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Power Theft Practices in Ghana: Key Perspective Indicators Undermining the Revenue Mobilization Among Some Selected Regions within NEDCo Operational Areas in Ghana

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Abstract

Power theft remains a challenge to electricity companies globally. Presently, despite the invention of new technologies to help combat it is also another difficult task because is not easy to detect and track. In Ghana, power theft practices have been estimated yearly to be one of the indicators that underrates the country's economic growth. Therefore, the aim of this study was to investigate power theft practices: perspective keys undermining revenue mobilization in some selected NEDCo operational areas. This will help to determine power theft existence in those area understudy. A cross-sectional study design was adopted where 4 regions (Bono, Bono-East, Savanna and Upper West were selected because they serve as the zones in which NEDCo operates. The study regions were stratified into 2 zones thus, middle belt and northern belt zones. 200 participants were recruited for the study based on the eligibility criteria with 100 questionnaires been administered to each of the zones in order to ascertain their views. The study showed that poor service delivery and lack of stringent measure compelled people to steal electricity. Power theft is practiced by all irrespective of location. The best way to reduce power theft practices is by vigorous house-to house monitoring. More so, this calls for a greater urgency for research and development aimed at identifying proponent measures to mitigate power theft practices.

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Introduction

Power theft remains one of the unsolved challenges likely to affect all nations in the 21st century because it is difficult to detect and track (Siddharth, 2014). In spite of the considerable measures and constitutional demands promised to the people of Ghana since independence paved way for multiple projects like Ghana Energy Development and Access Project (GEDAP), National Electrification Scheme (NES), Self-Help Electrification Project (SHEP), and some regionalized renewable power projects to help boost the electricity system (Kumi, 2017). Though the effect of these program implementation has come to heightened urbanization in Ghana. Its weakest form identified is theft practices often indulged by consumers. Power theft simply means illegally stealing electricity from a utility without made to pay the approved fee for usage (Depuru, 2011). Studies have shown that Power theft contributes nearly 80% of non-technical losses (McDaniel, 2009). This act has caused trivial problems to utility companies on how to mitigate the impact in terms of revenue loss (Dike, 2015). It is alarming to note that electricity companies in Ghana continues to battle with high incidence of reported cases of power theft and other illegitimate actions, leading to nearly 30% loss of electricity provided by the utilities It has been estimated that Ghana's utilities lose over 1 billion dollars every year due to electricity theft. (Yakubu, 2018). Power theft is the primitive cause of financial crisis faced by most utility companies in Ghana and the high rate of power theft practice is problematic and needs to be controlled. Sometimes, it is reported that the high NTL is usually concerned with consumers using a postpaid metering system (Sharma, 2016). Conversely, there are two types of losses: technical losses and non-technical losses (NTL). Some technical losses are enacted in some electrical equipment and could be due to heat degeneracy as current passes through the equipment (World bank, 2009). The sole aim of this research is targeted losses which can be controlled in some NEDCo operational areas since economic situation of most utility companies centers on revenue (Sabha, 2014). Hence, the goal of this article is to investigate power theft practices: key perspective indicators undermining revenue mobilization from both in some selected NEDCo area of operations in Ghana.

Literature Review

Developing countries like Indonesia, Malaysia, Myanmar, Thailand, and Vietnam in Asia have quantified billions of dollars lost through Non-Technical activities. (Nizar et al., 2006). Report in India admonishes that every year, an amount of 6 billion kilowatt-hours of electricity is stolen displaying 15% total supply of energy. This act creates disturbance making it difficult for emerging economies suffer in relation to transmission and distribution losses. For instance, India accounts for 1.5% of their GDP each year, resulting in power fluctuations. According to a world Bank report, the most vulnerable are the disadvantaged in society and trustworthy consumers who normally bear the cost of this problem; who will be billed highly (World Bank Group, 2004). It is crucial to appreciate the underlying factors that serve as motivation for electricity theft, it will help in the prevention of such thefts (Yurtseven, 2015). Sometimes the absence of accountability in the system of electricity, unchecked corrupt personnel endorsed by top-most politicians, non-payment of bills by powerful customers, lack of effective laws to deal with electricity theft, and non-enforcement of already frail laws act as factors responsible for electricity theft (Dike et al., 2015). In addition to this, bad governance, and customer's attitude from corrupt institutions, as they see nothing wrong with electricity theft can be attributed to factors that encourage people to engage in electricity theft. Presently, if you compare Ghana's electricity prices, since the year 2013; monthly electricity bills of people in the lower income bracket are presently higher than their monthly rent. Ghana's energy sector has been dependent for a long time on hydro power. Due to increased consumption due to urbanization and inadequate supply, the country is now relying on power and the selling price of electricity over the past ten (10) years is reported to have increased to almost 600%

