



Prevalence of Electricity Theft among Households in Lagos State, Nigeria

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Abstract

Power outages and blackouts have continued to characterize household electricity supply despite the desire of Nigerians to have improved quality of electricity supply. Nigeria has an installed electric power capacity of 12,500MW but power sent out daily as at the end of June 2019 was 3,419MW. This is 200kWh per capita, which is a fraction of 4,229kWh per capita for South Africa. Worst still, Nigerians have only 59.3% access to electricity and those connected to the grid face extensive power interruptions. Attainment of stable and reliable electricity supply requires three basic dimensions: technicalities, organisational structures and reduction of Electricity Theft (ET) to the barest minimum. Previous studies have focussed more on the technical and organisational requirements than on issues bothering on ET and its resultant effects on stable electricity supply. Therefore, this study investigated the prevalence of ET among households in Lagos State, Nigeria. A self-constructed structured questionnaire focusing on demographic characteristics and prevalence of ET was purposively administered to 580 households (area of franchise under Ikeja Electric Plc. = 330, under Eko Electricity Distribution Company = 250), using the statistical sample size determination formula. Descriptive and inferential statistics was used to identify and analyse prevalence of ET among households. The extensive Electricity theft among households in Lagos State, Nigeria, was exacerbated by weak enforcement of anti-electricity theft laws with severe consequences on the entire electric power value chain. Strengthening institutions for enforcement and application of anti-electricity theft laws is recommended to mitigate the problem.

Keywords: Electricity theft in Lagos State, Electric power utility, Anti-Electricity Theft, Laws, Electricity tariff

1.0 INTRODUCTION

Theft is quite common in electricity distribution systems as a result of which the utility fails to receive the full price of the power it sold in many countries, especially the developing ones [1]. Electricity theft harms the financial health of distribution companies and affects future investments in the power sector. Energy worth billions of dollars is stolen every year and the costs are routinely passed on to the paying customers directly in the form of high tariff rates and indirectly through poor quality of service [2].

Electricity theft alone costs hundreds of millions of dollars every year to electricity distribution companies in Pakistan. In Ghana, about 30% of electricity supplied by the utility companies is lost through theft and other illegal activities [3]. Similarly, theft of electricity in Uganda is a problem resulting into losses of up to \$30million annually for UMEME Ltd the main electricity distribution utility [4]

In 2008 alone, Inspectors in Turkey discovered that 196,000 electricity customers out of the 4.8 million subscribers were using electricity illegally [5]. However, electricity theft ratios in developed and developing countries differ substantially. The theft rate in the US and Western Europe is very low, approximately 1-2% of distribution. The OECD average is approximately 7%. In developing countries such as India, Malaysia, Bangladesh and Turkey, the size of the loss is far more considerable [6]

Of course, electricity theft in Nigeria is a symptom of a more serious malaise requiring a comprehensive empirical investigation as the effects of the losses to both the utilities and end-users can be very significant with a huge capacity to influence the quality of service delivery. Given the complex nature of the factors that lead to electricity theft, Smith [2] recommends that before any action is taken against electricity theft it is crucial that the problem be well understood. Nigeria's on-going struggle to reduce high electricity theft, despite having introduced many reforms and pre-paid meter technologies, makes it a worthy cause.

However, in discussing electricity theft with the aim of illuminating the problem, and importantly how to

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mitigate it, this study goes beyond the grandiloquence of why people steal electricity or why the problem has remained intractable as these have been largely addressed by earlier studies [7]. Consequently, the focus of this paper is on the magnitude or prevalence of electricity theft in Nigeria's electric power system. How big/huge is the problem of electricity theft in Nigeria Electricity Supply Industry (NESI) particularly among the households' electricity end-users? The main objective of this paper is to provide insightful answer to this question as part of the efforts aimed at mitigating the persistent and endemic problem of electricity theft in Lagos State, Nigeria.

The rest of this paper is structured as follows- Section 2 presents Nigeria's electricity supply industry: stylized facts; Section 3 presents some empirical Literature Review; Section 4 details Methodology while Section 5 contains Conclusion and recommendation.

2.0 NIGERIA ELECTRICITY SUPPLY INDUSTRY: STYLIZED FACTS

Over the years, Nigeria's effort to generate adequate and reliable electric power has undergone different transformations. This section presents information about reforms that led to the unbundling of the industry; the ownership structure, franchise areas and mode of operation of the two electricity distribution companies licensed to operate in Lagos state.

2.1 *Reforms that Led to the Unbundling of the Industry*

The electricity industry in Nigeria has undergone remarkable reforms, and the business of generation, transmission and distribution, which were together under single umbrella of Nigeria Electricity Power Authority, NEPA, later known as Power Holding Company of Nigeria, PHCN, has been unbundled into separate arms.

