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Recovery of Cost of Electricity Supply in the Nigerian Power Sector

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Abstract
The poor performance of Power Holding Company of Nigeria (PHCN) was attributed to low tariffs and inadequate revenue generation. The Federal Government of Nigeria is in the process of handing it over to private organizations to be involved in generation, transmission and distribution of electricity in the country under public-private partnership (PPP) arrangement. Private investors are in business to make profit and cannot afford to lose their investment. This study analyzed revenue generation in the power sector to determine the extent to which it covers the operational cost of electricity supply in the Nigerian power sector. The study also examined whether increase in tariff has significantly increased revenue, and the impact of the increase in power generated during the study period. We discovered that even though operational cost is not fully recovered in some years but the level of recovery is significant. Also revenue has significantly changed after the application of MYTO in 2008. However, the revenue generation did not have any significant impact on power generation. The major recommendations of the paper are that tariffs set should be such that would enable the private operators who may take over the sector to recover their cost and make gains. Effort should be made to block all illegal connections and avoid high transmission and distribution losses. Good quality service which includes regular supply of electricity should be ensured to motivate consumers and increase demand for electricity.
Keywords: Cost Recovery, Power Sector, Tariffs, Public-private partnership, Power generation.

Introduction
Africa's power sector has faced a lot of challenges within the last decade. The challenges include under investment in the sector, lack of infrastructural facilities which has resulted in insufficient generation of power, inadequate supply of electricity to consumers, and rising fuel prices leading to high production cost. Others are inflexible tariff system, distribution and transmission losses, and nonpayment of large bill arrears especially by government, large commercial and industrial consumers (Gambia, 2013). Yet there has been increasing demand for electricity in Africa. For instance it is estimated that the demand for electricity in Sub-Sahara Africa has grown from 153 kWh per capita and will get to 235 kWh in 2020 (Kaberuka, 2013) even though this is low compared with the global average of 2,730 kWh recorded in 2009. The per capita electricity consumption in North and South Africa is 620 kWh still not up to the world average. The increased demand for electricity supply in Africa is attributed to increased population and personal income levels. This suggests that the increasing demand is not matched with increase in power sector infrastructural development. The electric power sector as public enterprises are not operating as commercial enterprises hence cannot genera sufficient financial resources to maintain and upgrade existing infrastructures which are too old and lack adequate maintenance. In 2012 for instance, South Africa experienced power outage which resulted in loss of not less than R500 million (South African Chamber of Business, 2013). Governments all over Africa believes that liberalizing the energy sector would help to attract private sector participation in provision of electricity and that would help in improving the cost effectiveness of providing electricity (Kaberuka, 2013). Some African countries like Ghana, Gambia have taken drastic measures in an effort to tackle the infrastructural problems in their power sector by involving other entities in power generation and Nigeria having the same power sector problem as other African countries has also engaged in electricity reform process by involving the private sector in generation and distribution of electricity in the country. Tariffs have been increased using the Multi-Year Tariff Order (MYTO) in 2008 to last for five years. The MYTO was reviewed in 2012. This paper has been designed to analyze the effect of tariff increases on cost recover, revenue and power generation.

Statement of Problem
Power supply in Nigerian has been unstable, inadequate and unreliable. The problems have been attributed to the power sector's inability to generate enough revenue to maintain the system due to under-pricing of electricity service. The industry has not been able to generate enough revenue to cover its operating costs let alone its considerable capital expenditure needs (NERC, 2013). Amadi (2012) maintains that the absence of a cost reflective tariff caused the inability of the power sector to render effective services. The Transmission Company

of Nigeria (TCN, 2007), states that inappropriate pricing helped to compound the poor operational and financial performance of the industry. Part of the reform programme of the government is increase in tariffs. Power tariffs in Nigeria before the introduction of Multi-Year Tariff Order (MYTO), was said to be below the cost of supply. The pricing failed to consider commercial viability of the sector and the tariffs were not frequently reviewed. According to Kaitafi (2011), the average tariff in Nigeria was low for a very long time due to government control. The average tariff in Nigeria before 2002 was ₦4.50/kWh. In 2002, it was increased to an average of about ₦6.00/kWh (NERC, 2005). The first attempt to prepare an effective cost recovery policy/plan was made by NERC in 2008 when the agency introduced the Multi-Year Tariff Order (MYTO). It was believed that this new tariff order would ensure cost-effectiveness (NERC, 2012). Consequently, the price was increased to an average of ₦11.20/kWh in 2008 under MYTO. This increase of about 50% was still considered as one of the lowest in the world (Kaitafi, 2011). It was also below the price paid in most West African countries (The Presidency, 2010). As a result the MYTO was again reviewed in 2012 which raised the electricity tariff to an average of 23.89/kWh which is currently in use. Efficient power pricing contributes immensely to proper functioning of the power sector (Briceno-Garmendia and Shkaratan, 2011) because it ensures that tariff is cost reflective. It is only full recovery of all costs associated with electricity service that can guaranty sustainability in the power sector under the Public-Private Partnership being arranged by the Federal Government of Nigeria. The question is whether this increase has made full operational cost recovery possible? Has it made any significant impact on the revenue generation of the power sector? Has the increase in tariffs in any way positively affected power generation of the Nigerian power sector? The private sector in business to make profit and will not tolerate non recovery of cost.