(B&FMOnline, 2021). Electricity users may be dissuaded from purchasing electricity when prices are so high, even literate and higher income earners may also be motivated to avoid paying higher electricity bills (Depuru et al., 2011).

Methodology

Description of Study area

The Bono East region is a recently created region out of from Brong Ahafo Region. It has good marketed population density and most resident speak the Bono language. The Bono East Region vegetation consist mainly of forest and fertile soils between December and April is the dry season. The wet season is amid July and November with normal annual rainfall of near 750 to 1050 mm. The prime occupation of the inhabitants is mostly farming. They have a total population of 2,142,211. The Savanna Region is one of the newest regions in Ghana and yet the largest region in Ghana. The Savanna Region is boarded on the north by the Upper West region and the west by Ivory coast. The vegetation mostly entails of Sahel and savanna. The Upper West region is located in the north western turn of Ghana and to Upper East Region to the east and on the west by Burkina Faso. They have a total population of 1,554,322. The major occupation is mostly farming.

Selection of Study area

Four Regions were earmarked for this study, they were Savanna, Upper West which constitute the northern belt and Bono and Bono East which constitute the middle belt region. These regions were selected because they form part of the regions NEDCo electricity distribution company operate.

Population and Study design

This research adopted a cross-sectional survey design and a random study method was enacted. The research was part of a bigger study which started in March, 2019 and ended in May 2021. The cross-sectional study was achieved in May, 2019.

Research Method

To enable the research team, achieve the goal of this study, perusing of existing documents, field observations and conducting of interviews were the solid grounded factors that were employed in this qualitative study. The adoption of convenience sampling was employed since we were interested in people we could capture easily. In view of this, consumers were interviewed and asked some reasons people indulge in electricity theft. The participants readily opined answers deprived of any reservation as the question asked did not point straightly at them.

Respondent's survey

Structured questionnaire which consisted of open ended and close ended were designed for consumers to answer. A total of 200 questionnaires were deployed to all the selected NEDCo Regional Operational Areas selected under study. In view of this 4 Regions which have been earmarked for power theft practices were considered. 2 regions were assigned (Savanna and Upper West) as Northern belt regions (Bono and Bono East) and the other 2 counterparts were also noted to be the Middle belt. The questionnaires consisted of social demography of respondents, knowledge of electricity usage and power theft practices and its impact on the economy. 100 questionnaires from the middle belt regions (Bono and Bono East) were then compared to 100 questionnaires solicited from their northern belt counterpart (Savanna and Upper West regions) of Ghana to ascertain and undercover vivid information from consumers of electricity.

Inclusion criteria
Any Participant who had lived in the said regions for more than 5 years, a customer to the NEDCo proved to be more than 18 years and was willing to contribute in the study was involved.

Exclusion criteria
Any individual who is not a familiar citizen of the said regions, not a customer to the NEDCo company and were either below 18 years or who did not consent to partake in the study were not allowed to join this research.

Study tool (Questionnaire)
In Ghana, English, is the common communication language in Ghana to collect data from respondents by which well-organized questionnaires was formulated. The questionnaire was considered into four (4) units to cover the demographic characteristics, knowledge concerning power theft practices, attitude or perceptions concerning power theft, and participants' observance to preventive practices against power theft. In all, fifty-two (52) independent questions were answered; comprising eight (8) on demographic characteristics, twenty-nine (21) questions on knowledge, eight (8) questions on perceptions and seven (7) questions on preventive practices. The questionnaire was track through a series of peer review pilot. Review and pilot were accomplished before distributed out the study to participants. Lecturers of University of Energy and Natural Resources (Energy and Petroleum Department UENR) was the first to review the study tool. Their ideas and commendations were captured into the final tool. Additional phase of pretesting and pilot was carried out among 30 students chosen from various programs of study at UENR. Their responses were declared excellent with slightly challenges in completing the survey.