NEPA operated as a vertically integrated utility company and had a total generation capacity of about 6, 200 MW from 2 hydro and 4 thermal power plants. This resulted in an unstable and unreliable electric power supply situation in the country with customers exposed to frequent power cuts and long period of power outages and an industry characterized by lack of maintenance of power infrastructure, outdated power plants, low revenues, high losses, power theft and non-cost reflective tariffs.

In the year 2001, the reform of the electricity sector began with the promulgation of the National Electric Power Policy which had as its goal the establishment of an efficient electricity market in Nigeria. It had the overall objective of transferring the ownership and management of the infrastructure and assets of the electricity industry to the private sector with the consequent creation of all the

necessary structures required to form and sustain a more efficient electricity market in Nigeria.

In 2005, the Nigerian government enacted the Electric Power Sector Reform Act (EPSRA), which provided for the unbundling of Nigeria Electric Power Authority, NEPA, into a series of successor companies (6 generation companies, 11 distribution companies and 1 transmission company) created from NEPA; the Power Holding Company of Nigeria (PHCN) was formed as a transitional corporation; the development of a competitive electricity market and the establishment of a dedicated regulatory body.

In 2010, the Nigerian Bulk Electricity Trading Plc (NBET) was established as a credible off-taker of electric power from generation companies. By November 2013, the privatization of all generation and 10 distribution companies was completed with the Federal Government retaining the ownership of the transmission company. The privatization of the 11th distribution company was completed in November 2014. The privatized distribution companies became responsible for the supply, billing, metering and maintenance of energy to the customer and all other related services within their business areas.

2.2 *Emerging Challenges in the Electric Power Industry Post-privatization*

2.2.1 *Pre-Privation challenges*

Many international investors were initially cynical about participating in the power sector privatization because of the history of inefficiency and endemic corruption. Indeed, reputable international power companies, who possessed the requisite expertise and experience, declined any participation in bidding for any of the generation and distribution businesses. Thus, only very few investors, who really understood the intricacies of the sector, participated in the privatization and fewer still, took over the control and management of the successor generation and distribution companies.

International investors, who braved the seemingly bleak Nigerian power sector by electing to participate in the bidding process, almost lost the appetite to continue as they found the dearth of vital information rather frustrating. The insufficiency of information stalled their ability to conduct deep and conclusive feasibility and viability studies. Specifically, prospective investors had difficulty conducting technical, commercial and legal due diligence in order to properly evaluate the assets, determine their true value and the precise state of affairs. Labor unions, in defense of their members in the sector, frantically denied bidders, the opportunity of inspecting the books and facilities of the unbundled PHCN.

Additionally, severance benefits projected to be payable to the former PHCN workers, which was initially estimated by the Federal Government at ₦400 billion, (\$1.1b), was undoubtedly, one of the early clogs in the wheel of progress of the privatization exercise. Incidentally, and a clear mark on the entire privatization process, there were reports that most of the investors bemoaned taking over the generation and distribution assets of the relevant successor companies without conducting adequate due diligence on the assets. In truth, all of the privatized power companies and assets were acquired, based on assumptions, numbers and information issued by the federal government of Nigeria.

Similarly, international lenders who had the capacity to provide longer term and cheaper loans did not participate in the privatisation, but elected to wait and provide only working capital to successful bidders and or refinance existing facilities. Consequently, many of the investors obtained more expensive and shorter term loans. Issues which could not have been reasonably foreseen by the investors, given the inability to conduct proper due diligence, subsequently surfaced shortly after the required initial deposits had been paid to the BPE. These led to agitations for longer tax holidays and subsidy schemes, which was guaranteed to PHCN under the Multi-Year Tariff Order (MYTO)

2.2.2 Current challenges

Broadly, the challenge with effective and efficient electricity supply in the post-privatised electricity market in Nigeria can be summarized in one word: “shortage”. From feedstock availability to electricity units delivered to the end-user, there are severe strains that not only threaten the financial viability of the sector, but also practically repel fresh funding and investment across the value chain. Whilst the persistence of these challenges in a privatised framework does not call into question the validity of the reforms, it points to the need for Nigeria to do more in addressing lingering bottlenecks such as:

- The sub-optimal utilization of generating capacity;
- Inadequate transmission infrastructure and high distribution losses; and
- Low rates of collection.

For example, over 3,000MW of generating capacity is stranded due to gas constraints. Transmission capacity can only wheel 50-60% of installed capacity, while collection losses are considerably high at the distribution company (Disco) level.