Researchers have carried out various studies on the reform of electricity in Nigeria. For instance Adoghe, Odigwe and Igbinovia (2009) examined the "Effects of Power Sector Reform on Electricity Supply Reliability and Stability in Nigeria". Abiola and Adebayo (2012) researched on "Towards a Public Private Partnership in the Nigerian Power Sector: Challenges and Prospects". None of this was on cost recovery in the Nigerian power sector. The research work carried out by Briceno-Garmendia and Shkaratan (2011) on "Cut between Cost Recovery and Affordability" was a study on Sub-Sahara Africa" and not particularly in Nigeria. This study will serve as an existing literature on recovery of cost of electricity in Nigeria and future researchers will find it a very useful database for any related study on this topic.

Objective of study

1. To ascertain the extent to which increase in tariffs has affected recovery of cost of electricity supply in the Nigerian power sector.
2. To ascertain whether the tariff increase has improved revenue generation in the power sector.
3. To ascertain the extent to which the increase in tariffs has affected power generation in the Nigerian power sector.

Research questions

1. To what extent has the increase in tariffs affected cost recovery of electricity supply in the Nigerian power sector?
2. Has revenue generated by the power sector significantly improved as a result of increase in tariffs?
3. To what extent has the increase in tariffs affected power generation in the Nigerian power sector?

Research Hypotheses

1. Increased tariffs have not resulted in significantly cost recovered in the Nigerian power sector.
2. The increase in electricity tariffs has not significantly affected revenue generated from electricity supply in by the Nigerian power sector.
3. The increase in electricity tariffs has not significantly increased the power generation in the Nigerian power sector.

2. Review of Related Literature

Conceptual Framework of Cost Recovery

Cost recovery simply means recouping what was invested in providing services. Cost recovery is closely related to tariff. Tariffs mean payments made by beneficiaries of the service. They are streams of revenue from the users that would enable investment cost to be recovered (Mannapbekov, 2011). Tariff in the power sector is defined according to Kaitafi (2011) as the aggregate price paid by the final consumer of electricity for a It is through this that the provider of electricity whether public or private investor will be able to recover costs of energy consumed. Obviously the public sector finances invested in electricity supply are provided from tax payers' money and other sources of Government revenue. To ensure continued supply of the service and long-term sustainability, there is the need to recover all costs associated with the power service (IRC, 2013). Sustainability according to (IRC, 2013) connotes that the power programme is able to deliver as appropriate level of service in

terms of quality, quantity, convenience and continuity.

Cost recovery becomes imperative now that the Federal Government wants to hand over the power sector to private operators. For the private sector funds are often times provided by finance and credit institutions both local and international. They include international finance institutions (IFIs) or multilateral development banks (MDBs) such as The World Bank; African Development Bank (AFDB); International Finance Corporation (IFC); International Development Association (IDA), and others (Mannapbekov, 2011). The private operator would want to get involved in projects that will ensure recovery of investment cost and reasonable return on investment. According to Villarreal and Martinez (2012), "no reasonable investor would put his money in a project that could not, at least, recover its fixed cost". Given a predetermined set of service standard and tariffs, the operator assesses the financial attractiveness of the project using internal rate of return (IRR) or return on capital employed (ROE). Any revenues (tariffs) that will enable the operator to maintain, replace, modernize, and expand its services and assets may be acceptable (ADB, 2008). Costs expected to be recovered are electricity generation cost, transmission and distribution costs and they are capital intensive. The costs actually involved in service delivery are: the capital costs, operational and maintenance costs, and the connection costs. Capital cost is the infrastructural cost; for example the cost of land and building. Operation and Maintenance (O&M) costs are costs involved in production and distribution of services in addition to cost of maintaining the system. Connection costs are costs involved in connecting the user to the system (ADB, 2008). The totality of these costs is recoverable from consumer tariffs and or subsidies.

