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# ANALYSIS OF ENERGY MARKET CONDITIONS IN NIGERIA

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## Glossary of Terms

| | |
|---|---|
| MW/hr | Megawatt per hour |
| API | American Petroleum Institute |
| BS and W | Basic Sediment and Water |
| RVP | Reid Vapour Pressure |
| TCF | Trillion Cubic Feet |
| Ktoe | Thousand Tonnes of Oil Equivalent |
| CDU | Crude Oil Distribution Units |
| NXP | Nigerian Exports Proceeds Form |
| TWh | Terawatt hours |
| Kb/d | Kilo barrels of oil per day |
| LTO | Light Tight Oil |
| Bcf/d | Billion Cubic Feet per day |
| KWh/cap | Kilowatt hour per capita |
| KRPC | Kaduna Refining and Petrochemical Company |
| PHRC | Port Harcourt Refining Company |
| WRPC | Warri Refining and Petrochemical Company |

## 1.0 INTRODUCTION

Energy is a critical factor for economic growth of any country. Energy commodities facilitate economic development by increasing productivity and income as well as creating employment. The aim of an efficient energy market is to provide energy commodities to power the industrial, transport, household and service sectors of the economy. Hence, energy remains the lubricant of sustainable economic growth.

The crucial role of energy in the globalisation and market liberalisation of the global economy can be underpinned by the economic development of the 1990s, which resulted in the improved wellbeing of citizens, particularly among emerging economies. It is a recognised fact that availability and access to energy is a sine qua non for achieving industrialisation in any country. In terms of employment creation, the American Petroleum Institute (API) estimated that the energy sector supports more than 9.0 million jobs directly and indirectly, which is over 5.0 per cent the country's total employment. In 2012, the energy industry supported a total value added to the national economy of more than US$1 trillion, representing 7.7 per cent of US GDP (WEF, 2012). Asides from the huge impact of the energy sector on employment generation, it also act as catalyst for sustainable development and enhances resource efficiency. Indeed, energy is the "oxygen" of the global economy and the life-blood of growth in any nation.

Nigeria has ample renewable and non-renewable fossil fuels,

solid minerals, wind, hydro, and tidal wave. It is the sixth largest oil producing country in the world (Qua Petroleum Refinery Project, 2015). In spite of this, it is highly energy deficient in terms of its energy consumption needs (Tallapragada, 2009). For instance, a 10-year domestic refining capacity utilisation report of the three refineries in the country (Kaduna, Port Harcourt and Warri) with a dedicated 445,000 barrels per day (bpd) indicated huge gaps from 2004 to 2013. Of the 445, 000 bpd to be refined domestically, an abysmal 98,108; 36,891; 108,269 and 110,508 bpd were refined in 2004, 2007, 2010 and 2014, respectively. Due to low capacity utilisation of the refineries, the country has depended on massive importation of petroleum products to satisfy local demand.

Also, it is a fact that substantial supply gap for electricity generation still exists in Nigeria. Total installed capacity for electricity generation remained at 12,232 MW in 2014, the same level recorded in 2013, but showed an increase of 23.1 per cent above the level in 2012. The average generation capacity of electricity has been oscillating within the range of 2,623.1 MW/hr in 2007 and 3,485.5 MW/hr in 2014 against the estimated demand of 10,000MW per day (CBN Annual Reports). In fact, in the last one and half decades, output had not increased beyond 3,000MW per hour. The low and unstable capacity utilisation in electricity sub-sector reflected the large gap between installed and actual operational capacity as evident in an average of less than 40.0 per cent for the period discussed, (Iwayemi, 2008:18).

Consequently, even though the primary source of power remained the Power Holding Company of Nigeria (PHCN), all manufacturing firms rely on self-generated electricity to maintain sufficient back up to power their operations in the event of power failure. The development had impacted negatively on the capacity utilisation of firms, which had declined from 59.8 per cent in 2014 to 54.2 per cent in second quarter of 2015 and output of firms with attendant loss of revenue.

This poor performance of the sub-sector has generated debate that with the abundance and potentials of energy resources, there is no reason for Nigeria to import energy to achieve a sustainable generation capacity for optimum economic growth. Moreover, Nigeria had been able to trace the collapse of her industrial sector, and small and medium scale businesses and economic downturn to the inadequate and erratic state of the country's electricity market (Olugbenga, et al., 2013).

This paper examines energy market conditions in Nigeria by reviewing the global perspective vis-a vis domestic developments to provide insight into this important sector of the economy. However, the paper focuses on crude oil, gas and electricity, among other forms of energy sources. These energy sources comprise about 80.0 per cent of energy production in Nigeria. The objective of the study is to enhance an understanding of the dynamics of the energy sector, including its operations in order to respond adequately to shocks such as the recent Shale oil boom in the USA and the crash in crude oil

prices in the international market.

The paper is organised in eight sections. Following this introduction is section 2, which examined the global energy market, highligted energy demand and supply, sources of energy and energy prices. Section 3 discussed the stylised facts on Nigerian energy sector, while Section 4 highlighted the reforms in the Nigerian energy sector. Section 5 provided the outlook on energy conditions in Nigeria, while the challenges in the Nigerian energy sector were discussed in section 6. Section 7 provided the way forward with the concluding remarks covered in Section 8.

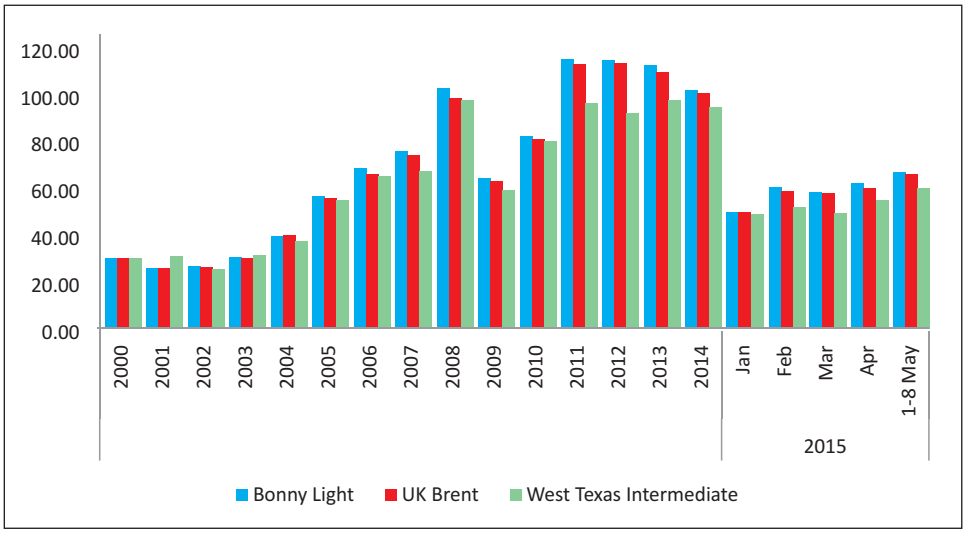
## 2.0 THE GLOBAL ENERGY MARKET

### 2.1 Energy Prices

### 2.1.1 Crude Oil Prices

Global oil prices have remained volatile and unpredictable, thereby attracting wide interest from policy makers, investors, financial institutions and the academia. Figure 1, showed a 15-year history of prices of selected crude oil streams, namely the UK Brent, the Bonny Light and the West Texas Intermediate at the international oil market in dollar terms for the period 2000 to May 2015.

**Figure 1: Average Crude Oil Prices (US$ per barrel, 2000 – May, 2015)**




**Source:** Reuters, May 2015.

From 2000 to 2003, global oil supply was constrained from keeping pace with the increased demand driven largely by

global economic growth, especially in Asia, leading to the surge in prices of crude oil in the international market. Thus, the world crude oil prices rose consistently from an average of US$38 per barrel in 2004 to over US$97 and US$101 per barrel for Brent and Bonny Light, in 2008 and 2011, respectively. The development was driven largely by the sustained increase in the demand for crude oil from the United States of America, China and Europe, occasioned by the continued growth in these economies. Other contributory factors included: reduced production capacity of major oil - producing nations due to reduced investment; political unrest, especially in the Middle East; and speculations about the possibility of further natural disasters such as the Hurricane Katrina, which threatened crude oil supply and put further upward pressure on prices.

At end-2008, the price of crude oil fell precipitously following the Global financial crisis, which started in the US housing and financial sectors. The development ushered in a sudden fall in crude price, not driven by oil market fundamentals. As the crisis intensified, crude oil prices fell concurrently from the prevailing US$100 per barrel, to slightly above US$60 per barrel in 2009. However, the fall in price was short-lived and thereafter rebounded in 2010.

As the global economy recovery commenced in 2010, oil price resumed its upward trend to about US$80 per barrel, buoyed by the political unrest in Libya, which interrupted supply to Europe. As the crisis eased off, prices fell slightly, only to rise again, recording the highest annual level of above US$112 per barrel in

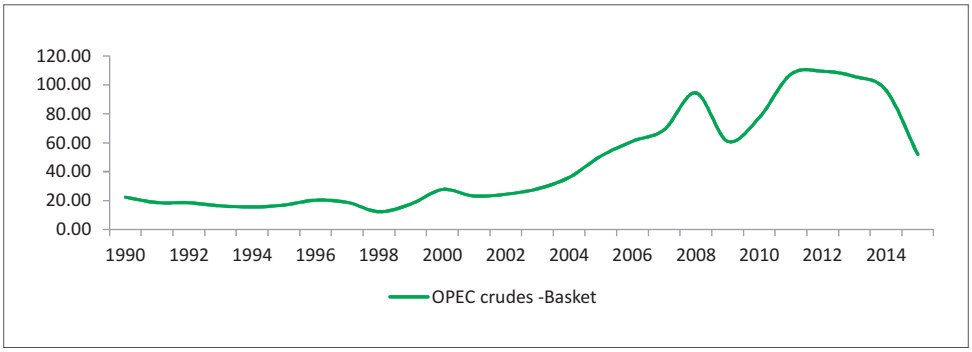
2012.

With rapid expansion of shale oil production in North America, which was offset by supply disruptions in the Middle East (World Bank Commodity Market Outlook, 2015), the global oil market moderated as OPEC crude basket prices rose above US$100 per barrel. However, it declined from US$105.87 per barrel in 2013 to US$96.29 in 2014. Several factors accounted for this, including increasing supply from the US shale oil, new paradigm shift in the core OPEC producers and slow growth in the big Asian consuming countries. In the first half of 2015 (Figure 2), average crude oil prices remained below US$60 per barrel. This could be attributed to the continued stance of the core OPEC members in retaining their quota in the market.

Similarly, the price movement of the OPEC basket as illustrated in Figure 2, exhibited same trend as the other crude streams. The OPEC basket price is a composite of various crude variants, which in turn are references of other crudes from 12-member countries[1]. The basket has a wide range of prices (US$11) between the most expensive crudes such as the Nigerian Bonny Light and the cheapest one, the Venezuelan Merey, explaining why the average OPEC basket price is below world expensive oil crudes like the Brent, Urals, Isthmus and Dubai.

