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An Empirical View of Business Model Innovation in The Energy Sub-Sector (Electricity) of Nigeria

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Abstract

This study examines Business Model Innovation in energy sub-sector (electricity) of African sub-Saharan region of Nigeria. The research method used is the secondary approach drawn from a synthesis of peer reviewed international and national literature, journal, reports and documents related to business model innovation. Teecee (2010) postulated that the concept of business model lacks theoretical foundation in economics or business studies due to the difference between theoretical and practical approach. In furtherance, analysis and discussion were drawn from empirical review and finding from consulted literature. The major finding of the study revealed that there exists a business model innovation for the energy sub-sector (electricity) in Nigeria, however, the sector is constraint with inadequate financial, human and material capital base, infrastructure, tools for research and development, operational framework and non-robust policies that would provide for the construction of a sustainable business model for the sector. The study recommends that; the government of Nigeria should develop a single policy documents for the various energy sources that will address the issues of dynamism in energy generation, transmission, distribution and pricing; and channel substantial resources to technological development, research and development in the energy sector; and ensure that only companies that have competence and capacity in the sector are allowed to participate in the process of privatization bidding and award of energy licenses.

Keywords: Business model, innovation, pricing, tariff, energy

1. Introduction

This paper takes a closer look at business model Innovation in the energy sub-sector (electricity) of African Sub-Saharan region of Nigeria, with a view to examine the methodology, concepts and innovation that make up the price mechanism for energy transition. According to USAID (2019) Nigeria is the largest economy in Sub-Sahara Africa, however, limitation in the power sector has continued to constrain growth in the economy. The country has the potential to generate 12,522 megawatts (MW) of electric power from existing plants but is able to generate only about 4,000MW which is inadequate for domestic consumption (USAID, 2019). This brings to question how energy generated is distributed to meet the rising energy demand in the country and what business model is applied for energy transition by the generation, transmission and distribution companies. In furtherance, the major question this paper aim to answer is; how effective/ efficient is the delivery mechanism of the existing business model in energy transitions in Nigeria?

It is a well known fact that Nigeria's major energy source comes from non-renewable (hydro and thermal) power supply solely controlled by the government not until 2005 when the privatization of electricity distribution companies began in (NERC 2005). According to Hannon, Foxon, & Gale's study (as cited in Hall & Roelich, 2016) the dominant supply business model for the electricity has been the corporate utility selling units of energy to consumers in liberalized national market. Could this be the case for the energy sub-sector in Nigeria? To answer this question, the study will examine the various business models used by energy producers in the Nigerian market. In addition, the study aims to contribute to the already existing debate on business model innovation by managers and academics with a view to identify gaps and make recommendations that would serve as a reference point for business managers, academics, government and private organizations. The paper is structured as follows: chapter one (i) deals with the introduction and methodology; chapter two (ii) embodies the main section, which is the theoretical and empirical literature and findings, and chapter three (iii) captures the conclusion and policy recommendations of the paper.

1.1. Research Method

The research method used is a qualitative approach drawn from a synthesis of peer reviewed international and national literature, journal, reports and documents related to business model innovation.

2. Literature Review

2.1. Theoretical Literature

According to Reis (CNBC News 2018), innovation in the energy sector is about decentralization of energy sources and development of business models that satisfy both the producers and consumers of energy in a competing market economy. Globally, innovation is seen to be synonymous with new edge technology and how leading technological companies are been able to change the world around using combinations of various energy sources to development hard ware such as electronic devices and other sophisticated gadgets to programme the way we do

things and providing a new level of convenience for household and the business community. Shafer, Smith and Linder's study (as cited in Umihana, 2014) defined business model as representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network. Foxon's postulated (as cited in Hall & Roelich, 2016) technological and business model innovation must co-evolve with policy and system regulation for energy transitions to be achieved. According Nussey, 2018, innovation is the discovery and development of technologies from different energy sources for onward transmission to the end user, but without a business model that wove all components, innovation cannot be said to be a breakthrough. Nussey, 2018 gave an example of an online transport company Uber and Lyft, have relatively few employees and do not own cars, but even in the face of stringent regulatory resistance that protects existing taxi industry, they were able to develop a business model using new technology to provide a new level of travel convenience through real time online business interaction that taxis didn't offer thereby transforming the transport industry with a more exciting experience for both users and the company. According to Nussey a good business model answers two important questions; how products or services are paid and who is making the profit. Therefore, business models have to be innovative for a product to stand the taste of time.

