, the share of petroleum in GDP has declined to less than 16 per cent compared to 37 per cent at its peak in 1981. Agriculture and Services account for 20 and 59 per cent of the GDP respectively. However, in spite of the GDP figures, the fiscal significance of oil continues to be very important. Oil accounts for between 70 – 80 per cent of government revenue and between 95-97 per cent of foreign exchange earned in the economy. Why is it that these other sectors are contributing so much to the GDP and not corresponding proportion to government revenue and foreign exchange for the country? A key answer to this puzzle is simply that the energy sector is weakly linked with the rest of the economy because of the short local value chain in Nigeria. The lack of local processing of petroleum is a major contributing factor and the heavy presence of foreigners in the sector.

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### Empirical Analysis of Value Chain and Development in Nigeria

The impact of a sector on economic development is a function of the forward and backward linkages of the sector, which is dependent on the length of the value chain and the proportion that is domiciled within the country. The development of infrastructure and other assets is an important enabler of economic growth especially in developing countries like Nigeria. The nation has invested a significant amount of resources over the years into various categories of assets such as infrastructure (including roads, rails, energy and airports), human capital, (including education and health), mineral resources and agricultural resources.

These assets are expected to contribute directly to growth and indirectly to facilitating the productivity of the private sector, through reduction in transaction and trade costs, enhancement of competitiveness, generating direct and indirect employment, boosting private sector incomes and reducing poverty. Infrastructure development has also been seen as a major determinant of foreign direct investment (FDI) inflows.<sup>1</sup>

Integration along the value chain – whether horizontally or vertically – has often been used to generate incremental value. The benefits from economies of scale from horizontal integration in most activities of the value chain are widely acknowledged, particularly with respect to exploration and production activities, where scale helps industry participants to access better funding, to diversify investment and development risk, and to serve as long-term insurance to partners such as host governments. As a country strategy, there are natural resource limits in encouraging exploration and production activities, as well as issues of appropriate depletion strategy. In other segments of the value chain, however, some countries have successfully managed to attract substantial investment beyond their domestic requirements. Vertical integration at the country level, in the sense of deliberate industrial policies to guide or encourage diversification along the value chain, has to be pursued in Nigeria to capture a larger share of value-adding processes.

The standard criterion for value creation along the petroleum value chain is for the value of aggregate outputs to exceed the value of aggregate inputs (economic costs such as production cost, cost of funding, cost of resource depletion on a sustainable basis). At the most general level, the potential sources of (contributors to) petroleum sector value creation are: (i) Exogenous context and conditions, (ii) the companies participating in the sector, and (iii) the sector's organisation and institutional properties.

One of the facts from the review above is that the number of stages of value chain for energy in Nigeria is few. Moreover, the linkages, especially the forward linkage is very weak. This suggests weak and low level of integration of the economy both across sectors and regions/states. The imported component of the value and supply chains is also very high implying low domestic value added.

In addition, the country needs to fully utilise all the potentials contained in petroleum. Petroleum Engineers and Scientists have shown that Nigeria can obtain as many as 6,000 by-products from petroleum. Yet, in Nigeria, the focus has been on very narrow products mainly gasoline, kerosene and diesel.

### Reasons for and Implications of Low and Weak Value Chain Development

There are several factors that have led to the low and apparently weak value chain development in Nigeria. This weakness is manifested in the high proportion of Nigeria's oil and natural gas production being exported in their primary forms with very little forward linkages with the economy. Nigeria holds the dubious record of being the highest oil producer in Africa as well as the largest importer of refined products. Moreover, the high rate of gas flaring is another factor in the presence of inadequate supply of gas to existing power plants in the country.

Most of the equipment and facilities in the energy sector range from low to high-end technology products, a great proportion of these are imported. The passage of the Nigerian Oil and Gas Industry Content Development Act 2010 (Local Content Act) has improved the situation to some extent, however, the weak capital goods sector and the weak linkage between the universities and the industry continued to make the sector heavily dependent on imports for these critical inputs.

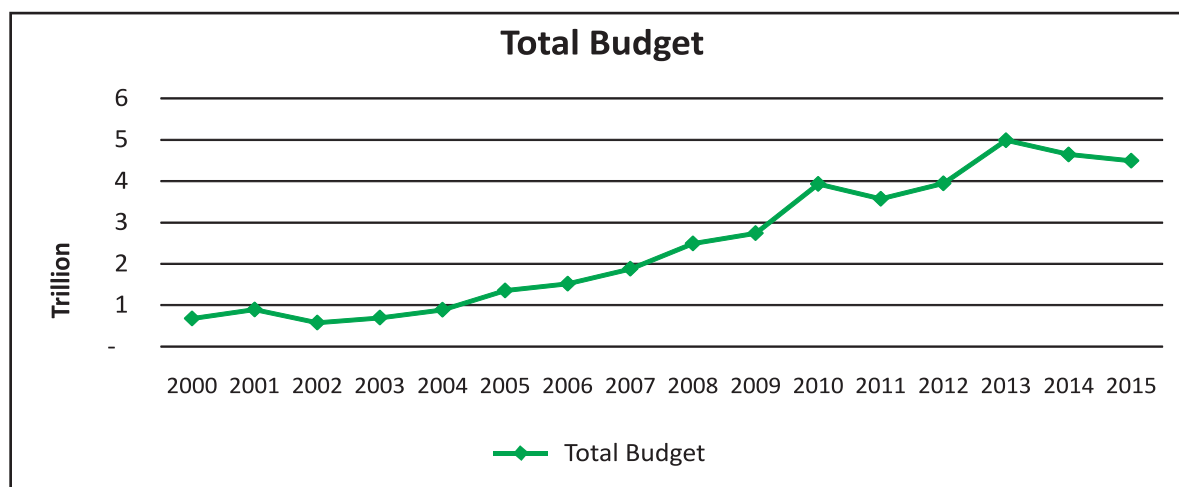
We can also see from figures 1 and 2 that there has been relatively modest allocation of capital budget of the government to the infrastructure sector, including energy. In fact, during the military era there was virtually no investment in the power sector, neither were new power plants constructed nor additional transmission and distribution infrastructure built.

<sup>1</sup>Sahoo, P. 2006. FDI in South Asia: Trends, Policy, Impact and Determinants, Asian Development Bank Institute, Discussion Paper No.56, Tokyo.

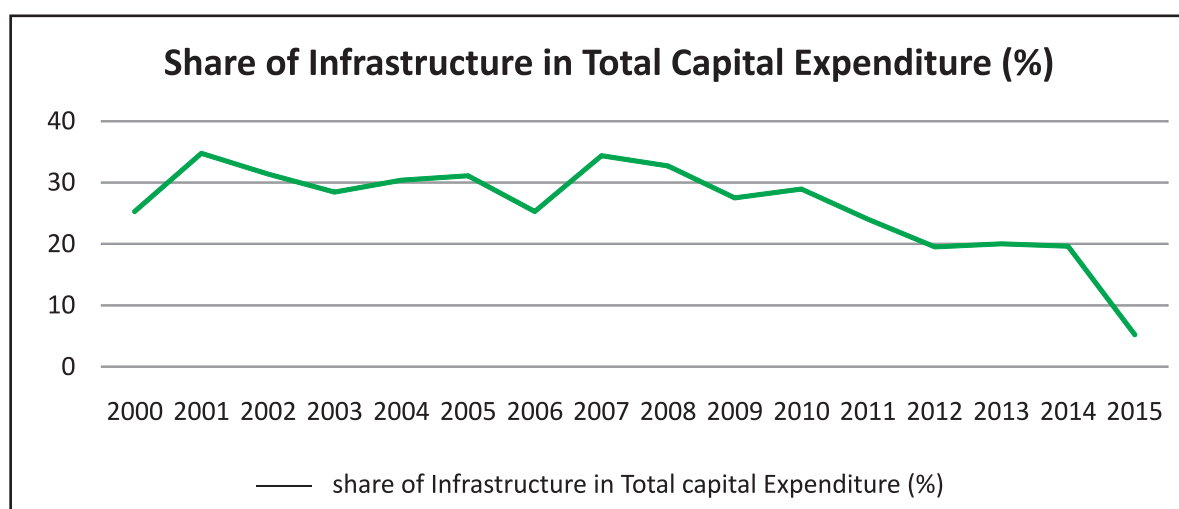




April, 2017



**Figure 1:** Government's Total Annual Budget



**Figure 2:** Government's Share of Infrastructure in Total Capital Expenditure

Moreover, the lack of investment and institutional and governance issues have made Nigeria one of the countries with the highest Transmission and Distribution (T&D) losses in the world. The consequence is that the sectors are contributing far below their potentials. The case of the energy sector is perhaps more serious in this case. A good indicator of this is that while energy sector has strong fiscal linkage with the rest of the economy contributing more than 97% to foreign exchange earnings, 75% to government revenue, its contribution to GDP is less than 17%. This suggests that the outflow from the sector is very significant.

In Saudi Arabia, OPEC's largest producer, the oil and gas sector accounts for 48 per cent of the GDP. Qatar's oil and natural gas account for about 55 per cent of the GDP. About 40 per cent of the United Arab Emirates' GDP is directly based on oil and gas output, while Venezuela's oil and gas sector is around 25 per cent of the GDP. The President, International Association for Energy Economics, Prof. Wumi Iledare, said, "In Nigeria, the contribution of oil is mostly revenue, and revenue does not translate into GDP if there are no productive activities in the economy, which come from oil. If the local content law is fully implemented, the contribution of the oil sector to the GDP will rise. All of the above cannot be extricated from the highly volatile performance of the economic growth rate and other major macroeconomic indicators in recent years.



## Recommendations and Conclusion

### Strategic Policy Options for the Petroleum Industry Value Chain

Value addition in the sector is embedded within, and affected by, matters of sector organisation and governance, which to a large extent are the result of specific policy decisions. For example, the National petroleum and industrial policy, including degree of direct state involvement, commercial vs. non-commercial objectives, industrial linkages to other sectors of the economy are quite important in influencing value chain.

