Energy Sector Governance and Cost Reflective Pricing in West Africa

by

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ABSTRACT

This study was carried out to consider the effectiveness of energy sector governance and electricity pricing in Nigeria – which also has implications for West Africa's power pool and energy policies in the region. This paper applies the concept of cost reflectivity to analyze the current electricity tariff regime in Nigeria. Multi Year Tariff Order (MYTO) 2015 methodology was applied in the analysis - employing the marginal cost (MC) and marginal revenue concepts (MR). It was noticed that, the cost of providing a unit of electricity (1 kWh) varies by region while the revenue generated from providing the same unit of electricity also varies by region. However, energy sector governance in the main West African electricity market - Nigeria - is very weak. While, a competitive market structure is gradually emerging, debts accrue along the value chain with every unit of power consumed. More so, the underlying assumptions of the methodology have been consistently violated and as such tariffs have not been completely cost-reflective. Some underlying assumptions of the MYTO methodology need to be reviewed for it to sufficiently de-risk energy investments in Nigerian Electricity Supply Industry (NESI) especially against macroeconomic shocks.

Keywords: MYTO, NESI, Investment, GenCos, TCN, DisCos, Nigeria

ABBREVIATIONS

MYTO:	*Multi-Year Tariff Order*
NERC:	*Nigerian Electricity Regulation Commission*
NEPA:	*National Electric Power Authority*
PHCN:	*Power Holding Company of Nigeria*
GWH:	*Gigawatt-Hour*
KwH:	*Kilowatt-Hour*
GDP:	*Gross Domestic Product*
TCN:	*Transmission Company of Nigeria*
NESI:	*Nigerian Electricity Supply Industry*
DisCos:	*Electricity Distribution Companies*
GenCos:	*Electricity Generation Companies*
CAPEX:	*Capital Expenditure*
OPEX:	*Operating Expenditure*
WACC:	*Weighted Average Cost of Capital*
MC:	*Marginal Cost*
MR:	*Marginal Revenue*
MYTO-1 or MYTO (1.0):	*Multi-Year Tariff Order 2008 to 2021*
MYTO-2 or MYTO (2.0):	*Multi-Year Tariff Order 2012 to 2017*
MYTO-2.1:	*Multi-Year Tariff Order 2015 to 2018*
MYTO-2.1 (Amended) or MYTO 2015:	*Multi-Year Tariff Order 2015 to 2024*

1 INTRODUCTION

1.1 Background to the Study

Energy plays a fundamental part in the economic growth process. More than three-quarters of the studies reviewed find a positive correlation between energy use and economic growth, and half the studies find a positive and significant causal link from energy use to economic growth. Energy use is either the cause or the facilitator of economic growth (The CDC Group Plc, 2016). To achieve economic growth and consequently, development, it is therefore of utmost importance for developing economies to stimulate growth in energy provision. In view of the structural problems facing Nigeria and other developing nations, an influx of private and public investments will be instrumental in increasing her productive capacity.

Though often overlooked, energy industry governance is crucial to the realization of policy goals. Sustainable economic development is unachievable without clear rules and effective governance of energy industries. Due to policy incoherence, governance issues and misalignment of electricity markets are some of the key factors hindering renewable energy innovation in many countries (Ang, Röttgers, & Burli, 2017). The case of electricity tariff risks associated with potential investments in Nigeria Electricity Supply Industry (NESI) demonstrates the need for better governance. Furthermore, for investors to be convinced that NESI is profitable for investments, the issue of the cost-reflectivity in the tariff system needs to be considered. This is particularly relevant for electricity supplies into the West African Power Pool (WAPP). More so, with the Nigerian Bulk Electricity Trading Plc (NBET) managing the long-term relationship between Nigeria and Niger's NIGELEC, as well as, Benin Republic's SAKETE. According to Shaw, Attree, and Jackson (2008), cost reflectivity is a requirement that prices and charges signal the cost of an activity. Cost reflectivity implies that prices depend on factors such as location, time, pattern of use and other users. Cost reflective pricing results in allocative efficiency and a customer's response depends on how much the service is valued. The maximization of society's benefit resulting from cost reflectivity makes pricing efficient (CUAC, 2015). The following discourse gives a context to the underlying issues.

Electric power generation in Nigeria began in 1896. In 1972, NEPA was formed, which later metamorphosed to Power Holding Company of Nigeria - as a holding company created for the unbundling and subsequent privatization of the government ownership. The GDP of Nigeria's power sector in 2015 was estimated at ₦536,673,000,000 (NBS, 2016) with 25 power plants in the country. According to the World Bank, Nigeria is second to India on the list of countries with the highest electricity access deficit with 75 million people compared to India's 263 million persons (Muanya, 2017).

