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The Implications of Estimated Billing System on Nigerian Electricity Consumers

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Abstract: *Estimated billing is a system of charging unmetered electricity consumers for electrical energy consumed based on their previous usage, without considering the actual quantity of energy consumed. Consumers in this system are mandated to pay far above what they consumed on monthly basis. It involves buying/ selling of electricity after consumption. The complaints from the consumers of electricity on the unreliability of supply from the distribution company in Nigeria, as well as high estimated bills for the energy consumed, and the management of the available supplies to take care of needs of consumers with limited resources is discussed. This work takes a critical look at the electricity consumers consumption pattern with the use of estimated bills and prepaid meter bills in one of the major Estates in Owerri, Imo State, Nigeria, from two EEDC clients who are apparently living in the same building, but different flats. Their utility bills between the months of September 2016 and August 2017 were used in this study. The total load assessment for a three-bedroom home occupied by these consumers was carried out. A software-based graphical analysis of the data gotten from them was carried out. This analysis revealed implications of estimated billing system on these consumers as compared with the benefits of prepaid billing. This research was summed up with a far reaching recommendations which if implemented will curb the menace of estimated billing system in Nigeria.*

Keywords: *prepaid, post-paid, consumer, reliability, meter, power, electricity bill, utility, implications, energy.*

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I. INTRODUCTION

The then Nigeria electric power network operator, Power Holding Company of Nigeria (PHCN) was over the years faced with the problem of revenue collection (Oseni T, 2002). This is mostly because electricity bills are sent to consumers after energy consumption. Consumers are reluctant to pay electricity bills due to the high estimated bills that is associated with the unreliable power supply. This low reliability resulted in the proposition of reliability-base billing equations by (Ogujor E.A 2007). The low reliability of electric power supplies has little or no impact on the network operator because whether there is power or not, the normal estimated monthly electricity bills are sent to consumers in the post-paid method. Therefore, the consumers suffer the cost of generating power for their individual usage and the cost of electricity that was never supplied by PHCN. What is the cost implication of this estimated billing system? This is the research question that this paper will address.

The defunct PHCN introduced the digital pre-paid meter in 2006 whose operation is similar to the loading of recharge card in the GSM handset. If power is available and the prepaid meter is loaded with units, the loaded units decreases only when load is connected and stops when power fails.

GENCOs obtain funds by selling what they generate to DISCOs, since DISCOs are unable to realize all money for the energy sold to consumers, losses are incurred through power theft, hence GENCOs are under-performing in generation. DISCOs incur loss through three basic areas namely: huge unpaid bills by the consumers (**Collection loss**), power leakages due to poor, aged and insufficient generation, transmission and distribution network and power infrastructure **(technical loss),** illegal consumption of power by consumer who are customers of DISCOs and bypass of meters by consumer to reduce the power they pay for **(Commercial**

loss). The Aggregate technical, commercial and collection losses (ATC&C) in Nigeria is about 50% and as a result, there is high level of poor payment culture and this invariably leads to low power availability to the end users.

One of the great challenges faced by power supply in Nigeria from inception and was aggravated since handover from PHCN to private owners in 2013 is the controversy between the DISCOs and electricity consumers over the inappropriate billing system. There is arbitrary and lack of transparency in the method used by energy providers to cost and assess the customer energy consumption. Such dark practices manifest through estimated billing systems and irregularity in metering. It is noted that the bill for any current month is prepared before the end of the month, sometimes, indiscriminate charging due to loss of revenues incurred by DISCOs (Ofonyelu C.C and Eguabor R.E., 2014; Jain A, et al, 2011). The tariff system practiced in Nigeria for the electricity distribution, which is regulated by NERC, is called the Multi – Year Tariff Order (MYTO); a methodology to regulate fair electricity prices between consumers and DISCOs for efficient operation costs.