Power Sector Reform in Nigeria

Inadequate supply of electric power has been a big problem confronting Nigeria. It has led to high cost of using generator as an alternative supply of power. Less than 40% of the Nigerian population is supplied with electricity leaving the rest without. The generating capacity of electricity in Nigeria in 2000 when the reform started was 2000MW. By generating less than 4,000MW of electricity, the Nigeria's per capita consumption was 0.03kw. This per capita consumption of electricity evidences the level of industrial activity going on in the country, hence the level of development and the standard of living of people in this country. The problem was attributed to lack of increase in the existing generating units from 1990 to 2000, lack of overhauling for up to a period of 15 years, and rapidly decaying of existing generating infrastructure and under pricing of electricity services.

To tackle the problem the Federal Government embarked on transformation of the sector through some reform processes. The transformation agenda includes maintenance, rehabilitation and upgrading of existing units in the 8 power stations in Nigeria. The government embarked on construction of four thermal power stations in various parts of the country; the unbundling of NEPA into18 companies and establishing PHCN in 2005. The 18 successor companies created consist of: 6 power generation, 1 transmission and 11 distribution companies (Muhtar, 2009). Approval was also given for the construction of seven new power stations in the Niger Delta in order to take advantage of the huge gas resources in that area. As part of the reform programme, the Federal Government embarked on the process of deregulating the power sector and therefore encouraged private sector participation in generation of electricity under the Independent Power Producers (IPP) arrangement so that the IPPs would generate power and sell to PHCN under power purchase agreement. The administration's target then was to generate up to 10,000MW by the year 2007 when it would hand over power to another government but this objective was not achieved. The Public Private Partnership (PPP) is now being extended to the distribution of power in the country. Involvement of the private sector becomes imperative because Nigerian Government alone cannot afford the capital requirements for development of the electricity sector in the country. Their call for participation is a welcome development because it is expected that Partnership project would provide growth for the sector, instill financial discipline, reduce corruption in the public sector (Ogunloye, 2010), and reduce the financial burden of infrastructural provision on the national budget.

The reform gave rise to the establishment of the Nigerian Electricity Regulatory Commission (NERC) to regulate and control tariffs by providing different pricing options for arriving at tariffs to power generators via the Multi-Year Tariff Order {MYTO} (TCN, 2012).It was in order to attract the private sector investment that a system of electricity pricing called MYTO was established. MYTO was described as a tariff regime which determines electricity price based on revenue requirements of the whole industry.

Its aim was to provide a pricing structure that would ensure that efficient industry operators earn a moderate return on investment in addition to protecting consumers against excessive pricing. It is to provide for continuous reduction in transmission and distribution losses. In compliance, the Federal Government approved the implementation of MYTO and market rules in April 2008 and February 2009 respectively thus providing a framework for tariff determination and rule of engagement in the electricity industry (Okafor, 2012). MYTO was now put into operation in 2008 for the first time and was reviewed in 2012. Its success will depend on how seriously the stakeholders (the Government, the private sector operators and the electricity consumers) handle the implementation. However, no significant change has occurred in electricity supply in Nigeria. For instance, Available generating capacity of electricity in Nigeria by December 2011 was about 3800 MW (Nnaji, 2011) as

against 6000MW which is the installed capacity (TCN, 2012). This is considered grossly inadequate for a country with a population of 150m people when compared with South Africa that generates 41,000MW for only 40million people (Transmission Company of Nigeria {TCN}, 2007). United Kingdom with a population of 57.5m generates 76,000mw with per capita consumption of 1.33kw. United States of America and Brazil with populations of 310m and 201 respectively generate 1,010,172MW and 100,000MW (The Presidency, 2010).

Conceptual Framework of PPP

Public-Private Partnership (PPP) is not a new phenomenon; it has been identified world over as a means of providing infrastructure growth in an infrastructural deficient state or nation. Public-Private Partnership (PPP) is a contractual relationship between the public and private sector organizations which provide the private sector the opportunity of supplying public services or infrastructure under the control and monitoring of the public sector. The private sector finances the service and brings innovations, technology and its resources while the public sector provides sufficient control and monitoring of these contracts (Njidda, 2009) to ensure that the service is supplied in a cost effective manner. Traditionally government projects are supposed to be financed from capital funds or loans from foreign organizations. Innovations and public sector reforms have discovered that a better alternative to government funding of provision of services or infrastructure is private sector participation. Through PPP the burden of providing public services is shifted. The public sector services can now be effectively provided or delivered by the private secto financial challenges of the time when the government's ability to provide service was constrained, still the demands for public services increased as is the case in Nigeria today, though the responsibility remains that of the public sector. The success of any PPP relationship depends largely on the design, terms of the contract, operations, constraints and effective monitoring of the contract procedures (Zero Emission Communities, {ZEroco2}, 2011). Some developed countries have found PPP useful in public financial management and have recorded successes.

