



Electricity theft: Analysis of the underlying contributory factors in Ghana

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ABSTRACT

Developing countries, including Ghana, are grappling with a high rate of electricity theft; it is affecting the income generation capacity of their utility companies. The infrastructure deployed by these utility companies to detect and control electricity theft are poor resulting in an immense loss of revenue. This study was undertaken to identify the underlying contributory factors that encourages electricity theft in Ghana. Studies undertaken in other countries revealed that, electricity theft is as a result of economic and political reasons such as poverty and unemployment. Using data captured from the Ashanti Region, which is the most populous region in Ghana, we studied the factors that cause electricity theft and ranked them in order of the most significant. In this study, higher electricity prices, poor quality of power supplied, corruption, poor enforcement of the law against electricity theft, and the PURC not fighting for the interest of consumers were found to be the main causes of electricity theft. Other factors are attitudinal, illiteracy, unemployment, and poverty.

1. Introduction

Developing countries like Ghana continue to struggle with the menace of electricity theft, a development that has hampered the growth of the energy sector. There are two (2) utility companies in Ghana, namely, ECG and NEDco-VRA. They are public entities enjoying monopoly; they make low profits and render poor service to consumers due to huge distribution losses which are caused mainly by theft. Low revenues have affected their capacity to re-capitalize for expansion, resulting in erratic power supply. A significant number of electricity meters in Ghana are postpaid; they are read monthly by the staff and subcontractors of the utility companies for subsequent billing. The utility companies believed that, electricity theft would be curbed if prepaid meters are deployed. However, after aggressively deploying prepaid meters in some parts of the country, electricity theft assumed a more alarming proportion. Smith (2004) posits that electric power systems cannot be fully secured against theft. Depuru et al. (2010) also contend that electricity companies in emerging economies suffer from NTLs; detecting and controlling the possible causes of these losses is challenging, due to the bad nature of their infrastructure.

NTL is the term used to describe losses in the distribution of electricity as a result of theft and other irregularities by consumers (Nizar and Dong, 2009). Billing anomalies and theft of electricity account for a

large part of NTLs and affect electricity supply (Depuru, 2011). Genuine customers bear the brunt of these losses as they are made to pay higher bills to make up for the losses. Transmission and distribution losses that are recorded in India is ranked as one of the highest in the world with an average of 30% of total electricity produced. In terms of GDP, the estimated loss accounts for 1.5% and is growing rapidly (Sinha et al., 2011). According to Nagi et al. (2010), developed economies like the United States of America and the United Kingdom also experience NTLs, although it is not on a large scale like developing countries in Asia and Africa. NTLs of 20–30% have been detected in India, Pakistan, Lebanon, and Bangladesh. NEDco-VRA is reported by Cityfmonline News (2017) to have discovered that consumers who use prepaid meters engaged more in electricity theft as compared to postpaid meter users. They disclosed further that 45% of electricity theft was recorded in their operational area and could result in the collapse of the utility company. They further discovered that consumers who use prepaid meters are more motivated to steal electricity than consumers using postpaid meters. When the electricity units of prepaid meter users is finished or is low, they tamper with the meter to reconnect electricity, especially where they cannot get access to vending centers to purchase electricity units immediately. The prepaid meters which the utility companies claim are tamper proof have not succeeded in reducing electricity theft.

Abbreviations: ECG, Electricity Company of Ghana; GDP, Gross Domestic Products; MIDA, Millennium Development Authority; NEDco-VRA, Northern Electricity Distribution Company of the Volta River Authority; NTL, Non-Technical Loss; PURC, Public Utilities Regulatory Commission

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In Ghana, about 30% of electricity supplied by the utility companies is lost through theft and other illegal activities. In 2011, ECG listed 2.4 million customers with a distribution loss of 31.82%, technical loss of 10.38%, and commercial loss of 21.45% (MIDA, 2012). The shortage and erratic electricity supply in Ghana is partly attributed to theft, as well as inadequate generating capacity, and high cost of powering thermal generators. The economy of Ghana has lost many jobs and huge investments after the onset of the energy crisis in 2010. Human lives have been lost through electrocution or fire outbreaks as a result of illegal connections to steal electricity. The major actors in electricity theft in Ghana were identified as consumers, staff of the utility companies, and their accredited agents (Yakubu and Narendra, 2017). In determining the reasons why people engage in electricity theft, one is tempted to conclude that the overriding reason is poverty. This assertion may be true for low income urban and rural dwellers; however, this study revealed that a substantial number of businesses, churches, and middle income households were also involved in electricity theft.