Two highly respected authors in the field of strategic management and entrepreneurship Amit and Zott's postulated (as cited in Umihana, 2014) that the subject of Business Model Innovation (BMI) is of high significance for managers and academic researchers for three core reasons. First, BMI represents an often underutilized foundation of future value; secondly, producers could find it more difficult to replicate an entire novel activity system than a single novel product, and finally, managers should never undermine the competitor's effort in the BMI area since such innovations are a potentially powerful competitive tool.

In search for the relevant underlying economic theory associated with business model, Teecee's study (as cited in Umihana, 2014) postulated that the concept of business model lacks theoretical foundation in economics or business studies due to the difference between theoretical and practical approach. Teecee argues that the economic theory being a "caricature of the real world" and simply assuming that customers will buy a product if the price is lower than the perceived value, neglects the importance of the concept of business models. On the other side, entrepreneurs and managers have to give a close consideration to the design of business model because "business model are necessary features of market economies where there is customer choice, transaction costs and heterogeneity among consumer and producers, and competition".

Conceptuality, Johnson, Christen and Kagerman' study (as cited in Umihana, 2014) defined four elements that jointly create delivery and capture value in a business model. These are customer value proposition (CVP), profit formula, Key Processes and Key resources. Figure 1below illustrates these factors with their sub-elements.

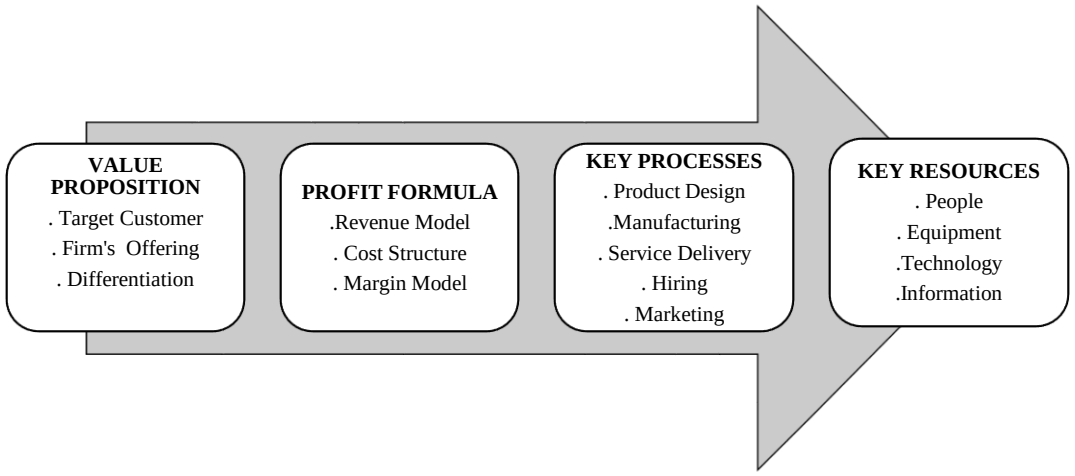

Figure 1 Business Model – Key Components (adapted from Johnson, Christensen, and Kagermann 2008, p.5)

2.2. Empirical Literature

According to Reis (CNBC News, 2018) who is the Vice President, Head of Innovation B2C E.ON, the company had developed various business models. In the *First business model*; the company sell solar panels and batteries to customers to produce their own energy and with innovation of "Vitual Power Cloud" energy users are able to store energy and use it whenever they want. In the *Second business model*; Energy companies install mega batteries in homes as such customers pay to the energy company instead of the utility company. Lastly, in the *Third business model:* the company had with the aid of mobile devices come up with a solutions for customers that use electric cars, for example, customers receive real time information about the next charging station and its location through application installed on their mobile devices. in addition, digital technology platforms has made it easier for companies to scale customer needs globally, and as a result, companies have developed digital devices that help customers optimize, regulate and control energy usage in their homes even when they are absent, by means of a software application Reis (CNBC News 2018).

According to Nussey, 2018, in 1880 Thomas Edison invented a business model that made electric light affordable to everyone, he achieved economies of scale that made electricity cost–effective for hundred of customers at once. Customers just pay for electricity when they use it and also commercialized electric meter to precise measure and bill usage. In 2010 and 2011, solar installation in the United States experienced a spurt, this was largely due to the development of a business model called Solar Power Purchase Agreements (solar PPA's) which was popularized by pioneer solar company, SunEdison and its CEO, Jigar Shah. They created a simplified, standard approach that let solar buyers avoid upfront capital costs and just pay for the solar power as they used. The business model took away initial technical and financial cost for customers

which made the model attractive and acceptable to both producers and consumers (Nussey, 2018).

