Sustaining the Nigerian Electricity Sub-Sector: Challenges and Prospects

By

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Abstract

Within the entire arsenal of the energy sub-sector, electricity and petroleum are the most crucial to the development of the Nigerian economy. The absence of stable electricity is inimical to economic growth and development in Nigeria. It raises the cost of doing business, scaring potential investors away. Electricity touches just about every aspect of the life of cities and towns in present-day Nigeria. It is needed in hospitals, schools, research institutes, offices, industries and homes. As boarders open up freer flow of goods and factor inputs, there is a need to pay adequate attention to the sustenance of the electricity sub-sectors so that Nigeria can reap the benefits that comes from globalization and trade liberalization. More so, as Nigeria moves towards the achievement of the Millennium Development Goals through the National Economic Empowerment and Development strategy, the need for the availability and affordability of electricity in Nigeria can not be overemphasized.[1]

Keywords: electricity, economic growth, development, power holding company of Nigeria.

1. Introduction

Public electricity generation in Nigeria started in 1896 with the installation of a 30kw generating set at Marina Lagos by the colonial Public Works Department. Electricity installation continued in this manner until 1950 when Electricity Corporation of Nigeria (ECN) was created to integrate electricity supply and make for more efficiency in the sub-sector (CNB, 2000).

By 1969, ECN operated 132kilovolts while Niger Dam Authority (established in 1962 for the development of Kanji Hydro Electricity Project) operated 330kilovolts.

Government Decree No. 24 of 1972, from the merger of the previous Electricity Corporation of Nigeria, (ECN) and Niger Dams Authority (NDA), created National Electric Power Authority

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(NEPA). That Decree gave NEPA the mandate to "maintain, co-ordinate an efficient and economic system of electricity supply for all part of the federation". However from this year, it ceased to exist and has now been renamed Power Holding Company of Nigeria, (PHCN).

According to FGN (2007), the National Electric Power Authority (NEPA) had become a highly inefficient power utility and consequently was broken down into the Power Holding Company Nigeria Ltd. (PHCN) in April this year. A total of 18 new companies were created for the generation and distribution; and to ensure effective, efficient and stable power supply.

Electricity generation in Nigeria comes from two major sources: Hydro and Thermal (which include fossil fuel like coal, gas and crude oil). The existing power stations and their installation dates are shown in table 1 below:

Table 1: Electric Power Stations in Nigeria

Hydro	**Thermal**			
	Steam	**Gas**	**AGO**	**Coal**
Jebba, Niger (1983-1984)	Egbin, Lagos (1987)	Afam, Rivers (1982)	Ijora, Lagos (1956)	Oji power station Enugu has remained shut since 1970
Shiror, Niger (1989-1990)	Sapele, Delta (1978-1980)	Sapele, Delta (1981)		
Kanji, Niger (1968-1978)		Delta (1966-1990)		

***Source**: NEPA Review, 1990.*

Presently, political instability and poor macroeconomic management no longer hobble Oil-rich Nigerian but the same cannot be said about corruption, gross inadequacy of social and basic infrastructures.

Nigeria cannot meet the socio-economic and technological demands of the 21st century without a conscious boost of the level of its electricity consumption. Nigeria's hydro and thermal power generating stations have an installed capacity of 4,000 MW, but due to lack of maintenance and corruption, twin ills of most public service utilities, they are operating below their installed capacity. The actual power generation is often much less, typically between 1,500 to 2,500 mw, current actual output is a mere 1,400 mw, at least, 1,000 mw short of the actual demand in the country put at 2,400 mw. Table 2 shows the growth in generating capacity and the projections of the vision 2010 committee.

Table 2: Installed capacity and capacity Utilized in the Electricity Sub-sector (1975-2005).

Year	Installed capacity in Mega Watt	Capacity Utilized in %
1975	926.2	42.7
1976	1125.2	41.7
1977	1114.2	48.3
1978	1793.7	29.1
1979	2230.6	31.9
1980	2230.5	36.5
1981	2430.0	36.5
1982	2902.1	33.6
1983	2856.8	34.8
1984	3178.0	32.3
1985	3995.5	31.6
1986	4016.0	30.6
1987	4548.0	28.3
1988	4548.0	29.3
1989	4548.0	32.2
1990	4548.0	33.8
1991	4548.0	35.6
1992	4540.0	37.0
1993	4548.6	36.4
1994	4548.6	39.0
1995	4548.6	39.8
1996	4548.6	40.8
1997	4548.6	40.4
1998	4548.6	37.8
1999	5580.0	33.3
2000	5580.0	31.2
2001	6180.0	27.5
2002	6180.0	36.2
2003	6130.0	38.8
2004	6130.0	45.1
2005	6861.6	40.5

Source: *Central Bank of Nigeria Statistical Bulletin, 2005.*

The essence of this paper is to examine the electricity sub-sector the Nigerian economy equally referred to as the power sector, with view to discovering the cause(s) of the crises rocking the sector. By so doing, this paper hopes to proffer policy solutions to the cancerous problem of erratic electric supply in Nigeria.