The policies should effectively address the mechanism/regime for capital allocation between different stages of the value chain, and within individual stages; market structure (monopoly, oligopoly, competition) and barriers to entry; the identity, responsibilities and competencies of regulatory authorities; general legal and regulatory provisions, including market and trade regulation; licensing policy to steer sector activity towards a minimum/maximum level in terms of exploration, production, refining, number of retail stations etc.; upstream depletion policy; and the tax system (as well as any subsidies) in order to encourage certain behaviour and to capture a share of the value for the state.

Similarly, there is the need for the opening up of the petroleum business to Nigerians for more investment. The NNPC, in a publication, outlined significant opportunities existing in the petroleum sector, particularly the gas sub-sector, which has been significantly underutilised due to lack of adequate infrastructure. Opportunities are available in the upstream, midstream and downstream segments, depending on technological and financial resources available to potential investors.

### Available opportunities include:

- 1. Midstream and Downstream Investments**
  - a. LPG bottling, distribution and marketing.
  - b. Plastics conversion and manufacturing.
  - c. Urea, Methanol and related plants.
  - d. Power Plants.
- 2. Critical Gas Infrastructure Investments**
  - a. Participation in consortia to build the gas Central Processing Facilities (CPFs) that will process feedstock for the petrochemical and fertilizer plants.
  - b. Pipe mills over 2 – 3000km of pipeline to be laid between 2012 and 2014, including the Ob/Ob-Oben line (48" \* 120km); Calabar-Ajaokuta-Kano (48/56" \* 1200km) and many others.
- 3. Service**
  - a. Engineering design and related support services: The National Content Law requires that a significant portion of the engineering for all the above investments must be done in Nigeria, hence opportunities exist in setting up engineering services.
  - b. Fabrication yards: significant amount of fabrication must be done in Nigeria. Existing fabrication yard capacities may be inadequate for the scale of activities envisage over the next 2-3 years.
  - c. Pipe laying activities: pipe coating, transportation and installation.
  - d. Logistics haulage and related services.

Finally, there is the need to explore modern energies and renewable energy portfolio. This will help to facilitate the availability, reliability and accessibility to energy, which is fundamental to development.

It is also important to develop and link the rural and urban areas and significantly reduce the disparity in the living conditions of people living in both areas.

### Conclusion

Value chain analysis is very important for economic development. This is particularly true of energy and finance value chain. The weak and underdeveloped nature of value chain for the energy sector is an important contributor to the volatile and generally low state of economic development in Nigeria today leading to high rate of unemployment, poverty and general misery levels. The recommendations provided will be useful in helping to strengthen the value chain and its contributions to the country's economic growth.





April, 2017

# Using Oil and Gas Resources for Energising the Diversification Process of the Nigerian Economy: The Costs of Missing the Present Opportunity

Ado Ahmed\*

In spite of the proven negative effect of fossil fuel to the environment, fossil fuel will continue to be relevant to the Nigerian economy and indeed to the global economy for a long time to come. Nigeria has relied almost completely on these resources abandoning other sectors that such as agriculture which contributed immensely to the economy prior to the discovery of oil. As a dependent economy that imports almost everything from consumables (toothpick, fish, poultry products, households' items) to industrial raw materials and machinery, the flow of foreign exchange from the sale of fossil fuel has kept the economy going. Infact the buoyancy of the economy depends on the price of crude oil in the international oil market and the volume of oil production. The current trouble of the economy is largely explained by the near complete dependence of the economy on the exports of oil, which accounts for about 90% of total exports, the falling price of crude oil in the international market and the destructive insurgent activity in the Niger Delta.

Oil is also important to Nigeria because it bankrolls the operation of the government. Revenue from the Oil sector provides the largest portion of revenue to the Nigerian State. Thus government ability to finance its operations and fund key infrastructure projects that impact on people's lives depend on the quantum of revenue it realises from the oil sector assuming the absence of official corruption. No other sector or sectors have been able to fetch appreciable revenue to the government over the years close to the revenue generated by oil. In fact according to the World Bank estimates, oil funds more than 70% of government budget. It should therefore be expected that anything that affect this revenue source will adversely affect government's operations or performance significantly.

Government's fiscal fortunes worsened to the extent paying workers salaries became a celebrated achievement even by the Federal Government! Because government is the largest spender in economy, the impacts it easily spread to the wider economy as its financial reality continued to deteriorate due to falling revenue from the oil sector.

Though the contribution of oil and gas to GDP is not very significant due to the lack of linkage of the sector with the wider economy, nevertheless its contribution to the GDP of the country cannot be ignored. Oil contributed about 10% to the GDP of the country in 2015 according to the National Bureau of Statistics' Report. Despite the capital-intensive nature of oil production relying on sophisticated machines and equipment the sector provides employment opportunities albeit a modest opportunity.

However oil can play another important role for the Nigerian economy besides those discussed above. The development of the Nigerian economy requires continuous and sustained supply of modern fuels, which the nation dearly needs to grow and develop. The poor performance of the Nigerian economy has been attributed to a large extent to the dismal performance of the energy sector which has failed to provide the needed energy to stimulate production in the economy (Adenikinju, 2005 Iwayemi, 2008; FGN, 2010 among others).

The collapse in the oil price in the oil market presents Nigeria with one of the best opportunities to dramatically change its policy on energy resource application from that of getting revenue for the government to that which utilises its abundant energy resources for energising domestic production. The plummeting price of oil has greatly constrained foreign exchange earnings and government revenue. This has created serious havoc on the economy and social lives of the citizenry.

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The policy response has been the diversification drive of the national economy through developing the economic potentials of agriculture, solid minerals, manufacturing, service and creative industry and other sectors. The optimal performance of these sectors however requires sufficient supply of energy, which is currently inadequately and unreliably supplied. Thus there is need for a policy shift using the country's energy resources to provide for the domestic energy needs of the economy so that private sector investment can be catalysed into the different sectors of the national economy. Though it may sound attractive, it is not an easy task. One of the biggest constraints the nation will face will be the mobilisation of the required resources. Government currently does not have the requisite financial resources to invest in increasing energy supply because such projects require colossal amount of resources. However, the private sector can mobilise such resources given the right incentives and commitments.

Multiple benefits will be had through this policy shift. Enhanced energy supply to the national economy will go a long way in closing the supply deficit in the country. This will expectedly increase domestic production of goods and services creating more employment opportunities in the process. The level of unemployment in Nigeria is alarmingly high. In fact many of the social ills currently being experienced in Nigeria such as armed robbery, kidnapping, youth restiveness, prostitution among others have been attributed to the alarming rate of unemployment in the country.

The increased energy supply to the economy will greatly improve the attractiveness of the Nigerian economy to local and foreign investors. The continuous flow of private investment to the national economy will undoubtedly enhance economic activity in the country. Nigeria's exports will become more diversified enabling the country to diversify its exports earnings in the process. Nigeria's dependence on foreign or imported goods is also expected to greatly decline with increased domestic production of goods and services. Great employment opportunities could be created which will greatly enhance the income earning status of the youth thereby reducing youth participation in violent activities.

Oil dependence over the years has exposed Nigeria to series of external shocks such as those that followed the oil price hikes of 1973, 1979, 1990, 2008 and the most recent 2014 with grave consequences on the national economy (Walker, et al, 2015). Oscillation in oil prices will continue to be the permanent feature of the oil market and economies and governments heavily reliant on the oil monies will perpetually be exposed to fiscal crisis with the possibility of economic recession as is currently being experienced by Nigeria, Venezuela, Saudi Arabia, Ecuador, among others.

The costs of missing the present opportunity to successfully diversify the economic base of the nation will be unbearable to a nation whose corporate existence is being threatened from the different sections of the country and whose institutions have already been weakened by years of corruption and massive looting of government treasury for the last three or more decades. If the current diversification process is not sufficiently energised through enhanced supply of electricity, Nigeria is going to lose a golden opportunity and her economy will continue to be dictated by the swings in the global oil market.

This is an opportunity that Nigeria cannot afford to fail to put to proper use to diversify its economy because the costs will be too heavy for the country to bear. The future of the country's economy and her political and social landscape may be very difficult to define. The diversification of the economy needs the support of the energy sector. The country must learn to use its energy resources not as a source of government revenue but for energising domestic production for local and international market.

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# Structural Breaks, Electricity Generation and Economic Growth in Nigeria

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## Introduction

Steady and abundant electricity supply is a vital input in consumption and production activities. Changes in an economy's structure, such as changes in energy policy or economic development regime, reforms in energy regulation, or institutional developments, may account for growth instability (Lee and Chang, 2005). Considering the fact that electricity policies are formulated on the background of ensuring stable relationship between electricity generation and economic growth, this paper empirically test this hypothesis while also testing the direction of relationship between electricity generation and economic growth in Nigeria.

Nigeria has adopted various economic reform models to ensure an all-encompassing development over the decades. These include the National Plans of the 1970s to the Rolling plans of the 1980 post-Structural Adjustment period and to the recent 2017 Economic Recovery and Growth Plan. A sizable number of energy policies with particular interest on increased electricity generation have also been formulated. Notable, is the 1988 power sector reform and the passage of the Electric Power Sector Reform Act 2005. The latter reform gave birth to the unbundling of the power sector, which has hitherto remained under State control. A unique feature of all the reforms was to address the problem of unstable generation and the acute power shortage arising from dilapidated structures, obsolete equipment among others. However, the reliability and quality of electricity supply remains a serious issue, as significant gap exists between electricity demand and supply.