The methodology for setting electricity prices in Nigeria has been vague and uncertain since the Nigerian electricity sector was established. One reason is that electricity was considered a public welfare service to be provided by the government. Therefore, the electricity price had traditionally been subsidized. Prior to 2008, a uniform pricing structure was used in which the electricity tariff remained fixed for years despite continuous rise in the price of generation fuels. Consequently, the company operated with monthly deficits of nearly ₦2 billion and this resulted in unreliable and inadequate electricity supply. This pricing regime discouraged the entry of profit oriented private investors (the existing law or absence of enabling legislation was a greater deterrent to private investment than the tariffs). There was a need for appropriate policies to institute transparency in tariff determination and provide stability and predictability in electricity pricing (Bello, 2013).

Owing to this, Nigerian Electricity Regulatory Commission (NERC) was established to develop a new tariff regime towards reforming energy markets. One of the primary functions of NERC is to ensure that prices charged by licensees are fair to consumers and sufficient to allow the licensees to finance their activities and to allow for reasonable earnings for efficient operation. NERC is empowered to establish one or more tariff methodologies for regulating electricity prices to prevent abuse of market power. In its effort to provide a viable and robust tariff policy for NESI, NERC in 2008 introduced a Multi-Year Tariff Order (MYTO) as the framework for determining the industry's pricing structure. The MYTO methodology provides the process to tariff regulation - in compliance with the statutory obligation in Section 76 of the Electric Power Sector Reform Act (EPSRA) 2005 (FGN, 2005). It provided a fifteen-year tariff path for the electricity industry with minor and major reviews bi-annually and every five years respectively (NERC, 2012)

The first MYTO model was introduced in 2008, reviewed over the years and several alterations have been made to it. Initially, the model termed MYTO 1.0 was applied from 2008 to 2012. Subsequently, following a major review of the methodology in June 2012, MYTO 2.0 was issued and it was to remain effective from 2012 to 2017 (Adeyeye, 2017). However, after a minor review in December 2014, NERC issued a new MYTO called the MYTO 2.1 that was to take effect from January 2015 to 2018. That was not to be because in April 2015, NERC, revised and amended MYTO 2.1 by removing the collection loss component of the electricity tariffs resulting in MYTO 2.1 (**amended**). Subsequent review of the amended model brought about the issuance of MYTO 2015 which is expected to remain effective from 2015 to 2024. MYTO 2015 methodology provides for a 10-year tariff scheme that ensures all stakeholders make necessary investments and recover profit between 2016 – 2024 (Adeyeye, 2017).

1.2 Statement of The Problem

Nigerian Electricity Supply Industry (NESI) operations report indicates that over N534 billion of revenue was lost by the power sector in 2016. Among the reasons for the loss were shortages in gas supply, frequency and line limitations, as well as, water levels management constraints that led to several cases of electricity outage in the country. According to Ahiuma-Young, Obasi & Ejoh (2017) part of the N534 billion lost could have been used to bridge the liquidity gap in the power sector, estimated at N1trillion.

Despite the above, the greatest risk faced by investors across the entire electricity value chain in a privatized power sector is payment risk – which is particularly high in Nigeria's power sector. Distribution companies (DisCos) - primary revenue source of the entire power sector value chain - have been unable to meet their energy payments in full and other obligations to the electricity market. Thus, Generation companies (GenCos), gas producers and gas suppliers are owed billions of naira in outstanding payments for power generated and sold to DisCos (Omonfoman, 2016). The consequences of poor governance and under-utilized or under-performing power sector are: poverty, inequality, and high operating costs, as well as, difficulty of doing business. The afore-mentioned issues hamper economic growth and sustainable development of any developing economy.

The impact of electricity generation or consumption on economic growth has been thoroughly analyzed and studied in different countries - developed and developing, including Nigeria. However, the pricing models or methodology behind electricity generation, transmission and distribution in such countries have received little attention. Ahmed (2013), assessed the impact of MYTO on the flow of private investment to the Nigerian electricity supply industry (NESI). The study indicates that tariff review has a positive and significant impact on the flow of private investment to NESI though it explains only about 3% of the variation in the dependent variable (FPI).

Have the Multi Year Tariff Orders (MYTO) been reviewed continually because the pricing methodology is weak or they are not cost-reflective? Could it be due to poor governance in the energy sector or a combination of both. This study aims to answer these questions, provide empirical evidence on whether Nigeria's MYTO system is cost-reflective and, if yes, to what extent is it? Some studies have focused on Nigeria's MYTO regime but very little empirical research has been done on it. Moreover, very few studies have emphasized the governance aspect of energy sector pricing considered here and so this study aims to fill these knowledge gaps.

1.3 Objectives of the Study, Research Questions and Scope

The general objective of this study to find out if the prices determined by using the Multi-Year Tariff Order (MYTO) methodology reflect the costs of electricity generation, transmission and distribution. It measures the unit cost of energy provision relative to the revenue per unit to determine net profit or loss accruing along the value chain. Specifically, the study addresses the following questions: Is the revenue from one unit of electricity provided greater than the cost of producing that unit? If not, how has energy sector governance failed to bring about cost reflective pricing in NESI?

The study covers the period from 2015 to 2017 and focuses solely on the MYTO (2015) methodology and the power sector of the Nigerian economy. The limitations of this study include the confidentiality of the model and reliability of the secondary data used. However, the analysis is conceptually sound and discussions significantly contribute to existing literature. Furthermore, it highlights key issues for future research endeavours.