For this purpose, this paper is divided into four sections, the first section introduces the paper, section two deals with the theoretical and empirical evidences, section three discusses some evidence from Nigeria while section four concludes the paper.

2. Electricity Sub-Sector and Economic Growth: Theoretical Underpinnings and Empirical Literature

Capital formation has been identified as the fundamental key to growth and development. According to Gills (1988), while analyzing the Harrod Domar Growth Model, the major determinant of economic growth is capital formation, which depicts a creation by investment in plant and equipment occasioned by savings mobilization from households and investors.

Dwivedi (2002) defines capital as any man made input to the prosecution. This includes electricity, machinery, plant, communication, transport, roads, railways, education and health services, etc.

Sustainability in the electricity sub-sector has its theoretical underpinning on the Neo-Classical theory of Economic Growth as generalized by Meade (1963). His production function is represented thus,

$$Q = f(K, L, R, t).$$

where K, L, and R represent capital, Labor and Land respectively and t represents time (and is a trend factor for constancy in technological improvement). Meade, holding land constant, concluded that

$$dQ = Vdk + WdL + dQ^1.$$

where V, W and Q^1 are the marginal efficiencies of capital, labor and the impassively and dK and dL are proportionate increments in capital and labor respectively,. He therefore maintained that economic growth is a function of technology and capital and implicitly, a function of infrastructure development (electricity inclusive).

Jingan (2003) supports meade (1963) when it asserted that technological changes are regarded as the most important factor in the process of economic growth. They are related to changes in the methods of production, which are the result of new technique of research or innovation. Changes

in technology lead to increase in the productivity of labour, capital and other factors of production.

Kindleberger (1988), in observing that part of the reasons why economic theorist did not consider economic growth as an economic problem needing solution was that it proceeded so effectively in western Europe and Northern America, maintained that considerable lump of money must be regularly committed to the provision of infrastructure before a country can place it self on the path to sustainable development.

Importance of Electricity to Economic Growth

The importance of electricity in our daily lives cannot be over emphasized. According to Douglas Encyclopedia 1983, cited from Uju (2007), annual use of electricity in the United States is estimated at about 46,000kilowatt hours per working person. No person by sheer of muscle can produce in a day the energy represented by just one Kilowatt-hour of electricity. The average power, which a person can exert, is estimated at about 35 watts. Thus, a person averaging 250 eight-hours days of manual work per year is estimated to expand energy equivalent to about 67 kilowatts-hour. Hence a factory worker using some 46,000kilowatt-hours annually will have the equivalent energy assistances of 683 people helping on the job year long in the absence of electricity supply! In addition to the above assertion,

a. A good business opportunity exists in the electricity sub-sector. The provision of electricity is not solely the business of the government; the private sector can get involved in both generation and distribution aspects. As at now, the existing plants have a total capacity of 4,000mw whereas about it is envisaged that about 10,000mw set as target by Nigerian government for 2008 (Daily Independent, 2007) and about 15000mw is needed to take the Nigerian economy to the realization of the 2015 Millennium Development Goals.
b. Presently, the per capita electricity consumption of Nigeria is about 161kwhr and this is below the world average. The reliability and actual consumption of electricity in every nation is an index of socio-economic development (Uju, 2007). Increase in power supply facilitates an increase in GDP, vice versa, as supported by an Indian Annual Power Survey cited in Uju (2007) on the elasticity of electricity consumption with respect to

India's GDP, which discovered that a 1% increase in GDP results to a 1.14% increase in electricity consumption.

c. Ramire & Asfahani (2000) maintain that if Africa had enjoyed growth in power generation infrastructure comparable to those of East Asia in the 1980s and 1990s, the annual growth rate of its economy would have been not less than 1.3%.
d. World Bank (1994) advocates that adequate and appropriate infrastructure and social amenities help to determine one country's failure and another's success in diversifying production, expanding trade, coping with the population growth, reducing poverty and improving the environmental conditions. Good infrastructure equally raises productivity and reduces production costs.
e. Availability and affordability of power supply is a major corporate variable; its presence attracts investors. This translates to increases in investment, employment, income and economics of scale arising from linkages in the supply, distribution and consumption chain in the host environment.
f. Poor infrastructure causes production costs to go up as high as 45% higher than other countries (Yar'Adua, 2007).