Analysis of Statistical Data
Graph Pad Prism statistical software© (Version 5) was used for the analysis. Answered questionnaires received were entered manually using Microsoft excel 2018 version. Output measures were demonstrated in simple frequency, p=value and odd ratio. Welch's unequal variances t test Chi-square analysis and was used to test for variances of categorical variables between the study communities.

Results
Results for Objective 1:
To investigate the impact of power theft on the economy of Ghana.
Our study focused on some key perspective power theft practices, indicators from participants in the study area leading to power lose among some consumers dwelling in the 4 selected regional capitals NEDCo operational stations in Ghana. The factors which undermine the Ghanaian economy as perceived by some participants within the study area. (Bono East, Bono, Savanna and Upper west region). The social demography of study participants due to age showed that, fewer proportions of the participants who lived in middle belt (3 %) were observed to have the age association with the age group 18-20 compared to their northern zone counterparts (7 %) as shown in Table 1 below. This was not statistically significant (p= 0.194) with an odds ratio of 0.41. Yet, greater proportions of the middle belt participants (12 %) were in the adult population. i.e., age over 60-70 compared to their respondents in the middle belt, although the difference was not significant. The study again showed that intermediate aged group who were known to be within category 30-40 were more abundant in the northern belt (32 %) compared to their middle belt (20 %) and the difference was not significant with p value of 0.053 and odd ration of 0.37. The northern belt recorded a highly

significantly number of females (52 %) compared to participants in the middle belt (57 %) (p>0.05)(Table 1). This results also revealed that, greater proportions of participants (67 %) from the northern belt were living in as married couples compared to their middle belt counterparts (43 %) (p-value of 0.0006) as displayed in Table 1 below. The results also displayed that greater majority of participants from the northern belt were also living a singled-life (37 %) or divorced (11 %) compared to their northern zone counterpart (19 %) or (9 %) with p-value of (0.8) as made known in Table 1. More so, this study sought to investigate some social demographic parameters, analysis based on occupation. A highly significantly greater portion of participants from northern belt region (65 %) who were working as Apprentice compared to their middle belt participants (49 %) (p=0.022)(Table 1). We indicated that there were about 4 times more number of participants who lived in the middle belt were perceived to be at risk to electricity theft compared to their northern zone counterpart (Odds ratio=4.57)(Table 1). The study went ahead to further probe and solicit views from participants regarding their behavioral power theft practices in their nearby communities. The researcher teamed to understand that power theft practices have been the norm in certain communities for some time being. To help achieve this objective, the under listed questions were used for investigations in their regional capitals.

Table 1: Social demographic of Participants in the study community

Variables	*%Number cases examined (200)*	*% Middle belt region(100)*	*%Northern belt region(100)*	*p-value*	*Odd ratio*
Age					
18-20	10(5.0)	3(3.0)	7(7.0)	0.194	0.41
20-30	50(15.0)	19(19.0)	31(31.0)	0.05	0.522
30-40	52(16.0)	20(20.0)	32(32.0)	0.053	0.37
40-50	39(19.5)	15(15.0)	24(24.0)	0.108	0.558
50-60	17(8.5)	8(8.0)	9(9.0)	0.7998	0.879
60-70	32(16.0)	12(12.0)	20(2.0)	0.1228	0.546
Gender					
Male	80(40.0)	43(43.0)	48(48.0)	0.0478	0.8173
Female	120(60.0)	52(52.0)	57(57.0)	0.4777	1.224
Marital Status					
Single	56(28.0)	19(19.0)	37(37.0)	0.0046	0.399
Married	110(55.0)	43(43.0)	67(67.0)	0.0006	0.37
Divorce	20(10.0)	9(9.0)	11(11.0)	0.637	0.8
Separated	4(2.0)	1(1.0)	3(3.0)	0.312	0.33
Widowed	10(5.0)	5(5.0)	5(5.0)	1	1
Educational Level					
Jhs	72(36.0)	25(25.0)	47(47)	0.0012	0.38
Shs	52(26.0)	21(21.0)	31(31.0)	0.106	0.59
Diploma	16(8.0)	5(5.0)	11(11.0)	0.118	0.43
Tertiary	6(3.0)	2(2.0)	4(4.0)	0.41	0.49
None	56(28.0)	23(23.0)	33(33.0)	0.115	0.6