In the U. S. it was initiated in the 1980's and the vision then was that of down-sizing government as a result of financial challenges of the time which was a constraint on the government's ability to provide service, still the demands for public services increased as is the case in Nigeria today. Many developed and developing economies have imbibed it as a sure way to enhance infrastructural development in areas such as education, industry, roads networks, railways, airport, seaports, power supply and others. Innovative ideas such as "market-based reforms" and "the New Public Management" all advocate that partnership with the private sector is a means of improving accountability and quality of service in the public sector (Battaglio, 2009). No government can be so self sufficient as to provide all the infrastructural facilities. Countries such as USA, Canada, UK, Britain, Italy, Spain, Australia and others, use Public-private partnership as solution for deficiency in infrastructural growth and development.

Many countries of the world have successfully transformed their power sector through public-private partnership. For instance in Asia private sector was involved in the construction of IPP power projects. Countries in Latin America, Central and Eastern Europe, Former Soviet Union (FSU) all focused on divestitures of utilities while the Government controlled the operation of the system through regulation. The common belief was that the commercialization and economic efficiency objectives would not be achieved if the power sector continued to be completely operated by the public sector (Deloitte, Touch, Toumatsu, 2004). The authors recorded 20 case studies of successful private power financing projects in emerging markets. For instance in Argentina, the study recorded that through PPP, Edenor company established to provide electricity distribution services in northern Buenos Aires, recorded successful significant improvement in operations and finances. The PPP arrangement resulted in the reduction in energy losses from 30% in 1992 to 10% in 1999; improvement in quality of service, decrease in average interruption per customer a year from 13% to 5.7% within 5years; reduction in average duration of interruption from 22% to 8.6% per annum. In addition the access to electricity supplied by poor households was ensured.

Peru, South Africa, Philippines all has success stories of PPP in electricity supply (Deloitte, 2004). As Deloitte, Touch, Toumatsu, (2004) states, with the prevalence of political interference, mismanagement or lack of management, corruption, and lack of incentives for improving efficiency in the state owned utilities, transferring ownership to the private sector was seen as the best means of instilling commercial discipline, and economic efficiency. Recently the Federal Government of Nigeria and U.S. signed an MOU for $ 1.5bn dollar life line for IPPs expansion in Nigeria (Nnaji, 2011). This is expected to bring improvement in the power sector as has been the case in other countries.

Tariffs Setting in Nigeria

The MYTO does not provide for uniform tariffs but there is provision for different tariffs for low-income consumers all over the country. A uniform tariff of N4.00 per kWh with no fixed charge has been set for this class of customers.

Apart from this different tariff for low-income customers, there is no uniform tariff for all the Distribution companies. All other tariff classes in each Disco has its tariffs set on the basis of that Disco's specific cost profile

in serving that customer class. Tariff in the Power Holding Company of Nigeria are graduated as Residential, Commercial, Industrial, Special, and Street Lighting and based on units consumed. The fixed charge is payable by all customers except the R1 group every month whether electricity was consumed or not.

Tariff Methodology

The pricing principle adopted by NERC is the Building blocks approach to determine tariffs payable by consumers. This method ensures that every cost from generation, transmission and distribution are included. Using this approach, the overall revenue requirements of the industry were established and used as the basis for calculation of the revenue to be collected per unit of sales. By this approach the government agency (NERC) has taken care of under-pricing of electricity and full cost recovery if customers are able and willing to pay. The distribution losses are also built into the tariffs and passed on to the consumers.

Determination of Distribution/Retail Prices

Since the building blocks approach gathers together all the industry cost, it then follows that the retail tariff in Nigeria comprises costs of natural gas, wholesale generation, transmission, distribution, metering and billing to the consumer. These costs are more detailed as follows:

- Cost of supply of wholesale electricity injected into the transmission network.
- Charge for use of transmission system for each mWh delivered to distributor/retailer's bulk supply provided
- Cost of distribution through the local distributor's/retailers network.
- Marketing, metering, billing and revenue collection costs
- Institutional charges
- Federal Government tariff subsidy targeted at vulnerable tariff classes R1 & R2

The generation and distribution charges are determined and set out by the Nigerian Electricity Regulatory Commission. The distribution costs comprise allowance for a return on capital invested; depreciation cost; cost of operation and maintenance of network; distribution losses across the network, and meters and metering costs.