According to Brookings, 2019, despite the differences in geographic and sector focus of businesses in Africa, what entrepreneurs have in common is the imagination to see the continent unmet needs as opportunities for entrepreneurship and the long term commitment required to build business of meaningful scale. Successful African innovators are also deeply conscious of the barriers to their businesses success, and careful to build long term resilience into their business models. For example, Nigerian based entrepreneur and founder Aliko Dangote, Africa's richest man has build a shock-proof manufacturing model through vertical integration of supply chain, on-site power generation, robust engagement with government and an internal manufacturing academy. This shows that the energy sector can be properly harnessed and sustained if serious investors swing in with the appropriate business model.

2.3. An outlook of International Intervention in Nigeria Electrification Project as Business Model for Electricity Expansion.

Several international organizations have identified the energy sector in Nigeria as a source for global economic expansion. According to World Bank, 2019 under the World Bank Nigeria Electrification Project; the development objective is to increase access to electricity service for households, public educational institution, and underserved Micro, Small, and Medium Enterprise (MSMEs) with an investment of about $756,000 million. The project comprises of four innovative components and business models for its sustainability among which are (i) minimum subsidy tender for mini grids (ii) performance-based grants program (stand-alone solar systems for one million homes and MSMEe at lower cost) (iii) energizing education objective to provide reliable, affordable, and sustainable power to public universities and associated teaching hospitals; and (iv) providing technical assistance to build a framework for rural electrification up-scalling, support project implementation as well as broad capacity building in Rural Electrification Agency (REA), Nigerian Electricity Regulatory Commission (NERC), and other relevant stake holders (World Bank, 2019).

To further support the Nigerian Electrification Project, according to USAID 2019, Power Africa assisted the government of Nigeria with agreements to move the Qua Iboe gas project. This was contained in a World Bank project information document which showed the Bank's board approval of US$395 million for the Azura Edo IPP (Azura) and the Exxon Qua Iboe Independent Power Project (QIPP), (World Bank 2014) and also with agreements on several solar projects that will help diversify the country's energy mix. In addition, interventions such as; a. Transaction advisory; b. Loss reduction work with utilities; and Partnership with National Association of Regulatory Utility Commissioners was rendered.

Power Africa through USAID and the U.S. Trade and Development Agency (USTDA) has collaborated with Nigeria to improve commercial operations and reduce losses at five distribution companies in Nigeria. Power Africa is also supporting off-grid options as well. Through a 15 million Dollars Overseas Private Investment Corporation (OPIC) loan, Lumos Incorporation, is deploying rooftop solar panel kits to approximately 70,000 residential and small commercial

customers in Nigeria, using a lease to-own business model. The U.S African Development Foundation (USADF) in partnership with General Electric and other supporting partners in collaboration with Power Africa has awarded $900,000 grants to entrepreneurs for innovative, off-grid energy projects in Nigeria (USAID 2019).

These facts are supported by a World Bank date demonstrated in a graphical presentation in figure 1 below, the graph show that energy supply shortfall in Nigeria are further marred with generally inefficient technical and commercial management of the grid system, leading to interruptions and poor service delivery.

"Power Africa is comprised of 21 U.S Government Agencies, over 145 private companies and 18 bilateral and multilateral development partners to support sub-saharan governments by working together to increase the number of people with access to power. Power Africa's goal is to achieve 30,000MW of new generated power and 60 million new connections by 2030 to reach 300 million Africans. (USAID 2019)"