Occupational Role					
Farmer	20(10.0)	16(16.0)	4(4.0)	0.005	4.57
Apprentice	114(57.0)	49(49.0)	65(65.0)	0.022	0.52
Trading	4(2.0)	2(2.0)	2(2.0)	1	1
Government worker	36(18.0)	11(11.0)	25(25.0)	0.01	0.37
Unemployed	10(5.0)	8(8.0)	2(2.0)	0.05	4.3

Footnote Norther belt region refers to Upper west and savanna whiles the Middle Belt regions refers to Bono East and Bono; OR refers to Odds ratio , p<0.05
was considered significant at 95% confidence intervals.

From the analysis, result of the study showed that, (95 %) of participants dwelling in the middle belt have heard of power theft practice compared to (80 %) of their northern belt counterpart and this was shown to be statistically significant with p-value of 0.0013 and <0.001. From there we reserved to know from the analysis that, greater proportions of participants who were interviewed in the northern belt out of 100 people, (14 %) had encountered culprits of power theft and they gave worries that sometimes it is painful to identity wrongs and report to authorities in-charge and nothing good seems to come out of it and this was not found to be statistically significant with p-value (<0.0001) as shown in Table 2 below. Again, follow up question of measures taken against such culprits and to our surprise, greater proportions of respondents from the middle belt dwellers (66 %) responded "no" as compared to their northern belt counterpart (37%) and this was also found to be highly statistically significant with p-value (< 0.001) as shown in Table 2 below. This study further investigated whether there is a high cost of electricity tariff and has it being the underlying reasons which has motivated people to steal electrical power? Greater proportions of middle belt inhabitants (90 %) were willing and bold to express their concern on the escalating prices of electricity tariff and added that it might have been the precluded reason which sometimes drive people steal electrical power compared their northern counterpart (66 %) and this was also seen to be significant. Also, the question regarding will the electricity supply companies run at loss when people continue to steal electricity without they being identify and caught were also noted from the participants and answers were a bit revealing, fewer proportions of respondents (27 %) from the middle belt region believed that the electricity companies have a lot of revenue, donor fund from developed countries and mobilization from the government and in that case will not suffer at a loss at all and this was also found to be significant per p-value (<0.001).
The research identified that greater proportion of consumers from middle belt zone (97 %) who willingly showed interest in this study attested to it that country whose inhabitants continue to steal electricity and engage in dubious power practices can really cause harm to the state's economy. In this study believed that power theft had great impact on the nation as well as their northern counterpart (63 %) as noticed in table 2 below.

Table 2: General view of Participants in relation to power theft practices

Variables	***%Number of cases examined (200)***	***%Middle belt Region (100)***	***%Northern belt Region (100)***	***P-value***	***Odd ratio***
Have you heard of power theft?					
Yes	175(87.5)	95(95.0)	80(80.0)	0.0013	4.8
No	23(11.5)	5(5.0)	18(80.0)	0.004	0.24
Have seen such practices before?					
Yes	17(8.5)	3(3.0)	14(14.0)	0.0447	0.28