[1]Sahara blend (Algeria), Girassol (Angola), Oriente (Ecuardor), Iran heavy (Iran), Basra light (Iraq), Kuwait export (Kuwait), Es Sider (Libya), Bonny light (Nigeria), Qatar marine (Qatar), Arab light (Saudi Arabia), Murban (United Arab Emirate) and Merey (Venezuela).

**Figure 2: Average Prices of OPEC Crude Basket (US$ per barrel) (1990- 2015)**

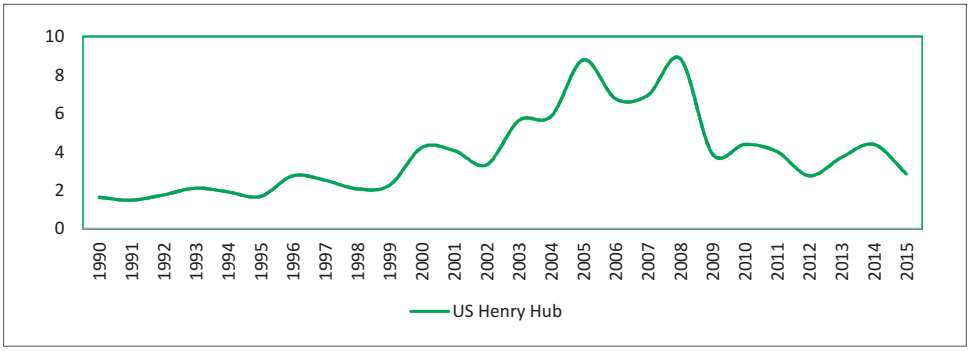



**Source:** Reuters, August 2015

### 2.1.2 Natural Gas Prices

Natural gas prices are benchmarked on henry hub in the international market and traded on LNG trends. In the domestic market, the prices are set up by the Oil Producers Trade Section (OPTS), the NNPC and NGC. At the international scene, the prices ranged from US$1.70/million British thermal unit (mBtu) in 1991 to US$4.23/mBtu in 2000 (Figure 3). In 2003, prices rose to US$5.63/mBtu and further to US$8.85/mBtu in 2008. Natural gas prices were higher in these years, due to withdrawals from existing coal and nuclear capacity, which led to increased use of existing natural gas-fired plants and the development of new plants. The quest for clean energy, following the Kyoto resolution, led to an increase in the demand for gas for electricity generation amidst constrained supply. In Nigeria, the electricity transformation policy identified gas as the best fuel for electricity generation.

**Figure 3 : Natural Gas Prices (US$/mBtu) (1990 - 2015)**




**Source:** Energy Information Administration

## 2.2 Electricity Generation and Consumption

The cost of power (electricity) generation and distribution remains a key constraining factor for cheap electricity supply to aid economic and social development. Though data from Energy Information Administration (EIA) showed improved electricity generation over the years, Nigeria, however, still lag behind South Africa, India and Brazil and other peer economies in meeting the consumption level or electricity supply in the country. The World Bank (2015) noted that Nigeria's total electricity generation improved in the last decade from 14.73 billion kilowatthours in 2000 to 27.03 billion kilowatthours in 2011, representing an increase of about 54.5 per cent (Table 1). However, this has not improved the electricity condition. The proportion of total electricity production from hydroelectric sources witnessed a decline from 38.2 per cent to 20.9 per cent in 2000 and 2011, respectively. On the other hand, the ratio of total electricity production to natural gas and oil sources improved from 60.3 and 1.5 per cent in 2000 to 63.3 and 15.8 per cent in 2011, respectively. Renewable energy source

contribution of 5.6 billion kilowatthours in 2000 rose to 8.1 billion kilowatthours generated in 2004, but witnessed sustained decline from 7.8 billion kilowatthours in 2005 to 7.2 billion kilowatthours in 2013.

Investment in energy by the private sector in Nigeria experienced significant increase prior to the global financial crisis, as it rose from US$295 million in 2001 to a peak of US$828 million in 2005 (Table 1). The impact of the crisis was deceleration in investment in the sector even though it rebound in 2013 as the private sector investment commitment increased to about US$407.3 million.

Development indicators from the World Bank (2015) showed that total consumption of electric power increased by 8.9 per cent from 2012 to 2013. From 9.1 billion kilowatthours in 2000, the total consumption of electricity rose continuously to 18.0 billion kilowatthours in 2005, and further increased to 30.3 billion kilowatthours in 2013. Electricity power consumption per capita stood at 178.38 KWh per capita in 2013, compared with the 74.13 KWh per capita recorded in 2000, representing a significant increase of 140.6 per cent over the period of analysis. This development was attributable to huge demand for electricity requirements by households and firms during the decade. The percentage of the total rural population that had access to electricity improved from 27.9 per cent in 2000 to 34.9 per cent in 2010, as more villages were connected to the national grid. Access of the urban population to electricity, however, witnessed a decline from 84.0 per cent recorded in

2000 to 78.8 per cent in 2010. This was accounted for by the incessant disruptions in consumption due to overloading. The percentage of total electricity transmission and distribution recorded during the period declined from 5.62 billion kilowatthours or 38.2 per cent in 2000 to 2.58 kilowatthours or 9.6 per cent in 2011. The World Economic Forum's Global Competitiveness Report 2014-2015 ranked Nigeria 141 out of 148 countries in terms of the quality of electricity supply.

**Table1: Energy Indicators for Nigeria (2000 – 2013)**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012* | 2013* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric power consumption (kWh per capita) | 74.13 | 75.20 | 104.15 | 101.43 | 123.02 | 128.66 | 111.15 | 138.11 | 126.45 | 119.82 | 135.40 | 148.93 | 163.83 | 178.38 |
| Electric power consumption (kWh) (Million) | 9,109.00 | 9,476.00 | 13,459.00 | 13,444.00 | 16,730.00 | 17,959.00 | 15,929.00 | 20,328.00 | 19,121.00 | 18,617.00 | 21,624.00 | 24,453.00 | 27,400.67 | 30,318.67 |
| Electric power transmission and distribution losses (% of output) | 38.15 | 38.72 | 37.53 | 33.39 | 31.08 | 23.71 | 31.07 | 11.53 | 9.42 | 5.87 | 17.22 | 9.55 | 14.56 | 16.40 |
| Electric power transmission and distribution losses (kWh) (Million) | 5,618.00 | 5,987.00 | 8,085.00 | 6,739.00 | 7,545.00 | 5,580.00 | 7,181.00 | 2,650.00 | 1,989.00 | 1,160.00 | 4,497.00 | 2,581.00 | 4,167.00 | 4,877.50 |
| Electricity production (kWh) (Million) | 14,727.00 | 15,463.00 | 21,544.00 | 20,183.00 | 24,275.00 | 23,539.00 | 23,110.00 | 22,978.00 | 21,110.00 | 19,777.00 | 26,121.00 | 27,034.00 | 31,567.67 | 35,196.17 |
| Electricity production from hydroelectric sources (% of total) | 38.22 | 38.21 | 38.22 | 36.90 | 33.40 | 33.00 | 27.10 | 27.10 | 27.10 | 22.90 | 24.40 | 20.90 | 20.73 | 19.73 |
| Electricity production from hydroelectric sources (kWh) (Million) | 5,628.00 | 5,909.00 | 8,234.00 | 7,448.00 | 8,108.00 | 7,768.00 | 6,263.00 | 6,227.00 | 5,721.00 | 4,529.00 | 6,374.00 | 5,650.00 | 6,638.67 | 7,199.17 |
| Electricity production from natural gas sources (% of total) | 60.29 | 54.68 | 40.19 | 57.40 | 54.52 | 56.68 | 64.34 | 64.32 | 64.14 | 64.29 | 64.29 | 63.30 | 62.97 | 62.48 |
| Electricity production from natural gas sources (kWh) (Million) | 8,879.00 | 8,455.00 | 8,659.00 | 11,586.00 | 13,234.00 | 13,343.00 | 14,868.00 | 14,779.00 | 13,541.00 | 12,715.00 | 16,794.00 | 17,113.00 | 19,938.67 | 22,137.67 |
| Electricity production from oil sources (% of total) | 1.49 | 7.11 | 21.59 | 5.69 | 12.08 | 10.31 | 8.56 | 8.58 | 8.75 | 12.81 | 11.31 | 15.80 | 16.29 | 17.79 |
| Electricity production from oil sources (kWh) (Million) | 220.00 | 1,099.00 | 4,651.00 | 1,149.00 | 2,933.00 | 2,428.00 | 1,979.00 | 1,972.00 | 1,848.00 | 2,533.00 | 2,953.00 | 4,271.00 | 4,990.33 | 5,859.33 |
| Electricity production from oil, gas and coal sources (% of total) | 61.78 | 61.79 | 61.78 | 63.10 | 66.60 | 67.00 | 72.90 | 72.90 | 72.90 | 77.10 | 75.60 | 79.10 | 79.27 | 80.27 |
| Electricity production from renewable sources (kWh) (Million) | 5,628.00 | 5,909.00 | 8,234.00 | 7,448.00 | 8,108.00 | 7,768.00 | 6,263.00 | 6,227.00 | 5,721.00 | 4,529.00 | 6,374.00 | 5,650.00 | 6,638.67 | 7,199.17 |
| Energy imports, net (% of energy use) | (122.53) | (123.03) | (101.23) | (118.49) | (125.86) | (119.50) | (120.37) | (115.95) | (106.97) | (108.76) | (121.28) | (117.14) | (124.11) | (128.30) |
| Energy production (kt of oil equivalent) | 201,602.98 | 211,055.86 | 195,974.18 | 216,318.83 | 229,819.19 | 233,791.65 | 235,809.72 | 232,537.45 | 230,206.53 | 228,077.63 | 254,779.14 | 256,927.24 | 275,444.28 | 289,869.08 |
| Energy use (kg of oil equivalent per capita) | 737.29 | 751.03 | 753.64 | 746.94 | 748.17 | 763.04 | 746.64 | 731.61 | 735.58 | 703.14 | 720.93 | 720.64 | 732.40 | 741.15 |
| Energy use (kg of oil equivalent) per $1,000 GDP (constant 2011 PPP) | 259.98 | 260.09 | 257.90 | 237.59 | 182.58 | 184.75 | 171.53 | 161.58 | 157.05 | 144.26 | 140.98 | 138.13 | 134.99 | 131.92 |
| Energy use (kt of oil equivalent) | 90,595.51 | 94,633.01 | 97,388.86 | 99,007.38 | 101,751.11 | 106,509.46 | 107,004.78 | 107,683.10 | 111,224.99 | 109,255.20 | 115,137.78 | 118,324.59 | 123,308.58 | 127,843.28 |
| Investment in energy with private participation (current US$Mn) | .. | 295.00 | 462.00 | 34.00 | na | 828.00 | na | 280.00 | na | na | na | na | na | 407.30 |
| Fossil fuel energy consumption (% of total) | 17.74 | 19.32 | 19.47 | 18.90 | 19.07 | 20.79 | 19.31 | 17.81 | 18.47 | 15.00 | 17.16 | 17.40 | 18.91 | 20.11 |
| Fuel exports (% of merchandise exports) | 99.64 | 99.66 | 94.04 | 97.90 | na | na | 98.24 | 93.67 | 91.74 | 90.36 | 87.13 | 89.13 | 84.04 | 87.62 |
| Fuel imports (% of merchandise imports) | 1.72 | 2.17 | 1.35 | 16.03 | na | na | 2.87 | 1.79 | 1.61 | 1.02 | 1.40 | 9.95 | 2.38 | 20.17 |
| Oil rents (% of GDP) | 40.49 | 36.63 | 25.67 | 28.60 | 32.63 | 38.24 | 34.17 | 31.13 | 32.04 | 23.73 | 16.36 | 19.12 | 16.43 | 13.43 |
| Note: * indicate authors' projections | | | | | | | | | | | | | | |
| Source: World Bank Development Indicators | | | | | | | | | | | | | | |

## 2.3 Determinants of Energy Conditions

Globally, the determinants of the energy market conditions are similar in most countries (Atallah and Bean, 2015). They include among others, changes in demand, changes in supply, natural

gas production and consumption, changes in price and electricity pricing.