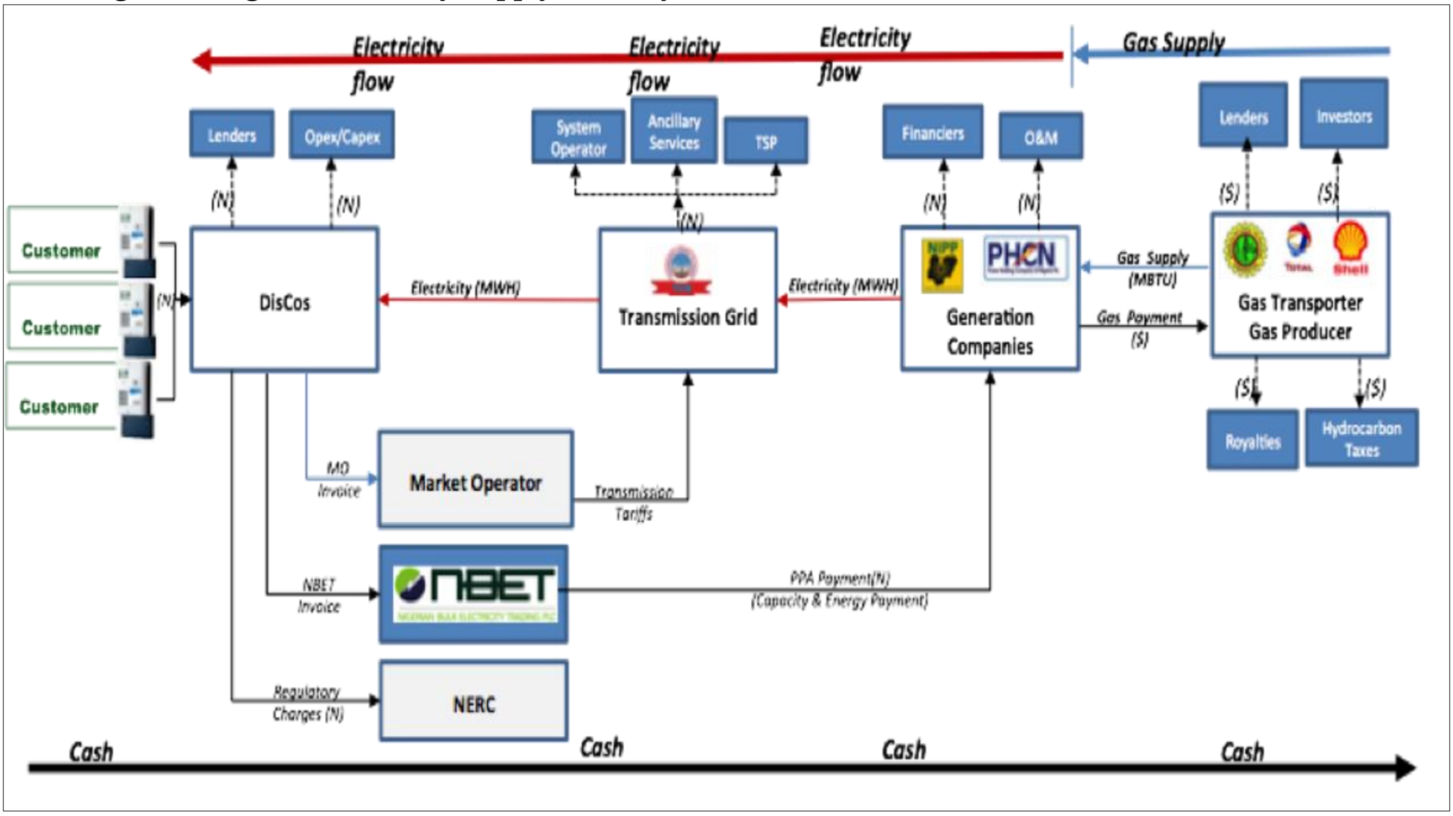
2.1 Conceptual Review of Literature

Power flows from generation to transmission and then to distribution where it is sold to consumers. Generation involves conversion into electricity from energy resources like fossil fuels, uranium, wind, biomass, hydro, geothermal and solar. It includes electricity produced in electricity-only plants and in combined heat and power plants (OECD, 2016). After electricity is generated at a power plant (by a generating company/project), it is transmitted on high-voltage power lines before it can be distributed to homes and businesses. Electric power transmission involves transferring electricity from power plants to local distribution grids. Subsequently, it is distributed to end-users on local power distribution lines. Electricity distribution is the final stage in electricity delivery and it is the most familiar portion of the supply chain as power lines carry electricity into homes and businesses (IER, 2014).

Nigerian Electricity Supply Industry (NESI) is made up of seven (7) generating stations, one (1) transmission system and eleven (11) distribution/marketing zones which are captured in Figure 1. Distribution companies (DisCos) generally serve as financial conduits within the industry: receiving and distributing electricity to end-users; billing customers; providing payment services for collecting and remitting revenues (after deducting its overhead costs) to the Nigerian Bulk Electricity Trading Plc (NBET).