2.2.3 Electricity Distribution Companies in Lagos State

As a direct result of the Electric Power Sector Reform (EPSR) bill that was signed into law on March 11, 2005, a total of 11 Electricity Distribution Companies (called DisCos) were formed. These DisCos, including Eko Electricity Distribution Plc., (EKEDP) and Ikeja Electricity Distribution Plc, (IKEDP) were further privatized on 1st November 2013, thus completing the cycle of reform efforts in Nigeria that began almost a decade back. Ownership of the new distribution companies is as follows: New Electricity Distribution Company Limited - 60%, Bureau of Public Enterprise - 32% and Ministry of Finance Incorporated - 8%. Lagos state is the only state in Nigeria where two (2) Electricity Distribution Companies were licensed to operate. The two DisCos are Eko Electricity Distribution Company and Ikeja Electricity Distribution Company.

2.2.3.1 Ikeja Electricity Distribution Company (Plc.)

a. Ownership

Ikeja Electricity Distribution Plc. is the largest Nigerian power distribution company with estimated 1,292,113 customers {9}. It is based in Ikeja, capital of Lagos State. The ownership of the company is made up of the Federal Government of Nigeria (40%) and Korea Electric Power Corporation (KEPCO) - Sahara Group (60%). Prior to privatization, Ikeja Electricity Distribution Company (now known as Ikeja Electric Plc.) was created as one of the directorates under the defunct utility monopoly, National Electric Power Authority (NEPA) in 1986 and operated as Lagos North Distribution Directorate. It evolved over the years and transformed to Ikeja Electricity Distribution Company (IKEDC).

Under the privatisation scheme, the Sahara Group through a Special Purpose Vehicle, New Electricity Distribution Company Limited (NEDC) (with KEPCO as its technical partner) acquired a 60% stake in Ikeja Electricity Distribution Company (IKEDC) (which has subsequently rebranded into Ikeja Electric Plc. (IE)). IE is a public limited liability company owned in partnership with Bureau of Public Enterprises and the Ministry of Finance Incorporated, who have a 32% and 8% stake respectively. Following the handover of the defunct IKEDC to the NEDC/KEPCO Consortium, the company did undergo a period of transformation.

b. Franchise area and mode of operation

The operations of IE cut across 8 Local Government Areas of Lagos State, namely: Alimosho, Ikorodu, Ikeja, Epe, Oshodi, Agege, Shomolu and Kosofe. It also covers parts of Yaba and Mushin Local Government Areas. At takeover on November 1, 2013, the

company operated through the Corporate Head Office and eleven (11) Business Units namely: Abule-Egba, Akowonjo, Ikeja, Ikorodu, Ikotun, Ipaja, Oshodi, Ojodu, Odogunyan, Ogba and Shomolu. By 2015, these business units were restructured for more effective management and utilization of available resources. The company now serves its customers from the headquarters at Obafemi Awolowo Way, Alausa, Ikeja, Lagos and through six (6) Business Units and 54 Undertakings which cut across its license area.

c. Access to Meters

At takeover, over half of the company's customers were either unmetered or had obsolete meters. This was a major challenge as it made energy accountability difficult, as well as encouraged the use of estimated billing which led to both over and under billing.

The Advanced Metering Infrastructure (AMI) project was launched in partnership with technical partners, KEPCO, to address various issues within the network including closing of metering gaps, revenue assurance, remote monitoring, providing more accurate customer information, improving maintenance culture and thereby reducing fault occurrence, load analysis – prevention of faults, prompt escalations and fault clearing, forecasting, easier detection of non- technical losses and mitigation of technical losses. AMI is an integrated system of smart meters communicating wirelessly with an IT infrastructure in the background, which enables effective energy data management. It allows the monitor of meters in real time.

The vision for the AMI project is for IE to have the capability to carry out proper energy accounting, through the pre-paid smart meters. In addition to this benefit, smart meters allow customers make informed choices about their energy usage. These smart meters would subsequently eliminate the reliance on estimated billing; improve billing efficiency and customer management. Furthermore, it provides a platform that enables the Company perform services such as service activation or deactivation remotely, as well as detecting customer outage, using wireless communication.

The company set out to install 600,000 new meters across its network and to connect 592,000 new customers over a 5-year period. The aim was to reduce the commercial losses to manageable level within a stipulated time. In 2015, it commenced metering project at the top end of the distribution network chain. The company successfully metered over 90% of 11KV feeders which is the first point of receipt of power for distribution within the Company's network, and over 30% of its distribution transformers which are used for managing the supply of

electricity to consumer residence and outlets. Furthermore, it started the deployment of the Non Maximum Demand meters during the year. By the end of the year, it had successfully deployed over 30,000 smart meters to customers within the network.