### 2.3.1 Changes in Demand

Population has been established as one of the key drivers of energy demand. According to the United Nations (UN) Population Division, global population is expected to increase from over 7.2 billion in 2014 to almost 9.0 billion in 2040. More than 90 per cent of the rise in population is expected to come from developing countries. India is projected to be more populous than China in 2028. Thus, global GDP is projected to increase from 3.1 per cent in 2014 to about 3.8 per cent in 2018, led by the rapidly growing economies of developing countries. As population increase over time, the provision for better standards of living drives increase in energy consumption. Therefore, in the long-run, the impact of population growth, including changing age structures will have implications for energy demand and economic growth. Thus, the energy demand, which is projected to grow significantly by about 52.0 per cent over the period 2010 through 2035, will largely be driven by population and economic growth in the non-OECD countries (Energy Information Administration, 2014).

However, since 2013, global oil demand was said to be increasing at an average of 1.0 mb/d annually and is estimated to reach 96.0 mb/d by 2019. Out of this, demand from the OECD is projected to fall from 45.9mb/d in 2013 to 45.2 mb/d in 2019. Although the demand from Russia and other Eurasia is expected to increase slowly, the largest increase in demand is

expected to come from developing countries, with an annual rise of 1.1 mb/d. In other words, by 2015, the non-OECD oil demand will be greater than the OECD oil demand for the first time (OPEC 2014). This is very important for an oil resource-rich country like Nigeria and provides continuous incentive for the country to implement competitive policy regimes (Ward and Asiodu, 2013).

### 2.3.2 Changes in Supply

The recent surge in the domestic production of oil in the US has led to a dramatic shift in the country's demand and supply outlook. According to the EIA (2014), the US oil production increased from about 7.0 million barrels a day in 2012 to over 8.0 million in 2014 and exceeded 9.0 million barrels during January and February, 2015. Therefore, it is projected that the US will be one of the world's largest producers of oil by 2020, largely driven by the increased production of Shale oil. United States of America is likely to move from a net oil import country to a net oil export position by 2025.

Nigeria's crude oil exports averaged about 1.50 million barrels per day (mbd) in 2014 and the US has been the major importer. However, since 2010, demand for oil from the United States has dropped as the economy gradually attains self –sufficiency in oil production. The dynamics of supply and the possibility of the US competing for the same export market with cheaper oil do not

[2]The unconventional production differs from conventional methods whereby sands containing kerogen are crushed using in-situ or ex-situ technologies to collect the gas into a reservoir before it is drilled out

necessarily indicate that the supply market is constricting, especially for Nigeria's crude. With demand remaining strong in the non-OECD countries, like China and India, it is expected that Nigeria will take advantage and seek new markets outside the US. This is very crucial given the fact that Nigeria's oil sector accounts for 80.1 per cent of Nigeria's export earnings at end-2014.

### 2.3.3 Natural Gas Production and Consumption

The British Petroleum (2015) report estimated that the proven conventional reserve is 606.4 tcf. This represents 40.0 per cent of world gas, while the 60.0 per cent is unconventional[2]. The top ten producers include Iran (18.0 per cent), Russia (17.0 per cent), Qatar (13.0 per cent), USA (5.0 per cent) and Nigeria (2.7 per cent). According to the EIA (2014), the demand for natural gas will grow faster than the other major fuels with a projected demand of 5.4 trillion cubic meters (tcm) in 2040, replacing coal as the second largest source of fuel. The non-OECD countries are expected to account for more than 70 per cent of the total consumption growth and production of natural gas over the period. However, the US unconventional gas resource has altered the global LNG market dynamics with new technology driving domestic production at relatively cheaper rates; thus supplying more LNG to Europe and the Asia Pacific. Available data showed that Nigeria exported over 28.27 million standard cubic meters (mscm) of gas in 2013, making Nigeria the 5$^{th}$ largest exporting countries in the world. Europe is Nigeria's biggest export market and the largest exporter in the Atlantic basin. However, the risk to Nigeria lies in the potential of the US to

export her Shale gas to the global market. With Nigeria's proven gas reserves of approximately 187 tcf (trillion cubic feet), as such Nigeria, can best be described as a gas province. Although Nigeria is blessed with abundant gas resources, not much of it has been harnessed, with the nation's primary focus being on crude oil production. The domestic gas market is generally underdeveloped with a record of high gas flaring and a significant percentage of available natural gas being exported as liquefied natural gas. The country needs to develop clear regulatory and competitive policies to open up her market and focus on being a competitive, low cost and highly reliable supplier to the global market.

### 2.3.4 Changes in Price

The implications for the recent fall in crude oil prices on the Nigerian economy is far reaching, especially given the fact that Nigeria is a mono-product economy that relies heavily on revenue from the sale of crude oil. In 2014, 80.1 per cent of the country's foreign exchange earnings come from the sale of crude oil and the country's annual budget is often prepared based on the estimates from crude oil prices and output projections. For instance, the highlights of the analysis of the 2015 Appropriation Bill passed recently by the National Assembly was based on the benchmark oil price of US$53 per barrel and production level of about 2.28 mbpd. The risk, therefore, is that if oil prices fall below US$53 per barrel, the country will experience a disruption in foreign exchange earnings and government revenue. The government will be faced with the problem of inability to meet the competing

demands in the economy; and hencel be forced to find other means of resources to complement the apparent short fall in available resources. Consequently, price changes for petroleum could also have a spillover effect on the market for natural gas, the source of energy most closely competitive with petroleum (IMF, 2000).

## 2.4 Electricity Pricing

Electricity pricing in Nigeria is divided into two. One, for generation and the other for distribution, which is regulated by the Nigerian Electricity Regulatory Commission (NERC) under the principle called Multi-Year-Tariff-Order (MYTO).

According to the NERC, the principles and assumptions on which electricity pricing is based include cost recovery, attraction for investment, security, certainty, return on investment, efficient use of the network and allocation of risks. The cost recovery is aimed at a reasonable return on capital, while the investment principle is designed to attract local and global investors. The critical principle in the MYTO is the capability of the structure to allocate risk efficiently.

## 3.0 STYLISED FACTS ON NIGERIA ENERGY SECTOR

### 3.1 Endowments

The sustained effort to generate electricity in Nigeria over the years has revealed the richness of energy resources in addition to oil and gas resources. These include: hydro; tidal wave; sun; wind; coal; gas; and some elements of uranium for nuclear power. These energy forms for electricity power generation abound in sizeable commercial quantities in the best natural form across the country to support a vibrant electricity market. Studies conducted by the NNPC, the Ministry of Mines and Steel Development, and the Nigeria Export Promotion Council showed that Nigeria is endowed with various natural energy resources. The Ministry of Mines and Steel Development in its minerals search in 2012 discovered additional quantities of coal located in Nassarawa, Kogi and Benue States, in addition to the reserves in Enugu state.

However, Nigeria is naturally endowed with oil and gas, which makes it stand out among all other Nations in the world energy market. The stock level of gas is estimated at 196 tcf[3] of proven (P1 + P2)[4] reserves, with significant attractive upside geological properties that have zero sulphur and rich liquids. The British Petroleum (2014) estimated Nigeria's proven conventional gas reserves at 182 tcf, making the country the seventh largest conventional gas reserves globally and the largest in Africa. The BMI (2015) reported that Nigeria has the 9th largest gas reserves

[3]This is the gross gas commodity in trillion cubic feet (tcb).
[4]P1 is proven reserves for gas associated with oil and P2 is proven reserves for non-associated gas.

in the world, while the NNPC estimated the total natural gas reserves at 165 tcf, including 75.4 tcf of non-associated gas. Geological findings by the Federal Ministry of Petroleum Resources and the NNPC in May 2008 indicated huge potentials in Nigeria's gas reserves as this could be developed to 600 tcf.

According to the Organisation of Petroleum Exporting Countries (OPEC), Nigeria's crude oil reserves is estimated at 37.1 billion barrels, but produces a daily average of about 2.0 mbpd of crude oil, making it the largest producer in Africa. With the exception of the statutory 445,000 bpd dedicated for domestic refining, the rest are exported. Referenced as the Bonny Light in the international oil market, Nigeria's crude oil consists of various grades priced according to the geological property of the crude and determined by the API Gravity, BS and W, Sulphur Content, Pour Point, RVP and its density. It is, however, graded the best crude classified as light and sweet. It enjoys high price premium, consistently above the OPEC Basket average price.

## 3.2 Institutional Arrangements

The operation of the oil and gas market follows a three-chained system, comprising upstream, midstream and downstream activities operated solely by the NNPC. The upstream activities include exploration, oil and gas production and joint venture activities. From 1937 to 1993, exploration for, and production of, oil and gas activities were restricted to on-shore with few off-shore activities not more than 200 meters water depth. According to the NNPC, from 1993 to date, the industry witnessed substantial activities in deep water operation,

exceeding 2,500 meters water depth. Since gas was not the main target, it was flared until ageing fields and environmental concerns compelled the re-injection, trapping and extraction of gas for other uses (www.nnpcgroup.com).

The Joint Venture activities are partnerships between the NNPC and major oil companies, which are necessitated by high technical and huge capital requirements of upstream activities. The NNPC is responsible for the management of oil block bidding, issuance of exploration and mining licences. Other partnerships are the Joint Operating Agreements (JOAs), the Production Sharing Contracts (PSCs) and Service Contracts. The deep water venture has been financed mainly by the International Oil Companies (IOC). In the first six years of the deep water operation, US$864 million was committed to exploration and production activities. This increased to approximately US$1.3 billion by end-1998 (www.nnpcgroup.com).

The mid-stream comprised various initiatives by the NNPC, including Greenfield Refinery, Renewable Energy, Gas to Power and the Nigerian Gas Master Plan. The downstream industry in Nigeria was established with four refineries, two in Port Harcourt (PHRC), and one each in Kaduna (KRPC) and Warri (WRPC). The refineries have a combined installed capacity of 445,000 bpd for the statutory dedicated domestic crude. The two refineries in Port Harcourt are located at Alesa Eleme, with a total name plate CDU capacity of 210,000 bpd. It has a jetty for product import and export located 7.5km away from the refinery

complex. The KRPC and the WRPC have name plates CDU capacities of 110,000bpd and 125,000 bpd, respectively. The Pipelines and Products Marketing Company (PPMC) completes the infrastructural structure of the retail market with the Petroleum Products Pricing Regulatory Authority (PPPRA) providing the oversight function (www.nnpcgroup.com).