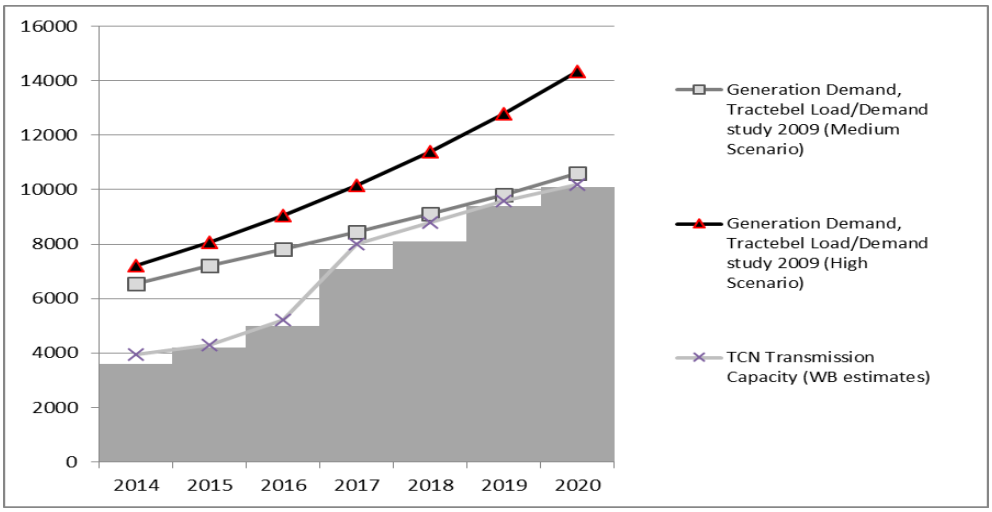

Figure 2: Supply Short Fall in Nigeria

Source: World Bank, 2019.

In 2013, the Mobile for Development Utilities Programme facilitated a joint venture between a mobile and energy company, Mobile Telecommunication Networks (MTN) and a Netherland energy solution company LUMOS launched a solar energy business model innovation that provide consumers energy with power off-grid. The business model innovation is a breakthrough in Nigeria which combines technology from telecommunication and off-grid solar system. The business model provides modern electricity through reliable smart solar systems. The MTN-Lomus Product is made available to buyers on a lease to own basis and its cost is spread over a year term, payable in affordable installments via mobile phone from an MTN airtime account. The MTN and LUMOS business model allows a customer to full ownership of the energy system after a total payment within an agreed duration. Lumos produced an 80W pay-as-you-go

(PAYG) solar home systems and reached its 500 system goal for the pilot in May 2015 and sold more than 3000 SHS in September 2015.

2.4. Nigeria Energy Sector and Regulations

Public electricity generation in Nigeria began the year 1896, with the installation of 30kw generating set at Marina Lagos by the colonial public works department. In 1950, the Electricity Corporation of Nigerian was established by the legislative council as a central body to integrate electricity supply and development (Sambo, 2008,). By 1969, ECN operated 132 kilovolts at a time when the Niger Dam Authority (NDA) established in 1962 operated 330kilovolts. ECN and NDA were merged by government decree No. 24 of 1972 to create what was then called National Electric Power Authority (NEPA). That decree gave NEPA the mandate to "maintain and coordinate an efficient and economic system of electricity supply for all parts of the federation". The inability of government to effectively manage NEPA called for a new reform of the power sector after the country transited power to a civilian regime in 1999. The reform of the power sector in with the enactment of the Electric Power Sector Reform (EPSR) ACT 2005 opened doors of opportunity for investment by the private sector. Subsequently, the Power Holding Company of Nigeria (PHCN) was formed as a transitional corporation that comprises of eighteen (18) successor companies (Six (6) generation companies, eleven (11) distribution companies and one (1) transmission company) created from NEPA. In 2010, the Nigerian Bulk Electricity Trading Plc (NBET) was establishment as a credible off-taker of electricity power from generation companies. By 2013, the privatization of all generation and ten (10) distribution companies was completed while the privatization of the 11^{th} distribution company was completed in November 2014 with the Federal Government retaining the ownership of the transmission company. (NERC, 2019).

According to USAID (2019) Power Africa has provided support to the Nigerian Electricity Regulatory Commission (NERC) through a partnership with the National Association of Regulatory Utility Commissioners (NARUC). NARUC provides guidance on regulatory practices and tariff settings. According to Nigerian Electricity Regulatory Commission (NERC) 2019 Nigeria has an abundance of renewable energy resources, with a vast and mostly untapped potential in renewable energy sources, NERC has set a target of generating a minimum of 2,000MW of electricity from renewable energy by the year 2020; an assured investors of guaranteed price and access to grid, feed-in-tariff for solar, wind, biomass and small hydro power purchase agreement (PPA) based on plant life circle of 20 years. With a plan for electricity distribution companies (DisCos) to procure 1000MegaWatt (MW) (50%) and Nigerian Bulk Electricity Trading Company (NBET) to procure minimum of 1000MW(50% of the total projected renewable sourced electricity). In line with the National Policy on Renewable Energy and Energy Efficiency, the Commission approved three windows for grid connected renewable energy projects which are:

a) Net-metering for very small capacities (typically below 1MW).

b) Feed-in-tariff for capacities up to; a. 5MW; b. 10MW; c.10MW of Biomass and d. 30MW of small hydro.

c) Competitive tender for capacities above the threshold outlined in "b" to be procured through NBET.

