



Perception of Household Consumers on the use of Electrical Energy Prepaid Meter in Bwari Metropolis

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ABSTRACT

Prepaid metering system is a method of billing system whereby the consumers pay for electricity before consumption. The study assessed the perception of household electrical energy consumers on the use of prepaid meter in Bwari Metropolis. Two research questions were formulated. Descriptive research design was adopted for the study. Questionnaire was the sole instrument used for the study. The population of the study was 3200 head of housed hold that are connected to distributed network and are using prepared meter. Purposive sampling was used to sample 320 household. Mean and standard deviation were used to answer the research questions. The instruments were validated by three experts in electrical and electronics technology education and electrical and electronics engineering. The reliability coefficient obtained was 0.92. Out of 320 questionnaires administered 306 were retrieved which indicated 95.6% returned rate. The findings that emerged among others are: consumers do not find it easy to buy prepaid meter, they prefer prepaid meter over post-paid meter billing system, electrical appliances are used based on demand and electricity consumption is high. The following recommendations were made among others: The consumers both residence, industrial and commercials should be engaged in using electrical energy saving appliances, tools and equipment in order to reduce the high rate of electricity consumption. Government should make a way of subsidise the cost of prepaid meter, so that both the low income can have access to it.

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INTRODUCTION

It is challenging for the management of an organization to agree with consumers and meet financial targets while at the same time managing consumers' relationship when making brand changes or changing from one operation system to another. Sometimes consumers embrace changes while at other times consumers retaliate against changes (Hawkins, 2015). Consumers seek goods and services to satisfy their basic needs and desires. Consumers' behaviour towards the goods and services is much more than studying what consumers buy. It attempts to understand how the decision-making process goes and how it affects consumers' buying habit.

Consumers are people or organizations that purchase goods or services. Hawkins (2015) defines consumers as humans or other economic entities that use a good or service. Consumers of electricity are the end users in the generation, transmission and distribution chain of electrical energy supply. Therefore, energy consumers are the final users of electrical energy in the community, and they could be individual, organization or household. Accordingly, it is important for electricity generation, transmission and distribution Companies to find out in advance what their consumers' expectations are. Failure to meet or exceed these expectations could lead to dissatisfaction on the part of the consumers (Cristobal, 2018, Ofir, Ene & Okoro, 2007). Many researchers agree that there is a positive



correlation between quality and customer satisfaction (Cristobal, 2018). When consumers are satisfied with a company's goods and services they are bound to check back again, and also to spread the news to others. Electrical energy consumers are satisfied only when electrical energy is available, reliable and cost effective.

The basic function of electricity generation, transmission and distribution companies is to supply adequate electricity to its consumers as economically as possible with reasonable level of reliability. Reliability is the probability of a system, component or product to perform its functions without failure, under a given condition and for a given period of time (Anumaka, 2011). It is absolutely necessary for electrical energy provider to ensure that their components are capable to carry and supply electricity to the consumers for a specified period of time under a specific condition. Therefore, electrical reliability can be defined as the level to which electrical components performed its functions to ensure that electrical energy is supplied to its consumers at the appropriate time and condition. Electrical reliability also involves ensuring that electrical energy is adequate and secured. There are two basic components when discussing reliability of electricity, these are adequacy and security. Adequacy can be referred to as the ability of electricity generating, transmitting and distributing equipment (for example, prepaid meter) are sufficient to produce and supply quality electricity (proper voltage) to its consumers at all time. At the same time security in terms of electricity reliability refers to the ability of electrical equipment (for example, prepaid meter) to withstand any abnormal condition which are capable to cause loss of system which may be due to natural or man-made factors such as a surge in current, short circuiting and lightning. Electric energy providers have a lot to do in terms of electricity reliability to their consumers. In Nigeria, there have been a lot of reformation in the electric power sector. The Power Holding Company of Nigeria is the main company that is responsible to provide electrical energy.

The Power Holding Company of Nigeria (PHCN) is a sole electrical energy company which generate (GENCOs), transmit (TCN) and distribute (DISCOs) electricity throughout Nigeria.