### 3.3 Market Dynamics

The trade pattern and instruments used in the Nigerian energy market define the dynamics of the market. Beginning with the gas sub-sector, there are two institutions operating in the market in uncontested fields of export and local trades. They are the Nigerian Gas Company (NGC) and the Nigerian Liquefied Natural Gas Limited (NLNG). The NGC handles domestic trade, while the NLNG is strictly for export trade. The NLNG trades on long-term contracts of about 20 years and delivers its goods by liquefied trains discharged to re-gasified plants at destined stations (NLNG Annual Report, 2013). Asia accounted for 74.0 per cent of global sales in 2013. This is a viable and sustainable market as its sustainability is not threatened by Shale gas production. The NLNG generated US$1.4 billion profit after tax in 2013 from the sale of 280 liquefied Natural Gas cargos (NLNG Annual Report, 2013). The domestic gas market is exclusively under the ownership of the NGC, where it solely supplies its customers (gas-fired electricity companies, commercial and industrial entities). The NGC sells gas to commercial sub-sector (which is the smallest clientele) at US$7.3 per mbtu and US$4.30 per mbtu to industries. It is constrained to sell to its major clients (electric power companies) at US$2.5 per mbtu, which is a major

obstacle to the revenue of the Company.

Oil trade commences with the lifting of crude in line with ownership structure of each well. The Federal Government is in joint venture arrangement with major oil companies and receives royalties in the form of tax. Lifting activities averaged about 40 counts monthly from the various terminals, mainly Bonga, Escravos, Agbami, Forcados, Bonny Akpo, Okoro and Erha. The evacuated crudes are sold mostly to Europe, Asia and the South America, notably Brazil. The key selling instrument is a projected NXP issuance and since no well-head is metered, production figures are mostly based on forecast in the NNPC. These make accounting for actual revenue receipts difficult.

Trade in electric power involves private entities, such as the Generation companies (Gencos) and Distribution companies (Discos) under the regulation of the Nigeria Electricity Regulatory Commission (NERC), through a Multiple-Year-Tariff-Order (MYTO) methodology. According to the NERC, the MYTO provides a 15-year tariff path (July 1, 2008 to June 30, 2023) for the Nigerian Electricity Supply Industry (NESI). The pricing principles underlying the MYTO guide the operations of the industry.

The Nigerian Electricity Regulatory Commission (NERC) found it necessary to adopt a holistic and scientific approach to correct pricing of electricity over time to ensure gradual sector development through the instrument of a cost reflective and fair tariff regime. In this approach, the interest of consumers and

investors are considered in order to address the problem of electricity supply and proper pricing of power in Nigeria. The approach involves the introduction of the Multi-Year-Tariff-Order (MYTO) methodology by the NERC. The MYTO is the new tariff order which calculates electricity prices based on revenue requirements of the whole industry. This approach is aimed at ensuring the necessary support for operating and capital expenditures of the various sub-sector i.e. generation, transmission and distribution. It is expected to aid the pricing of electricity in the most reasonable and equitable manner (NERC, 2008).

The MYTO was based on an industry wide determination of current and future costs. The charges included: the wholesale price of generated electricity sold to national grid; transmission charges; retail tariff schedules; the transmission system operator; the PHCN Headquarters charge; the regulatory charge; and the payment and level of tariff equalisation payments between distributors in order to continue to maintain a national uniform tariff. The tariff schedules will be reviewed each year and changes made to the regulated charges, if there are material variations greater than plus or minus 5.0 per cent (in magnitude) in the rate of inflation, exchange rate and cost of gas (NERC, 2008).

### 3.4 Contribution to the Economy

The contributions of the energy sector to any economy are in three ways: domestic consumption to power economic activities; source of external and internal revenues and an instrument of political negotiation at the world level. Energy is so

vital to the economy that it has been termed the oxygen of the economy. In assessing the contribution of energy to economic activities of the nation, the use of GDP becomes essential. To capture the entire essence of energy in an economy, the IEA compiles energy baskets[5] of countries of common interest, to which Nigeria is a member.

The 2012 IEA energy commodity basket of Nigeria (Table 2) summarised the country's energy transaction, revealing the dominant role of oil and gas in Nigeria's export earnings and heavy reliance on unclean energy, comprising biomass, animal dung and waste to fuel its economy. The country produced 176.0 million tonnes of energy (measured on calorific value only), of which 73.5 per cent comprised crude oil, while gas made up about 5.8 per cent. Of total production, 148 million tonnes was exported, leaving only 23 million tonnes for domestic consumption.

**Table 2: 2012 Energy Basket of Nigeria in ktoe on net calorific value basis**

| | Coal | Crude Oil | Oil Products | Gas | Hydro | Biomas | Elect | Balances[1] |
|---|---|---|---|---|---|---|---|---|
| Production | 30 | 129,409 | | 33,645 | 487 | 108,142 | 2469 | 274,182 |
| Imports | - | - | 8440 | - | - | - | - | 8440 |
| Export | - | 126,413 | 755 | 21,032 | - | - | 309 | 148,509 |
| Domestic Consumption | - | 2,996 | 7,685 | 12,613 | - | 108,142 | 2,164 | 133,600 |

**Source:** International Energy Agency, 2015

### 3.4.1 Powering the Nation

On net calorific value, Nigeria's economy is fueled by unclean

[5]The commodity basket is a statistical compilation of all energy productions, uses, imports, exports and transmissions for a particular year.

and traditional energy, comprising 80.9 per cent of the total consumption. Cleaner and modern energy like gas and electricity comprised only a paltry amount of 11.1 per cent. This deficiency is confirmed by the huge gap between demand for and supply of electricity and gas in the domestic market. Per capita electricity supply in Nigeria ranked among the poorest in the world, amounting to 155 KWh, compared with 384 KWh for Ghana, 4,410 KWh for South Africa and 15,904 KWh for Qatar (World Energy Survey, 2014). With a population estimated at 170 million, this provides a huge domestic market opportunity for gas and electricity consumption.

### 3.4.2 Source of Revenue

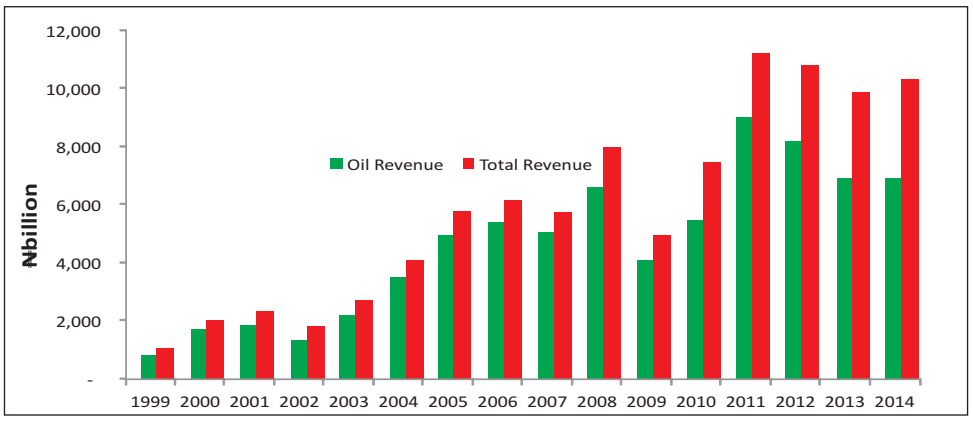
Table 2 above showed that a major part of domestic energy produced was exported based on the traditional policy of maximising revenue from natural endowments, rather than using same to achieve domestic energy sufficiency only. The oil and gas energy sub-sector alone generates substantial revenue in form of petroleum profit tax, royalties, export earnings from sale of equity shares, tax incomes from corporate activities, salaries, investment income and gains from corporate social responsibilities.

From the graph below, it can be gleaned that from 1999 through 2008 to 2014, oil revenue contributed more to the total revenue profile of the Federation, with the difference being accounted for by the non-oil revenue. In spite of the drop in

[6]Balances are total products of each energy item captured in the selected accounting year on activity basis such as production all through consumption activities

total revenue in 2007, 2009 and 2013, respectively, the share of oil revenue was still larger. The plot depicts clearly that Nigeria relies significantly on oil exports.

**Figure 4: Oil Revenue Compared with Total Revenue (1999 to 2014)**




**Source: Central Bank of Nigeria**

### 3.4.3 Political Relevance

Given the size of its oil and gas endowment in terms of proven reserves and market position in the world oil and gas markets, Nigeria attracts world recognition. Nigeria is considered important by world energy agencies, fund's managers and large corporate investors on account of its oil and gas reserves. This is evidenced through the influence oil production has in the forecast of world crude prices, particularly during disruptions and anticipated reduced production.

Nigeria's bilateral relationship with the United States (US) had been cordial and positive, as the US had remained its major importer of its crude – Bonny Light compared to other sub-Saharan African countries. In addition, its comparatively small

share in the OPEC basket notwithstandin, the geological property of Nigeria's crude helps to shore-up the OPEC reference basket price, which enhances Nigeria influence as a member of the cartel.

## 3.5 Negative Impacts

A major negative impact is the huge spending of foreign exchange on electricity generation through replacement of spare parts and the refurbishment of other components without estimable results. Data available from the Office of the Account General of the Federation (OAGF) between 1999 and 2007 showed that the government spent US$3.6 billion to increase electric power supply to the nation. Table 3 below shows the breakdown of spending for each year and the ruling exchange rate at the different time periods.

**Table 3: FGN Capital Releases to the Power Sector**

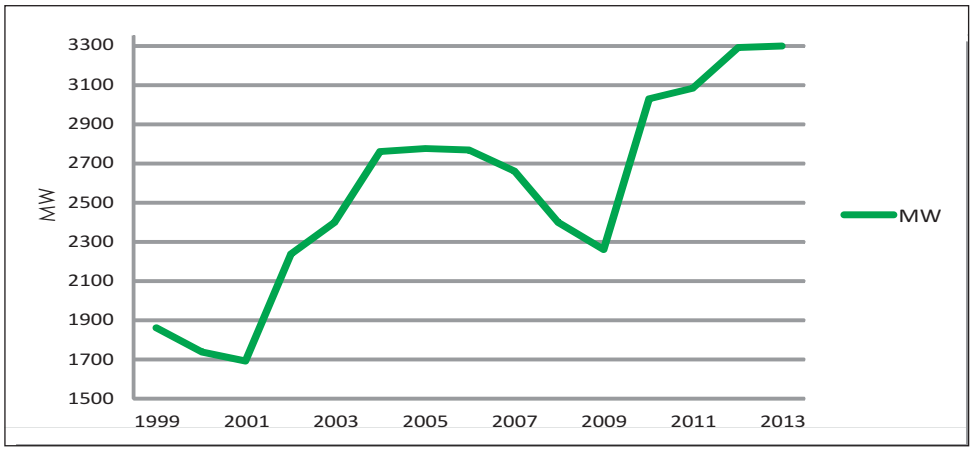
| Year | ₦ (Billion) | US$ (Million) | Average Exchange Rate (₦ per US$) |
|---|---|---|---|
| 1999 | 6.7 | 72.28 | 92.6934 |
| 2000 | 49.8 | 487.73 | 102.1052 |
| 2001 | 70.9 | 633.36 | 111.9433 |
| 2002 | 44.2 | 394.84 | 111.9433 |
| 2003 | 5.2 | 43.00 | 120.9702 |
| 2004 | 54.5 | 421.32 | 129.3565 |
| 2005 | 70.3 | 531.97 | 132.1500 |
| 2006 | 72.4 | 562.77 | 128.6500 |
| 2007 | 61.1 | 485.58 | 125.8300 |
| Total | 435.1 | 3,632.83 | |

Source: Office of the Accountant General of the Federation, Nigeria.