Electricity trading and functioning of the market is hinged on funds flowing backward from consumers through the distribution outlets to the rest of the electricity value chain. Though, a key objective for the sector reform was to ensure liquidity in the electricity value chain, but it is currently not happening (Ogbu, 2016). More so, the inadequate provision of pre-paid meters for many consumers hampers revenue collection and realization of return on investment. This situation is further complicated by power theft and several illegal connections that are not accounted for within the MYTO regime (Adeyeye, 2017). In the prevailing circumstance, it is apparent that energy sector governance should be re-evaluated to de-risk investments and ensure the emergence of sustainable electricity trading.

Figure 1: Nigeria Electricity Supply Industry



Source: Sahara Group (2017)

Under MYTO-2, there were two (2) major changes to the existing methodology and these were brought about by the need to:

- ✓ be more flexible in wholesale power generation pricing
- ✓ consider several other variables during minor reviews

This major review afforded stakeholders the opportunity to evaluate the methodology, make inputs into the existing model, incorporate Feed-In Tariffs (FITs) for renewable energy (wind, biomass, solar and small hydro) and develop tariffs for coal-fired power generators. Some of the assumptions reviewed included: available generation capacity, forecast of electricity demand, expansion of the transmission and distribution networks, capital expenditure (capex), actual and projected sales, operating costs (opex), fuel costs, interest rates, weighted average cost of capital (WACC) and revenue collection efficiencies and subsidies.

NERC (2012) used the building blocks approach as a regulatory method to set Distribution Use of System (DUOS) charges. The building blocks approach is simply a way of bringing together all costs identifiable in the industry in a consistent accounting framework. In the approach, NESI's overall revenue requirements were computed and used as the basis for calculation of the revenue to be collected per unit of electricity sold. The annual revenue requirements for distribution and retailing determined, using the building block approach, was then divided by the forecasted level of energy delivered to each of the existing eleven (11) distribution networks to produce a DUOS charge per unit of electricity to be sold and collected by the relevant Disco.

Cost reflective pricing is when the price of a good or service reflects its cost of production. It has several benefits, for example: where a consumer values a good/service more than its cost of production, the consumer will purchase the good/service. This results in net benefit to society because the cost of inputs is less than the benefits gained (by the consumer). Where a consumer does not value a good/service more than its cost of production, the consumer will not purchase the good/service. This prevents a net loss to society. By sending signals about production costs, cost reflective pricing allows consumers' and producers' resources to be allocated to activities that have the greatest net benefit to society. This maximisation of welfare makes pricing efficient (Jones, 2015).

3.1 Theoretical Framework and Methodology

Marginal cost pricing and average cost pricing are two basic concepts of energy pricing that are widely used (Bhattacharyya, 2011). Although long-run average cost is sometimes a proxy for marginal cost both concepts are fundamental to determining the most profitable level of output from a given plant. Marginal variable cost, or simply marginal cost MC(y) is the increase in variable cost incurred when output (y) is increased by one unit:

$$MC(y) = VC\,(y + 1) - VC\,(y) \qquad (3.0)$$

Theoretically, a more precise definition can be obtained by regarding VC(y) as a continuous function of output (Dorfman, 2006). Given certain economic disadvantages of average cost (Bhattacharyya, 2011), the marginal cost concept is applied here. The short-run marginal cost concept assumes that at least one factor of production is fixed. This offers a simplistic and easy to understand analysis. More so, it can be used very conveniently to ascertain the cost-effectiveness of the pricing methodology in the power sector. If the marginal cost of any given output (y) is less than the price, sales revenues will increase more than cost as output is increased by one unit (or even a few units); and profits will rise. Conversely, if the marginal cost is greater than the price, profits will be increased by cutting back output by at least one unit. It then follows that the output that maximizes profits is the one for which MC(y) = P_0. In the short-run, at a given price, the profit-maximizing firm will produce and offer the quantity for which the marginal cost equals that price (Dorfman, 2006).

The conclusion that marginal cost tends to equal price is important in that it shows how the quantity of output produced by a firm is influenced by the market price in a competitive market. Thus, the quantity that the firm will produce in response to any price can be found by plotting the marginal cost curve, and for this reason the marginal cost curve is said to be the short-run supply curve for the firm (Dorfman, 2006)

3.2 Model Specification

The model to be used in this study is specified below:

$$PR_E \text{ or } LO_E = TR_E - TC_E \qquad (3.1)$$

Where: $PR_E \text{ or } LO_E = Profit\ or\ loss\ due\ to\ electricity\ provision$

$TR_E = Total\ revenue\ from\ electricity\ provision$

$TC_E = Total\ Cost\ of\ Electricity\ Provision$

Rewriting equation (3.1) above using the marginal cost (MC) and marginal revenue (MR) concepts and inputting them in the short-run profit-maximization function:

$$PR_E = MC_E < MR_E \qquad (3.2)$$

$$LO_E = MC_E > MR_E \qquad (3.3)$$

$$Note: MR_E = p_e$$

Where: $PR_E \text{ or } LO_E = Profit\ or\ loss\ due\ to\ electricity\ provision\ respectively$