No	183(91.5)	97(97)	86(86.0)	0.0993	5.3
How did you hear it?					
Radio	53(26.5)	47(47.0)	6(6.0)	<0.001	13.9
Television	127(63.5)	50(50)	77(77.0)	<0.001	0.3
caught on sight	3(1.5)	0(0)	3(3.0)	0.081	0.139
Was the culprit known to you?					
Yes	100(50)	37(37.0)	63(63.0)	<0.001	0.22
No	100(50)	63(63.0)	27(27.0)	0.0002	2.9
Were actions levelled against the culprit?					
Yes	65(32.5)	65(65)	0(0)	<0.001	0.003
No	135(67.5)	96(100)	39(39.0)	<0.001	0.003
Did you report it to the electricity Authority yourself?					
Yes	160(80)	97(97.0)	63(63.0)	<0.001	19
No	40(20.0)	3(3.0)	37(37.0)	<0.001	0.053
What actions were used against the culprits?					
Fine	42(21.0)	7(7.0)	35(35.0)	<0.001	0.14
Imprisonment	158(79)	93(93.0)	65(65.0)	<0.001	8.86
disconnection from grid	5(2.5)	0(0)	5(5.0)	0.0235	0.09
What measures should be taken against the culprits?					
Fine	106(53)	33(33.0)	73(73.0)	<0.001	0.182
Imprisonment	93(46.5)	66(66.0)	27(27.0)	<0.001	5.25
removal from grid	1(0.5)	1(1.0)	0(0)	0.3161	3.03
Where some equipment's taken away by Nedco?					
Yes	183(91.5)	97(97.0)	86(86.0)	0.0993	5.3
No	17(8.5)	3(3.0)	14(14.0)	0.0447	0.28
Is power theft common in your locality?					
Yes	175(87.5)	95(95.0)	80(80.0)	0.0013	4.8
No	23(11.5)	18(18.0)	5(5.0)	0.004	0.24
Can't tell	2(10)	0(0)	2(2.0)	0.1552	0.2
Is electricity bill too costly these days?					
Yes	106(53)	33(33.0)	73(73.0)	<0.001	0.182
No	93(46.5)	66(66.0)	27(27.0)	<0.001	5.25
Can't tell	1(0.5)	1(1.0)	0(0)	0.3161	3.03
Have you seen an official taken money from a culprit?					
Yes	25(12.5)	2(2.0)	23(23.0)	<0.001	0.07
No	84(42)	34(34.0)	50(50.0)	0.0219	0.52

Can power theft have impact on the economy of Ghana?					
Yes	160(80)	97(97.0)	63(63.0)	<0.001	19
No	40(20.0)	3(3.0)	37(37.0)	<0.001	0.053
Will the electricity company run at loss when there is too much power theft practices?					
Yes	93(46.5)	27(27.0)	66(66.0)	<0.001	0.3
No	53(26.5)	47(47.0)	6(6.0)	<0.001	13.9
Can't tell	3(1.5)	0(0)	3(3.0)	0.081	0.14

Footnote Norther belt region refers to Upper west and savanna whiles the Middle Belt regions refers to Bono East and Bono; OR refers to Odds ratio , p<0.05
was considered significant at 95% confidence intervals.

Moreover, this researcher sought to know from the participants again on how NEDCo company deliver service to their customers and actions being taken to curb power theft practices. Respondents were asked whether they have some knowledge on AMI. It was worthy to note that quite large proportions from both middle belt (86 %) and their northern cohort (76 %) with p-value (<0.001) had no idea about AMI. Also, we sought to know about meter tampering practices. We also asked from respondents to give name to places they have seen practicing it. It was alarming to note that greater participants living in the middle belt gave proofs that they have witness such an incidence of meter tampering (97%) as compared to their northern opponent (63 %). Also, we resolved to know from this study the different theft practices adopted by culprits of electricity theft in these areas understudied. It was alarming to find out that greater proportions living in the northern zones (87 %) identified "commercial consumers" in terms of amount to be the highest group that steals electricity, followed by domestic users which recorded (10 %). Lastly, greater proportions of participants from the northern belt (77%) pinpointed that satellite-offices be established in populated areas to help monitor power theft practice as compared to their opponent. More so, a higher member from the north (50 %) did not see the benefit of the company disbursing resources to train staffs in remote areas and this was seen to be significant with odd ratio of 3 in table 3 below.