Additional spendings were made subsequently up to 2014, to execute the Presidential Power Sector Reform Agenda and other newly formed initiatives. However, the data from 2008 to date was not available.

Despite these spending, the inadequate electric power supply situation remained almost unchanged. The graph below shows that following the commencement of the spending, electric power supply became worst trending downward from 1999 to 2001. It however rose sharply from 1,700MW in 2001 to 2,700MW in 2006. The increase was however, short-lived as the supply declined to 2,255MW in 2009. It later increased continuously to a peak of 3,300MW in 2013 as shown in Figure 5.

**Figure 5: Electricity Generation (MW)**




**Source:** PHCN

The second negative impact is the issue of subsidy. In Nigeria, subsidy was initially applied to electricity, then extended to all petroleum products and later streamlined to the electricity

supply, premium motor spirit (PMS) and household kerosene (HHK). However, the subsidies on diesel and aviation fuel were removed. The consequences were the deregulated prices of these energy sources. With respect to electricity, certain classes of consumers, such as premises exclusively used for residence (house, flat or multistoried house R1 Life-Line); residential premises used for manufacturing activities (welding and ironmongery, D1 Single and 3-phase, D2 LV Maximum Demand and D3 HV maximum Demand (11/33 KV)); and special customers (agriculture and agro-allied industries, water boards, religious houses, government and teaching hospitals, government research institutes and educational establishments), enjoy different rates of subsidy. However, since electricity constitutes only 1.62 per cent of the total consumption of the Nigerian energy basket, the subsidy does not hurt to large extent government revenue and external reserves substantially.

The challenges of subsidy are localised in the petroleum products subsector, notably PMS and HHK, where huge revenue is drained through subsidy payout on imports of PMS and HHK. Data from PPPRA indicated a yearly retail cost of PMS per litre of ₦91.39, ₦111.70, ₦145.99, ₦153.52, ₦147.76 and ₦126.89 for 2009, 2010, 2011, 2012, 2013 and 2014, respectively. This cost indicates clearly a differential with regulated pump price for PMS that has to be sustained by subsidy. To derive the amount of subsidy paid, the pump price is deducted from the total landing cost computed by the PPPRA multiplied by the total PMS consumption. The estimated subsidy paid and other related

statistics are as indicated in Table 4.

**Table 4: Derived Subsidy Payment**

| Year | Total PMS Consumption (Billion Litres) | Total Cost (₦per litre) | Pump Price (₦ per litre) | Subsidy Rate (₦ per litre) | Subsidy Paid (₦ 'Billion) |
|---|---|---|---|---|---|
| 2009 | 13.2 | 91.39 | 65 | 26.39 | 348.4 |
| 2010 | 14.4 | 111.7 | 65 | 46.7 | 670.7 |
| 2011 | 17.0 | 145.99 | 65 | 80.99 | 1,379.4 |
| 2012 | 14.1 | 153.52 | 97 | 56.52 | 797.4 |
| 2013 | 14.7 | 147.76 | 97 | 50.76 | 748.7 |
| 2014 | 14.4 | 126.89 | 87 | 39.89 | 574.4 |

**Sources:** Authors computation based on data from Petroleum Products and Price Regulation Agency (PPPRA).

Table 4 showed that total subsidy paid by the Federation Account during this five-year period was N3.94 trillion, excluding payments for interest rate and foreign exchange differentials (Table 4). Meanwhile, the NEITI 2013 Audit Report stated that PMS subsidy payment from 2009 to 2011 was N2.95 trillion. This suggests intuitively that the PMS subsidy in Nigeria consumes a huge proportion of the nation's revenue.

In addition, PMS imports also claimed substantial foreign exchange, thus, contributing to the depletion of foreign exchange reserves, putting pressure on exchange rate and depreciating the naira in the foreign exchange market. Using the Central Bank of Nigeria's window, the pressure of petroleum products import on Nigeria's scarce foreign exchange earnings, can be gleaned as presented in Table 5. This was derived by

multiplying the prevailing exchange rate by the total cost of imports, which included the cost of cargo import and other charges paid in US dollar.

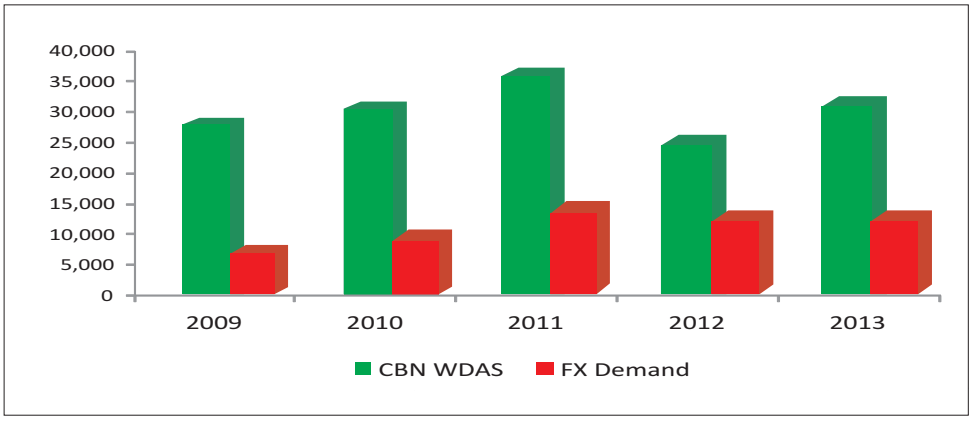
**Table 5: Fuel Import Foreign Exchange Consumption**

| Year | Total PMS Consumed (litres) | Landing Cost | Amount in | Exchange Rate | Total FX in (US$' Mn) | Total CBN WDAS (US$'Mn) |
|---|---|---|---|---|---|---|
| 2009 | 13,203,538,881 | 76.84 | 1,014,559.93 | 149.69 | 6,778 | 27,531 |
| 2010 | 14,361,191,832 | 96.58 | 1,387,003.91 | 150.48 | 9,217 | 30,172 |
| 2011 | 17,031,429,794 | 129.05 | 2,197,906.01 | 158.21 | 13,892 | 35,698 |
| 2012 | 14,108,831,138 | 135.92 | 1,917,672.33 | 157.32 | 12,190 | 24,627 |
| 2013 | 14,749,415,923 | 130.49 | 1,924,651.28 | 157.27 | 12,238 | 30,836 |
| 2014 | 14,429,123,530 | 133.21 | 1,921,161.81 | 157.30 | 12,214 | 27,732 |

**Source:** Central Bank of Nigeria

Table 5 showed that PMS imports had at one time (2011) consumed up to US$13.89 billion, increasing from US$6.78 billion in 2009. Figure 6 also showed that PMS import, which was 25.0 per cent in 2009, grew to 49.0 per cent in 2012, before declining to 40.0 per cent in 2013. Most of these wastes could have been saved if supplies were domesticated.

**Figure 6: PMS FX Demand Vs WDAS Total Supply in US$**




**Source:** Central Bank of Nigeria

## 4.0 REFORMS IN THE ENERGY SECTOR

### 4.1 Policies, Programmes and Interventions in the Energy Sector

The energy market in Nigeria had enjoyed concerted government efforts and visible presence in the form of policies/programmes/interventions simply stated here as government efforts along the value-chain of the industry from upstream down to retail. Some of these efforts were structural changes, regulatory reforms, capacity expansion and institutional restructuring, all aimed at increasing energy supply.

#### 4.1.1. Oil

The industry reforms brought into existence the Nigeria National Petroleum Corporation (NNPC) in 1975, the Petroleum Products Pricing Regulatory Authority (PPPRA) in the early 2000s, the Nigerian Local Content Development Initiative and Greenfield Refinery Projects, no other significant reform measures have been noticed. These initiatives as good as they were, have not been able to address fundamental issues in the industry. Consequently, the industry continued to witness environmental challenges, including poor fiscal structure. This led to the significant divestments by major oil producers in the sub-sector, culminating in the introduction of the Petroleum Industry Bill (PIB) in 2008. The proposed PIB is an Executive Bill that seeks for an Act to provide for the establishment of a legal, fiscal and regulatory framework to address the environmental and other related matters in the oil sub-sector.

If the Bill had been passed into law, expert opinion holds that, it

would have brought about positive developments, which include: arresting the increasing divestments; attracting new investments; incorporating the fundamental principles of the Nigerian Extractive Industry Transparency Initiative (NEITI) Act; addressing environmental and community issues; opening up the industry for privatisation; establishing sustainable fiscal regime for the Nigerian fiscal system; and leading to full optimisation of the benefits of the oil industry.

### 4.1.2. Gas

The Gas sub-sector is recognised as a key asset capable of transforming the Nigerian economy through vital sub-sectors, such as electricity, petro-chemicals, cement, iron and residential. The sub-sector, therefore, had attracted special attention from Government in Nigeria. Among the efforts is the Gas Master Plan, aimed at providing a framework that would ensure the realisation of maximum value from the country's gas resources. It is intended to leverage on the multiplier effect of gas in the domestic economy and optimise the nation's share of the high value export market. Specifically, the Plan was targeted at addressing impediments to the development of the domestic gas sector, engender the monetisation of gas, reduce gas flaring and guarantee long-term gas security for Nigeria. The plan is also expected to facilitate timely and cost- effective gas production to meet global and domestic demands. The plan was hinged on three critical elements, namely Gas pricing policy (the policy); domestic gas supply regulations (the regulation); and gas infrastructure blueprint (the blueprint). Other efforts include: the Gas-to-Power; Gas Processing Facility;

the Nigeria LNG Company Limited; and the Nigeria Gas Company.