Several empirical studies in Nigeria have examined the electricity consumption-economic growth nexus (see for example, Akinlo, 2009, Ogundipe and Apata 2013 and Iyke, 2015). However, existing literature remains divided on the direction and magnitude of the relationship. A major factor in the differences can be traced to the methodologies adopted and in particular to how structural changes in the economy are incorporated into the analyses.

A recent innovative approach that has been used to account for the structural breaks is the Rolling Impulse Response (RIR) that accounts for variation across different sample windows (Blanchard and Gali, 2007).<sup>1</sup> Unlike the conventional structural breaks techniques, the RIR method has the ability to describe variations over a sample period without necessarily imposing discrete break over full-sample observation. This is the approach adopted in this paper.

Therefore, the paper departs from the extant literature by considering the impacts of changes in economic structure.

## Theoretical Framework and Methodology

In providing the theoretical framework for the relationship between electricity generation and growth, the production function based on growth theory is adopted. Within this framework the impact of electricity on (aggregate) output is usually modelled in two main ways: firstly, directly when electricity services enter production as an additional input and secondly, indirectly when they raise total factor productivity by reducing transaction and other costs, thus allowing a more efficient use of conventional productive inputs (Straub 2008). Hence, a standard functional model showing relationship between electricity generation and economic growth is specified below:

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<sup>1</sup>The full sample VAR approach was employed to compare results with RIR approach.





$$Y_t = Af(L_t, K_t) \quad (1)$$

Where  $Y_t$  is output indicator,  $A$  is total factor productivity or efficiency parameter,  $L_t$  is labour,  $K_t$  is capital. Following (Ogagavwodia, 2014) electricity indicator is assumed to impact on output through factor productivity. Total factor productivity is further assumed a function of electricity indicator ( $X_t$ ). Thus:

$$A_t = f(X_t, L_t, K_t) \quad (2)$$

Equating equations (1) and (2) and substituting for  $A_t$  gives:

$$Y_t = f(L_t, K_t, X_t) \quad (3)$$

An empirical testable model was then developed from equation (3):

$$GDPgr_t = \alpha + \beta_1 LF_t + \beta_2 GFCF_t + \beta_3 ELECTgt + \varepsilon_t \quad (4)$$

$GDPgr_t$  denotes output indicator and it is measured by real GDP growth rate (Edquist and Henrekson, 2006),  $LF_t$  is labour force proxied by population,  $GFCF_t$  is gross fixed capital formation used to measure capital, and  $ELECTgt$  stands for electricity indicator which is measured by quantity of electricity generation.<sup>2</sup> It is theoretically expected that labour force, gross fixed capital formation and electricity generation will directly impact on economic growth.

We test for the order of integration of the two series using the Augmented Dickey Fuller (ADF) and Philip-Perons (PP) unit root test. If the variables are stationary at levels  $I(0)$  or mixture of  $I(0)$  and  $I(1)$  we proceed to test for the short-run relationship of the model using Granger-causality test (Naka and Tufte, 1997). The short-run relationship between the electricity generation and economic growth is performed in two steps. First, we use Vector autoregressive (VAR) model to show dynamic relationship between electricity generation and selected variables. Second, we test for the possibility of structural break exploring the dynamic rolling impulse response (RIR) model which is specified to empirically analyse equation (4). The RIR function is a bivariate model within the VAR framework; it shows the dynamic interaction between the quantity of electricity generation and economic growth across different sample periods. The RIR estimable model is specified as:

$$GDPgr_t = \delta + \sum_{j=1}^k \theta_j GDPgr_{t-j} + \sum_{j=0}^k ELECTgt_{t-j} + \varepsilon_t \quad (5)$$

In eq. (5) GDP growth rate is specified as a function of its lagged value and current and lagged value of quantity of electricity generation.

The RIR approach is based on change in the response pattern of a surface contour as shown by the estimates of output growth rate and quantity of electricity generation relationship. Instability/ structural break in output growth rate-electricity generation is determined by the nature of the surface contour, a flat surface contour indicates stability, while a spiky contour indicates otherwise.

Data were sourced from Central Bank Statistical Bulletin (various issues) and IEA statistics for the empirical analysis. All variables were used in their natural log form and cover quarterly series spanning from 1970 q1 to 2014 q4.<sup>3</sup>

### Empirical Analysis and Results

The time series properties of the series are presented in Tables 1 and 2. Table 1 shows the stationary analysis of the variables using the Augmented Dickey Fuller (ADF) and Phillips-Peron (PP) Unit Root Test Statistics. The result revealed that most variables in the model are stationary at their levels, while only one is not, implying that the series are mixture of  $I(0)$  and  $I(1)$ . The null hypothesis of unit root cannot be rejected for all the variables in the model specified in the previous section. Consequently, the dynamic relationship between electricity generation and GDP growth rate can be determined within a VAR framework. As such, we

<sup>2</sup>Gosh (2009) makes a case for electricity generation being a more meaningful indicator than electricity consumption in countries with high levels of non-technical transmission and distribution losses (e.g. as a result of theft or pilferage of electricity), as the use of official data may lead to a systematic underestimation of real electricity consumption.

<sup>3</sup>Note that data for 2015 and 2016 electricity generation in Nigeria were not available as at the time of this research. Rolling impulse estimation deals with large number of observations.





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ascertain a short-run statistical association among the variables using Granger causality test based on the Block Exogeneity Wald Test approach.

**Table 1: Unit Root Test Result**

Augmented Dickey Fuller (ADF)			Phillips-Perron (PP)		
Series	Intercept	Trend and Intercept	Series	Intercept	Trend and Intercept
ELECTg	-2.429	-2.510	ELECTg	-3.697**	-2.890
RGDPgr	-2.414	-3.118	RGDPgr	-6.947*	-7.123*
LF	-0.677	-5.931*	LF	-0.316	-1.399
GFCF	-0.533	-2.491	GFCF	-0.500	-2.586

Note: \*\*\* \*\* \* indicates significance level at 1%, 5%, and 10%.

The result for Granger Causality Test in Table 2 indicates no short-run relationship between electricity, real GDP growth rate and gross fixed capital formation. Suggesting that electricity generation does not account for economic growth in Nigeria. This is not too surprising given the fact Nigeria's electricity generation remains one of the lowest in the world, thus, its non-impact on general economic activities and the huge dependence on private autogeneration. The finding is also consistent with other literature (Yoo and Kim, 2006). However, there is causality between electricity generation and labour force.

**Table 2: Granger causality Test Result**

Null hypothesis: Electricity Generation Granger cause:		
Variable	Chi-Sq	Prob.
GDPgr	1.94	0.38
LF	33.07	0.00*
GFCF	2.30	0.31

Note: The Granger Causality Tests are based on VAR Granger Causality/ Block Exogeneity Wald Test. \*\*\* \*\* \* indicates significance level at 1%, 5%, and 10%.

The dynamic response of the selected variables to electricity generation is presented in Figure 1 based on full sample VAR approach. Central to this study is the relationship between electricity generation and economic growth rate. The response of real GDP growth rate, though negative, tends towards zero both in the short and long lag, confirming insignificant impact of electricity generation on real growth rate in Nigeria. Until the 4th-quarter period, labour force did not respond significantly to electricity generation. While the response of fixed capital formation also remained insignificantly negative to impulses from electricity generation throughout the lag period. The findings are not too different from the results obtained from Granger causality test.



**Response to Cholesky One S.D. Innovations  $\pm 2$  S.E.**

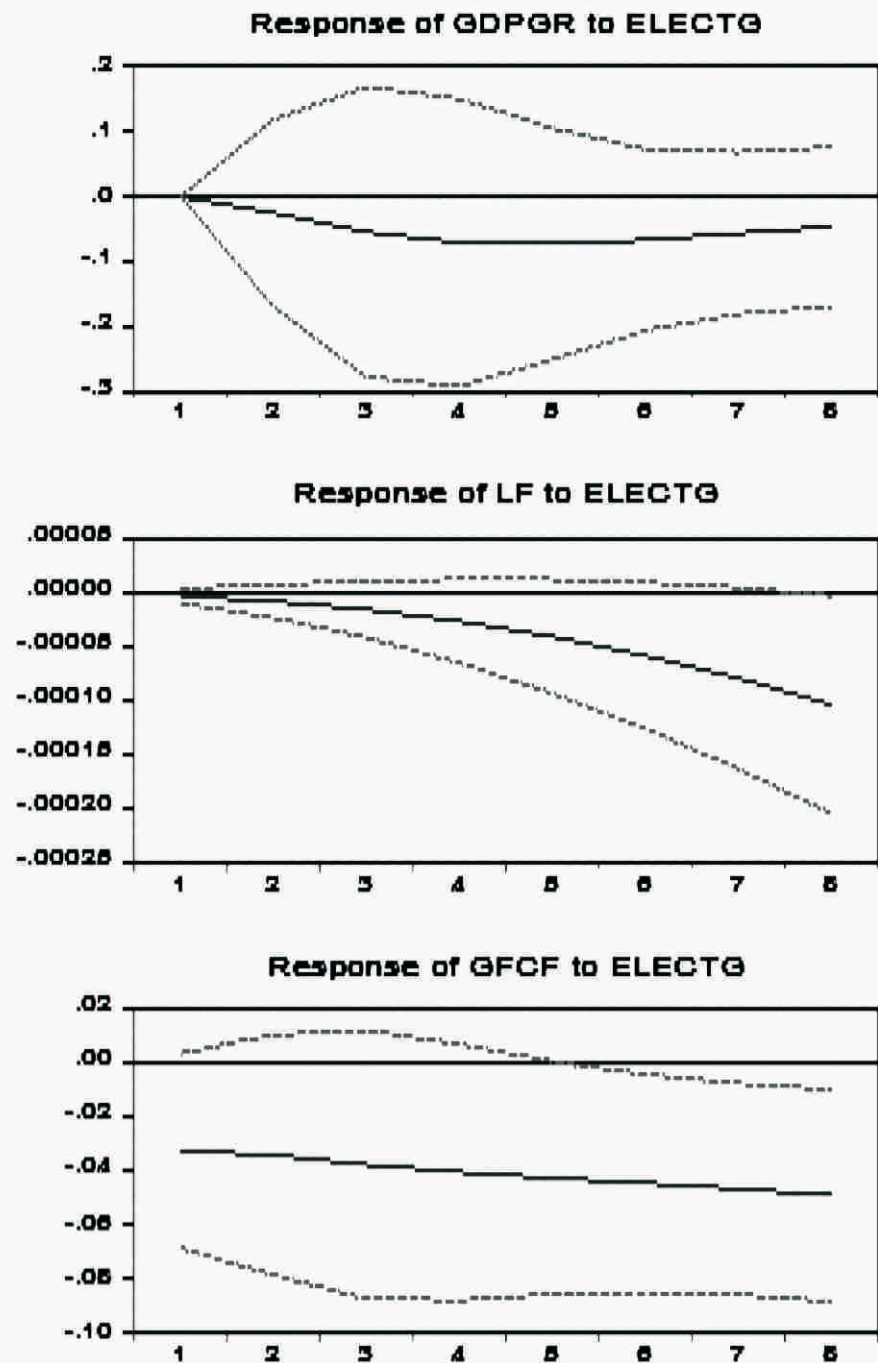


Figure 1: Dynamic Response of Real GDP Growth Rate, Labour Force and Gross Fixed Capital Formation to Electricity Generation