In order to meet up with household electrical consumers' expectations, distribution companies have tried different methods to ensure that electricity is available and reliable to the satisfaction of the consumers. Efforts have been made in ensuring efficient revenue collection. One of the efforts is the introduction of post-payment metering system.

Over two decades, the electricity bill payments system in the country is post-payment system. Post-payment is the system of billing whereby electric energy consumers pay after the consumption of electrical energy. It is a system which allows you to start using electricity from first day of installation even without paying for it, and so it is credit friendly to the consumers (Martin, 2014 and Mathenge, 2015). But this system does not allow the consumers to control what they use therefore; it is not budget friendly. Because consumers could use more than what he/she budgeted for or can afford for that month. Sometimes it is a kind of estimated billing system where the utilities decide what to bill a consumer based on their estimation or the kind of house, he/she lives or the personality of the consumer. However, the DISCOs suffer extreme low revenue collection as a result of customers defaulting in payment. After the consumption of electrical energy, customers are reluctant to pay for the energy they consumed (Egboboh, 2021). Therefore, in 2006 PHCN introduced prepaid metering system as a means of reducing the rate of defaulters and increase revenue, and also to ensure that electricity is reliable and available to the consumers.

Prepaid metering system is a method of billing system whereby the consumers pay for electricity before consumption. Mathenge (2015) explained that in the prepayment system there is nothing like credit because the consumers have to purchase and pay for energy prior to consumption. In line with this, many argue that prepaid metering system give full control to the consumers to control their budget, allow them to be aware of their electricity consumption rate. Some other benefits of prepaid metering system include: encourages consumers to use less electricity, there is no manual disconnection of customers, discourages bribery by both utilities and consumers, it allows the consumers to monitor the level of energy



consumption, and it reduces operational cost because it is a paperless revenue collection (Mathenge, 2015; Martin, 2014 and Miyogo, Nyanamba & Nyangweso, 2013).

The Nigerian Electricity Regulatory Commission (NERC) as reported by News Agency of Nigeria (2019), stated that only 43% of Nigerian electricity consumers have meters. The report indicated that out of 8,881,443 registered active electricity consumers, only 3,811,729 (42.92%) had been metered, indicating that 57.08% of the consumers were still on estimated billing as at the end of June 2019. Egboboh (2021) reported that NERC has attributed electricity customers' apathy towards payment for electricity bills to poor access to prepaid meters. It was revealed that out of 10,516,090 registered electricity customers as of 30 June 2020, only 4,234,759 (40.27%) has been metered.

Ever since the introduction of prepaid meter 20 years ago, distribution and collection of prepaid meters to consumers around Nigeria has been a major headache. According to Amaza & Okwurionu. (2018) the DISCOs have been unable to finance the acquisition and installation of meters, which in turn has allowed high commercial and collection losses to continue to plague Nigeria's electricity sector. As part of the effort by Nigerian Electricity Regulatory Commission to make available prepaid meters (NERC) April 2018, 22 companies were given approval to provide prepaid meters to customers.

However, the adoption of prepaid metering system by DISCOs has raised different kinds of complains by both the consumers and DISCOs managements. The major complain by the consumers is that the DISCOs are reluctant in providing the prepaid meter while, DISCOs major complain is that some consumers with prepaid meter still involved in illegal connection, bypassing or tampering with prepaid meters which reduces their revenue collection. For instance, the Ikeja Electricity Distribution Company (IKEDC) reported that 43,000 prepaid meters out of the 134,000 installed by the company have already been tampered with (Punch, 2014). In spite of the complains by DISCOs there have not be any comprehensive examination to why consumers with prepaid meter installed in their houses still bypass or tamper with the meters; despite the

numerous advantages of prepaid meter on the side of electrical energy consumers, as compared to estimated billing or postpaid metering system. Therefore, the researchers aimed to find out the effects of prepaid meter on household energy consumption in Bwari metropolis.

