

## Original Research Article

## Nigeria's Energy Sector Privatization: Reforms, Challenges and Prospects

Francis A. Oluleye\*, Alex O. Koginam

Department of Economics and Development Studies Federal University of Otuoke, Bayelsa State Otuoke, Nigeria

**\*Corresponding Author**

Francis A. Oluleye

**Article History**

Received: 08.09.2019

Accepted: 17.09.2019

Published: 30.09.2019

**Abstract:** The Nigeria's energy sector has undergone series of policy reforms to address the inefficiency and mal-administration that have bedeviled it for several years. The government deregulated electricity supply in 2005 by privatizing and concessioning major national power assets. In addition, the legal frameworks to guide activities in the sector and institutions to manage and regulate the post-privatisation electricity supply industry have been established. This paper gives a historical overview of the Nigeria's electricity supply and observes that challenges still faced by investors in the sector include: gas shortages, insecurity of power assets, high cost of operation, lack of adequate capital for consistent performance and the inactivity of some licensed firms. The study recommends the institution of correct electricity supply tariffs that reflect prevailing market conditions, reduction in the number of unmetered electricity users, diversification of the sources of power generation in the country and sustained investment in transmission infrastructure by the government.

**Keywords:** Energy, Reforms, Privatization, Concessioning, Growth.

### INTRODUCTION

The contribution of energy to the growth of the world's economy in the aftermath of the great depression and World War II is increasingly clear as several severely impacted economies - Germany, Great Britain, U.S.A, etc. – have been revolutionized through the application of varied forms of energy resources in industry and commerce leading to their economic growth and sustained development. In fact, the availability of cheap energy (crude oil and natural gas) in the early 1940s and the application of innovations in energy technologies to industrial production is the main driver of the increases in employment, medical and education services and the enhanced conditions for study, work and leisure in developed countries [1].

Energy is a critical element of consideration in the pursuit of economic growth in any nation. Its importance lies in the array of productive activities to which it could be applied if the macroeconomic objectives were growth in foreign exchange earnings, low unemployment levels and creation of livable environments. Thus, energy is an essential resource of interest whether the economy is production or service oriented.

Nigeria has enormous deposits of fossil fuel. It is the sixth largest producer of crude oil and its 193.35 trillion cubic feet of proven gas reserves make it the 9<sup>th</sup> largest host of gas endowment in the world [2]. Crude oil and gas exports are therefore major foreign exchange earners for the country. In addition, there are ample deposits of other fund energy resources such as coal and wood fuel and flow energy sources (wind, tidal and hydro).

However, there seems to be a dis-connect between abundant wealth in energy resources and the pace of industrial activities in the country. This has been attributed to the persistent gap existing between energy demand and energy supply in the country [3]. Energy resources consolidate activities in other sectors of the economy such as commerce, agriculture, education, mining and manufacturing. Therefore, when the resource is readily available in an efficient manner, cost of production would decline as industrial activities in these sectors increase. Conversely, inefficient production systems, high cost of production and growth in unemployment levels; and poverty would be the problems confronted in economies were energy demand outweighs energy supply.

**Copyright @ 2019:** This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

CBN [4] observed that between 2004-2014, Nigeria's three main refineries (Warri, Kaduna and Port-harcourt) combined were unable to meet the national target of 445, 000 barrels per day (bpd) of refined products as only 98,108, 36,891 and 110,508 barrels per day were refined and supplied in 2004, 2010 and 2014 respectively, thus creating a shortage in supply that was filled by the importation of refined petroleum products. However, importation of refined products could have dire consequences for the economy as it implies the loss of foreign exchange and creation of jobs opportunities abroad.

The situation is also deplorable in the power sub-sector as population pressures continue to push the demand for power beyond the capacity generated and distributed by the country. It is estimated that less than 47% of the more than 180 million Nigerians have access to a consistent supply of electricity [5]. This is in spite of marginal improvements in generation capacity from 1473, 21.92 and 29.83 billion kilowatts in 2000, 2010 and 2018 respectively [2]. Continuous access to electricity is important for households in their amenity use and to small and medium scale industries in reducing variable cost of production and creating employment opportunities. Thus, electricity is the main lubricant of industrial activities and economic growth for nations.