These indicates the willingness of the Nigerian government to open doors of opportunity to the business world to come and invest in a business seen to be very viable and filled with untapped potential for the growth and development of the energy sector, green revolution and energy market in general (NERC 2019). No doubt, the Nigerian renewable energy market has begun to experience exploration with investment by national and multi-national companies who believe in the future and sustainability of renewable energy. According to United State Energy Information Administration (EIA, 2016), Nigeria's power sector suffers from poor maintenance of electricity facilities, natural gas supply shortages, and inadequate transmission and distribution network. Nigeria has an average daily generation of 4000MW against the actual electricity demand which is placed at an estimated 10,000MW. Nigeria also has one of the lowest rates of net electricity generation per capita in the world (EIA 2016). To support this claim, the USAID Nigeria Power Africa Fact Sheet 2019 stated that Nigeria's current access to electricity supply is at 45%, rural access 30% and Urban 55% respectively while households without power rest at 20million.

This implies that Nigeria has Electricity energy gap of over 6,000,0MW, this identified gap could be seen as an opportunity for entrepreneurs to invest in various sources of energy generation, transmission and distribution in Nigerian. Notwithstanding, out of an average 4000MW daily generation, transmission and distribution still remains a challenge due to poor investment and lack of adequate infrastructure. Licensed Electricity Distribution Companies (Discos) still battle with issue of meter installation, procurement, and distribution and non-payment of energy consumed by some members of the public. All this could be associated with the companies low capital investment in human capital and material resources, weak research and development unit resulting in a weak business model.

2.5. Tariff

According to USAID Nigeria Power Africa Fact Sheet (2019) Nigeria has privatized its electricity distribution companies creating a wide range of tariffs among the distribution companies. Section 32 (d) of the Electric Power Sector Reform (EPRS) Act, 2005 is to ensure that the prices charged by licenses are not only fair to customers but sufficient to allow the licenses to finance their activities and make profit for efficient operation (NERC 2005). It is in view of the EPRS Act that the NERC under Section 76 of the EPSR Act 2005, established a methodology for determining electricity Tariff Order called the Multi-Year Tariff Order (MYTO) model which sets out tariffs for the generation, transmission and distribution of electricity in Nigeria. The MYTO is used to set wholesale and retail prices for electricity in the industry by employing a unified way to determine total industry revenue requirement that is tied to measurable performance improvement and standards. The tariff model is also designed as an incentive based regulation that seeks to reward performance above given benchmarks, reduce technical and non-technical//commercial loses and leads to cost recovery and improved performance standards from all industry operators in the Nigerian Electricity Supply Industry (NESI). The objectives of the MYTO are: (i). cost recovery/financial viability; (ii). certainty and

stability framework; (iii). incentive for improving performance; (iv). allocation of risk; and (v). simplicity and cost-effectiveness.

According to Abuja Electricity Distribution Plc Annual Report 2015, in 2008 NERC introduced a Multi-Year Tariff Order (MYTO) as the frame work for determining the industry pricing structure and this forms the basis of revenue earned by the Company after taking into consideration changes as applicable per the Transitional Electricity Market (TEM) rules as issued by NERC. Consequently, the introduction of the MYTO has increased the company revenue by 30% as a result of the 33.20% increase in tariff by NERC from 2014. However, this policy could be said to only be applicable to the non-renewable (hydro) energy sector.

2.6. NERC MYTO Tariff Business Model

The MYTO methodology uses a building blocks approach in setting transmission and distribution tariffs, providing the benefits of both price cap and incentive based regulation. Figure 3 below shows an illustration of the MYTO generation, transmission and distribution business model of the Nigerian Electricity Regulatory Commission (NERC).