LITERATURE REVIEW

Different studies have been done in the past concerning prepaid meter billing system, contribution and advice has been made. Whereas, most of these studies were on the importance of prepaid meter to utility and consumers, differences between postpaid, estimated bill and prepaid billing system, analyses of actual power consumption using prepaid meter and how to control electricity thefts (bypassing and tampering of prepaid meter) by consumers. None or little work has been done on the effects of prepaid meter on household energy consumption to determine the reasons behind bypassing or tampering with prepaid meter by consumers while prepaid meter was said to possess numerous advantages to consumers compared to postpaid or estimated billing system. Fachohun, *et al*, (2017) in their study looked at the electricity consumer's consumption pattern with the use of estimated bills and pre-paid meters and found out that pre-paid metering of consumer's electricity consumption gives a better need-based energy management, in which case, with the use of prepaid metering system, there is a reduced case of lost income, and waste in comparison to the present demand-based management system.

However, it does not address the reason why consumers with prepaid meter installed still bypass the meter. Makanjuola, Shoewu, Akinyemi & Ajose, (2015) in their study found out the problems of prepaid metering system in Nigeria and were able to recommend some possible best solution to the problem. But their study recognized problems that prevents utility not to provide prepaid meters to their consumers it does not address the issue behind the bypassing of prepaid meter by the consumers. Ogbuefi, Ene & Okoro, (2019) they did a work by analyzed the actual power consumption of each load connected to prepaid meter. Their study found out that the appliances connected to prepaid meter actually consumed less energy compared to what the



consumers were thinking. Martin, (2014) used household level monthly usage data from customers enrolled in prepay programs at two Kentucky rural electric cooperatives, he investigated whether there is a change in consumption after these customers enrolled in the program. The results indicate among others that prepay customers reduce their consumption by an average of 11% after enrolling in the program. It is an indication that prepaid meter is of advantage to consumer.

Amaza, (2018) reported on the order on unauthorised access, meter tampering and bypass giving by NERC. It was reported that the major complaints of DISCOs are the tampering and bypassing of prepaid meters by electricity customers. They are not addressing the reasons behind the bypassing of prepaid meters. For instance, the Ikeja Electricity Distribution Company (IKEDC) reported that 43,000 prepaid meters out of 134,000 installed by the company have already been tampered with (Osigwe *et al.*, 2018), Jain & Bagree (2011), did a study on a prepaid meter using mobile communication. Their study focused on how to reduced electricity theft which bypassing is one of the causes of electricity theft and increase the revenue collection. Dike, *et al.*, (2015) look at the way to reduce electricity theft in Nigeria using global system for mobile communication (GSM) based prepaid meter. The results obtained from the simulation shows that immediately an illegal load is connected to the utility system either within the residential meter jurisdiction.

Reliability, availability, accessibility and cost effectiveness of electricity are major factors electric energy consumers are after. Whenever the consumers are frustrated before their needs are been met, they get feed up and look for alternative options to satisfy their needs. In order to meet the needs of electrical energy consumers DISCOs introduced prepaid meter. Different researchers revealed the advantages of prepaid metering system for both utility and electrical energy consumers (Ogbuefi, *et al.*, 2019; Akande, *et al.*, 2019; Mathenge, 2015; Martin, 2014).

The findings of the study conducted by Miyogo *et al.*, (2013) show that electric energy consumers have embraced the prepaid billing system and emphasized that prepaid billing

system allowed consumers to be more conscious with their consumption. In an ideal situation, prepaid meter should be distributed to all electrical energy consumers in Nigeria, but the reverse is the case. Akande *et al.*, (2019) argued that the introduction of the prepaid meter is a medium to increase the revenue collection. But it is not so in Nigeria, instead it was found to reduce the revenue generation because prepaid meter revenue generation is based on the availability and reliability of electricity supply. Also, some consumers were found to bypass or tamper with the prepaid meters (Paul. 2019, Makanjuola, *et al.*, 2015). For instance, the Ikeja Electricity Distribution Company (IKEDC) reported that 43,000 prepaid meters out of 134,000 installed by the company were already tampered with (Osigwe *et al.*, 2018).