In fact, Nigeria and most African countries are relatively backward in terms of citizen's access to power when compared to countries in Asia that attained independence within the same period. For instance, as indicated in table 1, Malaysia and Singapore are two countries that were equally colonized by imperial Great Britain with a large population size; but after independence in 1963 and 1965, have respectively been able to achieve full access to electricity for people.

**Table-1: Selected Countries, Year of Independence and Proportion of Population without access to Electricity**

Serial No.	Country	Year of Independence	Population without electricity	Percentage of Total population with electricity	Percentage of Urban Population	Percentage of Rural Population
1.	Nigeria	01/10/1960	95.5 million (2013)	45%	55%	37%
2.	Togo	27/4/1960	5 million (2013)	27%	35%	21%
3.	Madagascar	26/6/1960	19.4 million	15%	37%	4%
4.	Guinea	02/10/1958	8.7 million	26%	53%	11%
5.	Malaysia	16/09/1963	100,000	99.5%	99.8%	98.7
6.	Grenada	07/03/1974	11, 121 (2012)	91%	100%	80%
7.	Guyana	26/05/1966	154, 540 (2012)	79%	91%	75%
8.	Singapore	09/08/1965	-	100%	-	-
9.	Mali	22/09/1960	11.4million (2013)	26%	53%	9%

Source: CIA World Factbook, 2018.

Consequently, most African nations have embarked on reforms targeted at improving the performance of public utilities especially electricity and telecommunications. Nigeria is one of such states that have embarked on an ambitious deregulation of its power sector to create opportunities for private investment and improve the growth of the economy.

This paper therefore examines Nigeria's energy sector development with focus on the reforms undertaken by the government in the electricity subsector. The objective is to evaluate the post privatization performance of this critical sector and bring to limelight challenges still bedeviling it and proffer recommendations that could ameliorate their impact on the economy. Moreover, the prospect that deregulation of the power sub-sector affords the economy would be studied. The emphasis on the electricity subsector is in recognition of its primary role in the quest for the industrialization of Nigeria. The rest of the paper is organized in five (5) sections. Following the introduction is section 2 which highlights the history of electricity development in Nigeria. Section 3 discussed the privatization of the power sector, while post privatization challenges and prospects are discussed in section 4. The concluding remarks and recommendations are contained in section five.

## Section 2: History of Electricity Development in Nigeria

Pre-Independence Period (1898 – 1959)

The pre-independence period presents an interesting era in the history of power generation in Nigeria. The foundation of the power sector is rooted in the year 1898 when two small generating sets with total capacity of 60kw were installed in marina, Lagos, by the colonial government. The marina area was the seat of the colonial government of Lagos. However, other localities in Nigeria had a feel of electricity supply after the 1914 amalgamation of the northern and southern protectorates. Claudius [6] has listed successively, the order of access to electricity supply in some towns in Nigeria as depicted in table 2 below:

**Table-2: History of Electricity Access in some Selected Towns in Nigeria**

TOWN	Port-harcourt	Kaduna	Enugu	Maiduguri	Yola	Zaria	Warri	Calabar
YEAR	1928	1929	1933	1934	1937	1938	1939	1939

Source: Claudius [6].

Moreover, electricity assets in the Lagos colony were under the coordination of the public works department while those in the localities were under the purview of the Native Authorities (N.A). Furthermore, the Nigeria Electricity Supply Company (NESCO) was licensed by the government in 1929 to generate electricity. The Kurra Falls hydro-electric plant is a landmark achievement of NESCO [7].

The need for proper coordination of all electricity assets in the country led to the establishment of the Nigeria Government Electricity Undertaking (NGEU) as a unit under the public works department of the Lagos colony in 1946. This was followed by the enactment of the ordinance act No. 5 of 1950 which created the Electricity Corporation of Nigeria (ECN). As part of its role, the ECN consolidated power assets in the country and became the national center for generation, transmission and distribution of electricity in Nigeria. It has been noted that the integration of power assets by ECN created a single account for all revenue proceeds from the sector and led to improved power supply [6].