II. MULTI YEAR TARIFF ORDER (MYTO):

This is a tariff system designed for the Nigerian Electricity Market to provide a unified way to determine efficient total industry revenue requirement, and provide a 15-year tariff path in the power sector with minor reviews each year due to certain factors such as gas prices, exchange rate and inflation, and major reviews every five years, when all inputs are discussed with stakeholders. MYTO is used to set wholesale and retail prices in the Nigerian Electricity Market. On 18th December 2015, NERC, set a new tariff for DISCOs for 2015 to 2024, this new tariff requires consumers in different categories and location to pay different charges for each kWh (EEDC, 2014).

III. FACTORS THAT DETERMINE ELECTRICITY TARRIF IN NIGERIA

Formally, electricity tariff/charge depends on three elements, name, (1) Energy Charge (2) Demand Charge and (3) Fixed Charge,

Nowadays, the price for electricity depends on four major factors listed below:

1. Location;
2. Tariff Class;
3. Tariff Rate;
4. The quantity of consumed energy (in kWh).

1. Location

It is not a surprise that there are different electricity distribution companies (DISCOs) in Nigeria. They are all located at various regions of the country. There are 11 distribution companies and each of them covers a certain area, with varying tariff plan, namely;

1- Enugu Distribution Company;
2- Kano Distribution Company;
3- Yola Distribution Company;
4- Jos Distribution Company;
5- Kaduna Distribution Company;
6- Abuja Distribution Company;
7- Port-Harcourt Distribution Company;
8- Benin Distribution Company;
9- Ikeja Distribution Company;
10- Ibadan Distribution Company;
11- Eko Distribution Company.

2. Tariff Class

The amount of money you spend on electricity also depends on your tariff class.

Electricity consumers in Nigeria are divided into 5 classes/categories, namely,

i. **Class A - Residential:** This category is strictly for residential energy consumers; R1 (life line), R2 (single and three phase), R3 (LV maximum demand), R4 (HV maximum demand)
ii. **Class B - Commercial:** This category is for consumers, whose premises are used for SMEs business e.g offices, beauty parlors etc. C1 (single and three phase), C2 (LV maximum demand), C3 (HV maximum demand).
iii. **Class C - Industrial:** This category uses their premises for manufacturing and other production processes eg. Shops and offices. D1 (single and three phase), D2 (LV maximum demand), D3 (HV maximum demand).
iv. **Class D - Special tariff:** These consumers include the following; religious houses, government buildings, educational establishments, hospitals, agro-allied industries. A1 (single and three phase), A2 (LV maximum demand), A3 (HV maximum demand).
v. **Class E - Street lighting:** This category includes S1 (single and three phase).

3. Tariff Rate and Quantity of Consumed Energy (kWh)

The Tariff Rate depends on your class. Main classes are divided by the DISCOs to sub-classes. The division is based on the average consumption of electricity by each class. It is different for each class and the Discos covering such area. It also depends on the quantity of consumed energy. Table 1 below gives the tariff for each DISCO and sub-class for the years 2017 and 2018 (2017/2018 in text). All numbers are in N/kWh.