The continued usage of postpaid electric meters or estimated billing system in Nigeria after 20 years of introduction of prepaid meter system, and also the bypassing or tampering of prepaid meters by consumers are indicators that there are challenges with the adoption of prepaid meters. Therefore, this study sought to find out the perception of household electrical energy consumers on the use of prepaid meter in Bwari Metropolis?

Aim and Objectives of the Study.

The major aim of the study was to determine the perception of household electrical energy consumers on the use of prepaid meter in Bwari Metropolis. Specifically, the study sought to determine the:

1. The views of household electrical energy consumers on power supply when using prepaid meter in Bwari metropolis?
2. The views of household electrical energy consumers of prepaid billing system in Bwari metropolis?

Research Questions

The study sought an answer to the following questions.

1. What are the views of household electrical energy consumers on power supply when using prepaid meter in Bwari metropolis?



2. What are the views of household electrical energy consumers of prepaid billing system in Bwari metropolis?

consisted of 22 items with five options and were validated by three experts in electrical and electronics technology education and electrical and electronics engineering Federal University of Technology Minna, Niger State. The reliability coefficient obtained was 0.92. The instrument was administered by the researchers through personal contact. Out of 320 questionnaires administered 306 were retrieved which indicated 95.6% returned rate. Data generated from the questionnaire was analysed using mean and standard deviation. Decisions on the research questions were based on the resulting means score interpreted relative to the concept of real lower and upper limits of numbers as shown in Table 1. SPSS version 23 was used for the analysis. Any item with standard deviation of less than 1.96 indicated that the respondents were not too far from the mean or from one another in their responses and any item having standard deviation equal or above stated value signified that respondents were too far from the mean.

RESEARCH METHODOLOGY

This research employed descriptive survey research design. The study was conducted in Bwari metropolis of FCT Abuja, Nigeria. Bwari is one of the towns in Federal Capital Territory Abuja. Bwari has a latitude of 9°17'8.12"N and a longitude of 7°22'43.21"E or 9.28559 and 7.378669 respectively.

The population of the study was 3200 head of household that are connected to distributed network and are using prepared meter in Bwari metropolis. The sample for the study consists of 320 household's electrical energy consumers with installed prepaid meters selected using purposive sampling technique. The instrument used for data collection was a structured questionnaire. The questionnaire was designed to generate data for answering the research questions of the study. The instrument

Table 1: Interpretation of Four Point Scale

S/N	Scale of R.Q 1	Scale of R.Q 2	Point
1	Strongly Agreed	Strongly Agreed	3.50 – 4.00
2	Agreed	Agreed	2.50 – 3.49
3	Disagreed	Disagreed	1.50 – 2.49
4	Strongly Disagreed	Strongly Disagreed	0.50 – 1.49

Key: R.Q = Research Question

RESULT

Research Question 1: What are the views of household electrical energy consumers on power

supply when using prepaid meter in Bwari metropolis?

Table 2: Mean on the views of household electrical energy consumers on power supply when using prepaid meter in Bwari Metropolis.

S/N	ITEMS	Mean	Standard Deviation	Decision
1	I experience more blackouts since the installation of prepaid meter.	1.10	0.53	SD
2	It is easy to buy prepaid meter.	0.46	0.32	SD
3	I can buy prepaid meter electricity units on my mobile phone.	2.64	0.65	A
4	I can buy prepaid meter electricity units using POS/ATM.	1.30	0.18	SD
5	Prepaid meter helps to protect my electrical appliances against electricity surge.	3.70	0.92	SA



6	Prepaid meters are well installed by AEDC personnel	3.50	0.57	SA
7	My prepaid meter develops faults every time	1.30	0.78	SD
8	Persistence of voltage fluctuation after prepaid meter was installed	1.55	0.19	D
9	Reduce utility staff access to my house	3.10	0.55	A
10	I prefer postpaid billing system	1.50	0.47	SD
11	I would encourage my friends to use prepaid meter at their houses	3.81	0.26	SA
12	I use all my electrical appliances every time there is power supply	0.66	0.33	SD

Key: SA=Strongly Agreed, A=Agreed, D=Disagreed and SD=Strongly Disagreed

Table 2. Shows that, respondents strongly agreed with items 5, 6 and 11 with mean values ranging between 3.50 and 3.81. Items 3 and 9 with the mean values of 2.64 and 3.10 signified that the respondents agreed with the questions raised on the items. The respondents disagreed with item 8 with the mean value of 1.55. Items 1, 2, 4, 7, 10 and 12 with the mean values ranging from 0.46 and 0.66 signify that the respondents strongly disagreed with it the items. Since the standard deviation of the respondent on

the view of household electrical energy consumers on power supply when using prepaid meter in Bwari metropolis are less than 1.96, it is an indication that the respondents were not too far from the mean or from one another in their responses.