$MC_E = Marginal\ cost\ of\ electricity\ provision\ (1\ kWh)$

$MR_E = Marginal\ revenue\ from\ electricity\ provision\ (1\ kWh)$

$p_e = Price\ of\ 1\ kWh\ of\ electricity$

4.1 Data Analysis and Discussion

To answer the research questions, descriptive statistical technique is applied to historical data sourced from the regulator (NERC). This approach is considered suitable using actual costs of electricity supplied and revenue data from the Nigerian Electricity Supply Industry (NESI) – hence, no need to estimate parameters and test the hypothesis using inferential statistical techniques. The unit cost of electricity provision is the marginal cost of providing 1kWh of electricity to the end users and in the Nigerian Electricity Supply Industry, it varies from one region to the other – and for the respective DisCos. From Table 4.1, the unit costs of generation, transmission and distribution add up to the unit cost of 1kWh of electricity supplied.

Table 4.1 Unit Cost of Energy Supplied

DisCos	Generation Cost (₦/kWh)			Transmission Cost (₦/kWh)			Distribution Cost (₦/kWh)			Unit Cost of 1kWh (₦/kWh)		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Abuja	9.82	13.26	13.09	2.64	3.38	3.61	23.63	17.06	12.07	***36.08***	***33.70***	***28.77***
Benin	8.49	13.26	13.09	2.28	3.38	3.61	29.42	21.88	15.53	***40.19***	***38.52***	***32.24***
Enugu	10.44	13.26	13.09	2.81	3.38	3.61	19.03	22.14	14.80	***32.28***	***38.78***	***31.51***
Ibadan	8.75	13.26	13.09	2.36	3.38	3.61	23.18	17.97	13.45	***34.29***	***34.61***	***30.16***
Jos	7.26	13.26	13.09	1.96	3.38	3.61	42.17	30.29	24.01	***51.40***	***46.93***	***40.72***
Kaduna	7.82	13.26	13.09	2.11	3.38	3.61	33.35	18.71	11.65	***43.29***	***35.35***	***28.35***
Kano	5.01	13.26	13.09	1.35	3.38	3.61	38.68	19.63	13.54	***45.04***	***36.27***	***30.24***
Eko	7.62	13.26	13.09	2.06	3.38	3.61	19.02	11.26	8.33	***28.70***	***27.90***	***25.03***
Ikeja	8.06	13.26	13.09	2.18	3.38	3.61	16.37	10.54	7.75	***26.61***	***27.18***	***24.45***
P/H	9.28	13.26	13.09	2.50	3.38	3.61	32.61	27.06	19.21	***44.39***	***43.70***	***35.92***
Yola	3.77	13.26	13.09	1.02	3.38	3.61	55.62	19.36	14.75	***60.41***	***36.00***	***31.45***

Source: Authors' Computation using data from NERC and MYTO (2015) Methodology

Along the value chain of Nigeria's Electricity Supply Industry, distribution appears to be the costliest. In this regard, distribution losses are due to poorly located and/or non-metered buildings nationwide - as presented in Table 4.2. Furthermore, it is notable that about 50% of the 6.85 million customers in the Nigerian Electricity Supply Industry are not metered.