Energy resources were therefore pivotal to the early commercial status of many towns like Calabar, Lagos, Port-harcourt and Ibadan. In fact, the history of the south east is incomplete without the Oji power station that fired the historic mines of the then eastern region of Nigeria. The Oji power station in Enugu state was built to produce 10MW and service the coal mines that were 50km away from the power station.

### Post-Independence Period (1960-2004)

The attainment of independence in 1960 and the quest to quicken the pace of industrialization necessitated investments in the energy sector, particularly hydro-power energy by the government. The Niger Dams Authority (NDA) was established in 1962 with responsibility for the development of hydro power as a component of the energy architecture of the country. Its functions include the construction and maintenance of dams and other works on the River Niger, generation of electricity by hydropower and the improvement of water navigation, irrigation and fish brines [8]. Hydro electricity is a renewable energy source that could be stored and supplied in a cost efficient manner to final consumers.

The NDA was instrumental in the harnessing of the tidal energy potentials of several rivers in Nigeria and the construction of dams. The Kainji Dam which is the biggest hydropower project in sub-saharan Africa sited along the River Niger was initiated by the NDA. The Kainji dam with an initial installed capacity of 80MW was upgraded to 760MW in 1978 by the government [9]. The table below provides a list of hydropower stations in Nigeria and their capacity.

**Table-3: List of Selected Hydro Power Stations and their Installed Capacity**

No.	Name of Power Station	River	Started in	Location	Capacity (MW)	State
1.	Kainji Power Station	Niger	1968	Niger	760	In use
2.	Mambila Power Station	Donga	1982		3050	Under Construction
3.	Jebba Hydroelectric Power Station	Niger	1984		540	In use
4.	Shiroro Hydroelectric Power station	Kaduna	1990	Kaduna	600	In use
5.	Zunguru Hydroelectric Power station	Kaduna	2013	Kaduna	700	Under Construction
6.	Gurara Power Station	Gurara			30	Under Construction
7.	Dadin Kowa Power Station	Gombe			29	Under Construction
8.	Kashimbila Hydroelectric Power Station	Gombe			40	Under Construction

In 1972, ECN and NDA were merged to form the National Electric Power Authority (NEPA). The merger by the military government was predicated on the belief that it would be economically efficient and effective for all power assets in the country to be controlled by a single public entity. Thus, NEPA assumed full control of generation, transmission and distribution of electricity, and all financial obligations and investment in the sector [7].

NEPA monopolized the power sector for more than two decades and by 1992 had a combination of hydro-power and gas fired power stations. However, it could not solve the problem of epileptic power supplies to residential and industrial consumers [10]. Consequently, there was the need for the government to re-examine its policies in the sector. The advent of democracy in 1999 gave new impetus to developments in the sector with the enactment of several power reform policies and renaming of the power entity as Power Holding Company of Nigeria (PHCN) in 2005.

### Section 3: Privatization of the Power Sector

Privatization has been defined as a mechanism that allows private individuals to effectively and efficiently manage public enterprises [11]. The policy of deregulation is premised on the belief that private business organizations possess superior organizational efficiency than publicly organized businesses.

However, it should be noted that there is no unanimity among scholars on the question of superior efficiency between private and public corporations. As opined by Pollitt [12], in the study of public and private electricity providers in the world, there are

no significant systematic differences between public and private firms in terms of efficiency. Similar opinion was also expressed by World Bank [2], which noted that the ownership structure of utilities is not the main cause of inefficiency in operations. Moreover, others have argued that privatization leads to increased revenue generation, create jobs, strengthens the capital market, benefits consumers and enshrines a competitive business environment [11].

For Nigeria, centralization of its electricity supply market on NEPA was predicated on the rationale that cost efficiency in utilities is achievable in natural monopolies [13]. Thus investments in the sector were solely borne by the federal government whose resources were not adequate to meet the demand for modernization and expansion of the national grid. The regulatory framework under NEPA was therefore burdensome on the economy with suppressed consumer demand, high energy losses and dearth in infrastructure. CBN [4] outlined the deficiencies of the monopolistic power market to include poor regulatory framework, inadequate infrastructure, severe revenue leakages; poor electricity pricing and ineffective management.