d. Electricity theft challenge

A major challenge faced by IE is the high incidence of electricity theft through meter bypass. According to its website, the company's network had been plagued with illegal connections. It also acknowledges that enforcing disconnection orders had been less than effective, often being subverted by illegal reconnections. To deal with these issues, it empowered the Vigilance, Strategy and Loss Reduction Unit of the Commercial department to monitor, apprehend and prosecute cases of energy theft and illegal connections and reconnections. As part of other strategies to tackle this challenge, it engaged the State and Federal Governments to pass appropriate legislation to fully address the issues related to energy theft across the distribution network. So far, efforts at reducing electricity theft in the network have been less than adequate. In addition, no single customer of the network has been prosecuted for electricity theft to date [8]

2.2.3.4 Eko Electricity Distribution Company (Plc.)

a. Ownership

Eko Electricity Distribution Plc. (Eko DisCo) is in the business of distribution of electricity in its licensed area, covering southern parts of Lagos with a total of estimated 626,294 customers [11] Ownership of the company is between the federal government of Nigeria (40%) and others (60%) made up of individuals who are Directors in the company that pulled resources together to set up the company as follows:

Charles Momoh, a director in the company, is the Managing Director of Atlantic Meridian Limited, which is an indigenous enterprise that provides services for the safe extraction, processing and purchase of oil. His management team now provides a huge part of Nigeria with electricity. Tunji Olowolafe, the second director, specializes in private and public infrastructural projects; Dere Otubu, the third director, is the Chairman of Staco Insurance, Senforce Insurance Brokers, SIC Property & Investment and Staco Prime Capital; Ernest Oji, the fourth director, is the Managing Director of Beta Consortium Limited, and Chairman of Alpha Consortium Limited. He has significant working experience in the power sector and took part in every stage of the division and reformation of PHCN. Next is George Etomi, also a director, is a lawyer in Lagos. Last but not the least is Oladele Amoda (the first Managing Director) who had a career as an electrical

engineer in the defunct PHCN. Every single person mentioned on this list has contributed to the development of Eko Electricity Distribution Plc [9].

b. Franchise area and mode of operation

Each DisCo is responsible for the electricity distribution activities in demarcated geographies called 'license area' of Nigeria. Eko Electricity Distribution Company covers the license area of southern part of Lagos state and Agbara in Ogun state.

This includes Badagry, Agbara, Ojo, Festac, Ijora, Mushin, Orile, Apapa, Lekki, Ibeju and Lagos Island. For ease of operation and division of work, the license area of Eko DisCo is segmented into 3 Circles and 10 Districts, namely:

- West Circle: It has 3 Districts – Badagry, Agbara, Ojo and Festac
- Central Circle: It has 4 Districts – Ijora, Mushin, Orile and Apapa
- East Circle: It has 3 Districts – Lekki, Ibeju and Island

Every District office has a consumer care centre (CCC), where customers visit and interact with the customer relationship officers (CROs) for resolution of their requests and complaints. To enable quicker resolution of network breakdown on low-tension (LT) network of 415 V, the company created minimum of 3 Zonal offices in each District. The zone team looks after all the operation and maintenance matters of LT network in a safe manner.

Eko DisCo receives its bulk power supply from the following two Transmission sources: Akangba (330/132 KV) and Ajah (330/132 KV); and thereafter, through 10 nos. of 132/33 KV transmission stations. There are 40 Injection Substations with a total installed capacity of 1137.5MVA. This capacity and system reliability would further increase with induction of various National Independent Power Project, NIPP, projects in Eko DisCo's high tension network (HT – 33 KV & 11 KV), which was designed for completion in mid-2015 but currently in advanced stage of completion.

There are over 6000 Distribution Substations with total installed capacity of around 2500 MVA, good enough to serve a present base of around 0.5 million customers and existing load demand on the network. There are many legacy challenges, though. The switchgears, transformers, relays, underground (U/G) & overhead (O/H) network, etc. that were inherited in November 2013, are said to be in a dilapidated & unsafe state requiring huge investment, and with adequate and timely allocation of Capex (capital

expenditure) by the regulator, Nigeria Electricity Regulatory Commission (NERC).

c. Access to Meters

Regarding meter access under Eko DisCo, the company through its website claims that metering of its registered customers is the company's priority and it is a continuous exercise. It is also indicated that it had metered 65% of its subscribers as far back as 2015 but the company is yet to supply update of the percentage of its customers currently metered. Eko electricity distribution company had earlier informed that the greatest obstacle towards metering the customers at the required pace was the problem of liquidity which slowed it down from raising enough capital to buy meters. Now that the customers are being made to pay for the meter through a newly introduced programme called MAP (Meters Assets Providers), it is expected that more of its customers would be able to have meter access.

d. Electricity theft challenge

Electricity theft is a major problem facing the operations of Eko DisCo. On its website, the company laments that it loses on the average the sum of N1.2 billion to electricity theft every month. This prompted it to devise a number of measures to tackle the problem. Prominent among the measures taken is its policy to reward whistle-blowers with the ability to bring to the notice of the company valid information regarding the activities of the individuals or groups stealing electricity within its network. Such whistle-blowers are to be rewarded with 20% of whatever amount that is recovered from each report. A number of high net worth customers had been caught. One of such electricity thieves is a hotel in Surulere area of Lagos that was caught engaging in meter bypass by officials of Eko Electricity Distribution Company. The Eko DisCo spokesman said that it was the complaint from the hotel against estimated billing that led to installation of three pre-paid meters in the hotel only for the customer to turn around to short-change the company through meter by-pass.