3. The Nigerian Situation

According to Chippla (2006), unlike the oil and gas industry, power companies do not make homogenous profits. Lower profit margins make them less attractive to investors, who would rather prefer to have their risks shared out. In the oil and gas industry, such risks are shared between the multinationals and the Nigerian government.

Herein lies the attraction for would-be foreign investors who may be able to seize the opportunity of a currently near-prostrate power sector to move into the Nigerian power generating market. Since the Lagos state government entered into an agreement with ENRON Corp of America to build a gas powered generation station, some of the other 35 states of the country are also at various stages of talks with many forign energy companies to build power stations. The Lagos State/Enron deal, already in operation would certainly put an end to PHCN's monopoly and the resultant constant and uninterrupted power supply would most likely come to the shores of Nigeria if these various projects succeed.

Table 3: Total Electricity Generations and Consumption (1975-2005)

Year	Total generation in Mega watt per hour	Total consumption in Mega watt per hour	Proportion of total Generation consumed
1975	395.4	318.7	80.6
1976	468.7	369.8	78.9
1977	538.0	435.7	81.0
1978	522.7	504.4	96.5
1979	710.7	460.1	64.7
1980	815.1	536.9	65.9
1981	887.7	335.9	45.1
1982	973.9	685.6	70.0
1983	994.6	696.7	70.0
1984	1025.5	625.5	81.0
1985	1166.8	717.4	61.5
1986	1228.9	841.8	68.5
1987	1286.0	852.9	66.3
1988	1330.4	853.5	64.2
1989	1462.7	976.8	66.8
1990	1536.9	898.5	58.5
1991	1617.2	946.6	58.5
1992	1693.4	993.0	58.6
1993	1655.8	1141.4	68.9
1994	1772.9	1115.0	61.8
1995	1810.1	1050.9	59.5
1996	1854.2	1033.3	55.7
1997	1839.8	1009.6	54.9
1998	1724.9	972.8	56.4
1999	1859.8	883.7	47.5
2000	1738.3	1017.3	58.5
2001	1689.9	1104.7	65.4
2002	2237.3	1271.6	56.8
2003	6180.0	1519.5	63.4
2004	2763.6	1825.8	66.1
2005	2779.3	1873.1	67.4

Source: *Central Bank of Nigeria Statistical Bulletin 2005*

Truly, NEPA has ceased to exist due to gross inefficiency. In its place is now the Power Holding Company of Nigeria but the changes have only been cosmetic. Blackouts are widespread across the country's biggest cities, and the capital, Abuja. And consumers are plagued with inflated bills, which in local parlance are called "crazy bills". In fact, according to most consumers, things have only got worse.

The strategy, which the immediate past president and his predecessor had adopted, is the rehabilitation of most of the ailing power generation plants across the country and the replacement and refurbishment of transmission lines and transformers. Obasanjo's predecessor, General Abdulsalami Abubakar in 1998, initiated contracts for the rehabilitation of most of these plants. Between 1999 and 2005, a stupendous $9.63 billion (N1.3 trillion) was spent on refurbishing the power sector (Binniyat 2007).

Although Nigerian currently has the capacity to generate about 4,000 mw of electricity yet South Africa, with a third of Nigeria's population (44 million people), generates ten times as much power. South Africa, with a population of 44 million produces 40,000 megawatt of electricity, compared with Nigeria's 4000mw maximum installed capacity for a population of 140million Chippla (2006).

However, top officials of the PHCN claim the power reforms have been successful. They say that revenue generation has gone up by 133% between 2003 and 2005. 'Nigerians should judge PHCN on the basis of the revenue index, rather than performance or service delivery,' said Joseph Makoju, managing director of PHCN. But critics argue that the only way of looking at the increase in revenue is to match the revenue with a corresponding leap in service orientation and power supply.

Table 4: Contributions of Electricity Sub-Sector to Economic Growth in Nigeria (1981-2004)

Year	* Electricity Contributions to GDP at Current Basic Prices Nm	** GDP at Current Market Prices Nm
1981	301.0	102686.80
1982	322.40	110029.80
1983	308.10	119117.10
1984	301.90	125074.80
1985	334.10	144724.80
1986	251.30	143623.90
1987	262.90	203037.10
1988	265.00	275198.20
1989	759.40	403762.90
1990	8282.00	497351.30
1991	909.92	574282.10
1992	949.50	909754.20
1993	992.39	1132181.00
1994	1144.18	1457129.70
1995	1192.06	2991941.70
1996	1240.09	4135813.60
1997	1236.56	4300209.00
1998	1186.93	4101028.30
1999	1228.08	4799966.00
2000	1269.70	6850228.80
2001	1459.99	7055331.00
2002	1896.26	7984385.30
2003	2000.94	10136364.00
2004	2277.69	11673602.20