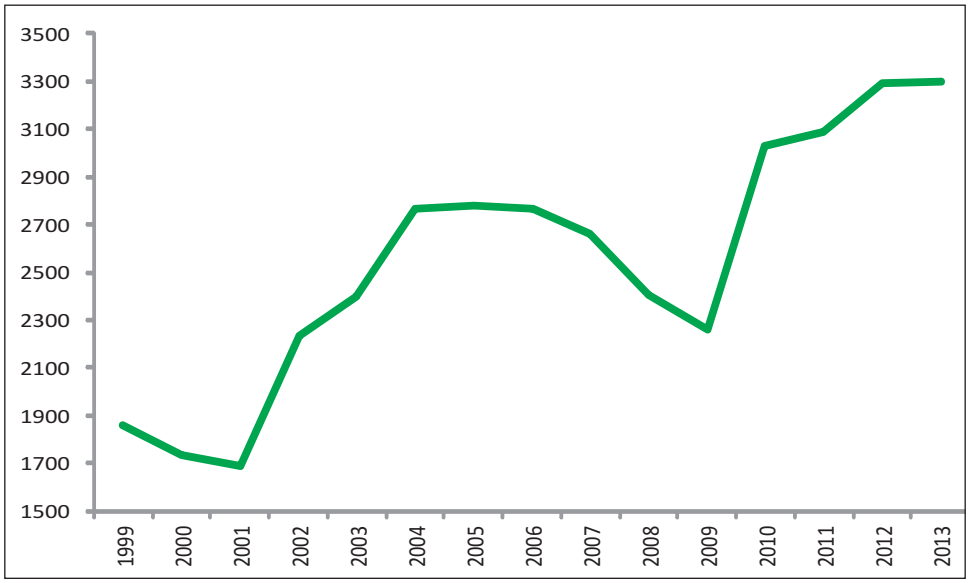
The gas sub-sector is an area where government effort has produced significant results. Earnings from gas exports stood at US$ 9.6 billion in the last 10 years, while domestic supply increased by about 1,827.0 per cent in the same period. In terms of policy, there are roadmaps towards strategic goals of achieving targeted supply to power, industry and commercial sub-sectors in the right mix.

### 4.1.3 Electricity

Growth in the electricity sub-sector had been hindered by monopolistic market structure, poor regulatory framework, wide investment gap, decayed and inadequate infrastructure, poor pricing and revenue leakages, including management deficiency.

Prior to the enactment of the Electricity Power Sector Reform Act (EPSRA) in 2005, government efforts in this sub-sector were investment of US$ 3.6 billion in the Independent Power Projects (IPP) from 1999 to 2007. The enactment of the EPSRA resulted to a successful privatisation of the industry, establishment of a well-structured regulatory commission, introduction of a functional market organ (Nigeria Bulk Electricity Trader), the Transmission Company of Nigeria (TCN) and an effective investment vehicle (the Multi-Year Tariff Order).

**Figure 7: Domestic Electric Power Generation from 1999 - 2013**




**Source:** PHCN

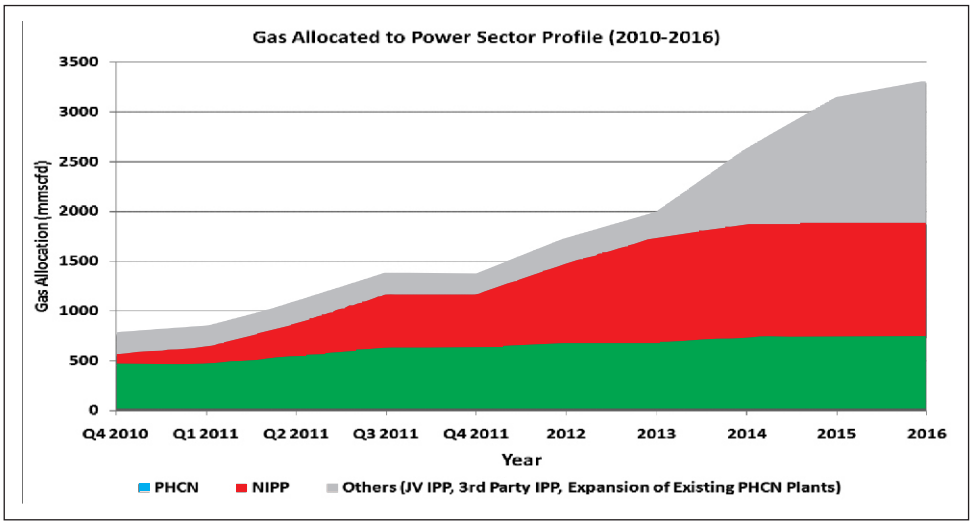
## 4.2 Gas to Power Initiatives

The crux of the new power sector reforms of the government is the focus on least cost and efficient sources of power generation and to encourage foreign investment. Given Nigeria's abundant gas reserves and the growing need for a reduction in gas flaring, the gas-to-power initiative embedded in the gas master plan is aimed at increasing the supply of natural gas to the gas plants in the country.

With over 75 per cent of Nigeria's power generation based on natural gas, there is need to guarantee the availability and reliability of domestic gas supply as a critical step in realising the goal of un-interrupted electricity supply to consumers. To forestall the threat of finance, the World Bank signed a Partial

Risk Guarantee (PRG) worth about $145 million, with a consortium of the PHCN, the Egbin Power Station, Chevron and The Deutshe Bank in April 2013. This guarantee will backstop government's payment obligations to a private investor/financier, ensuring that the investor gets paid by the World Bank upon a payment default by the Nigerian government. This milestone agreement is in a bid to support and enhance the county's generating capacity as well as improving the gas and power sector. About 3bcf/d of gas is targeted at the Power Sector with existing PHCN plants being cardinal base load consumers of the gas.

**Figure 8: Gas Allocated to Power Sector Profile (2010 -2016)**




Source: **Nigerian Gas Company**

There are presently about 22 existing gas turbines/gas fired power plants and 15 are under construction, to meet domestic electricity needs. Some of the existing gas turbines include: The Niger Delta PHCN plants; the Egbin; theAfam VI; and Geregu I

and II plants, among others. Regionally, there are three key gas projects, the West African Gas Pipeline (WAGP) project, which will supply gas to neighboring West African countries; the Trans-Sahara pipeline project, which seeks to transport gas to Europe via Algeria; and the proposed gas network for the supply of gas to the Equatorial Guinea.

## 5.0 OUTLOOK ON ENERGY CONDITIONS IN NIGERIA

The OPEC, projected that world energy demand would rise by 52.0 per cent over the 2010 and 2035 period (El-Badri, 2013). Renewable energy sources, such as solar, wind, small hydro and geo-thermal energy are projected to grow by more than 7.0 per cent per annum, accounting for less than 3.0 per cent of the global energy requirements by 2035. While the share of biomass is expected to stagnate around 9.0 per cent, the contribution of nuclear energy is anticipated to remain a little below 6.0 per cent over the same period. Fossil fuels are expected to dominate the market with the contribution projected to shrink from 82.0 to 80.0 per cent during the same period. For most of the period, oil is likely to continue to account for the major share in energy demand, with the overall share projected to decline from 33.0 per cent in 2010 to 27.0 per cent in 2035. The share of coal is expected to hover around 27.0 per cent, while the contribution of natural gas is expected to increase to 26.0 from 22.0 per cent during the sample period. The global refinery demand for crude is projected to slide from 78.0 mb/d in the first quarter of 2015 to 77.3 mb/d in the second quarter of 2015 and further projected to decline to … by 2035(IEA, 2015).

The projections in Table 6 indicate that the increase in world oil demand would linger around 93.6 million barrels per day for 2015 and is expected to …(IEA, 2015). Developing countries are expected to drive the global increase, with the Asia-Pacific and the Americas accounting for the largest share. The growth is expected to be driven, largely, by the transport sector, particularly road transportation in the non-OECD countries with

potentials to expand the downstream sector.

**Table 6: Global Oil Demand (2013 – 2016) (million barrels per day)**

| | 2013 | 2014 | 2015 Q1 | 2015 Q2 | 2015 Q3 | 2015 Q4 | 2015 | 2016 Q1* |
|---|---|---|---|---|---|---|---|---|
| **Africa** | 3.8 | 3.9 | 4.1 | 4.1 | 4.0 | 4.1 | 4.1 | 4.2 |
| **Americas** | 30.7 | 30.8 | 30.7 | 30.7 | 31.4 | 31.6 | 31.1 | 31.1 |
| **Asia-Pacific** | 30.3 | 30.7 | 31.7 | 30.8 | 30.7 | 32.0 | 31.3 | 32.5 |
| **Europe** | 14.3 | 14.1 | 14.0 | 14.1 | 14.4 | 14.1 | 14.1 | 14.0 |
| **FSU** | 4.8 | 4.9 | 4.6 | 4.6 | 4.8 | 4.7 | 4.7 | 4.5 |
| **Middle East** | 7.9 | 8.1 | 7.9 | 8.4 | 8.8 | 8.1 | 8.3 | 8.1 |
| **World** | **91.9** | **92.5** | **93.0** | **92.7** | **94.1** | **94.7** | **93.6** | **94.4** |
| **Annual Chg. (%)** | 1.4 | 0.7 | 1.4 | 1.2 | 1.1 | 1.0 | 1.2 | 1.5 |
| **Annual Change (mb/d)** | 1.3 | 0.7 | 1.3 | 1.1 | 1.0 | 0.9 | 1.1 | 1.4 |
| **Changes from last OMR (mb/d)** | 0.02 | 0.00 | 0.31 | 0.08 | -0.03 | 0.00 | 0.09 | na |

**Note:**
*****Authors projections; na means not applicable,
**Source:** Adopted from Oil Market Report (OMR) by International Energy Agency (IEA), April 15, 2015. Available at https://www.iea.org/oilmarketreport/omrpublic/

The demand by the OECD countries is projected to shrink in 2015 due to the slow growth in economic activities and the shutdown in refinery associated with the efficiency losses (IEA, 2015). Consequently, the weaker demand conditions will contribute to lower export revenues and worsening macroeconomic conditions in many non-OECD countries like Brazil, Argentina, Iraq and Nigeria.

The global crude oil demand for 2016 is projected to increase by

1.4 million barrels per day (mb/d) over the level in 2015 to 95.0 million barrels per day, owing largely to gradual improvements in global economic activities. The projected increase is higher than the growth of 1.1 mb/d projected for 2015. This is expected to have major implications on the prospects for expansion of the economy as revenue earnings improve.

## 5.1 Global Oil Supply

Higher oil supplies from the Middle East OPEC members and the continued build-up in the Shale oil production in the US will continue to lead to higher global oil supply and lower oil prices in the international market. Consequently, the global oil supply is estimated to rise by 1.0 mb/d month-on-month in March 2015 to 95.2 mb/d with the highest monthly increase recorded within the OPEC production in 4 years. Similarly, OPEC crude oil production is estimated to increase by 890 kb/d to 31.02 mb/d in March 2015 due to higher supplies from Saudi Arabia, Iraq and Libya.

Oil production by the non-OPEC countries is projected to increase by about 100 kb/d to 57.7 mb/d in March 2015, with the US leading and Russia contributing strongly to the year-on-year non-OPEC supply increase estimated at a rise of 1.8 mb/d. A downward adjustment of about 160 kb/d is, however, projected for North America for the second half of 2015 as against the slightly more negative outlook forecast for the US and Canada in March 2015. The slide in the forecasts reflected the bigger slowdown in the US LTO growth and unfavorable outlook for the Canadian output of non-oil sands (IEA, 2015).