Table 4.2 Customer Base and Distribution Metering Gap as at January 2017

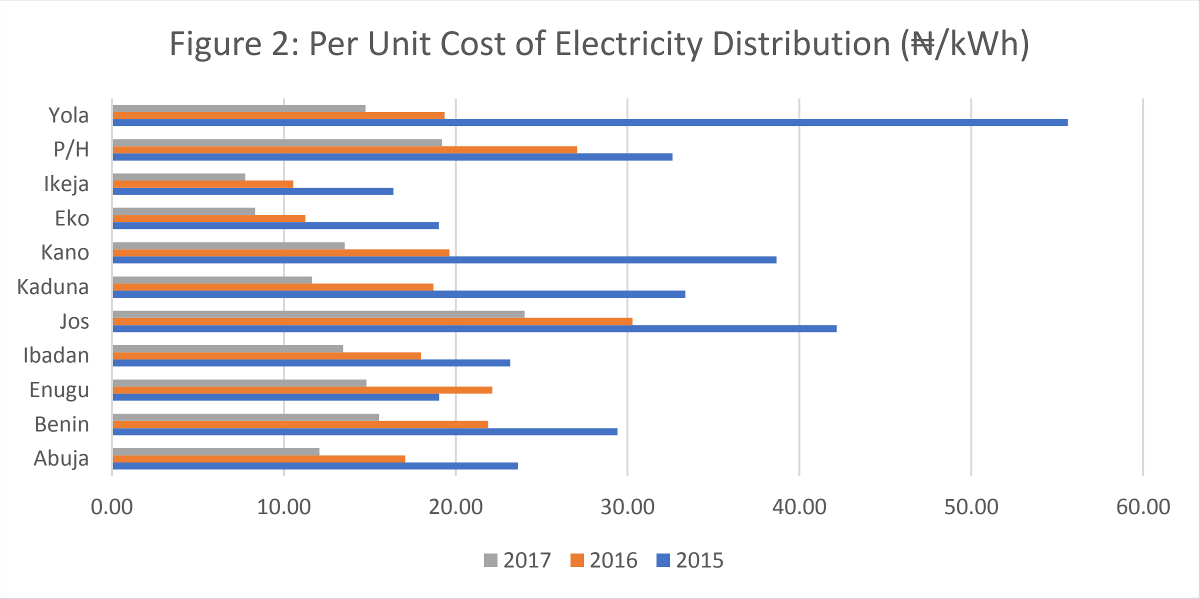
DisCos	Number of Customers	Total Metered	Metering Gap
Abuja	862,696	452,897	**409,799**
Benin	771,226	576,330	**194,896**
Eko	407,285	238,042	**169,243**
Enugu	809,829	222,184	**587,645**
Ibadan	1,375,811	621,187	**754,624**
Ikeja	755,525	479,862	**275,663**
Jos	329,858	175,517	**154,341**
Kaduna	405,951	225,695	**180,256**
Kano	472,453	150,322	**322,131**
PH	368,311	267,092	**101,219**
Yola	293,478	69,209	**224,269**
Total	**6,852,423**	**3,478,337**	**3,374,086**

Source: Authors' Computation using data from NERC

Non-metering along the value chain (grid level, intra-transmission and distribution) is a result of poor governance which has further implications. Some effects of non-metering by DisCos are:

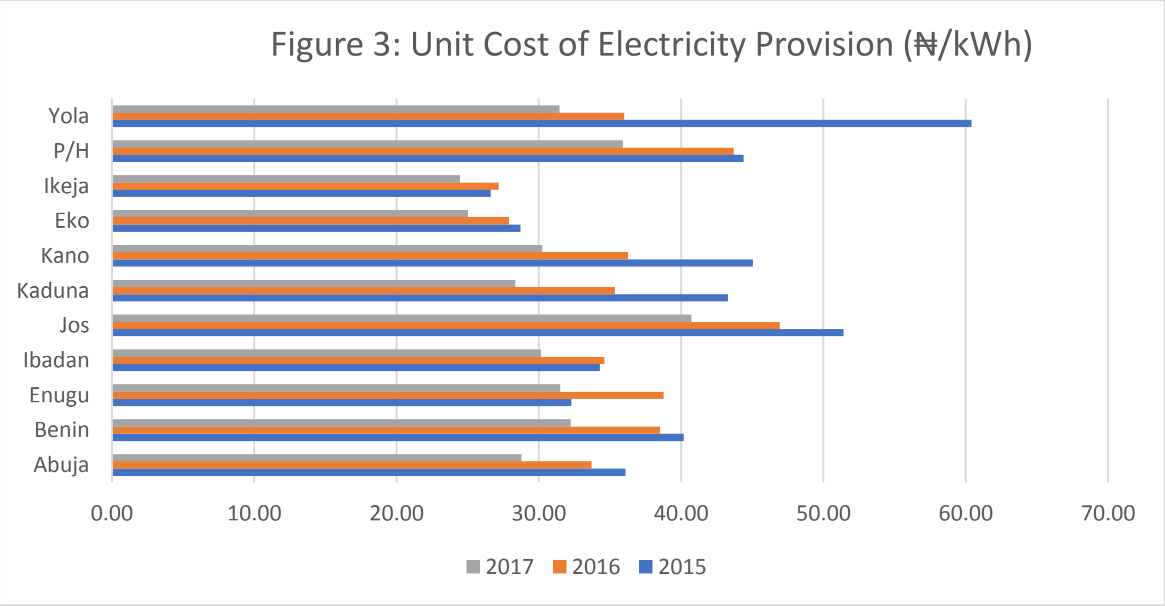
a) lack of accurate customer/consumption information, free electricity consumption by unknown/undocumented consumers and unquantified losses
b) poor management of distribution system and inefficient/costly service delivery

c) low revenue collections and unmet revenue projections by DisCos



Source: Authors' Computation using data from NERC and MYTO (2015) Methodology

Furthermore, due to distribution losses, costs incurred by DisCos are very high – understandably, the highest component of electricity supply cost in NESI. For instance, within the jurisdiction of Yola Distribution Company (DisCo) only 23.58% of customers have meters – the lowest percentage in the entire country.



Source: Authors' Computation using data from NERC and MYTO (2015) Methodology

As such, the unit cost of electricity distribution by Yola DisCo is among the highest. Although, the cost of generating and transmitting 1 kWh to Yola DisCo is among the lowest, it has one of the highest overall cost of providing 1 kWh. Meanwhile, Figure 2 and Figure 3 show that Ikeja DisCo has the lowest cost of electricity provision due to lower distribution losses incurred, economies of scale and possibly cost savings.