Research Question 2: What are the views of household electrical energy consumers of prepaid billing system in Bwari metropolis?

Table 3: Mean on the views of household electrical energy consumers of prepaid billing system in Bwari metropolis?

S/N	ITEMS	Mean	Standard Deviation	Decision
1	I am satisfied with the electricity unit bought	3.82	0.23	SA
2	I pay less since I started using prepaid meter	3.33	0.45	A
3	I enjoy the prepaid meter billing system	2.80	0.56	A
4	The rate of electricity unit consumption is low	0.51	0.55	SD
5	The electricity units are always available to buy	3.40	0.43	A
6	The electricity unit gets used up irregularly	1.10	0.71	SD
7	I am satisfied with AEDC prepaid meter tariff	2.32	0.48	D
8	Prepaid meter billing system is more accurate than any other billing system	3.19	0.54	A
9	I find it easy to recharge my prepaid meter	3.16	0.26	A
10	Prepaid meters are programmed accurately	2.55	0.92	A

Key: SA= Strongly Agreed, A= Agreed, D= Disagreed and SD=Strongly Disagreed

Table 3 shows that the respondents strongly agreed with item 1 with the mean value of 3.82. Items 2, 3, 5, 8, 9 and 10 with the mean values ranging between 2.55 and 3.40 signify that the respondents agreed with the questions posed to them. The respondents disagreed with item 7 with the mean value of 2.32 while, items 4 and 6 with the mean value ranging from 0.51 and 1.10

signify strongly disagreed. It is revealed that the respondents were not too far from the mean or from one another in their responses since the standard deviation of the respondent on the household electrical energy consumers of prepaid billing system in Bwari metropolis are less than 1.96.



FINDINGS

The following were the findings of the study.

1. No blackout since the installation of prepaid meters
2. It is not easy to buy prepaid meter
3. Prepaid meter protects electricity surge
4. Reduce utility staff access to customer's home
5. Prefers prepaid meter
6. Electrical appliances are used based on demand
7. Consumers paid less on using prepaid billing system as compared with post-paid meter system.
8. Electricity consumption is high.

DISCUSSION

The first objective was to determine the views of household electrical energy consumers on power supply when using prepaid meter in Bwari Metropolis.

Findings showed clearly that the household energy consumers using prepaid meter in Bwari metropolis were satisfied with the electrical power supply while using prepaid meter. Not that prepaid meter generate its own electrical energy but, in as much that AEDC supplied electrical energy to its consumers both the prepaid and postpaid consumers are connected but, prepaid meter consumers have some advantages over other in such there is no illegal disconnection and prepaid meters has ability to control or regulate what comes into it. This is supported by the study of Wagner & Wiegand (2018), in their study on prepayment metering of households revealed that 80 per cent of the households using prepaid meter surveyed said that they were satisfied or even very satisfied with usage of prepaid meter.

The study also finds out that electrical energy consumers prefers prepaid meter over other billing system. In support of this findings, Miyogo *et al*, (2013) revealed in their study that 96 out of 138 respondents were not ready to go back to the post-paid billing system. One of the reason for their preference for prepaid meter billing system could be as a result that there is no disconnection and no access to the customer's houses anyhow by the utility staff and it is pay as

you use and it allows customers to control and monitor their consumptions as they wish. The over mentioned are some advantages of prepaid meter. In harmony to the study Usman (2013) noted that about 30.4% of the respondents were satisfied with the prepaid meter billing system, and about 60.5% of the respondents have preference for it. All these are the advantages of prepaid meter.