Tariff Review

In Nigeria, MYTO provides a fifteen year tariff path for the electricity industry with minor reviews bi-annually and major reviews every five years. A major review in existing tariffs is required when there are material variations greater than plus or minus 5% in the rate of inflation, exchange rate fluctuations and change in cost of gas. The tariff

order schedule of 2008 was reviewed in 2012 as a result of increasing cost of power, cost of operation and management expenses and declining revenue as a result of absence of growth in electricity generation capacity. An inflation rate of 13% was applied to compensate investors against rising cost of business operation and to ensure that workers in the industry are paid living wages.

Subsidy Design

Consideration of the service standard desired and determination of total cost to be recovered will reveal whether there is any need for subsidies and the availability of such. Sometimes the tariffs may not be enough to achieve complete cost recovery which is the situation in Nigeria. Where cost recovery is not achievable through tariffs, there must be an arrangement to determine the subsidies that may lead to complete cost recovery (ADB, 2008). In Nigeria the tariff subsidy is targeted at the two tariff classes of low income earners.

3. Research Methodology

Ex post-facto research method was adopted in this work because the study aims at measuring the relationship between one variable and another. The variables involved in the ex post-facto work are not manipulated by the researcher. They are from annual reports and accounts of the power holding company of Nigeria. Secondary data were obtained from relevant journals both national and international, textbooks, and internet downloads. Others include PHCN publications quarterly magazines, and newsletters, PHCN annual report from 2001 to 2005, and its records from 2006 to 2011. The data were presented using tables, bar charts, and graphs. The hypotheses were tested using t - test.

4. Data Presentation and Analysis

4.1 Operational Cost and Revenue

Table 1 below shows the operating cost and revenue generated by the Nigerian sector from December 2001 to December 2011. The power sector was able to recover cost and had excess of revenue over operational cost in 2004, 2006, 2007 and 2011. Even after the increase in 2008 under MYTO, the power sector still had excess of operational cost over revenue in 2009 and 2010. The operational losses in these two years were ₦2, 098,974,614 in 2009 and ₦1, 717,231,607 in 2010. This result may not be surprising because the Nigerian power sector is not run as commercial enterprise hence emphasis is not on profit making. There is general lack of enthusiasm or zeal to make profit.

Table 1. Operating Cost and Revenue Generated - December 2001 to December 2011

Year	Operating Revenue in ₦	Operating Cost in ₦
2001	39,188,116.00	55,003,314.00
2002	71,463,980.00	85,098,263.00
2003	79,553,385.00	89,391,150.00
2004	102,435,925.00	101,857,010.00
2005	108,444,495.00	111,518,147.00
2006	12,005,317,752.00	5,643,465,546.00
2007	12,010,880,168.00	5,365,194,445.00
2008	10,779,449,144.00	6,682,617,710.00
2009	12,122,558,200.00	14,221,532,814.00
2010	15,890,465,079.00	17,607,696,686.00
2011	20,528,360,582.00	20,502,712,106.00

Source: PHCN Annual Reports and Accounts 2005
PHCN, Enugu

Hypothesis 1

Ho. Increased tariffs have not resulted in significantly cost recovered in the Nigerian power sector.

To determine the significance of cost recovery for the specified period, a t-test analysis was conducted on the operating cost for the study period. The results obtained are presented in Appendix 1.

The one-sample t-test statistics table reveals that the mean cost recovered for the period under study is approximately ₦7.6bn. From one-sample t-test result, a t-value of 3.292 was obtained. This value is greater than the critical t-value of 1.812. With p-value (0.008) < 0.05, this result is significant. This reveals that there is difference in cost recovered over the study period and this recovery is significant.

Therefore, the null hypothesis is rejected and the alternative is accepted thus, the extent to which cost is recovered is significant.

Hypothesis 2

Ho. The increase in electricity tariffs has not significantly affected revenue generated from electricity supply in the Nigerian power sector.

To determine whether a significant difference existed between revenue generation before and after the implementation of MYTO, the 2-independent samples t-test analysis was used. The results are presented in Appendix 2.

From the T-test Group statistics table, it is revealed that the mean operating revenue generated after the commencement of the implementation of MYTO in 2008 (₦14.8bn) was more than the mean operating revenue generated before the commencement of the implementation of MYTO (₦3.5bn).