Table 1. Tariff class of different DISCOs, showing the present and future tariff

S/N	Class	Enugu Disco Type – Amt. (₦)	Abuja Disco Type – Amt. (₦)	Ikeja Disco Type – Amt. (₦)
1 2 3 4 5	**Class-A Residential**	R1-4.00/ 4.00 R2S-30.93/31.00 R2T-34.28 /34.36 R3-48.12/48.23 R4-46.08/46.19	R1 - 4.00 / 4.00 R2 - 24.30 / 24.03 R3 - 47.09 / 45.72 R4 - 47.09 / 45.72	R1 - 4.00 / 4.00 R2SP - 21.10 / 18.94 R2TP - 21.73 / 21.15 R3 - 35.68 / 31.62 R4 - 36.11 / 32.00
6 7 8 9	**Class –B** **Commercial**	C1S - 34.28 / 34.36 C1T - 39.25 / 39.34 C2 - 45.24 / 45.35 C3 - 45.85 / 45.96	C1 - 37.39 / 36.25 C2 - 47.09 / 45.72 C3 - 47.09 / 45.72	C1SP - 25.56 / 21.76 C1TP - 27.59 / 24.45 C2 - 36.91 / 32.47 C3 - 37.30 / 32.81
10 11 12 13	**Class – C** **Industrial**	D1S - 40.37 / 40.46 D1T - 42.56 / 42.66 D2 - 45.67 / 45.77 D3 - 46.83 / 46.94	D1 - 36.07 / 34.96 D2 - 47.09 / 45.72 D3 - 47.09 / 45.72	D1 - 27.93 / 24.56 D2 - 37.54 / 33.02 D3 - 37.99 / 33.42
14 15 16 17	**Class – D** **Special tariff**	A1S - 34.16 / 32.24 A1T - 39.25 / 39.34 A2 - 45.26 / 45.36 A3 - 45.06 / 45.16	A1 - 35.74 / 34.63 A2 - 35.74 / 34.63 A3 - 35.74 / 34.63	A1 - 26.23 / 23.24 A2 - 29.53 / 26.17 A3 - 26.69 / 26.31
18	**Class – E** **Street lighting**	L1 - 32.86 / 32.94	S1 - 27.14 / 26.54	S1 - 18.99 / 16.83

This table shows that the numbers in each distribution company vary. However, some of the distribution companies clearly show an increase in electricity tariff for 2018. There is also the possibility of continued rise in the at least in the coming years.

IV. ELECTRICITY BILLING SYSTEM IN NIGERIA

The DISCOs use a monthly billing system in which the unit that is consumed in a previous month is paid in the succeeding month. In a typical bill, there are eight columns which contain: Descriptions, tariff code, read date, present reading, previous reading, multiplier, consumption and current charges. Under the descriptions columns there are always two rows which are energy charges and fixed charges. There is a number in the consumption column which is calculated by subtracting previous reading from the present reading. However, sometimes a number with "E" will appear by the side under the consumption column like 150E. This means that the consumption figure is not gotten from the meter reading but an estimate figure. The current charge is obtained by multiplying the consumption figure with the energy multiplier charge, plus the VAT, which is dependent on the classification of the premises.

For the electricity billing, Current charge = (consumption x energy multiplier charge) plus VAT in Nigeria.

Technically, electricity consumption is the amount of watts used over a period of time. So a standard measure of electricity consumption is the amount of watts used over an hour: the watt-hour (**Wh**). For example, a 40W light bulb turned on for one hour will use 40**Wh** of electricity. An electricity bill records the number of kilowatt hours (**kWh**) consumed over a period, which is usually around a month when the meters are read. A kilowatt-hour is simply a thousand watt-hours. So, using a 4,000W air-conditioner for one hour will consume 4kWh of electricity (4,000 Wh) (Charpell, 2014).

Example: For a consumer who uses 150 watts load per hour daily for one month, the Total Energy bill of the consumer will be calculated as follows if the per unit rate is ₦30.93k. (Take1month=30Days):

$$1\ unit\ =\ 1kWh$$

$$Total\ kWh\ =\ 150\ x\ 24\ hrs\ x\ 30\ days\ =\ 108{,}000\ watts-hour$$

$$Converting\ this\ into\ units\ where\ 1\ unit\ =\ 1kWh$$

$$Total\ Units\ Consumed;\ 108{,}000\ /\ 1000\ =\ 108\ units$$

$$Cost\ per\ unit\ (Rate)\ is\ ₦30.93$$

$$Cost\ of\ Energy\ Consumed\ =\ 108\ x\ 30.93\ =\ N3{,}340.44$$

$$VAT\ \rightarrow 5\%\ of\ 3{,}340.44\ =\ 167.02$$

$$Total\ due\ =\ 3{,}340.44\ +\ 167.02\ =\ ₦3{,}507.46$$

Therefore ₦3,507.46 is the total energy bill of the consumer for one month.