***Source**: CBN Bulletin 2003, *FOS Annual Abstract of Statistics (various Issues); Central Bank of Nigeria Statistical Bulletin 2005.*

Trying to get around the acute power shortage, some state governments have resorted to establishing independent power production (IPP) companies to boost electricity production. For instance, the Lagos State government in 1999 set up an IPP project that is presently producing 40 mw. Between 1999 and 2000, the Rivers State government in the Niger Delta region started the Omoku Power Station as part of the IPP gas to power project of the state.

Crises in the Sub-Sector

Crises in the electricity sub-sector are not unique to the Nigerian economy. Wines (2007) cited in International Herald tribune (2007) reports that power blackouts, load shedding and other utility jargon are hardly novel in sub-Saharan Africa, where many electricity grids are almost totally

unreliable. He further reports that since the onset of 2007, 25 out of the 44 sub-Saharan nations face crippling electricity shortages, a power crisis that some experts call unprecedented.

The causes of the crises range from strong economic growth in some places to economic collapse in others, war, poor planning, population booms, high oil prices, drought etc and these conditions have combined to leave both industry and residents short of power when many needed it most. (Wines 2007).

The International Herald Tribune (2007) reports that poor management is but one problem; War has devastated the power grid in Congo, in African's heart, and stalled plans to develop its vast hydroelectric potential. In Kenya, Tanzania, Uganda and parts of West Africa, drought has shrunk rivers and slashed the generating capacity of hydroelectric dams. Drought in Ghana, for example, has crippled gold has crippled gold and aluminum production and set off blackouts in Togo and Benin, which buy power from Ghana. Excluding South Africa, whose economy and power consumption dwarf other nations', the region's remaining 700million citizens have access to roughly as much electricity as do the 38million citizens of Poland.

Before now, South Africa's muscular chain of power plants fills the gaps of its neighbors. But South Africa now could experience up to seven years of its own electricity shortages. According to reports from the International Herald Tribune (2007), rolling blackouts blankets parts of the country and sporadic power failures have persisted. Lawrence Musaba, the manager of the Southern African Power Pool reports that the South African Power Sector have had no significant capital injection into generation and transmission, from either the private or public sectors, for 15, maybe 20 years. Yet South Africa's woes pale beside those of Nigeria, Africa's most populous nation.

The World Bank says its financing of power projects in sub-Saharan Africa is ballooning, from $250million five years ago to $660million last year to $1 billion in 2007 (International Herald Tribune, 2007)).

4. Challenges in the Electricity Sub-Sector of Nigeria

The major challenges faced by the electricity sub-sector in Nigeria can be summarized as follows:

1. **Militancy and Vandalism in the Niger Delta**: After militants blasted off gas pipeline in some creeks in Delta State from where gas is supplied to the 1300 Megawatt (mw) Egbin Power station on February 18 last year, the entire might of the Nigerian government was stopped from repairing the pipes by angry youth from the region who were protesting the wanton destruction of their environment and socio-economic neglect by oil firms and government. This report depicts the situation across Nigeria.
2. **Under Supply of Gas**: The Nigerian Gas Company (NGC) has been accused of undersupplying PHCN with gas needed for its thermal stations on the grounds that the power company owes it huge sums of money for gas already consumed.
3. **Low Water Level**: The forces of nature have equally been accused of compounding the problem; the hydro-power plants always produce at low peak while the dry season lasted.
4. **Poor Preventive and Routine Maintenance Culture**: Some of the facilities that are always hastily procured for the turn-around-maintenance of the power plants always turn out to be substandard. They would soon collapse as soon as they were installed. Uses of obsolete and heavily over-loaded equipments are the day in the Nigerian electricity sub-sector. More so, it has been observed that the hydro-dams have silted up, losing a huge volume of the reservoirs as run-offs and nothing is been done about it.
5. **Poor Accountability and Transparency Culture**: There has been such a monumental investment of public fund in the purchase of power facilities with no one carrying out an audit of their quality and even their real worth. This belies that fear of most watchers of the Nigerian power sector. According to Olori (2006), corruption is rampant in the new electricity companies – sex generating companies, 11 distributors and one transmitting – and little is being done to check it. Some technical staff have even been caught turning a blind eye and taking bribes from defaulting consumers.
6. **Poor Town Planning and Illegal Connections Leading to Over-loading of Facilities**: This is often a problem in Nigeria were building constructions in major cities are done without approvals and supervisions from the agency responsible for town planning. This often gives rise to illegal and improper wiring and connections.
7. **Inefficiency in the Billing and Collection System and Huge Indebtedness**: this challenge cannot be overemphasized. It has cost the electricity sub-sector a huge and continuous loss in the expected revenue accruable.