The sub-sample analysis based on RIR captured differences across 40quarters window (10-years) each, with the first window centred in 1980q1. Variation in the sample periods comes inform of spikes on the surface contour. Similarly, the result in Figure 2 further indicates a minor impact of electricity generation on real GDP growth rate in the early period of the 1980s, no impact was recorded in the subsequent periods. Hence, given the various electricity reform strategy over the decades, the poor and high instability in electricity generation has weak impact on Nigerian economic growth rate. It is worthy of note that findings from the sub-sample approach are not too different from the full sample VAR results.





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### Response of Real Gross Domestic Product Growth Rate

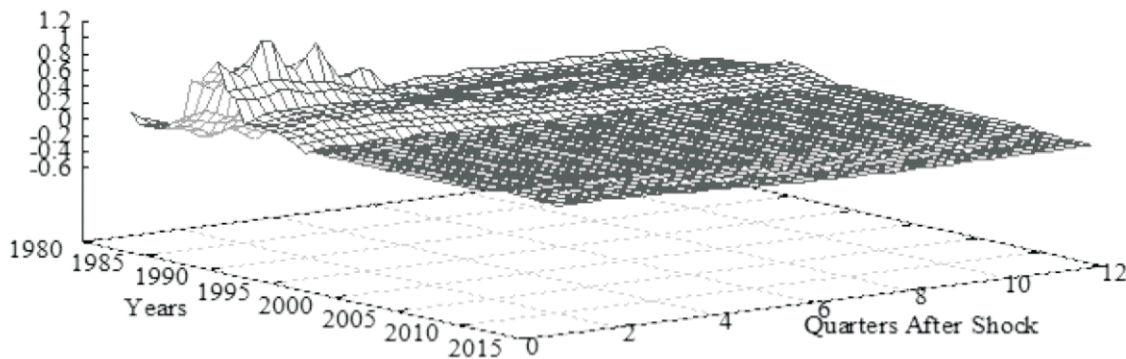


Figure 2: Response of Real Gross Domestic Product Growth Rate

### Conclusion

Instability and low electricity generation in Nigeria has continued to raise concerns. As such various energy reforms has been put in place to enhance optimal performance of the electricity sector given its role in economic growth and development. This paper used full sample VAR and structural breaks approach-rolling impulse response model-to obtain evidence for changes in the impact of electricity generation on Nigerian economic growth rate across sub-sample periods. Findings revealed that electricity generation does not Granger cause real GDP growth rate and gross fixed capital formation, while a short-run relationship exist for labour force. No strong dynamic relationship exists between electricity generation and real GDP growth rate over the lag period. Lastly, result from RIR technique indicates that real GDP growth rate does not respond to impulses from electricity generation over the years, but for weak impact in the early 1980s. The implication of the findings is that recent power sector reforms notwithstanding, the overall impact on economic growth is yet to be felt.

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## The New Wave for Ending Unreliable Power Supply in Nigeria

Emmanuel Charles\*

### Background of Electricity Supply Industry in Nigeria

Nigeria is a country that is blessed with abundant natural resources, which if properly harnessed will aid the provision of constant supply of electricity to the country's populace. These resources include oil and gas, coal, sunlight, water, etc. Power supply plays a vital role in the growth and development of any economy. It is a key catalyst for industrialisation of any nation, which in turn has a multiplier effect in the economy. Over the years, the electricity sector in Nigeria has witnessed tremendous changes overtime, but these changes have not made any significant contribution to the improvement of electricity supply in the country. There is no gainsaying that the country has lost enormous revenue due to unreliability of power supply in the country.

The evolution of the Nigerian electricity sector dates back to the late 1890s with the establishment of the first plant in Lagos by the colonial masters under the jurisdiction of the public works department. This was then followed by the establishment of other power plants such as the hydroelectric power plant at KURRA falls near Jos constructed by the Nigerian Electricity Supply Company (NESCO) a privately owned company. African Timber and Plywood Limited in 1930 brought on stream the SAPELE power plant and the Shell Petroleum Development Company established their power plant in Bonny and Delta areas.

In the 1950s, the Electricity Corporation of Nigeria (ECN) was established through Ordinance No.15 of 1950 to ensure the co-ordination and integration of the operating plant in the country. Following the establishment of the ECN, the Niger Dam Authority (NDA) was established due to the successful completion of the Niger Dam Hydroelectric project at Kanji in 1962. The NDA was mandated to oversee the development of hydroelectric facilities in the country. The existing law at that time charged the NDA with the responsibility of constructing and maintaining the dams and other projects on the river Niger and other locations in country.

Due to intermittent power failure witnessed in the country as a result of lapses in the operations of ECN and NDA, the two agencies were merged to form the National Electric Power Authority (NEPA) in 1972 under Decree No.24 of 1972. Thus, NEPA became a fully recognised government monopoly responsible for the generation, transmission and distribution of electricity to customers in the country.

Electricity generated by each of the power stations was sent directly to the national grid housed by the National Control Centre through the transmission lines scattered across the country. The National Control Centre on receipt of the power (electricity) will then redistribute it to different parts of the country. Stability could not however be attained.

The inefficiency of the State-owned electricity utility led the government to the current state of reform in the power sector with the formation of the Power Holding Company of Nigeria (PHCN) and the signing into law in 2005 of the Electric Power Sector Reform Act (EPSR). The EPSR Act brought about the restructuring of the electricity industry in Nigeria. The Act enabled private company participation in the electricity value chain. The Act further provides for the establishment of the Nigerian Electricity Regulatory Commission (NERC) to ensure monitoring and regulation of the power sector. Under the Act, the Government incorporated a Board of Directors for PHCN as a public limited liability company and also the unbundling of the PHCN into six generation companies, 11 distribution companies and one transmission company. The handover of these various

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business units to the private sector was through the outright core investor sales and concession under the Act.

The Act conferred ownership right of all the assets and liabilities of the PHCN to the new businesses. But with the challenge of the various reforms the sector had experienced, there has been no significant improvement in the country's electricity sector. These challenges have continuously allowed for unreliability of the power supply situation in the country. Several factors account for the unreliable power supply in the country. Some of which may be obsolete transmission and distribution Lines in that the transmission and distribution lines for the evacuation of electricity generated have become obsolete and as such require replacement. This has resulted in several and consistent power outages being experienced around the country. Underutilisation of generation capacity is another key factor responsible for the erratic power supply in the country. Nearly all the power generating plants in the country are operating under capacity. As such majority of the power plants in the country generate below their installed capacity. The utilisation factor of these power plants is very low. The country's power sector does not only have the issue of insufficient generation but also that of inefficient and ineffective utilisation of the installed generation capacity.

Furthermore, the procurement of refurbished power turbines constitutes a major factor to the unreliability of electricity supply in the country. It is not farfetched to assert that most of the turbines purchased into the country are substandard and used. Some of these turbines are refurbished, which thereby affects the workability of the power supply in the country. Also lack of mechanism for transmission/distribution losses minimisation in the course of transforming the electrical energy to heat energy as it flows through the conductors. Following loss minimisation mechanism is the lack of technical manpower that understands the workings of the power industry. This however is the general problem in Nigeria where corporations mostly government firms employ workers based on favouritism and tribalism instead of experience and level of expertise. As such the performance of these companies are very poor and the Nigerian Electricity utilities are no exception while none diversification of energy sources is central to power supply in any situation.

Nigeria over the years has been known for generating electricity from hydro until recently the government began emphasising the use of natural gas for power generation. The country however is blessed with enormous energy resources but the country still considers power generation from hydro and gas the best options. Finally, partial liberalisation of the electricity industry constitutes another factor for the erratic power supply in the country in that the electricity sector in the country is not fully liberalised as the government still has some level of control in the sector.

### Recommendations and Conclusion

To attain reliable power supply in the Nigerian electricity industry, the following measures are recommended:

1. **Diversification of the Country's Electricity Generation Sources:** There is an essential need for the country to diversify her electricity supply especially with a focus on the promotion of alternative energy. This is as a result of the fact that the extreme reliance of the country on oil has slowed down the development of alternative sources of energy even when there are diversification options for energy sources. As a result, the unreliability of electricity supply constitutes a giant drain on the development of the economy. It is therefore imperative to promote the use of alternative energy in the country.
2. **Government Support of IPP through PPP:** Ending the erratic power supply in the country will require government support for the development of independent power projects (IPPs) across the country as this will aid in accelerating the pace of providing power infrastructure development across the country. Public Private Partnership (PPP) approach for the development of independent power projects will be a robust way of increasing power supply in the country thereby catalysing the growth and development of the economy as a whole. Private sector participation can greatly improve quality, efficiency and ensure reliability in power supply.
3. **Full Liberalisation of the Market:** Full liberalisation of the electricity market is critical to allow for market efficiency and competition combined with increased private



participation for the growth of electricity sector. Government have to let go of the control of the market, as partial liberalisation of the market will not enable the attainment of full market potential.