In all, Eko electricity Distribution Company revealed that no fewer than 43,000 prepaid meters had been tampered with by their owners out of 134,000 installed by the company in the last five years. This figure represents about 32 per cent of the total number of prepaid meters in use across areas covered by the electricity company. Eko DisCo however admits that its efforts alone are not enough to combat the problem of electricity theft within its network. As such, it looks up to the federal government to put in place a set of policy measures that can reduce the problem to the barest minimum.

2.2.3.5 ATC&C Losses (%) by DisCos in Nigeria in 2019

It is useful at this point to describe the setting for our subsequent analysis of electricity theft in Nigeria. In the following discussion, the size of the aggregate technical, commercial and collection losses under all the eleven DisCos in Nigeria is presented below. Aggregate Technical, Commercial and Collection Losses (ATC&C) refer to all electric power losses from generation to distribution. The ATC&C is made up of Technical Losses (TL) and Non-Technical Losses (NTL). Technical losses occur naturally and are caused by power dissipation in transmission lines, transformers and other power system components. Technical losses (TL) in transmission and distribution (T&D) are computed from the information about total load on the grid and total energy billed, (Soma

et al 2010). Non-technical losses (NTL) on the other hand, are caused by actions external to the power system. Electricity theft essentially constitutes the NTL in electric power system.

First, and in the broader context, is the significantly large size of ATC&C as can be observed in Table 1. Three important observations are clearly evident in the data. One is the huge gap between the Multi-Year Tariff Order (MYTO) target of 26% and actual losses across the eleven distribution companies. They range between 23% and 74%. In the best performing DisCos, (Ikeja and Eko), ATC&C is almost double the MYTO benchmark. Also notable is the wide variation in the losses and by implication, the size of electricity theft.

Table 1: ATC&C Losses (%) by DisCos in Nigeria in 2019

DISCOs	MYTO Target (%) for 2019	ATC&C (%) 2019Q1	ATC&C (%) 2019Q2	ATC&C (%) 2019Q3
Abuja	24	41.96	40.71	41.91
Benin	31	56.62	49.67	46.22
Eko	14	29.79	24.96	24.80
Enugu	29	53.01	50.09	52.42
Ibadan	25	50.18	46.23	48.45
Ikeja	15	28.33	22.51	22.76
Jos	44	60.13	60.94	60.52
Kaduna	32	73.45	65.06	63.07
Kano	29	48.50	45.45	41.64
Port Harcourt	37	63.14	60.85	61.01
Yola	28	68.64	69.91	62.11
Overall DISCOs MYTO Level	26			
Overall Technical, Commercial and Collection Losses		48.72	44.53	43.65
Overall Technical and Commercial		20.02	19.81	18.40
Overall Collection Losses		35.90	30.84	30.95

Source: Nigerian Electricity Regulatory Commission Third Quarter Report 2019. Page 40

Lastly, and also of concern are the size of the overall collection losses at 30-35% in 2019. Notably, electricity theft contributes substantially to collection losses. Besides, network losses in Nigeria are among the largest in the world.

3.0 SELECTED LITERATURE REVIEW

This paper belongs to the category of the extensive literature on illegal behavior which includes theft, tax evasion and corruption and how to control them. This literature can be classified broadly into two major traditions. First is the literature on economic analysis of criminal behavior which dates back to Becker's rational choice under uncertainty [10] In explaining criminal

behavior and how to control it, Becker and his followers emphasized the central role of incentives in deterring or encouraging illegal activity. A basic assumption is that the individual decision maker would compare the expected benefit and cost of engaging in the activity where the cost combines the probability of being caught and convicted, and the severity of the penalty when caught. The main prediction of the rational choice model of criminal behavior is that an individual would be predisposed to engage in an illegal act when the expected benefit exceeds the expected cost [11]. The basic message is that high probability of detection coupled with severe punishment will reduce crime because they serve as disincentives to illegal behavior.

Another strand of the literature with focus on corruption and tax evasion and their control, adopted the principal-agent-client model [12]. Moral hazard (hidden action) and adverse selection (hidden information) features embedded in the interactions among the economic agents involved in corruption and other illegal activity have raised important theoretical and empirical issues that has been addressed using an agency model.