Consequently, reforms in the power sector were conceived by the government to rejuvenate the sector through the incorporation of private initiative. Privatization of the Nigeria electricity supply industry as opined by Nnaji [5] was designed to open the industry to private investment of capital and ensure the sale of power assets to private investors where applicable, with the overriding objective of ensuring improved capacity in generation transmission and distribution of power in the country. In addition, the policy was intended by the government to remove structural rigidities that had bedeviled the sector, increase access to electricity for rural communities and ensure quality as well as reliable supply of electricity to Nigerians.

Consequently, in order to address the three fold issues of NEPA's operational inefficiency, poor financial performance and dearth in power infrastructure; the government had to reform the sector with an amendment of its laws. In 1998, the electricity and NEPA act was amended to pave way for the deregulation of the sector. In addition, the National Electric Power Policy document of 2001 was framed to unveil the agenda of the government for the industry; while the legal basis for the de-establishment of NEPA and creation of successor companies were captured in Electric Power Sector Reform Act (EPSR) of 2005 [14]. The EPSR act effectively changed the structure of the Nigeria electricity supply industry with the disaggregation of the sector into autonomous components of generation, transmission and distribution [5]. The privatization process ensured that NEPA was de-established and renamed Power Holding Company of Nigeria (PHCN). Thereafter, it was unbundled through the establishment of private sector management of power transmission assets and the transfer of rights to distribute power to private companies. In fact, eighteen (18) new companies emerged from the unbundling of NEPA with six (6) in electricity generation, eleven (11) in electricity distribution and one as a power transmission company.

### Generation Companies

The EPSR act ensured the privatization of government thermal power plants and the concession of its hydropower stations. Table 4 is a list of the six (6) generation companies (GENCOs) that emerged from the process and their privatization status.

**Table-4: The Six (6) New Generation Companies (GENCO's) and their Privatization Status**

SERIAL NO.	GENCO	TYPE	INSTALLED CAPACITY	PRIVATIZATION STATUS
1.	Afam VI Power PLC	Thermal	776 MW	100% Sold
2.	Sapele Power PLC	Thermal	414 MW	51% Sold
3.	Egbin Power PLC	Thermal	1,020 MW	100% Sold
4.	Ughelli	Thermal	900 MW	100% Sold
5.	Kainji/Jebba Power PLC	Hydro	1338 MW	Long term concession
6.	Shiroro Hydro electric PLC	Hydro	600 MW	Long term concession

The importance of electricity generation cannot be over-emphasized since it's the first of the three stages in the national grid system. The power generated by the six (6) generation companies is complemented by those generated by Independent Power Producers (IPP's). Independent power producers are private firms with power plants in existence prior to the commencement of the privatization exercise in 2005. Most of the Nigerian independent power producers are sited in the Niger Delta as depicted in table 5 to take advantage of the natural gas generated from oil exploration and exploitation activities in the region.

**Table-5: Name and Location of Nigerian Independent Power Producers (NIPP) and their Installed Capacities**

Name of Station	Installed Generating Capacity (MW)	Location (State)
Sapele Power Station	450	Delta
Omotosho Power Station	450	Ondo
Olorunsojo Power Station	750	Ogun
Ihovbor Power Station	450	Edo
Alaoji Power Station	107	Abia
Calabar Power Station	563	Cross-Rivers
Egbema Power Station	338	Imo
Gbarain	225	Bayelsa
Omoku Power Station	225	Rivers
Geregu Power Station	434	Kogi

Source: PHCN News, January-August, 2009.

Electric energy generated by GENCO's is sold to the Nigerian Bulk Electricity Trading (NBET) Plc at an agreed price facilitated through power purchase agreements. The Nigeria Bulk Electricity Trading Plc was established by the EPRS act as the bulk purchaser of electric energy in the Nigeria electricity supply industry. It is the manager and administrator of the electricity pool in the Nigeria electricity supply market [15]. Nonetheless, in the Nigeria electricity generation market, four (4) generation options namely, transmission based on-grid generation, embedded generation, off –grid generation and captive generation form the mixture of energy generated in the country [14].