4. **Integration of Wholesale and Retail into the Value Chain:** The electricity value chain is critical to the attainment of constant power supply in the country. The alienation of the wholesale and retail space in the value accounts for illiquidity of the distribution players. Therefore there is the need to incorporate the wholesale and retail into the electricity value chain.
5. **Human Capital Development:** Although this is a general Nigerian problem in that the level of human capital development is low given that most companies especially government firms, employ workers not based on merit and competence but on favouritism and tribalism. As such, the organisations are filled with workers that lack professional and technical competence. Therefore it is essential to ensure consistency in human capital development of the organisations and also the electricity companies should focus on employing qualified and technically competent workforce to drive the sophistication in the new modern energy and power industry.
6. **Incorporate a Permanent EFCC unit in the Sector:** There are enormous economic crimes committed in the electricity sector in the country. It is, therefore, essential to establish a special unit of the Economic and Financial Crimes Commission (EFCC) that will be dedicated to the electricity sector with independent powers of investigation, arrest and prosecution without recourse to the Ministry of Justice.
7. **Adoption of Energy Efficiency and Conservation Policies:** In the world today, there has been great move towards sustainable energy by re-evaluating the way energy is generated and utilised so that social, environmental and economic aims of sustainable development are supported. Therefore in Nigeria, there is need for the Government to ban the use of electric gadgets and devices that waste electric energy and encourage the use of gadgets that save energy. The benefits of energy efficiency are self-evident. Many forward-thinking industrial and commercial countries in the world and Africa (such as Niger republic and Ghana) in particular have already adopted energy efficiency as a key policy towards maximising profits.
8. **Upgrade of Power Transmission and Distribution Equipment:** The new companies that took over electric power transmission and distribution business in Nigeria should embark on immediate upgrading of the power transmission and distribution infrastructures. More emphasis should be on transmission and distribution infrastructures now and then after ensuring that the equipment on ground can comfortably distribute the power currently being generated and the amount of power the generating companies intend to generate in the near future, then emphasis will now shift to power generation. The transmission and distribution infrastructures on ground cannot cope with the increase in the power generated.





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# Mainstreaming Nuclear Energy in The Nigerian Energy Mix: Implications for Sustainable Development<sup>1</sup>

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## Introduction

Nigeria has one of the lowest net electricity generation per capita in the world (Olatuyi, 2015) and only about 40% of Nigerians have access to electricity (ECN, 2014). With an installed grid capacity of 6,000MW, power generation rarely crosses 4,000MW of electricity presently, which is lower than what India generates from nuclear power plants alone (IAEA, 2009). Oketola (2015) corroborates this position and puts per capita electricity usage in the country at 136 kilowatt/hour, which is one of the lowest electricity consumption on a per capita basis in the world, when compared with the average per capita electricity usage in Libya, which is 4,270KWH; India, 616KWH; China, 2,944KWH; South Africa, 4,803 KWH; Singapore, 8,307KWH; and the United States, 13,394KWH.

Electricity demand is on the increase in Nigeria and it is strongly evident that the present energy mix may be inadequate to meet current and future needs. A major cause of this energy deficit in Nigeria is the absence of a robust and comprehensive energy basket. This unfortunate situation has brought to the fore, the need to explore alternatives to bridge the gap between demand for and supply of energy services in Nigeria. It has become necessary to include nuclear power in the current power mix as provided in the National Energy Policy (ECN, 2014); also Nuclear power plants are adjudged to have low operational costs and the added advantage of long life spans. The nuclear energy industry is an established industry; being over fifty years old, it has accumulated years of experience in nuclear power plant design and technology, making it safe and available for use. At present, nuclear power provides approximately 11% of the world's electricity and 2.1% of Africa's electricity (IEA, 2014 and Chad-Umoren and Ebiwonjumi, 2013).

However, despite the much-touted benefits of nuclear power, discussions on nuclear energy usually go with considerable care. Apart from the requirements of international regulation, nuclear energy – rightly and wrongly – is often associated with danger, catastrophe and warfare, with the recent case of the March 2011 catastrophe in Fukushima, Japan being put forward by critics as an example – the largest nuclear catastrophe after the Chernobyl 1986 disaster in Ukraine (Chad-Umoren and Ebiwonjumi, 2013 and Oludare *et al.*, 2014). But if used objectively and constructed to international specifications, nuclear energy can be a sustainable solution to electricity problems in Nigeria. This paper makes a modest contribution to the discourse on Nuclear power through the lens of sustainable development and suggests policy solutions to aid the seamless inclusion of Nuclear energy in the country's energy mix.

## Nuclear Energy Choice and Sustainable Development in Nigeria

The Sustainable Development Goals is evidence of the international recognition given to sustainable development issues; otherwise known as the Global Goals, it builds on the success of Millennium Development Goals (MDGs) the world committed to achieving by 2015. Goal 7 of the Sustainable Development Goals (SDGs) seeks to ensure access to affordable, reliable, sustainable and modern energy for all. Sustainable energy generation by expanding infrastructure and upgrading technology to provide clean energy sources in all developing countries is a crucial target that can both encourage growth and help the environment (UNDP, 2015). From a sustainable development viewpoint, the competitiveness of different supply options should be assessed on the basis of the full costs to society and diversity of supply in a

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<sup>1</sup>The full paper was presented at the 9<sup>th</sup> Annual conference of the Nigerian Association for Energy Economics on Energising Emerging Economies: Role of Natural Gas & Renewable Energy Resources.





world energy system largely based on fossil fuels (OECD, 2004). The analysis of nuclear energy characteristics within a sustainable development framework is vital. There is an increased effort by countries (Nigeria inclusive) to diversify energy generation towards a mix of fossil fuels, nuclear, hydropower, and renewable energy sources (OECD, 2004; SD, 2014).

**Box 1: The more people learn about nuclear power, the more supportive they are of it**

- 73% positive in Clean and Safe Energy Coalition survey in 2006.
- Nuclear power plants produce no controlled air pollutants, such as sulphur and particulates, or greenhouse gases.
- The use of nuclear energy helps keep the air clean, preserve the earth's climate, avoid ground-level ozone formation, and prevent acid rain

Generating 1 million kilowatt-hours of electricity produces:

- 996 metric tons of carbon dioxide from a coal-fired plant
- 809 metric tons of carbon dioxide from an oil-fired plant
- 476 metric tons of carbon dioxide from a natural gas-fired plant
- None from a nuclear power plant.

Nuclear power does not burn anything to generate electricity, saving 2.6 billion metric tons of CO<sub>2</sub>/year

- Nuclear energy accounts for 90% of all electric utility savings in carbon dioxide emissions since 1973.
- Nuclear power reduces worldwide CO<sub>2</sub> emissions by more than 2 billion metric tons per year.
- Nuclear accidents rarely occur and related deaths are limited to the accident area but the effect of emissions from other energy sources has global consequences.

Nuclear power plants require little land to produce 1000MWe of energy

- Solar plant consisting of 60 square miles of glass is higher
- Biomass: ethanol takes more for 1000MWe and potentially more smog.

5400 windmills needed for 1000MWe.

Source: Ervin (2011)

The option of nuclear energy has been adopted with considerable success (as well as concerns), prompting advanced research for deepening their usage. Nigeria, going by her energy performance, should take advantage of the changing global energy climate as a means to retrace her steps.

**Recommendations**

To become a symbol of success in nuclear energy development in foreign energy circles, the following recommendations are put forward:

1. The energy sector in general should be backed with the desired political will to condition it to better energise the economy.
2. There should be a purposeful collaboration among the relevant government ministries, departments and agencies involved in nuclear energy-related policy.
3. Better awareness to improve public perception is paramount to demystifying complex issues surrounding nuclear power.
4. The security situation in the country needs to be strengthened to guarantee the capability of the country to protect nuclear installations and also ease concerns over possible vandalisation or hijack.
5. Active participation and skilled cooperation with external institutions like the Environmentalists for Nuclear Energy (ENE), Nuclear Industry Association (UNI), World Nuclear Association (WNA), International Atomic Energy Agency (IAEA), World Association of Nuclear Operators (WANO) and West African Integrated Nuclear





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Power Group (WAINPG), to project and protect national interest in the area of nuclear energy relations.

6. Nigeria's first nuclear power plant is expected to cost over \$6bn. Finding local investors with this amount of liquidity will be very difficult. There is therefore the need for improved energy financing by encouraging more efficient finance mechanisms from domestic and international financial institutions to offer simplified financial solutions for energy partnership to help improve efficiency and drive down costs. Also, government should expand the scope of Venture Capital Financing (National Risk Fund Plc.) to embrace investments in the nuclear energy sector.
7. Government needs to create the environment for investment in nuclear power. There is the need for a professional and independent regulatory regime; development of policies on nuclear waste management and decommissioning; and adoption of international non-proliferation measures and insurance arrangements for third party damage.
8. Energy policy is within the realm of macroeconomic policy. Therefore sound macroeconomic management is essential to cater for volatility and shocks.
9. Pending legislative issues should be addressed to give institutional, legal and regulatory backing to nuclear energy efforts. A step in this direction will be the consideration and passage of the Nuclear Safety, Safeguards and Security (NSSS) Bill and the new Nigerian Atomic Energy Commission (NAEC) Act. Also, the establishment of the Nuclear Power Programme Coordination and Implementation Organisation (NPPCIO) should be finalised to serve as the planning, coordinating and implementing organisation for nuclear power programme.
10. Research and Development in nuclear energy in the country should be intensified by strengthening, streamlining and upgrading the existing nuclear research and development institutions.