The oil market outlook reveals more than sufficient supply to meet the existing demand, with prices that create balance between producers and consumers of the product. However, the downside risks in 2016 still remain in view of the uncertainties prevailing in the industry, particularly the Iran-US Nuclear concluded deal.

**Table 7: World Oil Production (million barrels per day)**

| | 2014 | 2015 Q1 | 2015 Q2 | 2015 Q3 | 2015 Q4 | 2015 | 2016 Q1 |
|---|---|---|---|---|---|---|---|
| **OPEC*** | 36.6 | 37.0 | 38.1 | 38.1 | 39.0 | 38.55 | 39.5 |
| **OECD** | 22.8 | 23.8 | 23.6 | 22.9 | 23.5 | 23.5 | 23.9 |
| **Non-OECD** | 29.8 | 29.8 | 30.4 | 30.2 | 29.9 | 30.1 | 29.9 |
| **Others** | 4.4 | 4.0 | 4.5 | 4.8 | 4.5 | 4.4 | 4.1 |
| **Total World Supply** | **93.7** | **95.31** | **96.52** | **97.24** | **97.46** | **95.55** | **96.68** |

*Includes condensates reported by the OPEC countries, oil from non-conventional sources, e.g. Venezuelan Orimulsion (but not Orinoco extra-heavy oil).
**Sources:** Extracted from Oil Market Report by International Energy Agency (IEA), April 15, 2015. Available at https://www.iea.org/oilmarketreport/omrpublic/

## 5.2 Global Natural Gas Demand and Supply

### 5.2.1 Global Natural Gas Demand

The global demand for natural gas was noted to have grown from 450.0 Mscf to 1,827.0 Mscf in the period 2000 - 2010 (IEA, 2012). The growth is projected to expand to 40 Bcf/d by end-2015 and over 50 Bcf/d by 2025. The significant expansion in the projected global demand for natural gas was attributed to the growing desire in many countries to adopt cleaner energy

sources in their quest for rapid economic growth towards lessening the impact of rising oil-based energy costs. The preference for natural gas as a source of energy is basically on account of its low carbon emissions, which is 43.0 per cent less than coal and 30.0 per cent lower than oil per every unit of energy supplied. The emerging economies of Asia, particularly China and India, including the Middle East and the South America, are ranked among the fastest growing gas markets in the world.

The growing desire for gas in the international market is also driven by its cost-effectiveness among clean energy sources. The number of countries importing gas increased from 17 in 2007 to 25 in 2015, mostly from Asia, the Middle East, South America, Europe, the Central America and the North America. Many developing countries such as Colombia, Bangladesh, El Salvador, Panama, Costa Rica, Lebanon, Croatia and Poland are planning to build gas import terminals towards significant involvement in international gas trade.

### 5.2.2 Global Natural Gas Supply

Global gas production received a boost in the early 2000s following the Kyoto Agreement to transit from coal-fired electricity generating plants to cleaner energy to reduce carbon emission. With the innovations in drilling technologies in the US and the resultant massive production of unconventional low costs gas from the Shale gas fields, the global outlook for natural gas supply improved considerably within the last decade.

## 5.3 Global Electricity Production/Consumption

There is no uniformity in the global electricity market as regional markets differed in structure, depth and regulations. According to Mirchi, et al., (2012), North America has the highest per capita electricity production, amounting to14, 167 kWh/cap. This was more than double the production ratio of the Western Europe (6,646 kWh/cap) and thrice the production of the Central Europe (4,411kWh/cap). It is also more than four times the production ratio of East and the South-East Asia (3,400 kWh/cap); eight times the ratio of North Africa (1,771 kWh/cap) and thirty times the production ratio of the Sub-Saharan Africa (490 kWh/cap).

Among the developing regions, East and South-East Asia recorded the most rapid increase in annual per capita electricity generation with an average of 6.6 per cent, followed by North Africa with an annual average of 4.7 per cent. South Asia and the Middle-East have annual averages of 4.5 and 3.8 per cent, respectively. The sub-Saharan Africa ranks among the lowest in annual per capita increase in electricity production, owing to its high demographic growth and low investment in electricity production.

## 5.4 Impact of the Global Developments on Nigeria's Energy Market

The energy landscape of Nigeria remains uncertain with low oil price, increasing divestment in the oil and gas industry, unresolved host community issues and poor regulatory framework. The implication is a decline in investment, which

heightens energy insecurity and the eventual slide in the sector's operational activities. A cursory analysis of the energy conditions in Nigeria revealed that the country had not optimised its huge energy potentials significantly.

The IMF (2014), in its October WEO, projected a boost for global output growth for 2015 and 2016 at 3.5 and 3.7 per cent, respectively, as a result of the lower oil prices. This growth trajectory implies increased demand for crude oil in the energy-intensive economies of the US and other trading partners of Nigeria. The increased economic activities are expected to ultimately drive aggregate demand to which oil prices may respond positively in the medium to long-term. The consequence of the price recovery would lead to the likely rebuilding of foreign reserves, and ultimately increase in investors' confidence. This has the tendency to stimulate domestic consumption and thus promote economic growth.
The lifting of sanctions on Iran by the US coupled with the OPEC's resolve to maintain current production level would culminate in increased supply that would keep oil prices at the current low levels in the short-term. The weak oil prices, apart from stimulating growth, will improve the purchasing power and private demand for crude oil-importing economies. Consequently, total energy consumption is expected to experience a boost that would translate into increased long-term growth and energy demand to be driven, largely, by labour force, income and population growth.

The rising cost of exploring alternative energy is another

indicator of possible improvement in oil price. Though the price of the Bonny Light had witnessed a decline from about US$107.98 per barrel in July 2014 to US$63.01 per barrel by end-December 2014 and further to US$59.5 per barrel by April 15, 2015, the trend is expected to revert as a result of the high cost of developing alternative sources of energy. The cheap oil price serves as a disincentive for huge investments in alternative energy exploration.

The appreciation of the US dollar by about 6.0 per cent in real terms is also expected to reduce the US exports, but increase in export in oil-exporting economies. Currency appreciation makes domestic products costly, compared with imported goods. The appreciation makes Nigeria's oil cheap, inducing oil-importers to increase their demand. It is expected that the lower oil prices will culminate in lower energy subsidies, in the face of lower production cost, and improved government revenue as subsidy revenue is efficiently utilised in providing economic and social infrastructure.

## 5.5 Global Drive for Renewable Energy

For Nigeria to meet its growing energy demand, the country needs to shift its focus from fossil based energy to renewable sources. This is because fossil fuels are not only non-renewable, but are also more expensive, with adverse environmental impacts. However, renewable energy resources such as wind, biomass, geo-thermal, tidal and solar energy can be replenished on continuous basis. The global wind and solar power capacity built in 2014 stood at about 100 gigawatts (GW) compared to the 74GW built in 2013 (EcoWatch, 2015). China

emerged as the leading investor in renewal energy followed by the United States. In 2014, wind production accounted for 39.1 per cent of Denmark's overall electricity generation from the clean energy sources, thus breaking a new global record. This excellent performance is an indication that the country will meet its aspiration of generating 50 per cent of its power from renewal sources in 2020.

Wind power generation in the United Kingdom improved by 15 per cent to 28.1 terawatt-hours (TWh) in 2014 from 24.5 TWh in 2013. Wind energy generation is sufficient to meet the energy needs of over 6.7 million households. Standalone turbines and grid-connected wind farms together supplied 9.3 percent of the electricity demand in 2014 compared to 7.8 per cent in 2013. Renewable energy accounted for about 26 percent of clean power generation, emerging as the highest contributor to electricity supply in Germany in 2014. More than 100 percent of Scottish households have their energy needs met in six months of the year via wind power (EcoWatch, 2015).

# 6.0 CHALLENGES IN THE NIGERIAN ENERGY SECTOR

## 6.1 Challenges in the Upstream Oil/Gas Sector

### 6.1.1 Production Challenges (Upstream)

Government underfunding of crude oil production has been identified as one fundamental challenge in the upstream sector. The NNPC has consistently not been able to meet its funding obligations to the Joint Venture operations. However, the government has adopted other funding arrangements, such as the Production Sharing Contract (PSC) and the Modified Carried Agreement (MCA) with the Multinational Oil Companies (MOCs) to provide long-lasting benefits.

### 6.1.2 Challenges in the Downstream Sector/ Oil Subsidy

Oil subsidies portend huge negative implications in three major ways, namely the macroeconomic, environmental and social Implications:

Macroeconomic Implications: Oil subsidies hamper economic growth, reduce public finance and create macroeconomic imbalances in the economy. To the extent that this price subsidy reduces the attractiveness of the industry to private investors, promotes inefficient technology, inadequate finance for upgrades and maintenance of infrastructure, and eventual severe energy shortages, which greatly disrupt economic activities.

Subsidies crowd out more worthwhile public spending on public

infrastructure in the transport, education, health, and other critical sectors. The higher domestic petroleum products prices are in neighboring countries, especially in the case of Nigeria, illegal trade, the risk of cross-border and regional smuggling are encouraged. This increases the risk of more budgetary spending in subsidies for products.

Subsidies have an adverse impact on fiscal revenue and public debt. Subsidies gulp government revenue, affect the value of the subsidising currency and create exchange rate crisis, resulting in the worsening of the balance of payments position through the arising current account deficit.

Environmental implications of subsidies include the creation of an incentive for over-consumption of petroleum products, which promote global warming and air pollution. Other negative externalities of subsidies are in the form of traffic congestion, higher rates of accidents and road damage since vehicular traffic is increased as a result of reduced and affordable PMS price, as evidenced by an IMF study on Iran (IMF, 2012).

The main social implication of petroleum subsidies is its reinforcement of inequality in the society as the targeted segment of the population hardly benefit from the programme. Studies indicate clearly that petroleum subsidies benefit the rich who own many cars and consume more of the products than the poor who don't necessarily consume these products.

### 6.1.3 Energy Infrastructure Capacity

#### 6.1.3.1 Inadequate Gas Infrastructure

The nation's gas endowments are yet to be harnessed due to the nation's primary focus on crude oil production. This has left the domestic gas market generally underdeveloped, with a significant percentage of available natural gas exported as liquefied natural gas, re-injected to enhance oil recovery or simply flared. This has exposed the weaknesses in the structure of the nation's power generation mix, thereby rendering power supply system unstable and unpredictable. This has necessitated the initiation and implementation of an appropriate gas pricing framework, a prerequisite for developing the domestic gas market.

#### 6.1.3.2 Security of Energy Infrastructure

The challenge of securing energy infrastructure remains daunting in view of the incessant vandalism of oil and gas installations in the Niger Delta region. This has adversely affected the supply of refined products as well as gas supply to thermal power stations.

#### 6.1.3.3 Investment and Operations

Energy infrastructure capacity challenges have caused some international oil companies (IOC) operating in Nigeria to divest their interests in some offshore and shallow water blocks. Most of these blocks are recognised oil fields, while others are gas fields. The blocks are sold under negotiated bid arrangements to rationalise the asset portfolios of the companies and as shift their

strategic development focus to the deep offshore operations in Nigeria.