Table 2: Load Assessment of a Customer's Three-Bedroom Apartment at New Owerri, Imo State.

Type of Load	**Power rating(W)**	**Quantity**	**Demand Factor**	**Actual Power(W)**
Medium size deep freezer	130	1	0.5	65
Washing machine	280	1	0.5	144
Microwave Oven	1000	1	0.5	500
Electric Pressing Iron	1000	1	0.5	500
Air-Conditional	1170	1	1.0	1170
Refrigerator	500	1	0.5	250
Ceiling fan	100	5	0.7	350
Incandescent Bulb	60	23	0.7	966
LG 32" Television	100	1	0.5	50
Sharp 14" Television	80	1	0.5	40
Sony Home-theatre	100	1	0.5	50
DSTV Receiver	50	1	0.5	25
DVD Player	50	1	0.5	25
TOTAL				***4135***

Table 3; Estimated bill of an EEDC client at New Owerri District, Imo Statefor a year (Sept. 2016 to Aug. 2017) (EEDC Utility bill)

S/N	Month/ Year	Tariff Class (TC)	Rate (R) (₦)	Unit Consumed (UC) (kWh)	Energy consumed (EC)(₦)	VAT (5% of EC)	Energy due (ED) for the month (₦)
1	Sept. 2016	R2S	27.13	110	2984.30	149.22	3133.52
2	Oct. 2016	R2S	27.13	97	2631.61	131.58	2763.19
3	Nov. 2016	R2S	27.13	129	3499.77	174.99	3674.76
4	Dec. 2016	R2S	27.13	165	4476.45	223.87	4700.27
5	Jan. 2017	R2S	27.13	170	4612.10	230.61	4842
6	Feb. 2017	R2S	30.93	80	2474.4	123.75	2998.12
7	Mar. 2017	R2S	30.93	400	12372.00	618.60	12990.60
8	Apri 2017	R2S	30.93	304	9402.72	470.14	9872.86
9	May 2017	R2S	30.93	188	5814.84	290.74	6105.58
10	Jun 2017	R2S	30.93	233	7206.69	360.33	7567.02
11	July 2017	R2S	30.93	146	4515.78	225.79	4741.57
12	Aug. 2017	R2S	30.93	146	4515.78	225.79	4741.57

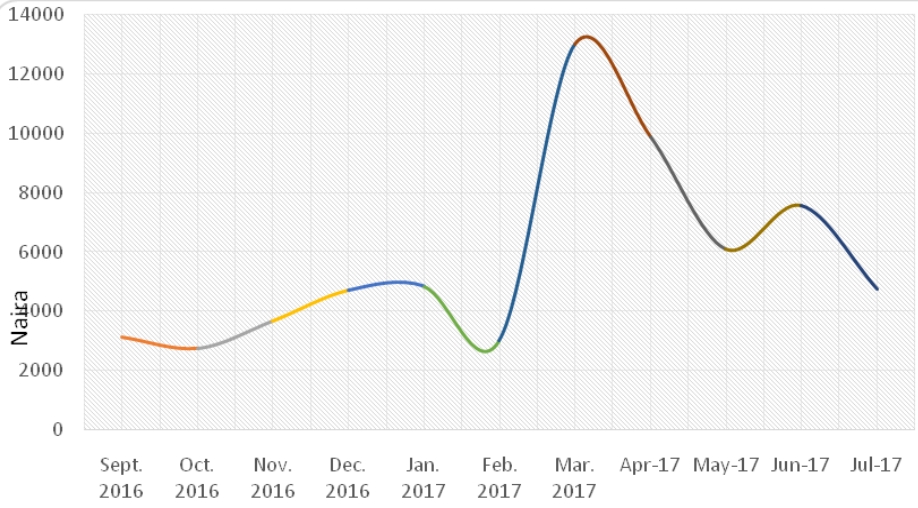

Fig 1: Graph showing the Estimated bill of an EEDC client at New Owerri District for a year