## Conclusion

The energy future of the country will largely depend on the choices made in the development of the energy mix of the country. The inclusion of nuclear energy can assure a future of cleaner energy and sustainable development. It is advocated that nuclear energy be included in the country's energy mix as it is not only clean, but it is also safe, reliable, durable and competitive.

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## Solar Home Systems Programme: *Power Beyond the Grid*

\*Funlola Osinupebi and \*\*Lolade Abiola

### Solar Home Systems Programme

The Federal Government is committed to supporting off-grid communities who have no access to electricity. The Advisory Power Team (APT), Office of the Vice President, Federal Republic of Nigeria, is working on a variety of methods to achieve this goal, one of which is supporting the deployment of Solar Home Systems to regions where access to electricity is minimal and at times non-existent. These Solar Home Systems offer a clean alternative to candles, kerosene lanterns and small petrol generators, which attract high running costs and have detrimental effects on the environment and on the health of the users.

Currently, each unit includes a solar panel, which powers four light bulbs, a radio, a torch and telephone charging points. Customers purchase the equipment on a Pay-As-You-Go basis, with eventual ownership coming after full completion of payment. The payments are modelled on community income levels - i.e. made as affordable as possible for these communities.

Beneficiaries in the pilot programmes in Osun, the Federal Capital Territory (FCT), Abuja, and Kwara have shown strong improvement in payment discipline. In December 2016, 12% of participants were in "bad credit", i.e. in default of 61 days or more. This was down from the 18% that was recorded in October 2016. As people are getting used to paying as at when due, according to the agreed payment plan, payment patterns keep getting better.

The project, supported by Niger Delta Power Holding Company (NDPHC), is to be expanded to 20,000 households, and aims to increase private sector investment in the off-grid solar household system market by attracting local and foreign direct investment into this emerging market.

The APT intends to support entrants into the solar home system market and create an enabling environment by addressing barriers to entry and ensuring that the policy and regulatory conditions are conducive to market expansion. Initial deployments will begin in States with low grid penetration, including Bauchi, Benue, Borno, Katsina, Kano, Kaduna, Nasarawa, Plateau, Taraba, and Zamfara.

The systems will be deployed to communities that are hardest to reach, thereby building up a distribution network of quality solar products to rural off-grid communities. This initiative is targeting the lower cadre of society that represent those at the bottom of the "power pyramid."

In addition to bringing power solutions, this programme will provide job creation opportunities and capacity development within each community. It is envisioned that this programme will touch the lives of hundreds of thousands of people and create at least 500 direct jobs and 5,000 indirect jobs.

The programme also includes the rehabilitation of over 1,000 abandoned solar powered water storage facilities located in various communities across the country. This initiative leverages on the diverse use of solar power as a sustainable energy source and entrenches the need to ensure maintenance of existing assets.

The APT strongly believes that an expanded household solar market will complement efforts to expand large-scale energy infrastructure - connecting people to power now while awaiting the expansion of the national grid.

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### How the Programme Works

1. Azuri Technologies (The Solar Home Systems' Providers) goes into a selected community and holds town hall meetings with locals to inform them of the product and its advantages over their current means of electrification (candles, batteries, kerosene, firewood etc.)
2. The price of the system -N1,500/month over a period of 3years after which the system belongs to the user. Users may wish to pay off the system prior to end of the 3-year payment period depending on liquidity.
3. Azuri enlists the support of the local chief or community leader to collate a list of people willing to buy the systems as well as a list of capable residents that can be employed as Azuri installers and agents.
4. After training installers and agents, Azuri begins system deployment within each community. The systems are all under warranty for a period of 3 years.



Vice President, Professor Yemi Osinbajo, formally launched the Solar Home Systems Programme in Wuna Village, Gwagwalada Area Council, FCT, on 31 January 2017.





## Legal and Regulatory Challenges to Solid Minerals Development in Sokoto State

\*Dr. Ibrahim Abdullahi and \*\*Barrister Safiyyah Ummu Mohammed

Nigeria is well endowed with a variety of strategic solid mineral resources, which are widely distributed across the 36 States of the country. Over 34 minerals have been identified nationwide and Sokoto State is one of the states of the country that is highly endowed with solid minerals such as kaolin, gypsum, limestone, red mills, phosphate (both yellow and green) and shade in commercial quantities (UNDP, 2014). More recently, the State Government through the Ministry of Solid Mineral and Natural Resources Development, authorised research on mineral resources with a view to determining their locations and commercial viability. The first phase of its findings identified 20 varieties of solid minerals (Muhammad, 2017).

Additionally in order to attain its goal of utilising such mineral resources in the State, a 4-year Strategic Development Plan has been designed by the State for onward transmission to the National Economic Council. This would enable the establishment of mineral based industries using the raw materials within the State. To achieve the set goal, the process must be executed within the established legal and regulatory frameworks for developing solid minerals in Nigeria.

Numerous changes have taken place before the current legal framework for developing the solid minerals sector in Nigeria was enacted. In 1973, The Nigerian Mining Corporation was set up to facilitate the exploration and exploitation of solid minerals by the Nigerian Government. Little success was achieved however due to the dominance of petroleum industry on the National economy (Gyang, Nanle & Chollom, 2010).

When the Ministry of Solid Minerals was established in 1995, it signaled a move by the Government to promote the development of the solid minerals sector in Nigeria. With the subsequent enactment of the Minerals and Mining Act of 2007 and the Minerals and Mining Regulations of 2011, the Federal Government of Nigeria has further shown its commitment in developing this important sector. Together, these enactments embody the sector's policy, regulatory and institutional frameworks. The Act empowers the Minister for Solid Minerals Development, on behalf of the Federal Government, to issue the following mining licenses:

1. Reconnaissance Permit;
2. Exploration License;
3. Small-Scale Mining License;
4. Mining License;
5. Quarrying License; and
6. Water Use Permit.

The Nigerian Minerals and Mining Regulation operates to streamline procedures for granting licenses to investors and guarantees access to mining sites with minimal encumbrances. Through various mining titles, the regulation provides for the right to search for and exploit minerals in Nigeria.

In order to diversify the economy and reduce reliance on the oil sector, the National Policy on Solid Minerals aims to ensure the development of the mineral resources of the country by providing clear rules for authorities; regulations for the exploitation of the minerals; and a prescribed pattern of development with roles of the different actors clearly defined.

Under the Constitution of the Federal Republic of Nigeria, 1999, as amended), mining and all sub-soil resources belong to the exclusive legislative list. Consequently, State and

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Local Governments with mineral deposits are precluded from legislating on mineral resources.

In order to make the States and Local Governments, which are closer to the mining enterprises to be joint stakeholders in the sector, the Minerals and Mining Act of 2007 provided for a forum for the three tiers of government to interact. This came through the establishment of a Minerals Resources and Environmental Management Committee.

The Minerals and Mining Act of 2007 and the Minerals and Mining Regulations of 2011, have provided new opportunities for domestic and foreign investors to enter the industry. Mining is to be private-sector driven with the government playing the role of administrator and regulator. This results in liberal space for foreign and domestic investment.

Though there have been major reforms in the legal and regulatory framework of the solid minerals sector, there still exist a number of challenges that hinder the development of the sector.

In Sokoto State, it is mostly artisanal and small-scale miners, who, though lacking in appropriate technology and sufficient funds, carry out mining activities. These miners who are a major feature of the sector are often reluctant to imbibe best practices in their operations. The manner in which mineral deposits are exploited portrays great danger for the communities where the resources are found. In Wamakko where the Cement Company of Northern Nigeria explores limestone in conjunction with local inhabitants, the environmental challenges caused by the exploitation cannot be manifold.

Other challenges include policy inconsistency, inadequate legislation and weak regulations. This, in addition to a lack of necessary infrastructure makes it difficult to enforce such policies and regulations that are needed to develop the industry. Effective implementation of policy to formalise the informal mining sector will help to reduce the significant barriers to inclusive growth and sustainable development in the sector.

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## Highlights of the Ninth NAAEE Annual Conference

\*Olubukola Victoria Moronkola

The Nigerian Association of Energy Economics (NAAEE) held its ninth annual international Conference at Sheraton Hotel, Abuja, Nigeria 25 – 26 April 2016. The theme of the Conference was “Energising Emerging Economies: The Role of Natural Gas and Renewable Energy.”

The Conference created a platform for energy practitioners, professionals, industry personnel and experts from the government, academia, private sector and the industry to analyse, discuss and network on ways in which natural gas and renewables can energise the economy and how both fuels will be the future driving fuels of the economy.

The Conference kicked off with various in the areas of:

1. Natural Gas and Renewable Energy Development Patterns.
2. Renewable Electricity Market Development.
3. Geopolitics of Petroleum Resources and Supply.
4. Role of Natural Gas and Renewable Electricity Market Development.
5. Energy Finance and Investment.
6. Electricity Economics and Policy.
7. Petroleum Economics and Policy Research.
8. Climate change and Energy Industries.
9. Green Energy and Economic Growth.
10. Hydropower and Market Power Issues.
11. Institutional and Regulatory Frameworks for Natural Gas Developments.
12. Renewable Energy Project Finance.

The Conference had in attendance Prof. Ricardo Raineri, the 2016 NAAEE President-Elect, serving and retired Government officials, industry players, members of the academia and students.