#### Transmission Company of Nigeria (TCN)

The privatization process also created an energy transmission company from the unbundling of NEPA in 2005. The Transmission Company of Nigeria was licensed on the 1<sup>st</sup> of July, 2006 to oversee the grid system, reduce system failures and ensure that sector players comply with the national grid code. The TCN is wholly owned by the government; however, it is managed by the private sector and has three main departments namely; Transmission Service Provider (TSP), System Operation (SO) and Marketing Operations [16].

The role of transmission in the energy value chain is prime as it is the vital link between generation and distribution of electricity to residential and industrial consumers.

#### Distribution Companies

Power distribution firms are the closest to consumers, thus their role in the energy value chain cannot be overemphasized. Distribution of power is typically done through substations and transformers that step-down high voltage to levels that are accessible to end users. The distribution grid operates mainly on 33KV, 11 KV and 415 lines [17].

The deregulation process created eleven (11) distribution companies (DISCOs), and effectively de-monopolized electricity distribution as each DISCO was assigned coverage areas to reduce conflict, streamline its operations and ensure steady power supply. Hence, via the energy generated and transferred to TCN, each DISCO's receives energy that it sells to households and commercial users.

**Table-6: Eleven Distribution Companies (DISCO's) and their Areas of Operation**

No.	Name of DISCO	Area of Coverage
1.	Abuja Electricity Distribution Company Plc	FCT, Kogi, Nasarawa and most parts of Niger State
2.	Benin Electricity Distribution Company Plc	Edo, Ondo, Delta and parts of Ekiti State
3.	Eko Electricity Distribution Company Plc	Southern Lagos: Ojo, Festac, Ijora, Mushin-Orile, Apapa, Lekki, Lagos Island and Agbara in Ogun State
4.	Jos Electricity Distribution Company Plc	Bauchi, Benue, Gombe and Plateau state
5.	Kaduna Electricity Distribution Company Plc	Kaduna, Kebbi, Sokoto and Zamfara state
6.	Kano Electricity Distribution Company Plc	Kano, Katsina and Jigawa states
7.	Ibadan Electricity Distribution Company Plc	Oyo, Ogun, Osun, Kwara and parts of Niger state, Ekiti and Kogi state
8.	Ikeja Electricity Distribution Company Plc	Parts of Lagos State: Ebule-Egba, Akowonjo, Ikeja, Ikorodu, Oshodi, Shomolu
9.	Enugu Electricity Distribution Company Plc	Abia, Anambra, Enugu, Ebonyi and Imo State
10.	Port-harcourt Electricity Distribution Company Plc	Akwa-Ibom, Bayelsa, Cross River and River State
11.	Yola Electricity Distribution Company Plc	Adamawa, Borno, Taraba and Yobe State



The EPRS act provides that electricity distribution companies interface with residential and industrial energy consumers and create a seamless system that ensures steady power supply and consumer satisfaction.

### **The Multi Year Tariff Order (MYTO)**

To overcome some of the problems that burdened the centralized energy structure, stifled investment in the power sector and contributed to the loss of revenue in NEPA, the Nigeria Electricity Regulation Commission as part of its obligations as stipulated in the 2005 EPSR act established the Multi Year Tariff Order (MYTO).

MYTO is a tariff methodology in the electricity industry used to determine prices across the three energy value chain – Generation, Distribution and Transmission/Retail. In the Nigeria electricity industry, MYTO is a unified system of regulated tariffs and provides a 15 year view ahead of tariff in the sector [18]. In addition, the pricing system seeks to create an incentive based regulated tariff structure that does not compromise on investments in energy and ensures recovery of capital in a manner that sustains and increase investments in the sector [15].

The MYTO approach for distribution and retail follows the building blocks approach that emphasizes performance projections and price caps. While for generation, the long-run marginal cost approach is utilized and involves the use of the full cycle of the lowest cost efficient new entrant in to the oligopolistic power generation market, taking into cognizance short-run cost of such variables as cost of fuel, operation and maintenance and long-run returns on capital [18].

Furthermore, to ensure that the tariff effectively reflect prevailing market situations, major reviews are undertaken every five (5) years through the observation of the following parameters: foreign exchange rates, cost of fuel, inflation rate and actual generation capacity [15].