Upon further analysis of the mean operating revenue generated in two different eras, a t-test value of -3.363 was obtained. This value is less than the corresponding negative t-critical value of -1.833. This implies the existence of a difference between operating revenue generated after the commencement of the implementation of MYTO and the operating revenue generated before the commencement of the implementation of MYTO. Also, with p-value (0.008) < 0.05, this result is significant. Therefore, the introduction and implementation of MYTO generated more operating revenue for PHCN. The trend chart is shown on Fig, 1 below.

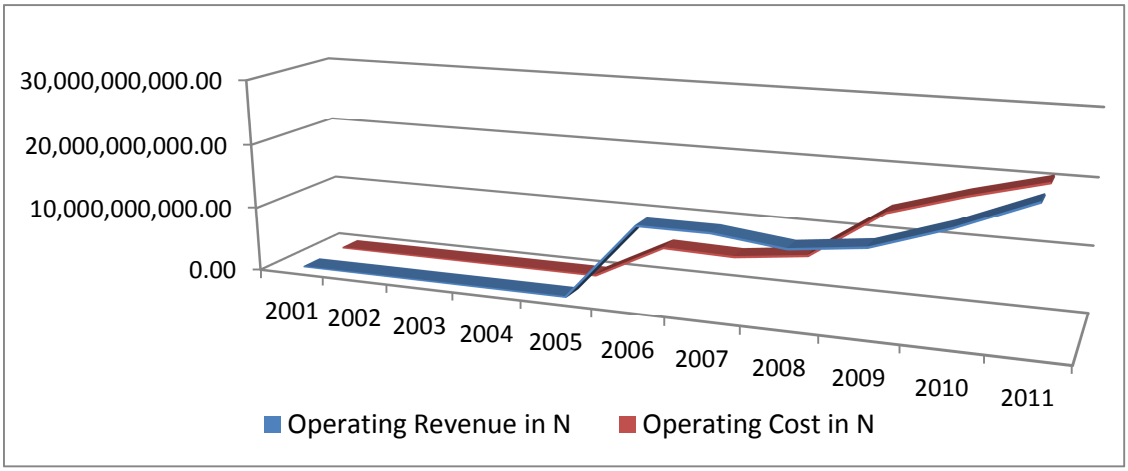

Fig.1: Operating Revenue and Cost Trend

Hypothesis 3

Ho. The increase in electricity tariffs has not significantly increased the power generation in the Nigerian power sector.

The data on table 2 below was use in testing hypothesis three.

Table 2: Electricity Production, Consumption and Loss in Nigeria 2000 to 2012 (billion kWh)

Year	Generation in billion kWh	Consumption in billion kWh	Loss in billion kWh
2000	14,750,000,000	13,720,000,000	1,030,000,000
2001	18,700,000,000	17,370,000,000	1,330,000,000
2002	15,900,000,000	14,770,000,000	1,130,000,000
2003	15,670,000,000	14,550,000,000	1,120,000,000
2004	15,670,000,000	14,550,000,000	1,200,000,000
2005	19,850,000,000	18,430,000,000	1,420,000,000
2006	15,590,000,000	14,460,000,000	1,300,000,000
2007	19,060,000,000	17,710,000,000	1,350,000,000
2008	22,110,000,000	15,850,000,000	6,260,000,000
2009	22,110,000,000	15,850,000,000	6,260,000,000
2010	21,920,000,000	19,210,000,000	2,710,000,000
2011	21,920,000,000	19,210,000,000	2,710,000,000
2012	20,130,000,000	18,140,000,000	1,990,000,000

Source: Index Mundi, http://www.indexmundi.com/g/.g.aspx?c=ni&v=79

To determine whether the changes in power generation were significant, a t-test analysis was conducted on the change in power generation for the study period. The results obtained are presented in Appendix 3.

The one-sample t-test statistics table reveals that the mean change in power generation for the period under study is 0.0373.

From the one-sample t-test result table (table 9), a t-value of 0.816 is obtained. This value is less than the critical t-value of 1.796. With p-value (0.432) > 0.05, this result is not significant. This reveals that there is no difference in power generation over the study period. Therefore, while certain changes (both increases and decreases) were experienced in power generation over the study period, no significant difference was determine in these changes.