Table 3: Complaint by Participants of service delivery by Nedco electricity company

Variables	*%Number of cases examined(200)*	*%Middle belt(100)*	*%northern belt(100)*	*p-value*	*odd-ratio*
Have you heard of Advanced Metering System?					
Yes	170(0.85)	86(86.0)	76(76.0)	0.15	3.13
No	20(10)	11(11.0)	9(9.0)	0.64	0.8
don't know	3(1.5)	3(3.0)	15(15)	0.081	0.14
Have you seen a meter been tampered for illegal connections before?					
Yes	160(80)	97(97.0)	63(63.0)	<0.001	19
No	40(20.0)	3(3.0)	37(37.0)	<0.001	0.053
don't know	(0)0	0(0)	0(0)	0(0)	0
Do you think more seminars should be embarked to train Staff' against power theft?					
Yes	102(51)	15(15.0)	87(87.0)	<0.001	0.03
No	36(21.0)	26(26.0)	104(10.0)	0.0004	6
Which of the following do they steal electricity most??					
Commercial	102(51)	15(15.0)	87(87.0)	<0.001	0.03
Domestic	36(21.0)	26(26.0)	10(10.0)	1.004	1
Will the electricity company run at loss when there is too much power theft practices?					

Yes	42(21.0)	7(7.0)	35(35.0)	<0.001	0.14
No	158(79)	93(93.0)	65(65.0)	<0.001	8.86
don't know	5(2.5)	0(0)	5(5.0)	0.0235	0.09
Do you think every area should have a sub- station to ensure proper monitoring in various households?					
Yes	127(63.5)	50(50)	77(77.0)	<0.001	0.314
No	53(26.5)	47(47.0)	6(6.0)	<0.001	
don't know	3(1.5)	0(0)	3(3.0)	0.081	0.139

Footnote Norther belt region refers to Upper west and savanna whiles the Middle Belt regions refers to Bono East and Bono; OR refers to Odds ratio , p<0.05
was considered significant at 95% confidence intervals.

Discussion

The motivation by consumers to steal electricity is often associated to poor living standards. In south Asia, poverty drives consumers to commit electricity theft (Smith, 2004). Another studies by Yurtseven, 2015 enhanced this claim that people found culpable for practicing power theft are domestic consumers, churches, and businesses who are not poor per worldly status. In our study, we realized that this assertion cannot be true since power stealing was practiced by all and sundry irrespective of the socio-economic status. Studies elsewhere have discovered that the amount of power stolen by people living in slum areas is small by assessment. Yet routine check-ups often target the poor in the community (BRDC, 2000). Another tool that was seen depriving most electricity companies was the practiced of corruption by some of their workers. The world's most corrupt nation that practice electricity stealing is India. Jamil and Ahmad 2014, describes how some corrupt officials working with electricity company in India connive with workers to reduce some tariff bills which at the end they will earn some percentage, divert monies supposed to be state own into their own pockets and do not disclose power theft culprits. Some could even be top officials. Smith, 2004 addresses that should be electricity officials should be paid well with huge renumerations so that they will not have to resort to bribes. This assertion was however true in our study. In our study we realized the short fall of some Regulatory work. In every system of electricity distribution, there is a regulatory governing it. Most electricity companies after passing on those regulations do not enforce it to work. The establishment of the PURC, has failed to embark on the rights of the consumer and disseminate information regarding the use of electricity. The establishment of International Utilities Revenue Protection Association to endorse the detection and deterrence of power theft–mainly for the financial security of power utility companies. The penalties of theft in the worst-case systems are imperative to the viability of the services provided. A report made by (Lovei and McKechnie, 2000), that power theft impacts upon the poor by preserving a system that profits the wealthy and powerful. Power systems may also encourage ''Grand Theft'' by awarding profitable contracts and monopolies that lead the enrichment of favored individuals. The prevention of power theft practices by consumers was noticed. Ideally, electricity companies operate as bureaucracies despite some few fractions remain as private sectors. Inspection and monitoring power users is an effective means to mitigate power theft practices but sometimes hard to practice by these companies (Gower, 2000). So increased investigation and surveillance may provide opportunity for more corruption (Anuradha, 2000). Our study discovered some measures to be used against culprits of electricity theft. There are several laws to be meted against someone who practiced power theft. Other countries measures are not different from what is being practiced here. While others are improving their outdated regulations enactments, Indian, companies like the