Another finding revealed that consumers do not find it easy at all to buy prepaid meter. Even when the consumers are ready to opt for it the delay in getting the meter from the utility providers makes the consumers discouraged. This finding agreed with the work of Makanjuola *et al*, (2015) in their study as they found out that among other disadvantages of prepaid meter is the delay in receiving and installation of prepaid meters. It is clear that even when consumers are ready to pay for the prepaid meter, they don't get it easy. These consumers are forced to remain on postpaid or estimated billing system which is against their wish and may end up in some illegal acts. Findings also revealed that respondents agreed that not all their appliances are being utilized because of the prepaid billing system.

The second objective of this study was to determine accuracy level of prepaid meter billing system of household energy consumption in Bwari Metropolis. The findings revealed that the prepaid meter billing system is accurate although there are disadvantages.

The findings of the study showed that customers agreed that the unit they paid for is the same as what appear on their meters. It was also revealed that the consumers are satisfied with the tariff on prepaid meter billing system. Unlike that of post-paid or estimated billing system where by the consumers are not sure of the bill that they will pay on next payment.

The findings revealed that the rate of electricity consumption is high. The over mentioned problem is capable of discouraging consumers to use prepaid meters, also forcing them to tamper with their prepaid meter sets or look for alternative means of power supply (like generator set, inverter and so on) to satisfy their needs. In support of this findings Shokoya and Raji (2019) revealed that higher electricity tariff is also a factor that causes electricity theft. These



high rates of consumption discourage consumer from wanting to pay for what they consume, most especially the commercial consumers that uses heavy duty machines. This finding is supported by the research conducted by Quayson-Dadzie (2012) which revealed that some prepaid-metered users perceived that prepaid meters consume more units in comparison to traditional meters. In agreement to this study Malama, *et. al.* (2014), discovered that 21% of the households have changed from using electricity to charcoal for cooking. It is worthy of note to say that when people could not afford electricity because of the high rate of consumption using prepare meter they look for alternative.

The study again finds out that electrical energy consumers using prepaid meter uses electrical appliances on demand. The fact that power consumption is high using prepaid meter has prompted consumers to use electrical appliances on demands and buy electrical equipment and electronics that consume less energy. In agreement with the study carried out by Wagner and Wiegand (2018), it was discovered that households now exchanged large electricity-consuming appliances for those with less energy consumption. At least 14 of the households surveyed had invested in a power saving appliance such as plug connectors and timer switches. Some households had also taken a whole series of measures to reduce their electricity consumption. The study also agrees with the work of Malama, *et. al.* (2014) noted that some of the consumers with prepayment electricity meters have shifted from using electrical appliances for some household activities such as cooking to the use of charcoal and firewood.

CONCLUSION

The study based on the perception of electrical energy household consumers using prepaid meter. It was revealed based on the two objectives of the study that in as much as the consumers did not run out of electrical units and electrical energy is supplied by AEDC prepaid meter uses enjoy power supply fully. Because there is no disconnection by AEDC staff, no access to consumer's house anyhow by AEDC staff, prepaid meters' control voltage surge and many more of the advantages being enjoy by

prepaid meter household electrical energy consumers. Findings of this study also revealed that the rate of electricity consumption using prepaid meter is high which could force the consumers to tamper or bypass the prepaid meter. The high rate of consumption will always force the consumers to take both positive and negative alternative steps.

RECOMMENDATIONS

Based on the findings of the study the following recommendations are made:

1. Government should make a way of subsidise the cost of prepaid meter, so that both the low income can have access to buy it.
2. Stringent rules for getting the prepaid meter should be reduce to allow people that have interest to have access to it.
3. There should be more work on the cost effects of using prepaid meter so that the consumers will be aware of the rate at which each appliance consume electric unit.
4. The consumers both residence, industrial and commercials should be engaged in using electrical energy saving appliances, tools and equipment in order to reduce the high rate of electricity consumption.
5. The AEDC should reduce the tariff on electricity in order to encourage the consumer on using prepaid meter and discourage them from bypassing and tampering with the prepaid meter.

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