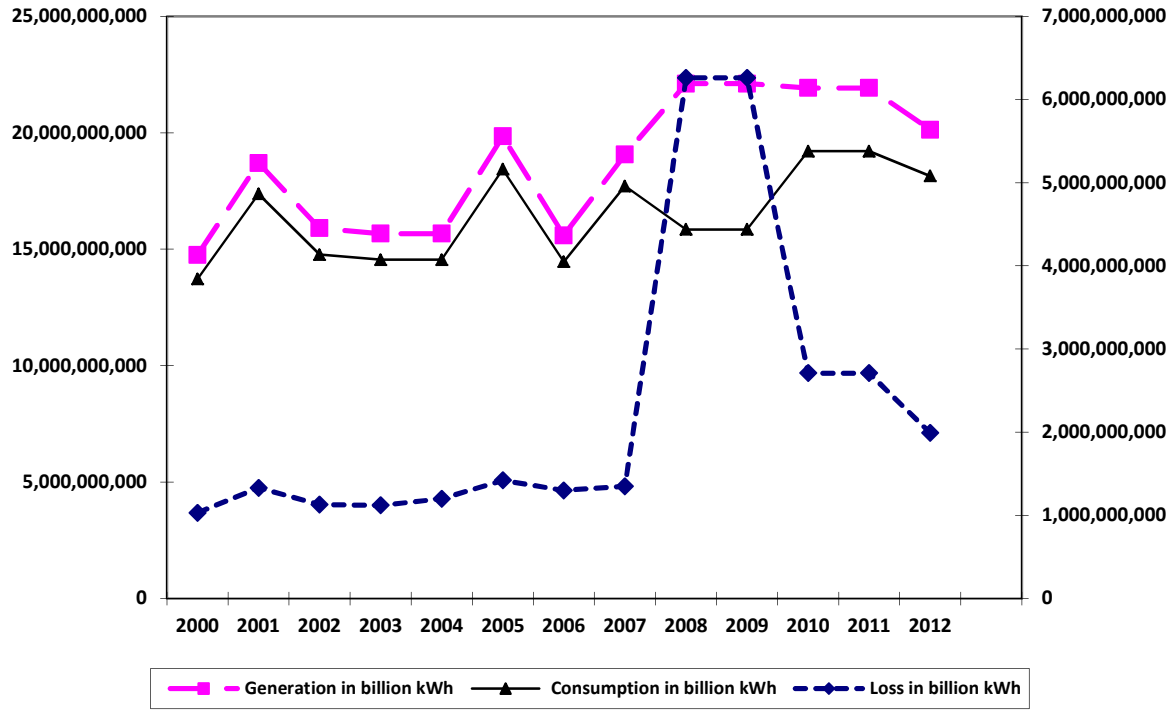

Figure 2.

Fig. 2: Trend Chart showing* Electricity *Production, Consumption and Loss

Electricity generation stabilized in 2008 and 2009 with 22.11billion each. In 2010 there was an increase from

22.11 to 21.92billion, an increase of 3.66%. In 2012 electricity generation decreased to 20.13billion, a decrease of 8.166%.

Transmission/Distribution Losses

The distribution losses as can be seen in table 2 above are quite much and may contribute to inadequate revenue generation. They are quite significant in 2008 and 2009 with the same figure of 6.26 million in kWh. The study by Briceno-Garnendia and Shkaratan, (2008) attributed the transmission/distribution loss in the power sector in the Sub-Saharan countries to operational inefficiency. The transmission/distribution loss was 28.3 % of power generated and 39.5% of consumption in 2008 and 2009 each. The transmission/distribution loss was ascertained by the researchers as by the Nigerian power sector. The transmission/distribution loss is 58% and 51.6% of revenue generated in 2008 and 2009 respectively. This varies from the figure of 76.8% of revenue generated as obtained by Briceno-Garnendia and Shkaratan, (2008) in their study. Pilferage is the main cause of transmission distribution losses. It is a hidden loss and contributes immensely to non recovery of cost of electricity supply.