Andhra Pradesh amendments to the Electricity Act (1910) contains punishments from 6 months to 5 years imprisonment, fines of between 5000 to 50,000 Rupees, and depriving the thief of electric power for up to 6 years (Barnes, 2000; Lundin, 2001). Also, one of the keys we found in our study hunting most electricity companies in terms of revenue generation was the non- payment of bills by users which is sometimes linked to politics. This act deprives most companies of the amount of revenue mobilization supposed to be accumulated by the company. The problem of arrears or non-payment is a difficult one. Electricity is an essential commodity and in our era politics the phenomenon ''no pay, no electricity'' policy will not be accepted in country. Providing alternative methods and places for bill payment may also help. In some occasion those in arrears are government agencies, and collecting can provoke legal and political hurdles that election year and unmetered agricultural use positively increase electricity theft. Findings from the casual effects model indicated that per capita income cuts power theft while fine, price, load-shedding, temperature and probability of detection increase power theft. Mirza et al. (2015) informed that per capita income and economic directness decrease power theft in Pakistan. Rightly, price and consumer base were noticed to increase power theft for the country. In this study, the most sought-after indicator which motivates consumers to practice power theft was known to be high pricing in tariff. Hikes in price of electricity is the influenced factor mentioned to effect NTL in the empirical literature (Jamil and Ahmad, 2013b; Mirza et al., 2015). Increased in higher electricity price increases NTL since those who do not have money have to steal power in time of usage. Hitherto, a sophisticated income level corresponds with lower NTL. This is due to a higher income of a country enables residents to recompense for the electricity they use without default and also pay for new connections instead of theft (Jamil and Ahmad, 2013b). The study also discovered that participants had no knowledge in AMI. AMIs refer to the upgrading of the electricity metering system by substituting old mechanical meters with smart meters. Smart meters are new implanted devices that provide two-way communication between the utility and the customer. These devices have innovative communication and computational capabilities, with the latent functionalities, such as improved service choices and transparency. Distribution utilities, billing of electricity and sending employees to read meters on site can be avoided by using AMI for the monitoring. Importantly, AMIs provide several new capabilities, including monitoring network-wide and individual electricity consumption, faster remote diagnosis of outages (with analog meters, utilities learned of outages primarily by customer call complaints), remote disconnect options, and automated power restoration. AMIs also seeks to advance the customers' access to their energy usage data and encourage the execution of demand-response schemes. One approval consumer gave to control power theft practices was the use of IT in most of their system installation. In recent years, basic protective measures such as tamper evident seals and secure-link communications have been developed for AMIs. Yet, they are not adequate to avoid successful attacks during the meter lifetime. Security researchers have recently identified cyber vulnerabilities in smart meters Mutebi et al. (2014) and were even able to perform rogue remote firmware updates (Winther, 2012). Notably, for instance in the U.S, hacked smart meters have been used to steal electricity, resulting in losses of millions for dollars (Golden and Min, 2012). Malicious insiders and outside hackers with only a moderate level of computer knowledge are likely able to convert and reprogram meters with low-cost tools and software readily available on the Internet. Golden and Min, 2012, also foresees and speculations with medium confidence that as smart grid deployments continue, the cyber theft of electricity will also rise. The most prospective reasons for this increase are the low costs of intrusion and high overall financial benefit for both hackers and customers.

Conclusion

Ghana has 2 main power distribution companies, thus VRA-NEDco and ECG. Despite control measures and pilot processes implemented by the NEDCo, power theft still exists in some of its operationalized areas. This study outlines some intriguing facts concerning loses, both residential and non-residential customers owe some huge amounts of money by power theft practicing which is a detriment to Ghana's economic growth. In this research, we resolve to conclude that, some consumers of electricity emanating from the northern belt were identified as culprits of power theft practices which was a bit surprising though less distribution of resources in the region and sometimes governments effort to help subsidize electricity tariff and make easy access for all. In view of this, we come to conclude with an assertion that power theft is practiced by all irrespective of location. Another concern was that, sometimes it was a bit challenge on the part of the VRA-NEDco to educate and warn the general public to desist from the dos' and don't involve in power theft practicing. It was also observed that sometimes some corrupt NEDCo Officials become negligent and channel power theft charges into their own pockets and allow some culprits to go escort free. A fruitful eradication of these power theft leakages will lead to a prominent laid down electricity supply system in the NEDCo operational areas. This will churn into retrieving of sustainable funds for the active operation of the firm including the refurbishment of obsolete transmission and circulation equipment to help advance on the technical losses.