### Some Key Issues Raised at the Conference

1. The timing as a key factor in the energy sector.
2. The diverse portfolio of renewable energy in Nigeria.
3. Human and technical resource development to allow the utilisation and management of the fuels.
4. Energy access to cost effective electricity.
5. Energy entrepreneurship to propel the Nigerian youths especially in small and medium scale renewable projects.
6. Synergy between gas price and producers.
7. Policies and laws to stimulate and sensitise the economy.
8. Synergy between the government and the academia.
9. Monetisation of the renewable drivers.
10. The relationship between population, energy poverty, energy demand, energy development, energy access, climate change, prospects and opportunities for renewable energy globally and most especially in Africa.
11. The unquestionable roles of data, research, planning and timing in the Nigerian energy economy and lack of information on renewable energy potentials for appropriate decision-making on improving energy supply.
12. The correlation of population, production and modernisation as being drivers of

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renewable energy in Nigeria.

13. The issue of endogenising various renewable energy sources in Nigeria.

### Some Recommendations of the Conference

1. Diversification of the economy and letting go of fiscal irresponsibility.
2. Proper policy planning and recommendation of natural gas and renewable portfolio in Nigeria.
3. The active involvement of public-private partnership in energy management.
4. Allowing market system to interplay so has to effectively and efficiently allocate the price of petroleum, which is the main fuel in Nigeria in which many fuels, goods and services prices depend on.
5. The integration and collaboration between the intellectual, government and policymakers.
6. Comprehensive energy security and diversity (exploring other options of energy and reduction in dependence on oil), investment in the transmission and distribution systems of the energy sector, policy planning and actualisation, institutional collaboration and implementation of the various energy master plans.
7. Having a census of the energy customers (which will allow for proper planning and allocation), adequate energy audit and taxation, better linkage and communication among institutions, energy availability and minimising the risks and costs associated with renewables and natural gas in Nigeria.
8. Adding value to the usage of gas and petroleum in Nigeria and active involvement of renewables in the energy mix in Nigeria.
9. The re-organisation of the political institutions and legal framework to accelerate the use of renewable energy and increase energy production in Nigeria.
10. Establishment of laws to enable the development of appropriate energy infrastructures.

At the end of the Conference, awards were presented to various deserving individuals and organisations including Prof. Adenikinju, the Director of the Centre of Petroleum Energy Economics, honoured as fellow of the association.



## Chairman and Keynote Speaker of Each of the Past NAAE Conferences in Nigeria, 2008-2016

CONFERENCE	THEME	KEYNOTE SPEAKERS	CHAIRMAN	DATE AND VENUE
1st Annual Conference	DEVELOPING AND SUPPORTING CRITICAL ENERGY INFRASTRUCTURE FOR VISION 2020: CHALLENGES, CONSTRAINTS AND PROSPECTS	CHIEF P. C. ASIODU, CON	Ambassador Baba Cana Kingibe, former Secretary to the Federal Government of Nigeria	29th-30th April, 2008, Transcorp Hilton Hotel, Abuja
2nd Annual Conference	ENERGY INDUSTRY: RESTRUCTURING INTERACTIONS BETWEEN BUSINESS, ECONOMICS AND POLICY	Dr. Taiwo Idemudia, former Head, Economic Section OPEC	Engr. Mutiu Sunmonu MD, Shell Petroleum Development Corporation of Nigeria	23rd -24th April, 2009 Sheraton & Towers, Abuja.
3rd Annual Conference	ENERGY, ENVIRONMENT, AND ECONOMIC GROWTH	Prof. A.S. Sambo, FNAEE, Director General, Energy Commission of Nigeria and Special Adviser to the President on Energy	Dr Emmanuel Egbogah, Former Special Adviser to the President of Nigeria on Petroleum Matters.	19th -20th April, 2010, New Chelsea Hotel, Abuja.
4th Annual Conference	GREEN ENERGY AND ENERGY SECURITY: OPTIONS FOR AFRICA	Mr. Osten Olorunsola, former Vice President, Gas, Shell Africa, former Director, DPR	Engr. Chima Ibenachie, former Managing Director, NLNG	28th – 29th April 2011, Sheraton Hotel & Towers, Abuja.
5th Annual Conference	ENERGY TECHNOLOGY AND INFRASTRUCTURE FOR SUSTAINABLE DEVELOPMENT.	Professor Einar Hope, 2010 IAEE President	Prof. A.S. Sambo, FNAEE, Director General, Energy Commission of Nigeria and Special Adviser to the President on Energy	23rd – 24th April, 2012, Sheraton Hotel, Abuja.
6th Annual Conference	ENERGY RESOURCE MANAGEMENT IN A FEDERAL SYSTEM: CHALLENGES, CONSTRAINTS AND STRATEGIES.	Chief Philip Asiodu, CON, Former Minister of National Planning	Dr Emmanuel Egbogah, Former Special Adviser to the President of Nigeria on Petroleum Matters.	22nd-23rd, April, 2013, Sheraton Hotel, Lagos.
7th Annual Conference	ENERGY ACCESS FOR ECONOMIC DEVELOPMENT: POLICIES, INSTITUTIONAL FRAMEWORK AND STRATEGIC OPTIONS	Professor Yinka Omorogbe, Nabo Graham Douglas Distinguished Professor of Law, Nigerian Institute of Advanced Legal Studies (NIALS), Abuja.	Professor Soji Adelaja, John. A. Hannah Professor of Land Economics, MSU, & Special Adviser on Economic Intelligence	16th -18th, February 2014, Sheraton Hotel & Towers, Abuja.
8th Annual Conference	FUTURE ENERGY POLICY OPTIONS: ASSESSMENT, FORMULATION AND IMPLEMENTATION TRENCHARD HALL, UNIVERSITY OF IBADAN, IBADAN, NIGERIA	Austin O. Avuru, FNAPE, MD/CEO, SEPLAT Plc	Dr. Emmanuel Egbogah, OON, P. Eng. Chairman, Emerald Energy Resource &, Former Special Adviser to the President on Petroleum Matters	Trenchard Hall, University of Ibadan, Ibadan, Nigeria
9th Annual Conference	ENERGIZING EMERGING ECONOMIES: ROLE OF NATURAL GAS & RENEWABLE ENERGY	His Excellency, Professor Yemi Osinbajo, SAN, GCON, Vice President, Federal Republic of Nigeria, Abuja.	Dr. H.Odein Ajumogobia SAN, Former Honourable Minister of External Affairs and Honourable Minister of State for Petroleum Resources.	24th-26th April, 2016 Sheraton Hotel & Towers, Abuja.





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# About Nigerian Association for Energy Economics (NAEE)

The Nigerian Association for Energy Economics (NAEE) is the Nigerian affiliate of the International Association for Energy Economics (IAEE) with a presence in over 100 Countries all over the world. The NAEE is however the first affiliate of the International Association for Energy Economics in Africa. The NAEE was formally inaugurated in Nigeria in December 2006 at the Nigerian National Petroleum Corporation (NNPC) Towers, Abuja.

## MISSION STATEMENT

The Association is a nationwide nonprofit organization of business, government, academic and other professionals that advances the understanding and application of economics across all facets of energy development and use, including theory, business, public policy, and environmental consideration.

## To this end, the Association:

- \* Provides a forum for the exchange of ideas, advancement and professional experiences in energy economics.
- \* Promotes the development and education energy professionals and;
- \* Fosters an improved understanding of energy economics and energy related issues by all interested parties.
- \* Provides a forum for contribution to national discourse on energy policy issues in Nigeria.

## Activities of the NAEE

The NAEE will achieve its objectives through the following activities:

- \* Publication of Professional Journal, Books, Newsletter and Press release.
- \* Organizing seminars, Conferences, Workshops, Public Lectures and other similar fora.
- \* Meeting and such other activities that will promote the objectives of the Association.

## MEMBERSHIP

Membership of NAEE is open to interested persons from the academia, corporate sector, scientific fields and government. According to the IAEE Bylaws, to which NAEE subscribes, any person interested in economics of energy and willing to pursue the objectives and abide by the policies of the Association is eligible for membership.

## The Association has the following categories of Membership:

- \* Direct Members
- \* Student Members
- \* Honourary Members
- \* Institutional Members

Membership of NAEE confers one with the following Benefits:

1. Receiving periodic issues of the Energy Journal as well as Economics of Energy & Environmental Policy
2. Participating in Energy Forum
3. Access to Online Worldwide Membership Directory and Online Conference Proceedings
4. IAEE Energy Blog
5. Keeping members informed of conferences and events within the energy industry.
6. Workings Paper Series
7. Placement Service
8. Student Programs

9. Member Publication Listing
10. IAEE Merchandise
11. IAEE Website
12. IAEE membership
13. NAEE Membership Directory
14. Free downloading of materials in NAEE Website
15. NAEE Membership
16. Receiving Nigerian Energy Newsletter.

## HOW TO BECOME A MEMBER

Any person interested in the economics of energy and willing to pursue the objective of the Association is eligible for membership.

1. Membership shall be accomplished by submission of a written application (by completion of association's membership form) and payment of the first year's dues.
2. Each member shall have one vote, members may vote at meeting of the members in person or by written proxy

## Membership Dues

1. Regular Member: N50,000 (\$100)
2. Student Member: N25,000 (\$50)
3. Institutional Members: N250,000

## NAEE ACCOUNT DETAILS

### Bank Name:

Guaranty Trust Bank Plc.

**Account Name:** Nigerian Association for Energy Economics

**Account Number:** 0110538168

**Sort Code:** 058152052

**Bank Name:** First City Monument Bank

**Account Name:** Nigerian Association for Energy Economics

**Account Number:** 1392531018



## ■ NAAEE Energy Forum - 5th Edition

### WEBSITE

The Nigerian Association for Energy Economics is on the World Wide Web and its address is [www.naee.org.ng](http://www.naee.org.ng)

The website has general information about the Association. You can also visit our website of the International body at [www.iaee.org](http://www.iaee.org)

Payment can be made online, Membership form can be downloaded from these websites.