## **Section 4: Challenges and Prospects**

### **Challenges**

Deregulation of the electricity sector has not eliminated all the problems bedeviling it. The Following are some of the challenges still faced by investors in the Nigerian Electricity Supply Industry:

#### **Lack of Adequate Capital**

The challenge of liquidity continues to confront the entire electricity value chain and is the reason for the prevalence of substandard distribution lines, infrequent maintenance of existing facilities and the use of obsolete equipments in the industry. In addition, the lack of capital limits the capability of the system to seamlessly wheel all the power generated by the GENCO's given inadequacies in infrastructure. In fact, the problem of capital is compounded by the fact that strategic capital equipment in the industry are mostly imported and therefore very costly given the foreign exchange rate of the domestic currency to major currencies of machinery exporting nations. The situation is worsened by poor revenue returns to investors in the NESI occasioned by the use of estimated billing practices and the attendant corruption that accompanies such system of electricity payment.

#### **Low Technical Capacity**

The problem of low technical capacity in the country especially in the electricity industry is a bane in the quest for consistent power supply. This, in addition to the lack of regular trainings for staff in the industry not only affects the quality of technical manpower, but may be the source of low staff morale in power firms. The power industry is a highly technical field which is constantly evolving and hence requires skilled, proficient and efficient staff that is highly knowledgeable and motivated to achieve set objectives.

#### **Unserious Licensees**

Another challenge is the number of companies granted on and off-grid electricity licenses by NERC that are yet to participate actively in the Nigeria electricity supply industry. Their unserious nature could slow the pace of progress in the NESI and reduce government projections. Though, it should not be that prospecting energy companies with a "No Objection" status from NERC are unserious about participating in NESI, some may just be impassive about the industry. It has been argued that some of these firms may have obtained the licenses as negotiating chips for future sale rather than due to their commitment to build and operate a power plant [14].

#### **Policy Inconsistency**

For the Nigeria power sector, its policies are only as consistent as the life of the political administration that formulated it. Since the unbundling of NEPA and the promulgation of the EPSR act in 2005, there have been several changes in the policies designed to reposition the sector. Though, policy reviews are imperative as they are intended to align the industry to present realities; it could also lead to the loss of investor confidence especially if they are politically motivated.

### Security Challenges

The security of power assets from sub-stations, transmission lines and generation plant is a major challenge confronting the Nigeria Electricity Supply Industry. In Nigeria, power assets such as transformers and cables are unsecured against fire, natural elements like rain and thunder storms which have devastating effects on their workability. In fact, theft of power assets from vandals in the Abuja Distribution Area alone was 233 in 2017 [19]. The security of these assets especially gas pipelines which are not just critical to the objective of achieving full electricity supply but capital intensive must be assured by the government at all levels to boost investor morale.

### Prospects

The reforms in the Nigeria Electricity Supply Industry (NESI) could spur the growth of the economy as the sector is key in the macroeconomic objective of expanding the productive capacity of the country. Moreover, given its huge population of more than 180 million people [20], and the increasing trend of electricity consumption after the reforms in 2005, the sector portends a huge market of opportunities for investors desirous to invest in any of the value chain. The following are prospective areas of investment in the electricity supply market:

(a) Investment in Mini-Grid Systems: Investment in Mini-grid systems is one area that is yet untapped since most localities, especially rural communities in the country are unconnected to the national grid. A Mini-grid system as defined in the mini grid regulations by NERC [16] is any isolated or interconnected local generation and distribution system with installed capacity between 0Kw and 1Kw, which is capable of serving end-users independent of the national grid. Investments in mini-grid systems is not only viable and cost effective, but creates a decentralized energy system capable of expanding rural electricity penetration in the country [15].