In this framework where the players pursue their own strategic interests which are often not mutually consistent, it is well-known that delegation of authority to an agent with inadequate monitoring creates an opportunity for bribery or other forms of corrupt practices between and the agent and the client. Imperfect observability or un-observability of the effort of the distribution staff in his theft-detection task creates a challenge for the distribution company because effort and outcome of theft-detection may not be well aligned. This may allow the staff to use his private information opportunistically and against the interest of the company. How to determine the appropriate compensation mechanism for the agent has been the subject of extensive debate in the literature.

Scholarly attention to the issues around electricity theft has increased noticeably during the last decade and a half [2]. However, attentions of researchers have focused more on determinants, modes and effects or impacts of electricity theft than its prevalence. Main findings of empirical literature regarding the relationship between electricity theft and its prevalence are presented below.

Smith [2] is one of the few studies that address prevalence of electricity theft in electric power system and the various forms and measures to reduce it. The study finds that lower losses (less than 6%) are most common in countries with low corruption perception and while higher losses are most common in countries with high corruption perception. The study links electricity theft with mal-governance.

In Ghana, about 30% of electricity supplied by the utility companies is lost through theft and other illegal activities [3]. Similarly, theft of electricity in Uganda is a problem resulting into losses of up to \$30million annually for UMEME Ltd, the main electricity distribution utility [4] In 2008 alone, Inspectors in Turkey discovered that 196,000 electricity customers out of the 4.8 million (5%) subscribers were using electricity illegally [6]. However, electricity theft ratios in developed and developing countries differ substantially. The theft rate in the US and the West Europe is very low, approximately 1-2%. The OECD average is approximately 7%. In developing countries such as India, Malaysia, Bangladesh and Turkey, the magnitude of the loss is far more considerable.

The above review shows that a limited attempt to empirically understand the prevalence of electricity theft in electric power system remains. Also, there is no study for Nigeria which is from the sub-Saharan African where energy poverty and power losses are comparatively higher. The current study therefore will help to fill this gap in the existing literature.

4.0 METHODOLOGY

4.1 *Data Type and Sources*

This study adopted the use of survey technique to obtain the required data on prevalence of electricity theft among households in Lagos, Nigeria. The electricity consumers focused upon were those that were classifiable under the residential category. It was assumed that the factors that motivated individuals using pre-paid meter to steal electricity might be different from that of a post-paid meter user. In low income communities in the suburb of Lagos state, Nigeria, there was mostly one meter for a household, even though there were many rooms in some of the houses. The population of such households often ranged from five to twenty. In the middle income neighborhoods, there were flats in each house with each person using one meter; there were often as many as ten flats in a house. It was assumed that, if ten people decided to steal electricity, their reasons might be different from that of one person stealing electricity.

Electric meter users were categorized into prepaid meter users and post-paid meter users. It was assumed that the two groups of consumers might be motivated by different reasons to steal electricity. Where meters were not provided, provision was made for respondents on estimated billing system. Survey methodology was used. To gather the required data, a self-developed structured questionnaire was developed. The questionnaire had five closed-ended questions and one open-ended question where respondents were asked to give a comment, bordering on their choice of reasons they believed would make customers engage in electricity theft.

In terms of sampling technique, a multi-stage sampling technique was used to obtain a sample of 500 households in the study area. In the first stage, the area was purposively divided according to three residential density areas: high, medium and low residential areas. The second stage involved a selection of six neighborhoods out of each residential density area. In the third and final stage, three study areas were randomly selected from each of the six neighborhoods identified based on residential density. The choice of the technique was made in order to give equal representation to all the households in the areas of franchise under the two Electricity Distribution Companies in Lagos State. The questionnaires were designed to

collect data on basic information relating to their socio-economic characteristics and prevalence of electricity theft in their place of abode. One questionnaire was administered to each household’s head/representative that had adequate information about the household’s electricity consumption pattern.

The researcher and the trained research assistants carried out the field survey in a manner designed to achieve high level of accuracy. Given proximity between households under Ikeja and Eko electricity Distribution Companies license areas and the need to collect accurate information, the questionnaires were given and collected instantly. For proper completion of the questionnaire, the team was instructed to interview the households’ heads so as to ascertain the correctness of the information submitted. Where the households’ heads were not available, the households’ representative was the next to be interviewed. A total of 580 households were sampled and 580 questionnaires administered out of which only 500 were returned (86.2%) for analysis.

5.0 RESULTS AND DISCUSSION

This study sought to estimate the size of the households’ electricity end-users who had been directly involved in incidence of electricity theft using self-structured questionnaire. They were asked whether they had ever been personally involved in any form of electricity theft or whether they knew anyone who had. The analysis of the responses received is presented in Figure 1. Fourteen per cent of the respondents claimed to have either being a party to or single-handedly perpetrated the act of electricity theft while 86.0% claimed innocence of the practice. In the license area under both EkoDisCo and Ikeja Electric Plc, 14 % of the respondents felt no compulsion about stealing electricity.