Table 4; Prepaid meter bill of an EEDC client at New Owerri (Area –A world-bank) District for a year (Sept. 2016 to Aug. 2017) (EEDC Utility bill)

S/N	Month/ Year	Tariff Class (TC)	Rate (R) (₦)	Unit Consumed (UC)(kWh)	Energy consumed (EC) (₦)	VAT (5% of EC)	Energy due (ED)for the month (₦)
1	Sept. 2016	R2S	27.13	95	2577.35	128.87	2706.22
2	Oct. 2016	R2S	27.13	97	2631.61	131.58	2763.13
3	Nov. 2016	R2S	27.13	105	2848.65	142.43	2991.06
4	Dec. 2016	R2S	27.13	102	2767.26	138.36	2905.62
5	Jan. 2017	R2S	27.13	105	2848.65	142.43	2991.06
6	Feb. 2017	R2S	30.93	50	1546.50	77.33	1623.83
7	Mar. 2017	R2S	30.93	50	1546.50	77.33	1623.83
8	Apr. 2017	R2S	30.93	105	2848.65	142.43	2991.06
9	May 2017	R2S	30.93	102	2767.26	138.36	2905.62
10	Jun 2017	R2S	30.93	85	2629.05	131.45	2760.50
11	July 2017	R2S	30.93	97	2631.61	131.58	2763.13
12	Aug. 2017	R2S	30.93	90	2783.70	139.19	2922.89

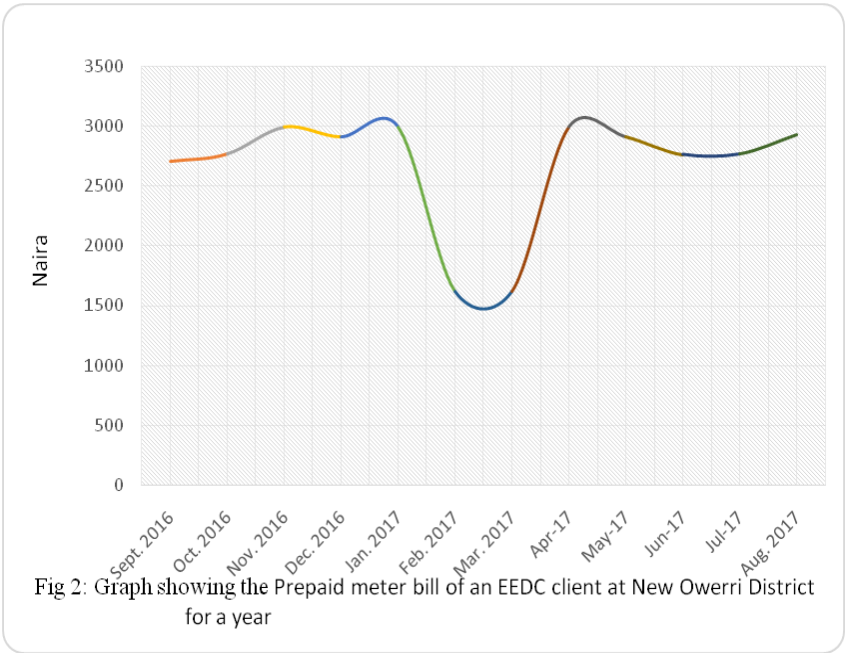

Fig 2: Graph showing the Prepaid meter bill of an EEDC client at New Owerri District for a year

Tables 3 and 4 shows estimated bills and Prepaid meter bills respectively of two EEDC clients at Area - A, world-Bank housing estate New Owerri District for a year (Sept. 2016 to Aug. 2017), the two consumers are under the same service transformer and apparently living in the same building but different flats. This study painstakingly visited these clients and took the statistics of their energy consuming gadgets in their homes which were found to be the same. Client A is using the estimated billing system, while Client. B, uses the prepaid meter billing system. From the graph (curve) of energy consumed against the month/year, the highest energy consumed by B occurred in Nov. 2016, Jan. 2017 and April 2017. When he consumed ₦2848.65k. His consumption became lowest in Feb. and March 2017 which were rated at ₦1546.50k. This lower consumption was as a result of their faulty sub-station which occurred between 13th Feb. and 17th March 2017, hence making the consumption for that period to be low. On the average, Client. B consumes between 95 and 105 units per month which keeps the total energy consumed resonating between ₦2570, and ₦2850 per month.