(b) Meter Asset Providers (MAP): The need to eliminate estimated billing which is a source of revenue leakage in the Nigeria Electricity Supply Industry formed the fulcrum of NERC Meter Asset Provider (MAP) Regulation No. NERC-12-112. NBS [20] notes that 7.48 million people in Nigeria have access to electricity in Nigeria, but about 4.1 million of the users were unmetered as at the last quarter of 2017. In addition, data also indicates that no DISCO had achieved 100 % metering of electricity consumers in their area 19 years after the unbundling of NEPA. The highest metered area been the Benin Distribution Company with 69% metered users [20]. A meter asset provider is defined as a person that is granted a permit by NERC to provide metering services – meter financing, procurement, supply, installation and maintenance- to retail consumers of electricity [17]. The MAP policy effectively de-limits meter provision from distribution companies as independent meter providers are now required to provide meters for electricity users in the country. Thus, given the high population of unmetered power users in each distribution area, it is a potential area of investment in the Nigeria electricity supply market.

### Transportation of Natural Gas

The imperative of steady supply of natural gas for the functioning of thermal plants cannot be overemphasized especially as the consumption of electricity by Nigerians in the post privatization era is steadily on the rise as indicated in table 6. Hence, the business of gas transportation portends bright prospects for the economy directly by ensuring job creation, reduced gas flaring and indirectly guaranteeing the mandate given by Nigerians to the electricity generation companies.

Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG) are domestically produced by the Nigerian Liquefied Natural Gas (NLNG) Company and are required by most thermal plants as fuel. In fact, CNG is environmentally friendly and can be stored and transported in special purpose built vehicles.



**Fig-1: Electricity Consumption in Nigeria (2000-2018) in Billion Kilowatts Hours (bkwh)**

Source: CIA World Factbook, 2019.

### **Section Five: Concluding Remarks and Recommendations**

The role of the energy sector in the economic growth and development of Nigeria is pre-eminent for two reasons; first it supports more than two third of the formal jobs in the country directly or indirectly and secondly, large number of people depend on it for ancillary activities like watching television, charging of phones and applications, reading, e.t.c., that enrich their lives. Thus, the outcome of the privatization of the power sector would only become beneficial to the country if the expectation of consistent electricity supply is achieved and translates to improved economic growth for Nigeria.

The economic potentials of the country could be positively spurred if the challenges identified in the previous section are surmounted. The following recommendations are therefore imperative:

#### **Sustained Investment in Generation and Transmission**

There is the need to sustain investment in the generation capacities of the country. In this regard, conscientious effort should be made by the government to improve the sluggish economic environment especially as generation companies are confronted with high cost of importing capital equipments. In addition, government's desire to privatize or concession the NIPP's to private electricity companies should be fast-tracked to ensure their efficient management. Also, private investors should be incentivized to explore the potentials in renewable energy for electricity as encapsulated in the captive energy regulations of NERC and inactive electricity licensees' sanction.

Furthermore, investments in transmission assets must be sustained to ensure that all the power generated are wheeled to consumers. Hence, there is the need for increased investment in the expansion of transmission lines controlled by the government owned Transmission Company of Nigeria (TCN).

#### **Correct Pricing of Electricity**

There is the need to ensure that electricity tariffs reflect current realities in the Nigerian Electricity Supply market. This is imperative as it would assure investors of their ability to obtain adequate returns for their investment and also ensure consumers of value for their electricity payments. The institution of right pricing in electricity supply could boost the revenues of firms in the entire value chain and reduce the level of intervention by the NERC to price related-disputes between sector players. In addition, improved returns on investment could generate multiple effects on the industry as power firms would be better positioned to invest in infrastructure and provide enhanced training and welfare schemes for their workers.

#### **Reduction in the Unmetered Population**

Also, there is the need to reduce estimated billing of electricity consumers in the country through the installation of prepaid metering systems. Prepaid meters should be provided for all consumers of electricity to reduce the vulnerability of estimated billing to financial fraud. In this regard, the MAP regulation should be encouraged to reduce the population of unmetered electricity users in the country and improve revenue for firms in the Industry.

#### **Investment in Improving Technical Capacity and Security**

Electricity generation and transmission is a highly dynamic industry that is sustained on the shoulders of technical knowledge. Consequently, investment in improving indigenous technical capabilities should be prioritized by the government. Power firms should be encouraged to partner with the National Power Training Institute of Nigeria and Universities in the training of staff. In addition, the Nigeria Society of Engineers should be commissioned by the government to play active roles in resolving some of the technical issues confronting the sector.