NERC MYTO Transmission and Distribution Business Model

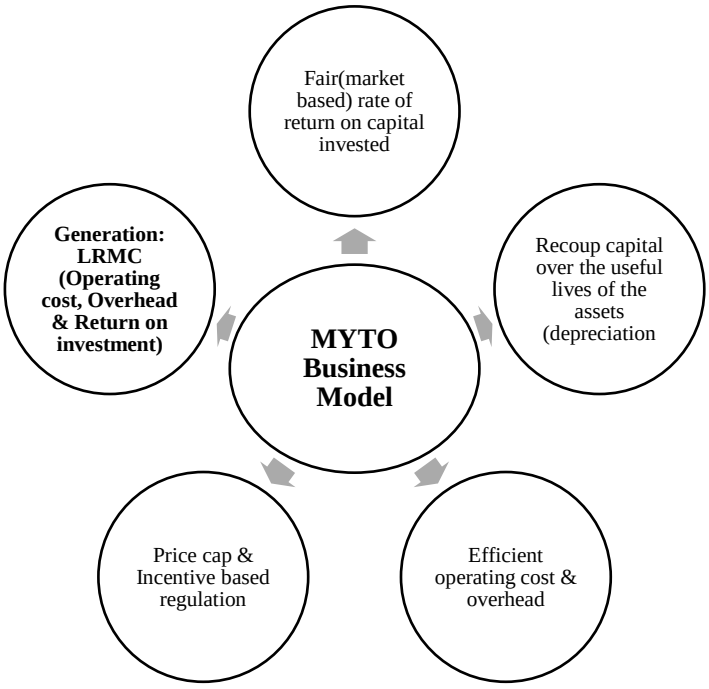

Figure 3: Diagram of NERC MYTO Generation, Transmission and Distribution Business Model

Source: Author

The three building blocks are:

a. The allowed return on capital: Fair (market based) rate of return on capital invested.
b. The allowed return on capital: Recoup capital over the useful lives of the assets (depreciation).
c. Efficient operating costs and overheads.

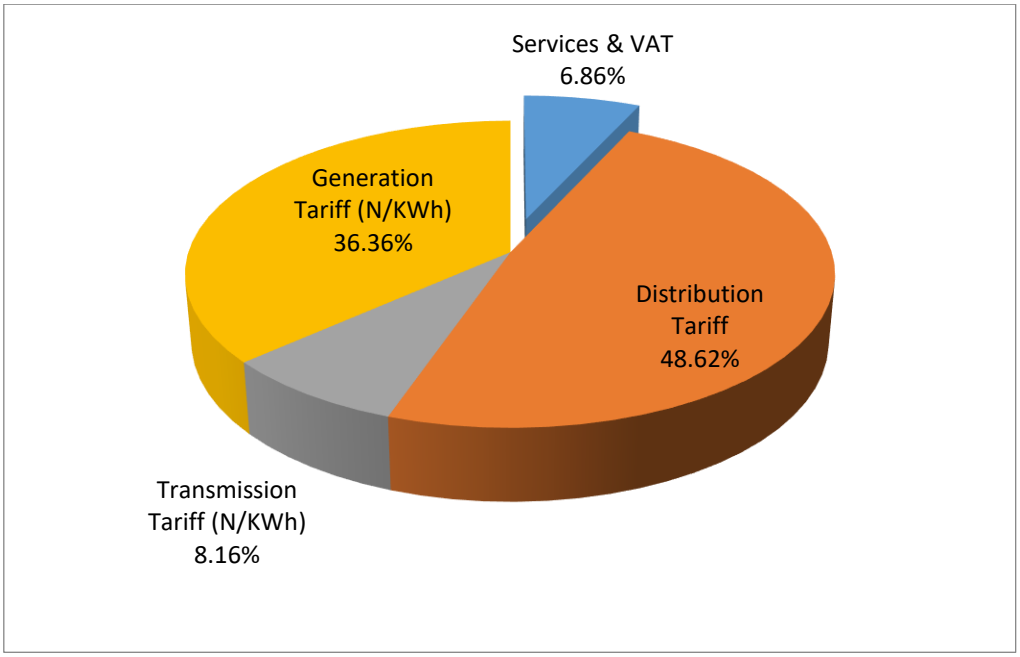

Figure 4: Electricity Tariff share percentage among Generation, Transmission and Distribution companies (adapted from NERC, 2019)

Generation tariff is determined using a benchmark Long Run Marginal Cost (LRMC) of the most economically efficient new entrant. This offers a transparent framework for determining electricity tariff that engender legitimacy and acceptance by providing for clear dis-aggregation and determination of necessary operating cost and overheads and reasonable Return on Investment. As seen in figure 4 above, out 100% tariff charge by energy companies, distribution companies part with 48.63% being the largest share while generation and transmission companies take 36.36% and 8.16% respectively. The remaining 6.86% serves as services & VAT.