Table 4.3 The Revenue Per Unit of Energy Provided

Average Tariff (₦/kWh)			
DisCos	**2015**	**2016**	**2017**
Abuja	36.08	33.70	28.77
Benin	40.19	38.52	32.24
Enugu	32.28	38.78	31.51
Ibadan	34.29	34.61	30.16
Jos	51.40	46.93	40.72
Kaduna	43.29	35.35	28.35
Kano	45.04	36.27	30.24
Eko	28.70	27.90	25.03
Ikeja	26.61	27.18	24.45
P/H	44.39	43.70	35.92
Yola	60.41	36.00	31.45

Source: Authors' Computation using data from NERC

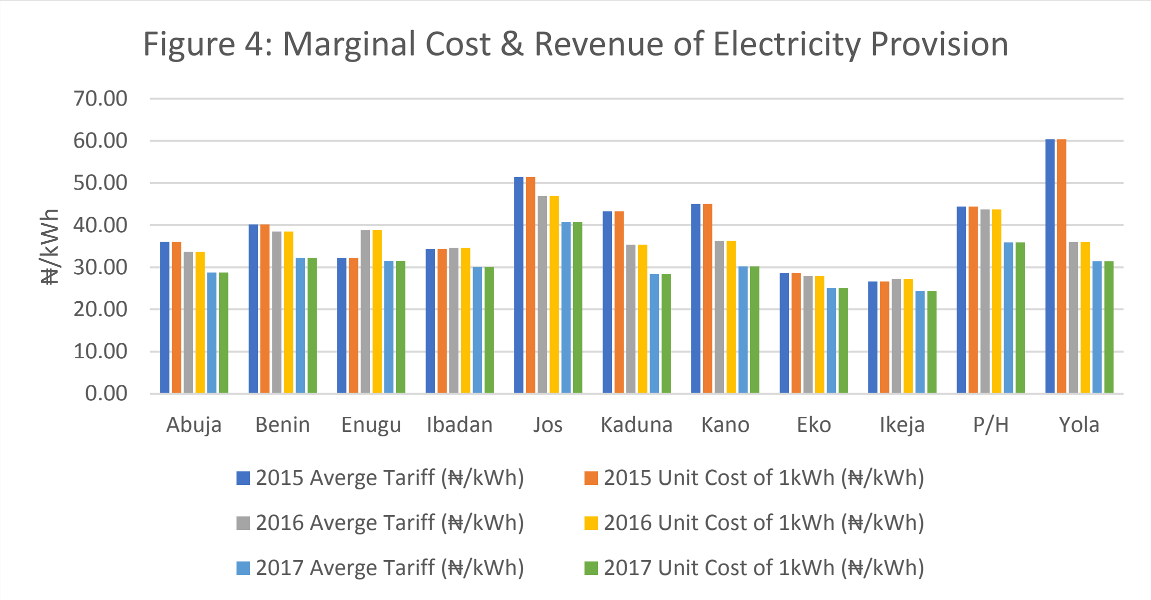
To maximize profits, in the short-run – where at least one factor of production is fixed – it is necessary for each firm's marginal revenue – market price – to be at the same level as the marginal cost. In a nutshell, to maximize profits in the short-run, firms will aim to supply energy at the point where their marginal cost (of generation/distribution) equals their marginal revenue. Table 4.3 shows that this varies for DisCos across the country. It is notable from the Table 4.3 that the average tariff paid by all five (5) classes of consumers in the power sector decreases over time. The revenue gotten from one unit of electricity provided is the marginal revenue generated by providing 1kWh of electricity for end users in NESI and it varies from one region to the other.

4.4 Unit Cost (computed) and Average Tariff of Electricity

	2015		**2016**		**2017**	
DisCo	**Average Tariff (₦/kWh)**	**Unit Cost of 1kWh (₦/kWh)**	**Average Tariff (₦/kWh)**	**Unit Cost of 1kWh (₦/kWh)**	**Average Tariff (₦/kWh)**	**Unit Cost of 1kWh (₦/kWh)**
Abuja	36.08	36.08	33.70	33.70	28.77	28.77
Benin	40.19	40.19	38.52	38.52	32.24	32.24
Enugu	32.28	32.28	38.78	38.78	31.51	31.51
Ibadan	34.29	34.29	34.61	34.61	30.16	30.16
Jos	51.40	51.40	46.93	46.93	40.72	40.72
Kaduna	43.29	43.29	35.35	35.35	28.35	28.35
Kano	45.04	45.04	36.27	36.27	30.24	30.24
Eko	28.70	28.70	27.90	27.90	25.03	25.03
Ikeja	26.61	26.61	27.18	27.18	24.45	24.45
P/H	44.39	44.39	43.70	43.70	35.92	35.92
Yola	60.41	60.41	36.00	36.00	31.45	31.45

Source: Authors' Computation using data from NERC and MYTO (2015) Methodology

Applying MYTO (2015) methodology sets the price of one unit of electricity provided equal to the cost for each regional market in Nigeria – as may be seen in Table 4.4 and Figure 4.