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Availability of data and materials

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References

1. Adom, P., (2016). Electricity supply and system losses in Ghana, *MPRA Paper No*. 74559. (accessed 8 January 2021).
2. Akinyemi, O., Ogundipe, A. and Alege, P., (2014). Energy supply and climate change in Nigeria. *Journal of Environment and Earth Science*, 4, (14), 47–61.
3. B and FTOnline, (2016). Power Tariffs go up 600% in 10yrs. ⟨http://thebftonline.com/business/energy/19407/power-tariffs-go-up-600-in-10yrs-as-thermal-takes-control-.html⟩ (Accessed 2 March 2012).
4. Otchere-Appiah, G.; Hagan, E.B (2018). Potential for electricity generation from maize residues in rural Ghana: A case study of Brong Ahafo Region. *Int. J. Renew. Energy Technol. Res. 2014, 3, 1–10.* Available online: http://ijretr.org (accessed on 2 February 2021).
5. Depuru, S.S.S.R., Wang, L., Devabhaktuni, V., (2011). Electricity theft: overview, issues, prevention and a smart meter based approach to control theft. *Energy Policy* 39 (2),1007–1015.

6. Golden, M. and Min, B., 2012. Theft and loss of electricity in an Indian State. *InternationalGrowthCenter,WorkingPaper*.URL:http://leitner.yale.edu/sites/default/files/resources/papers/GM_PowerTheft_20120409.pdf (accessed 7 March 2022).
7. Khan, M.A., Badshah, S., Haq, I.U. and Hussain, F., (2013). Measures for reducing transmission and distribution losses of Pakistan. *International Journal of Scientific & Engineering Research* 4, 4, 616–619.
8. Mirza, F.M., Hashmi, M.S. and Mirza, S.M., (2015). Long run determinants of electricity theft in Pakistan: an empirical analysis. *Pakistan Journal of Social Sciences* 35, 2, 599–608.
9. Mittal, P. and B. Tech Students of EEE, 2015. Wireless Electricity billing cum theft detection system. *International Research Journal of Engineering and Technology,* 2, 2, 83–86.
10. McDaniel, P.; McLaughlin, S. (2009). Security and privacy challenges in the smart grid. IEEE Secur. Priv., 7, 75–77.
11. Nababan, T.S., (2016). Analysis of factors affecting the electricity supply in Indonesia. *International conference on Accounting, Management, Economics and Social sciences (ICAMES), Millenium Hote, Jakarta*, 30 April, 2022.
12. Yakubu, O., Narendra, B.C., (2017). 'Electricity Theft: a case study of Ghana'. *Int. J. Mech. Eng. Technol.* 8 (10), 170–179
13. Nizar, A.H., Dong, Z.Y., (2009). Identification and detection of electricity customer behaviour irregularities. *In: Proceedings of the Power Systems Conference and Exposition. PSCE'09. IEEE/PES,* pp. 1–10. Retrieved from The Energy Commission of Ghana: *http://energycom.gov.gh/files* (accessed 12 March 2022).
14. Smith, T.B., (1993). India's electricity crisis: why do the lights go out? *Asian Survey* 33 (4), 376–392
15. Smith, T.B., (2003). Privatising electric power in Malaysia and Thailand: politics and infrastructure development policy. *Public Administration and Development* 23 (2).
16. Sharma, T.; Pandey, K.; Punia, D.; Rao, J. (2016). *Combating electricity theft in India. Energy Res. Soc. Sci.* 2016, 11, 40–52:
17. Winther, T., (2012). Electricity theft as a relational issue: a comparative looks at Zanzibar, Tanzania, and the Sunderban Islands, India. *Energy Sustain. Dev.* 16 (1), 111–119.
18. World Bank, (1999). Non-Payment in the Electricity Sector in Eastern Europe and the Former Soviet Union, *World Bank Technical Paper No*.423, Washington, DC, World Bank.

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