Also, there is the need to invest in the security of power assets against the vagaries in the electricity supply industry as disruptions could negatively affect the economy. Thus, the government and companies in the market should be encouraged to insure critical power infrastructure as well as provide security for all power installations against theft and mis-use by unscrupulous persons.

#### **Diversification of Sources of Electricity Generation**

There is the need to re-organise the national electricity mix with the inclusion of renewable sources of energy. Investment in renewable energy should be encouraged by the government as these sources are not only environmentally friendly but could serve the energy needs of most rural communities.

## **REFERENCES**

1. Lucas, P. L., Dagnachew, A. G., & Hof, A. F. (2017). Towards universal electricity access in Sub-Saharan Africa: a quantitative analysis of technology and investment requirements. *PBL Netherlands Environmental Assessment Agency, The Hague*.
2. World Factbook. (2018). *Country Comparisons: Natural gas - Proved Reserves*. Retrieved 02/13/19 from <https://www.cia.gov/library/publications>
3. Onakoya, A.B., Onakoya, A.O., Jimi-Salami, A.O., & Odedairo, B.O. (2013). Energy Consumption and Nigeria Economic Growth: An Empirical Analysis. *European Scientific Journal*, 9(4): 25-40.
4. CBN. (2015). *Analysis of Energy Market Conditions ins Nigeria*. Abuja: CBN Occasional Paper, No. 55.



5. Nnaji, B. (2011). *Public Sector Outlook in Nigeria: Government Renewed Priorities*. Abuja: FGN.
6. Claudius, A. (2014). Nigeria Electricity Industry: Issues, Challenges and Solutions. *Covenant University 38th Public Lecture Series*, 3(2):1-40.
7. Onochie, U.P., Egware, H.O., & Eyakwanor, T.O. (2015). The Nigerian Electric Power Sector: Opportunities and Challenges. *Journal of Multidisciplinary Engineering Science and Technology*, 2(4).
8. Manafa, N. (1995). *Electricity Development in Nigeria*. Lagos: Rasheen Publishers.
9. Emodi, N., & Dauda, S. (2015). Improving Electricity Access in Nigeria: Obstacles and the way forward. *International Journal of Energy Economics and Policy*, 5(1): 335-351.
10. Okoro, O. I., & Madueme, T. C. (2004). Solar energy investments in a developing economy. *Renewable Energy*, 29(9), 1599-1610.
11. Othman, A. (2003). *Privatisation in Nigeria*. Lagos: Ta'alim Limited.
12. Pollitt, M. (1995). *Ownership and Performance in Electric Utilities: The International Evidence on Privatisation and Efficiency*. London: Oxford University Press.
13. Scott, W., Clarke, G., Haggarty, L., Kaneshiro, R., Noll, R., Shirley, M., & Xu, L.C. (2004). *New Tools fo Studying Network Industry Reforms in Developing Countries: The Telecommunication and Electricity Regulation Database*. Washington, D.C: World Bank Policy Research Working Paper No. WPS 3286.
14. Nigerian Energy Support Programme. (2015). *The Nigerian Energy Sector: An overview with a special emphasis on renewable energy, energy efficiency and rural electrification*. Harburg: GIZ.
15. Anosike, N.B., Dara, J.E., Ngwaka, U.C., & Ememuoha, F.O. (2017). Analysis of Nigerian Electricity Generation Multi-Year Tariff Order Pricing Model. *Energy and Power Engineering*, 9(10): 541-554.
16. NERC.(2017). *NERC Regulations on Minigrid and the Nigerian Minigrid Market: Opportunities for Investment*. Retrieved from <http://www.mondaq.com>
17. NERC. (2017, 12 08). *Regulation for Meter Asset Providers (MAP)*. Retrieved 03/28/19 from <http://nerc.org.index.php/home/operators/rcs/346-MAP>
18. KPMG.(2016). *A Guide to the Nigerian Power Sector*. Abuja: KPMG.
19. Nigeria Electricity Hub. (2017). Over N500 million lost to electricity vandalism. Retrieved from 01/14/19 <http://nigeriaelectricityhub.com>
20. NBS.(2017). *Power Sector Report*. Lagos: Nigeria Bureau of Statistics.