Source: Authors' Computation using data from NERC and MYTO (2015) Methodology

Furthermore, the cost of providing one unit of electricity (MC) and corresponding price (MR) are projected to decrease yearly. Considering that the computed results, we can say that the MYTO methodology sets prices that are cost-reflective if every cost is passed on the consumer. However, the assumptions underlying multi-year tariff calculations are no longer tenable but have changed drastically as summarized in Table 4.5.

Table 4.5 Some changing Parameters/Assumptions of MYTO Methodology

Parameters	MYTO Tariff Projections 2016	Actuals as at 30th September 2016	Difference	Remark
Nigerian Inflation	8.80%	17.90%	103%	Exogenous variable negatively impacting on cost reflectivity of tariffs
Naira to U.S Dollar Exchange Rate	198.97	308.56	55%	Exogenous variable negatively impacting on cost reflectivity of tariffs
U.S. Inflation	0.20%	1.50%	650%	Exogenous variable negatively impacting on cost reflectivity of tariffs
Generation Capacity MW	5465	3213	-41%	Exogenous variable negatively impacting on cost reflectivity of tariffs
Energy Delivered to Discos GWh	38639	22718	-41%	Exogenous variable negatively impacting on cost reflectivity of tariffs
Generation Cost N/kWh + TLF	13.26	18.79	42%	Exogenous variable negatively impacting on cost reflectivity of tariffs

Source: Dr. Anthony Akah "**NERC's Perspective on Liquidity Challenge in the Power Sector & the Disco"** (2017)

Meanwhile, only changes in four (4) variables – inflation rate, gas prices, foreign exchange rates and daily generation capacity - call for minor review of the MYTO as stipulated by the NERC. Over the past two years, two of these variables - inflation rate and exchange rates - have been changing drastically. When the generation capacity (MW) and generation costs drastically change, a major review of the MYTO methodology is required. So far, MYTO methodology have become complex to govern in NESI. It has become more expensive to produce one unit of electricity but tariffs have not been raised to reflect the increased cost of generation, transmission and distribution. Another pertinent issue which is unclear but worth considering is the responsiveness of tariffs to unexpected declines in costs along the value chain.

5.1 Conclusion and Policy Recommendations

MYTO appears to be efficient and cost reflective as a methodology for energy price determination. Due to poor governance, its applicability in Nigeria Electricity Supply Industry (NESI) throws up peculiar challenges regarding timeliness or rapidness of cost reflectivity due to the metering gaps identified. The analysis indicates that when assumptions and parameters of MYTO methodology – available generation capacity, electricity demand, expansion of the transmission and distribution networks, capital expenditure, actual and projected sales, operating costs, fuel costs, interest rates, weighted average cost of capital (WACC), revenue collection efficiencies, subsidies, gas prices and foreign exchange rates – are not violated, the set energy prices (tariffs) are cost-reflective. However, when the assumptions are violated, the MYTO methodology does not set prices that are cost-reflective but misleading. This is because the marginal cost of providing one unit of electricity becomes higher than the marginal revenue. Consequently, every unit of power consumed results in some debt owed DisCos, transmission company of Nigeria (TCN), and generating companies (GenCos) - debts accrue along the value chain. Herein, lies another failure of governance.

Based on the findings of this study, the following are recommended:

I. Dealing with unmetered customers and closing the metering gap is highly necessary to reduce the losses in revenue from these unmetered customers. Also, a framework to decouple Metering from DisCos to facilitate third-party investment in metering should also be implemented so that DisCos can focus on the key task of distributing electricity. This will increase the efficiency of demand-side management. DisCos should also be made to purchase locally manufactured meters instead of importing at higher costs.

II. It is recommended that tariffs should be made 100% cost reflective with no provision for accommodating DisCos' inability to raise funds from commercial banks to finance underrecoveries built into the tariffs. The level of tariff sculpting (if any), should be determined by each individual Disco, however, this will be dependent on DisCos signing up to activate their contracts, making full payment and bearing stiff sanctions in case of default. Also, reviewing meter pricing (in the tariff structure) that is still benchmarked to Naira-US Dollar exchange rate of N160. This is one of the reasons why there is a shortage of meters in the market. Furthermore, the DisCos need to be transparent with their financial records and be more accountable to enable the GenCos and the TCN collect the monies due them

III. With regards to the available generation capacity, the implementation of feed-in-tariffs to attract and encourage private sector investment in clean coal-fired and solar-powered plants will increase energy available to send to the DisCos for distribution. The current level of interest rates (14%) discourages all investment borrowings locally by firms in the power sector, the commercial and development banks should give loans with single digit interest rates – from 0% to 9% - to these companies. Firms can then use these investments to expand and boost their available capacities. A reworking of the governance structure to reduce debt burden along the value chain will go a long way to make tariffs more cost reflective.

IV. With regards to the expansion of distribution and transmission networks, key steps should to be taken for the development of a smarter grid that will boost the efficiency of energy provision.

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