Another major operational challenge facing Nigeria's energy sector is the dearth of requisite skills and expertise, particularly in the electricity sub sector. This is because for Nigeria to be among the top twenty economies in the world, it must increase its electricity generation capacity from the current 3,650mw/hr to over 45,000mw/hr (Adegbulugbe and Adenikinju, 2008). This is no doubt a quantum leap, which will require different skills and expertise to manage the transition and cope with the growth. A combination of skills, including engineers, technicians and industry experts are required for every additional power plant. This, if not addressed, will no doubt constitute a major stumbling block to the sector and country.

#### 6.1.3.4 Refinery Infrastructure

The downturn in revenue from crude oil export has once again brought to the fore the need for a reduction in Nigeria's dependence on imported refined petroleum products. Out of the 5.13 billion litres of petroleum products consumed in Nigeria in 2013, over 90.0 per cent were imported and heavily subsidised by the Government (CBN, reports). This was because the refineries in Nigeria operated at dismally low capacity utilisation. In 2013, the Warri Refinery operated at 37.62 per cent of its installed capacity, the Port Harcourt Refinery at 8.20 per cent and the Kaduna Refinery at 29.14 per cent (CBN, 2015). Huge expenditure has been expended in seasonal Turn-Around Maintenance (TAM) without much result due ostensibly to the

obsolete state of the machinery.

Interestingly, recent refinery maintenance effort seems to have yielded a bit of respite. The Warri refinery is set to scale up the quantum of refined petroleum products in July 2015 to about 4.6 million litres per day at a capacity utilisation rate of 80.0 percent, while the Port Harcourt refinery is set to start producing about 5.0 million litres of refined products per day by end-July, 2015. Despite these maintenance effort, the huge supply gap and its effect on Nigeria's economic growth points to the need for structural reforms in the sector. Consequently, the Government has outlined plans to empower the Department of Petroleum Resources (DPR) to issue licences to private investors for modular turnkey refineries. Huge investments in refining infrastructure are required by the private sector, with the Government ensuring a healthy and enabling environment for the investors. This is expected to curb the supply and infrastructure challenges, as well as address the persistent fuel shortages.

## 7.0 THE WAY FORWARD

### 7.1 Deployment of Gas Infrastructure

There is the need to facilitate the deployment of gas infrastructure network across the country so as to ensure gas availability in all parts of the country. With stock level at 196 trillion cubic feet of proven reserves, Nigeria's natural gas endowment stands out in the world. The IEA (2010) report indicated that the Gas-Fired Combined Cycle Gas Turbine (CCGT) is the most attractive among competitive electricity generation technologies. This is because of its very low capital investment cost, short lead time of construction, which is approximately one year, high efficiency, operational flexibility, and low carbon emission intensity.

### 7.2 Security of Oil and Gas Installations

There is need to urgently address the problem of gas supply security. Gas-fired-power plants currently dominate the power generation mix in Nigeria. The dominance of gas over other types of fuels for power generation is due to its relative abundance and the lower cost of gas-fired-power plants. However, in recent times, this over-reliance on gas has revealed a major weakness in the structure of the power generation mix. First, gas supply is geographically located in the Niger Delta region as such it is not evenly distributed across the country; and second, the incidence of vandalism of gas supply infrastructure has increased, thereby reducing power supply and causing significant social and economic losses. This unstable gas supply has rendered the power supply system unpredictable. There is

therefore, the need for government to ensure all host community agitations are resolved to avoid production disruptions.

Specifically, there is need for the government to increase surveillance activities around oil installations. This can be achieved through improving synergy among relevant security agencies as well as the adoption of modern surveillance equipment and techniques. Finally, government should sustain current effort aimed at bringing sustainable peace to the Niger Delta region as this would go a long way in addressing the menace of militancy and other social unrest.

## 7.3 Renewable Energy Sources

The need for sustainable energy is rapidly increasing in the world. To this end, renewable energy has been identified as a veritable alternative to fossil fuels in a sustainable and environmentally-friendly manner. The development and utilisation of renewable energy should be accorded a high priority, especially in the light of increased awareness of the adverse environmental impact of fossil-based generation. A widespread use of renewable energy is important for achieving sustainability in the energy sectors in both developed and developing countries. Renewable energy is, undoubtedly, a promising solution to Nigeria's energy challenges. Apart from being sustainable and inexhaustible, it can be established in smaller units, thus, suitable for rural community management and ownership, and could be pivotal to economic development. Other advantages of renewable energy over

fossil fuels include:

### 7.2.1 Security of Supply

To the extent that renewable energies such as wind, biomass, geo-thermal, tidal and solar energy are constantly replenished from natural sources, they have security of supply. If appropriately explored, renewable energy resources can provide a reliable and sustainable supply of energy almost indefinitely. In contrast, fossil fuel resources are diminished by extraction and consumption.

### 7.2.2 Promote Decentralization of Energy Management

Renewable energy promotes system decentralisation and local solutions that are not necessarily dependent on the national network, thus, enhancing the flexibility of the system and provides economic benefits to small isolated populations.

### 7.2.3 Cheap and Easy to Generate

Renewable energy resources are generally well-distributed all over the world, even though wide spatial and temporal variations occur. Thus, all regions of Nigeria world have reasonable access to one or more forms of renewable energy supply. In addition, their rate of use does not affect their availability in the future. They can be cheaply and continuously harvested, and, are therefore, a sustainable source of energy.

### 7.2.4 Suitable for Rural/Community Development

Unlike the nuclear and fossil fuels plants that require huge capital and are owned by multinational companies or

governments, renewable energy can be set up in small units, suitable for rural community ownership and management. This way, the returns from renewable energy projects are internalised in the community. In Nigeria, this has particular relevance since the electricity grid barely extends to remote areas, and is usually expensive when it does. This presents a unique opportunity to construct power plants closer to where they are actually needed. This way, the much needed income, skill transfer, and manufacturing opportunities for small businesses would be injected into rural communities.

However, to fully tap into the opportunities, the country needs to establish renewable energy markets and continuously develop capacities in renewable energy technologies. In this way, the barriers and constraints to the transmission of renewable energy are circumvented. Specifically, the legal, administrative, and financing framework should be established to facilitate planning and implementation of renewable energy projects. Government should take the lead in promoting renewable energy technologies by initiating surveys and studies to establish their potentials in both urban and rural areas.

### 7.3 Environmental Considerations

Today's carbon-constrained world is understandably averse to pollution. Sanctions on pollution that began softly few decades ago have now reached stringent levels, involving penalties for polluters above tolerable levels and financial rewards for "non-polluters". It is, therefore, critical for any energy reform to be anchored on a pollution-free technology. Nigeria should,

therefore, identify and develop economically-viable and environmentally-sound energy sources to promote developmental objectives. In that regard, the adoption of renewable energy technologies will help to address the environmental concerns that emerge due to greenhouse gas emissions caused by power generation from oil, natural gas, and coal.

## 7.4 Competitive Energy Markets

Competitive energy markets play a key role in the development and deployment of new technologies. Strong competition in the electricity market has a positive effect on the efficiency of power generation and distribution for optimum returns. There is need, therefore, to enhance the efficiencies of end-use technology. This could be achieved through research, development, transfer and use of improved energy-efficient technologies and practices, with special attention to the rehabilitation, maintenance and modernisation of energy-generating infrastructure.

## 7.5 Conducive Environment for Private Sector Investment

Energy sector investments require huge capital, a long-term investment horizon and an advanced technology. To woo investors into the sector, the economic, political and social environment must be made attractive and conducive. The provision of an appropriate pricing framework that would enable investors recoup their investment and generate funds for new investments and expansion would serve as further incentives. This requires the total deregulation of the energy

sector and government involvement in the sector restricted to regulatory and oversight functions.

Secondly, there is a need for the established policy clearly defining the extent of support and incentives the Government would provide to developers of energy infrastructure, particularly gas-to-power infrastructure.

Statistics have shown that over 65.0 per cent of Nigerians live in the rural areas (Adenikinju, 2008). Thus, unless deliberate efforts are made, these Nigerians may be excluded from energy supply, as the current grid expansion take a long time to get to the rural areas.

## 7.6 Regional and Ecological Considerations

To achieve a balanced mix of energy that would guarantee stability, natural endowment of every region should be optimally exploited to boost the total energy generated and distributed. This would ensure that every region has at least one form of energy resource or the other. However, these strategies must be articulated, taking into cognisance the regional characteristics and advantages.

## 7.7 Electricity Capacity Development

There is need to carry out skill gaps analysis in a bid to ascertain the existing skill in the sector and what is required to attain the country's power supply projections. Thereafter, efforts should be made to develop training institutes to provide the necessary human capacity for the energy sector. This would involve

strengthening the existing training institutions such as universities, polytechnics, and technical institutes as well as establishing new ones, specifically to cater for the skill gap needs of the country's energy sector.

## 8.0 CONCLUSION

This paper highlighted the stylised facts on the Nigeria energy sector, including the natural endowments in oil and gas reserves, with high potential for enhanced economic growth, revenue generation and employment. The paper established that largely, energy produced was exported to maximise revenue from the natural endowments.

The paper also discussed the various policies and programmes that had been implemented by the Government over the years to improve the oil and gas industry, particularly the local content and importation of petroleum products. Despite the effort, little success was achieved. Similarly, in the electricity sub-sector, output had consistently been below 5,000 MW per hour for more than one and half decades.

With a projected boost in global output growth, it is suggested that the country should take advantage of the likely rise in demand for crude oil in the energy- intensive economies of the trading partners and rebuild the dwindled foreign reserves and re-awaken the waned investors' confidence. This will be achievable as the cost of developing alternative sources of energy is comparatively more expensive.

The energy basket in Nigeria has played a significant role in generating income for the economy. However, the need to prioritise the primary function of using the endowed resources was emphasised. The management of the resources has created a dysfunction in the economy, resulting into grim energy security concerns, which makes it imperative for the

transformation of the sector from being a leakage to a strategic source of energy security. A major concern is the massive spending on petroleum products subsidy. This practice is not sustainable as there are other areas of need begging for attention in the economy. Also, the huge foreign exchange consumption for importation of PMS in particular, constitutes a leakage on the economy and exerts undue pressure on the earnings from crude oil exports and exchange rate. This situation could be avoided if the domestic refineries were operating at optimal capacity.

Investment in energy by the private sector needs to be encouraged as the projections for the industry in the next decade signal a positive trend, coupled with the sustained macroeconomic improvement. The huge untapped electricity market offers great opportunities for both domestic and international investors, as their involvement will help to bridge the vast power supply gap created by rapid population growth and low investment in the sector.

The recent shift in the production structure of the US, particularly with reference to Shale oil, makes it critical for Nigeria to explore new markets in the non-OECD countries and ensure efficient funding of the National budget as oil sector accounts for over 85 per cent of Nigeria's export earnings. Another issue that calls for urgent attention of the Government is the gas sub-sector. Nigeria, being a gas province needs to harness gas resources to emerge as a major world supplier. This will change the country's focus away from only crude oil to enhance its foreign exchange earning capacity while reducing gas flaring.

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