**Contact:** for more information you can write directly to:

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c/o Professor Wumi Iledare, Ph.D.,  
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### Nigerian Association for Energy Economics (NAEE) PUBLICATIONS

1. Energy, Environment & Economic growth (2010)  
Price: N1,500.
2. Green Energy and Energy Security: Options for Africa (2011)  
Price: N1,500.
3. Energy Technology and Infrastructure for Development (2012)  
Price: N2,000.
4. Energy Resource Management in a Federal System (2013)  
Price: N2,500
5. Energy Access and Economic Development: Policies, Institutional Framework and Strategic Options (2014)  
Price: N3,000
6. Solving Nigeria's Energy Puzzle: Why Economic Analysis Matters :  
N200

**NOTE: These prices are only available at the conference.**





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## Distinguished Personality

# BIODATA OF PROFESSOR ADEOLA FESTUS ADENIKINJU

**P**rofessor Adeola Festus Adenikinju was born at Araromi-Obu, Ondo State. He completed his Ph.D from the Department of Economics, University of Ibadan in 1994, and the same year, joined the same Department as a lecturer II, rising through the ranks to the position of Professor of Economics in 2006.

Professor Adenikinju served his Department, Faculty and University in several capacities, including, Departmental Examination Officer, Chairman of the Professional Graduate Programme, Chairman of the Faculty of the Social Sciences Consultancy Committee, Business Manager of the Faculty Journal, *Ibadan Journal of the Social Sciences*; Director, M.Sc. Banking & Finance Programme, and Staff Adviser to the Nigerian Economic Students Association, University of Ibadan Chapter, as well as several other students' associations. As a Member of the University Senate, he was a member of the Curriculum Committee, Staff Housing Loan Committee, University of Ibadan Strategic and Internationalization Plan for 2015-2019 and the Chairman of its Finance Sub-committee. He also served as member of the University of Ibadan Power Implementation ad-hoc Committee, Chairman, Ad Hoc Energy Policy Committee, and member, Joint Council-Senate Earned Allowances Committee.

Outside the University, Professor Adeola Adenikinju served as Special Adviser to the Presidential Adviser on Energy Matters between 2005 and 2007; Gas Policy Analyst and Head of Unit, World Bank-Assisted Federal Government Gas to Power (G2P) Integrated Project, 2007-2008; Alternate Chairman, ECOWAS Regional Multi-sectoral Committee on Energy Access, 2005-2007; Lead Author, Global Energy Knowledge, a Network of International Energy Specialists; Member, Joint Technical Advisory Panel for the NEPAD Medium to Long-term Strategic Framework and the African Infrastructure Country Diagnostic Study. He was the Technical Adviser to the Presidential Committee on the Deregulation of the Downstream Petroleum Sector, 2009 and served on the Technical Sub-Committee of the Presidential Committee on the 25-Year Development Plan for the Nigerian Electricity Sector, 2005-2006; and Member, Nigeria Integrated Infrastructure Master Plan, 2013. Professor Adenikinju was a Senior Special Assistant to the President, Office of the Chief Economic Adviser to the President, 2010-2011, and Member of the team that prepared the First Perspective Plan for Nigeria, 1991-1993.

Professor Adeola Adenikinju was a Visiting Scholar to the International Monetary Fund (IMF) Washington DC in 1996 and 2005; Consultant to the World Bank, United Nations Economic Commission for Africa (UNECA), United Nations Industrial Development Organization (UNIDO), European Commission (EC), United States Agency for International Development (USAID), German Technical Cooperation Agency (GTZ), Economic Community of West African States (ECOWAS), Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), National Planning Commission (NPC), Nigerian Liquefied Natural Gas (NLNG), Department for International Development (DFID), African Economic Research Consortium (AERC), Partnership for Economic Policy (PEP), National Data Bank, Federal Ministry of Finance, Federal Ministry of Trade and Investment, Facility for Oil Transparency (FOSTER), Energy Commission of Nigeria (ECN), International Atomic Energy Agency (IAEA), Organisation for Economic Cooperation and Development (OECD), Organisation for Petroleum Exporting Countries (OPEC) and several others.





## ■ NAEF Energy Forum - 5th Edition

With respect to Academic and Professional Honours and membership of Learned Societies, Professor Adenikinju was Business Manager, Nigerian Economics Society, 2000-2004; President, Nigerian Association for Energy Economics, 2011-2015; Life Member, Nigerian Economic Society; Member, African Econometrics Society; Member, African Economic Research Consortium; Member, Association of Third World Studies, Philadelphia, USA; and Member, International Association for Energy Economics, IAEE. He is Editorial Board Member, the *Nigerian Tribune*; Editor, *Journal of Economic Management*; Member, Editorial Board, *The Energy Journal*. He is a Member of the Experts Panel, Nigeria National Resource Charter (NNRC) and a Distinguished Fellow of the Nigerian Association for Energy Economics, FNAEE. Professor Adeola Adenikinju is an External Assessor to several universities within and outside Nigeria. He has over 110 Publications to his Credit.

Professor Adeola Adenikinju is a Research Professor, at the Centre for Econometrics and Allied Research, (CEAR), and Director, Centre for Petroleum, Energy Economics and Law (CPEEL), University of Ibadan. He is happily married and blessed with children.



# SCENES FROM THE 9TH ANNUAL CONFERENCE

24TH-26TH APRIL, 2016 SHERATON HOTEL & TOWERS, ABUJA.



Opening Ceremony



Award presentation to Prof. Adeola Adenikinju (FNAEE)



Speakers



Cross session of delegates



Cross session of participants



Second Plenary Session



Participants at the Dinner



Cross session of participants



Cross session of participants



IAEE Officials



Cross session of participants at the 9th Conference



Participants at the Dinner



Cross session of participants



Cpeel Students & Staff with the Director Prof. Adenikinju



Students delegates



# ENERGIZING EMERGING ECONOMIES: ROLE OF NATURAL GAS & RENEWABLE ENERGY



Council Members



NAEE Council Members



Dignitaries on the High table



Cross session of participants



Dignitaries at the 9th NAEE Conference



Cross session of participants



Cross session of participants



Cross session of participants at the 9th Conference



Cross session of participants



Cross session of participants at the 9th Conference



Cpeel Student & Staff with the Director Prof. Adenikinju



NAEE President Prof Wumi Iledare with some delegates



Students delegates



Students participant



Cross session of delegates





**EMERALD ENERGY INSTITUTE**  
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**UNIVERSITY OF PORT HARCOURT**

## ▼ OFFERS ▼ ADMISSION ▼ INTO

Post Graduate Diploma (PGD) in Petroleum & Energy Economics  
Master of Science (MSc) Petroleum Economics, Management & Policy  
Master of Science (Msc) Energy Economics, Management & Policy  
Doctor of Philosophy (PhD) Petroleum Economics  
Doctor of Philosophy (PhD) Energy Economics  
Professional Masters in Energy Economics

Emerald Energy Institute  
for Petroleum and Energy Economics, Policy  
and Strategic Studies, University of Port Harcourt, is an international  
collaborative institute for graduate education in Petroleum & Energy Economics,  
Management & Policy. Its vision is to educate, equip and engage energy professionals and  
corporate policy decision makers in the petroleum and energy sector.

### **ADMISSION REQUIREMENTS**

**PGD:** A minimum of Second Class (Lower Division) in the relevant degree listed.

**M.Sc:** Candidates must possess a minimum of Second Class (Upper Division) Bachelor's Degree in Social Sciences, Management Sciences, Engineering or Science. Sponsored company staff and candidates with at least five (5) years experience in the petroleum and energy industries, and a Second Class (Lower Division) Degree with a minimum CGPA of 3.00 (on a 5.00 scale) may also be considered. Lawyers with sufficient years of experience in the oil, gas, and power industry will be considered.

**Ph.D:** A good M.Sc/MEng with a minimum CGPA of 4.00 on a 5 point scale.

**Application Fee:** A non-refundable Application Fee of N20,000 (Twenty Thousand Naira) only, in certified bank draft made payable to the Emerald Energy Institute, UNIPORT. The completed form should be submitted with the bank draft at the Emerald Energy Institute office or be sent by courier service with a pre-paid FedEx self-addressed envelope for acknowledgement. Application Form can be obtained from the Emerald Energy institute, or be downloaded from the website: [eeiuniport.edu.ng](http://eeiuniport.edu.ng).

### **Important Dates to Remember (Any Change will be Communicated by e-mail)**

☒ Completed Application Forms must be returned to the Director, Emerald Energy Institute For Petroleum, Energy Economics, Policy and Strategic Studies, University of Port Harcourt, on or before Monday, September 18, 2017

*For enquires. Please call: 08033086296; 07035587892 or Email: [ekwiadegbesan@gmail.com](mailto:ekwiadegbesan@gmail.com)*





# Unlock your potentials

## Experience:

- Rich blend of Faculty/World Class Curriculum
- Innovative Teaching Research
- Stable Academic Calendar

• CPEEL is a unique programme that takes learning and research beyond the usual boundaries. We are progressive, and our courses are designed and developed through ongoing industry, policy and academia input.

• The flagship of the Centre is graduate training leading to the awards of Master and Doctorate degrees in Energy Studies with different specializations. The Centre in collaboration with the Faculty of Law also offers LL.M and Ph.D. in Energy Law.

• Potential students require varied background degrees ranging from Engineering, the Social Sciences, Basic Sciences and Law.

## Programmes available at the Centre include:

- M.Sc. (Energy Studies), with specialization in:  
Energy and the environment | Energy Economics | Energy Finance | Energy Policy | Oil and Gas Economics Economics of the Power Industry | Renewable Energy | LL.M (Energy Law)

## PhD (Energy Studies), with specialization in:

- Energy and the environment | Energy Economics | Energy Finance | Energy Policy | Oil and Gas Economics.
- Economics of the Power Industry | Renewable energy | [PhD \(Energy Law\)](#)



## CENTRE FOR PETROLEUM, ENERGY ECONOMICS AND LAW

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