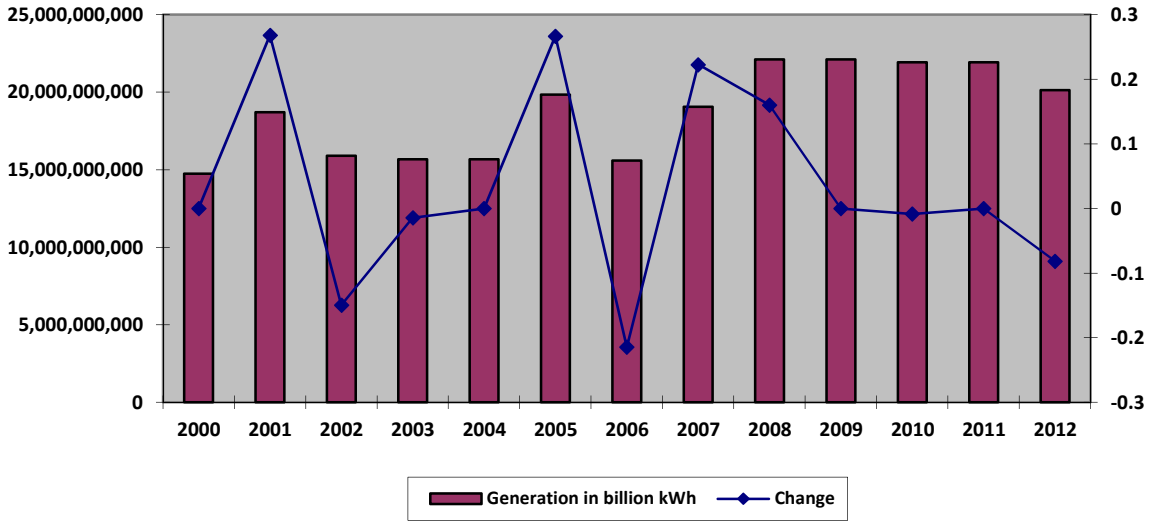

Figure 3: Change in Power Generation Trend

5. Findings

- Cost is not fully recovered in the Nigerian power sector. However the extent of recovery is significant.
- There is significant increase in revenue generation after the introduction of MYTO in 2008.
- There is no significant difference in power generation despite the increase in electricity tariff through MYTO since 2008. The increase in power tariff has no impact on power generation.

6. Conclusion and Recommendations

For success to be achieved in the Nigerian power sector, effective cost recovery must be given adequate attention especially now that power sector is about to be handed over to private sector. A tariff plan that takes into consideration the cost of and reasonable return on investment should be adopted if success is to be achieved. A tariff plan that considers the private investors' cost recovery will make the project attractive. However the component of an effective tariff system should not be neglected, that is the quality of service and ability of consumers to pay. It is
not good to draw up a tariff policy that is not affordable and may not be strictly enforced creating loopholes that may turn around to frustrate the investors.

Recommendations

- The cost recovery plan must try to balance cost of investment, quality of service, and the tariffs that customers are willing to pay. These three factors are very critical and interrelated aspects of sustainable service delivery. Presently the quality of service rendered by the PHCN is very unacceptable despite the increase which has run from 2008 May 2013. Tariff increase must be supported with adequate and regular service delivery, and increased efficiency. The new tariff must ensure full cost recovery not only operational cost but fixed cost included.
- Efforts must always be made by the electricity supplier to ensure collection of payments due from users in order to balance income and expenditure and achieve the financial plan of the project. Failure to

collect all charges due from users is a common reason for financial deficits which may not augur well with private investor. The prepaid metre

- system may take care of this collection problem. Honesty of workers must be seriously considered during engagement of staff especially for the private operators.
- There regulation against payment defaulters should be re-enforced. Now that the Federal Government planned hand over to private investors, adequate provisions should be made to protection them. They should also be legally empowered to deal with defaulter.
- Efforts must be made to drastically reduce transmission/distribution losses.

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Appendix 1
T-Test
One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
operating revenue	11	7.6126E9	7.66835E9	2.31210E9

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
operating revenue	3.292	10	.008	7.61256E9	2.4609E9	1.2764E10

Appendix 2

T-Test

Group Statistics

	era	N	Mean	Std. Deviation	Std. Error Mean
operating revenue	Before MYTO	7	3.4882E9	5.82025E9	2.19985E9
	After MYTO	4	1.4830E10	4.37162E9	2.18581E9

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
operating revenue	Equal variances assumed	1.037	.335	-3.363	9	.008	-1.13420E10	3.37265E9	-1.89715E10	-3.71257E9
	Equal variances not assumed			-3.657	8.034	.006	-1.13420E10	3.10114E9	-1.84880E10	-4.19603E9

Appendix 3

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Change in Power Generation	12	.0373	.15861	.04579

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Change in Power Generation	.816	11	.432	.03734	-.0634	.1381

Appendix 4. Change in Power Generation

Year	Generation in billion kWh	Change
2000	14,750,000,000	-
2001	18,700,000,000	0.267797
2002	15,900,000,000	-0.14973
2003	15,670,000,000	-0.01447
2004	15,670,000,000	0
2005	19,850,000,000	0.266752
2006	15,590,000,000	-0.21461
2007	19,060,000,000	0.222579
2008	22,110,000,000	0.160021
2009	22,110,000,000	0
2010	21,920,000,000	-0.00859
2011	21,920,000,000	0
2012	20,130,000,000	-0.08166