2.7. Challenges of Business Model in Nigeria's Energy Sector

After a critical review of literature, the study categorizes the challenges of business model in Nigeria into three main components; (i) Non-robust Policy and Operational Framework (ii) Deficit in Infrastructure requirements (iii) Macro-economic forces and lack of credit utilities. The categorization of these challenges is supported by World Bank 2019 which stated that the solar in Nigeria lags the regional benchmarks due to general unfamiliarity with the technology

and commercial structures, comparable commissioning performance, and power delivery benchmarks and that the price-delivery mechanisms have not been fully developed which contribute to inability to attract private capital at optimal rates and generally high over cost. USAID Nigeria Power Africa Fact Sheet, (2019) also identified some major challenges confronting investment and enabling environment in Nigeria energy sector as; Macroeconomic forces, Lack of creditworthy utilities and Lack of strong and transparent regulator needed to scale up the level of energy poverty in Nigeria.

Also, the MYTO business model developed by the NERC in collaboration with its relevant stake holders in the non-renewal energy sector has failed to meet up with expectations of electricity consumers generally due to lack of capacity of most electricity distribution companies to meet expected energy demand within the MYTO model. Despite the considerable increment in electricity tariff by the NERC, the distribution companies have not been able to meet up expectation. According to an online news report agency the Cable, Awojulugbe 2019, reported that the Government of Nigeria has set up a committee that will review the ownership of the electricity distribution companies (Discos) with intention to invest $250 million to boost the sector. Adding that, the government has spent over N1.7 trillion in the years 2017, 2018 and 2019 which is not sustainable for the government. If this decision comes into effect, then new investors will emerge and the MYTO business model may no longer stand the taste of time in the energy market and would have to give way for a more acceptable business model in a competing market as that of Nigeria.

2.8. Analysis, Discussion and Conclusion

Based on findings from empirical reviews, it is evident that there exist business models in the energy sector of Nigeria for both renewable and non-renewable energy. The introduction of the Multi-Year Tariff Order (MYTO) by NERC in 2005 as the frame work for determining the industry pricing structure which formed the basis for revenue earned by the Distribution Companies after taking into consideration changes as applicable per the Transitional Electricity Market (TEM) rules clearly defines the business model used by the electricity, transmission and distribution companies in Nigeria. The MYTO business model framework also determine the tariff for power generation using the Long Run Marginal Cost (LRMC) calculation to cover for operation cost, overheads and return on investment. However, the application of the MYTO model in the business environment as the sole concept for tariff setting has been challenged by many users. The model is widely criticized and seen as inefficient due the inability of energy producers to deliver quality service to consumers and address complaint that would aid improve the system work in a more efficient manner. The application of the MYTO is yet to test as a preferred and workable model largely because a huge number of household especially in rural areas are yet to be metered. There are also cases of price/unit disparity for different metering system across the distribution companies. This also points to the fact that the distribution companies have not adequately invested as agreed with the NERC on the required level of infrastructure to be put in place within the short-run. Consequently, the energy sector has continued to experience energy wastage and leakages as a result of poor investment in research, expansion of infrastructural base and non-rubost policy and operational framework which form

the key components in business model innovation. It is quite clear that financial and human capital is lacking in the overall energy chain in Nigeria.

3. Policy Recommendations

In view of the findings and discussion, the study recommends that the Government of Nigeria;

(a) Should review and/or develop new policy documents that meet international standards providing price- delivery mechanism that will enable investors develop business models (inclusive of price cap and incentive based regulation) for both renewable and non-renewable energy.
(b) Develop a single policy documents for the various energy sources that will address the issues of dynamism in energy generation, transmission and distribution and pricing. And possibly look at policies that would encourage energy mix.
(c) Should channel substantial resources to technological development, research and development in the energy sector and ensure that only companies that have competence and capacity in the sector are allowed to participate in the process of privatization bidding and award of energy licenses.
(d) Strengthen the capacity of Nigerian Electricity Regulatory Commission by collaboration with sister international agencies on the provision of favourable policy documents and other required mandate to suite the Nigeria's energy business climate.

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