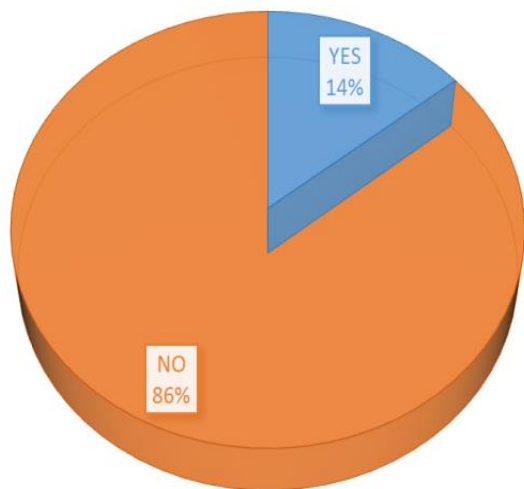


Figure 1: Prevalence of Electricity Theft among all Household respondents (Source: Field Survey, 2019)

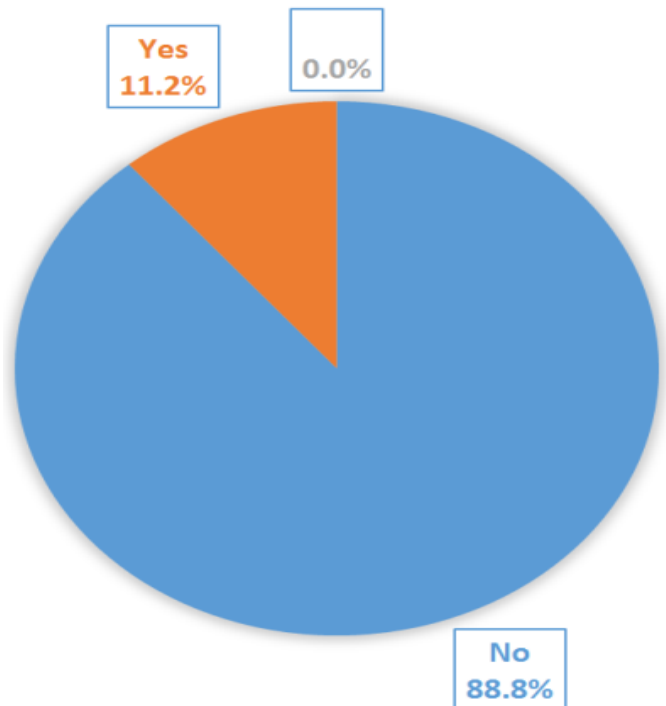


Figure 2: Prevalence of Electricity Theft among Household respondents under Ikeja Plc (Source: Field Survey, 2019)

Further analysis of the result as shown in Figures 2 and fig 3 revealed that 11.2% and 15.6% of the respondents had either being a party to or single-handedly engaged in act of electricity theft in the franchise area under Ikeja Plc, and EkoDisCo respectively. This shows that more households’ electricity customers in the area of franchise under Eko DisCo had no compulsion in stealing electricity. This difference in the attitude of customers under both DisCos is probably attributable to the fact that Ikeja Plc covers the more metropolitan area of the city of Lagos.

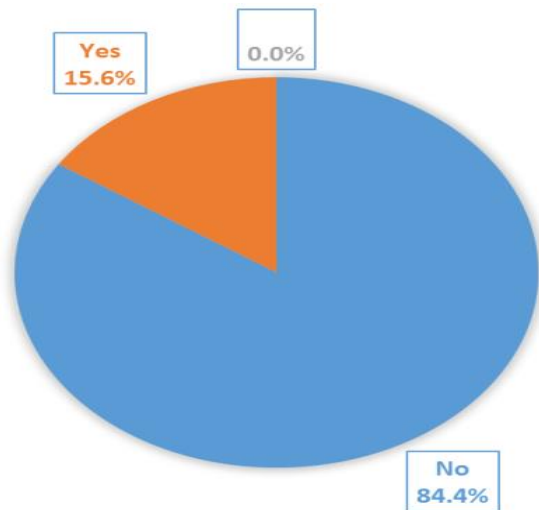


Figure 3: Prevalence of Electricity Theft among Household respondents under Eko Disco (Source: Field Survey, 2019)

6.0 CONCLUSION AND RECOMMENDATION

Beginning with the status of electricity theft worldwide, the paper briefly presented the stylized facts of the Nigerian power sector with special emphasis on Eko Disco and Ikeja Electric Plc, being the two DisCos licensed to operate in the electricity distribution segment in Lagos State. It detailed the challenges confronted by the two DisCos as regards incidence of electricity theft and progressed to investigate the prevalence of electricity theft among householder electricity end-users in Lagos State.