For Client A who uses estimated billing system, the curve of Fig. 2 showed that he consumed the highest energy in March 2017 at ₦12,372 which apparently was the time their transformer had issue and could not supply adequately for the month. Also his lowest consumption was noticed in Feb. at ₦2474.40 which was far above the lowest consumption for Client B which was at ₦1546.50

This study comparatively revealed that prepaid billing system is far better than estimated billing system because of the cost implications. Residential electricity consumption is cheaper using the prepaid meter than the estimated billing system. This is obviously shown in table 4, Fig. 2 and table 3, Fig. 1 respectively.

V. IMPLICATIONS OF USING ESTIMATED/UNMETERED BILLING SYSTEM

Having considered the available data and variables, it is obvious that estimated billing system has the following negative implications, thus;

- Over-billing of customers/ billing inaccuracies.
- Absence of service orientation to the customers.
- Collection of illegal money from the customers by the DISCOs officials.
- Illegal collection and stealing of power supply by the consumers.
- Inadequate power supply and metering system.
- Collection of disconnection / reconnection fees.

VI. BENEFITS OF USING PREPAID METER IN NIGERIA

Apart from the huge initial capital involved in supplying the meter to consumers by the utility companies, total replacement of estimated billing system with prepaid meters will guarrantee the certainty that consumers will pay for the actual energy consume as affirmed by Fagbohun O.O, et al. (2012) and Carolyne N. Metal (2013).

- Prepaid meter service creates opportunity of control of when and how much is paid for energy and effective usage. It helps in better budgeting.
- Reduces cost associated with billing, notification of disconnection, disconnection, and reconnection, customer service staff and call centers.
- Reduces bad debt and write-offs because arrears don't build up.
- Improves detection and management of outages.
- Metering and most importantly, prepaid system will enable the DISCOs to determine their revenues.
- Prepaid metering system reduces the level of contact between the energy provider officials and consumers,

VII. CONCLUSION

Estimated billing system is said to be analogous to fraud where consumers are mandated to pay far above what they consumed monthly. Most of the customers under this system are without meters and their residences are never visited to track the energy utilization over the period charged. Provision of meters to individual customers may not totally eradicate this menace; however it is a good step forward to the means. About 6 million electricity consumers in Nigeria were noted to have no meters to monitor their electricity consumption monthly. This encourages estimated and fixed charges allocated to the consumers which results in defrauding acts by the consumers not paying anything out of the over blotted bills.

For a better billing, energy conservation as well as need based energy management of resources, the prepaid energy metering of costumers premises offers solutions to the long experienced problems of inadequate supplies, corrupt acts been perpetrated by officials of utility companies at the consumer end. It ensures that the consumer pays only for energy consumed and not the estimated bill in postpaid billing systems which have been the bane of electrical energy consumers.

VIII. RECOMMENDATIONS

Since estimated billing system is exploitative and destructive, it provides the DISCOs the opportunity for over-pricing of energy consumption to the detriment of consumers, the following recommendations are therefore necessary;

- Estimated billing system should be outlawed completely from the Nigerian electricity market.
- The Nigerian Electricity Regulatory Commission should direct the various DISCOs to put all new customers in prepaid meter system.
- Due to dwindling revenues from prepaid meters; generation, transmission, and distribution networks should be improved, so as to increase power reliability thereby enhancing revenue generation.
- There is also the need to allow other interest groups in the industrial chain to supply customers the prepaid meters with the specified standard.

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