Consequences of Incessant Erratic Supply of Electricity in Nigeria

1. The Physical Quality of Life Index of Nigerians keeps declining as a result of inflation caused by a supply of goods and services produced and provided for at high cost from independent power sources.
2. There exists a latent economic potential that is waiting to be unleashed if, and only if, individuals and investors could find the electricity needed to power their dreams. For now, they are forced to turn to diesel-powered generators, which raise the cost of production of goods and providing services.
3. It is difficulty to realize the eight Millennium Development Goals of eradicating poverty, achieving universal primary education, women empowerment, reduced child mortality, improved maternal health, combat major diseases, ensure environment sustainability and develop a global partnership for development without electricity.

5. Policy Recommendations and Conclusion

Presently, government is building many power stations in the country. It has awarded a contract for the construction of the 2600 Megawatt (mw) Mambilla Plateau Hydro-Power station in Taraba State to China Gezhouba Group Corporation (CGGC) and China Geo-Engineering Corporation (CGC) at a cost of $1.4billion last month. Again, government has started the National Integrated Power Plants (NIPP) under which a sum of $2.5billion is being spent. The NIPP is made up of the 451mw Gbarian Power station in Bayelsa State; 230mw Ihovbor station in Edo State, the 230mw Gas Thermal station at Omoku, Rivers State and the Sapele 451mw power station in Delta State. The rest are the Egbema 338 mw power station in Imo State; the Calabar 561mw station in Cross River State and the 188mw Ibom Power plant in Awka Ibom State.

Apart from these, government is building a ₦37.1billion Gas Thermal Station at Papalanto, Ogun State, designed to produce 335 mw of electricity and another 335mw Omotosho Gas thermal station worth ₦37billion.

Although the aforementioned exercises are worthwhile, it is pertinent that government and its appropriate agencies should put the following policy recommendations into consideration.

1. A National Security Committee on Electricity should be inaugurated to fight against vandalism of high tension and other PHCN installations. The committee should collaborate with the affected residents to fight this economic sabotage and should be charged also with the responsibility of visiting the electrical markets to find out and punish those who deal on stolen and substandard electrical installations.
2. Re-orientation of workers through seminars and workshops aimed at curbing corruption and exploitation of consumers of electricity.
3. Electricity cables should be laid underground, just as it is done in advanced nations, to prevent destructions and hazards. Though it is more expensive, it will go a long way towards ensuring the safety of PHCN installations. Appropriate cable networking should be done with the master plan. Thus, utility companies should collaborate with builders before digging.
4. According to CBN (2000), the 30mw coal fired thermal-steam power plant located at Oji-River, Enugu State, was shut down permanently after the Nigerian Civil War due to lack of funds to rehabilitate it. This is uneconomical considering the fact that there is no other functional power plant in the South Eastern part of Nigeria.
5. A good plant mix to provide for contingencies cannot be over-emphasized. Nigeria should de-emphasize hydro generation and emphasize thermal (gas, coal, oil) because of seasonality of the water level.
6. Privatization remains the key to public sector inefficiency. The PHCN should be privatized for increased efficiency and effectiveness just as this policy has been applied in the telecommunications industry and is yielding positive outcomes.
7. Appropriate authorities should ensure, as a matter of duty, that government's annual spending (both capital and recurrent) and the revenues generated from the Electricity Sub-Sector in Nigeria, should be clearly published in appropriate media. This should not be grouped with data on other utilities as observed from the official statistics released by the Central Bank of Nigeria as well as the Federal Office of Statistics.
8. The refineries must be repaired to enhance the supply of gas and oil needed for power generation and distribution.
9. Government should initiate and subsequently encourage nuclear and solar generation options.

Conclusion

In conclusion, energy is the pivot of he economic life of any nation be it underdeveloped developing or developed. Its existence and maintenance serves as a yardstick for measuring a country's industrial capacity and capability. Electricity touches just about every aspect of the life of cities and towns in present-day Nigerian. As Nigeria struggles to place itself on the plane of industrial stability and economic advancement, as well as distribute the benefits of industrialization evenly across the different categories of peoples residing in it, the public sector must, as a matter of priority, provide an enabling environment to encourage the private sector invest in the Nigerian electricity sub-sector.

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