Electricity theft among the households in Lagos State, Nigeria exists in high proportion (i.e. in two digits 14%) and urgent steps are required to address it by addressing the factors that motivate consumers to engage in it. In this study, we found that there was a nexus between running micro-business (using electricity for functioning) in residential apartments, bribery and corruption, weak enforcement of anti-electricity theft laws and prevalence of electricity theft. Electricity theft is a serious crime and combating this crime requires the knowledge of the extent to which it affects the wellness and overall health of the electric power system. It is a source of substantial losses to public electric utilities and is therefore, a major concern for many governments.

This study makes a first step towards better understanding the phenomenon of electricity theft by giving a pictorial view of the seriousness of the problem and ways to combating it through institutional, legal and policy measures. To start with, any law or legal provision aimed at behavioral change can only be effective when there is strong and transparent enforcement. Nigeria statute books are replete with provisions for dealing with individuals or groups of people found to be engaging in electricity theft but the enforcement of these laws is horribly weak. For instance, Section 286(2) of the Penal Code LFN 2004 states that “whoever dishonestly abstracts, diverts, consumes or uses any electricity or electrical current is said to commit theft”. This crime is punishable under Section 287 of the Penal Code with imprisonment for a maximum term of five years or with a fine or with both fine and term of imprisonment. In addition, under section 10 of the Miscellaneous Offences Act, “any person, who unlawfully disconnects, removes, damages, tampers, meddles with or in any way whatsoever interferes with any electric fittings, meters or other appliances used for supplying or selling electricity shall be guilty of an offence and liable on conviction to imprisonment for a term not exceeding 21 years”.

The EPSR Act 2005 also makes ample provision for dealing with perpetrators of this crime. It affirms that any person who receives any electric lines or materials or infrastructure in parts or in whole knowing or having

reasons to believe the same to be stolen property, shall be found guilty of an offence under Section 427 of the Criminal Code, Sections 317, 318, 319A of the Penal Code and Section 94 of the EPSR Act 2005 and shall be punishable upon conviction with a term of imprisonment as provided under Section 427 of the Criminal Code, Section 317, 318, 319 of the Penal Code or Section 94 of the EPSR Act 2005 as applicable.

In the opinion of this study, the cost of committing the crime of electricity theft is presently too low to dissuade perpetrators from the act and it would be sufficiently raised to discourage the behavior only if the probability that an individual who steals electricity would be arrested and convicted is very high. This particular measure is very important in view of the fact that stealing of electricity is a practice that has been found to cut across all income groups. Hence, strong deterrent measure using instruments of enforcement of the law is highly recommended.

REFERENCE

- [1] Jamail, F. and Ahmad, A. “An Economic Investigation of Corruption and Electricity Theft”. *Pakistan Institute of Development Economics Working Papers* 92, 2013
- [2] Smith, T. B. “Electricity theft: a comparative analysis. *Energy Policy*”, 32(18), (2004), 2067-2076.
- [3] Yakubu, O., Babu, N. and Adjei, O. “Electricity theft: Analysis of the underlying contributory factors in Ghana”. *Energy Policy*, 123, (2018), 611-618.
- [4] Ssekika, E., “Uganda loses Shs 76bn annually to power theft: The Observer”, *Kampala, Uganda*. 2013
- [5] Tasdoven, H. B. Fiedler, A. Garayev, V. “Improving electricity efficiency in Turkey by addressing illegal electricity consumption: A governance approach”. *Energy Policy*, 43, (2012), 226-234
- [6] Bhattacharyya, S. “The Electricity Act 2003: will it transform the Indian power sector?” *Util. Policy*, 13 (3), (2005), 260-272
- [7] Iwayemi, A. “Controlling Electricity Theft in Nigeria: Analytical and Policy Issues”. *CPEEL Seminar Series. Centre for Petroleum, Energy Economics and Law*, University of Ibadan, 2020.
- [8] Ikeja Electric. <https://www.ikejaelectric.com/ikeja-electric-networks/>. Accessed December 19, 2019.
- [9] EkoDisCo. <https://ekedp.com/page/our-operations>. Accessed December 15, 2019

- [10] Becker, G. S. "Crime and Punishment: An Economic Approach," *Journal of Political Economy*, 76(2), (1968), 169-217.
- [11] Becker G. and Stigler G. "Law enforcement, malfeasance, and compensation of enforcers". *Journal of Legal Studies*, 3, (1974),1-19.
- [12] Mookherjee, D. and Png, I.P.L. "Monitoring Vis-à-vis Investigation in Enforcement of Law". *American Economic Review*, 82, (1992), 556-565.