In this research, the underlying factors which contribute to electricity theft are identified and ranked. Data was taken from the Ashanti Region, the region with the largest population in Ghana (Ghana Statistical Service, 2016). The remainder of this paper is structured as follows: Section 2 highlights the problem of electricity theft and the scope of the study, and reports on the review of relevant literature. Section 3 describes the methodology and data used. Section 4 discusses the results and Section 5 presents the conclusion and some policy recommendations.

2. Problem definition and scope

A number of developing countries in Asia including Indonesia, Malaysia, Myanmar, Thailand, and Vietnam have reported huge losses through NTLs (Nizar et al., 2006). Hundreds of millions of US dollars are lost to electricity theft annually in Pakistan (Jamil and Ahmad, 2014). Yurtseven (2015) reports the Turkish Electricity Distribution Company as saying that annually about 16 billion kilowatt-hours of electricity are stolen which represents about 15% of the total supply of electricity, translating to billions of dollars in financial terms. Developing economies suffer transmission and distribution losses, which in the case of India accounts for 1.5% of their GDP each year, resulting in power crisis. Poor people and consumers who are honest are those who normally bear the brunt of this problem; they pay higher bills and are subjected to persistent black outs (World Bank Group, 2004). It is vital to understand the underlying factors that serve as motivation for electricity theft, it will help in the prevention of such thefts (Yurtseven, 2015). In Uttar Pradesh, the largest state in India, 29% of power transmitted from 1970 to 2010 was not accounted for, implying possibly that it was lost through theft, not billed, or a technical loss (Min and Golden, 2014). In the estimation of Smith (2004), for countries in South Asia, electricity theft is common in areas inhabited by poor consumers. Smith (2004) studied the causes of theft of electricity and found that countries with ineffective accountability, unstable political environment, ineffective government, and corruption experience higher levels of electricity theft. Jamil and Ahmad (2014) in their study in Pakistan found that consumers' income and the price of electricity are factors that influence electricity theft; as consumers' income rises electricity theft reduces.

Yurtseven (2015) claims that the high rate of electricity theft in developing economies leads one to believe that poverty is the cause; however, in China the electricity theft rate is lower even though the poverty rate is high. In addition to income levels, Yurtseven (2015) also found that social capital, population rate in rural areas, temperature rate, and production of agriculture are the other factors that cause electricity theft. Steadman (2009) studied the reasons behind Jamaica's electricity theft, and utilizing local factors in his model, he established that income and levels of education were the driving factors behind electricity theft. Gumusdere (2004) in his master's thesis discussed

income and education as factors that determined energy theft in Turkey. Mimmi and Ecer (2010) in studying the social and economic factors that instigated those living in the slums of Brazil to engage in electricity theft found that, they were motivated by the perception that they were being discriminated against by the energy company and the poor quality of power supplied to them. In the estimation of Jamil and Ahmad (2014) electricity theft occurs where people believe the supposed benefits outweigh the risks. Mutebi et al. (2014) in their study on electricity theft in Kampala, Uganda, alluded to the fact that economic reasons and fraud within the utility companies were the main motivating factors that encouraged consumers to steal electricity. Their study confirms that electricity theft is seen by consumers in developing countries as a problem for the utility providers. No one is willing to alert the relevant authorities even if they find a consumer stealing. Golden and Min (2012) posit that in India theft of electricity is political and is more prevalent during years that state assembly elections are organized. Golden and Min (2012) further allude that sitting members of the legislature are more likely to be retained as theft of electricity in their area increases. They concede that their results failed to establish that electricity theft has a relationship with political criminality or is a result of institutional weakness.

In Nigeria, Dike et al. (2015) identified the absence of accountability in the market system of electricity, corrupt employees protected by the political system, non-payment of bills by powerful customers, lack of effective laws to deal with electricity theft, and non-enforcement of already weak laws as factors responsible for electricity theft. Dike et al. (2015) further contend that in developing countries like Nigeria, electricity theft also emanates from corrupt institutions, bad governance, and customer's attitude as they see nothing wrong with electricity theft. Depuru et al. (2011) also categorized factors that encourage people to engage in electricity theft to include social and economic factors, higher levels of unemployment, low literacy rates of consumers, corruption, and lack of enforcement of existing laws which are themselves very weak. Depuru et al. (2011) further contends that illiterate consumers do not understand the implications of their actions as they lack awareness of the law. Unscrupulous employees of the utility companies responsible for billing and reading the meters are also known to be corrupt. In Ghana electricity prices have tripled since the year 2013; monthly electricity bills of people in the lower income bracket are currently higher than their monthly rent. Ghana's energy sector has been dependent for a long time on hydro power. Due to increased consumption and inadequate supply, the country is now relying on thermal power and the selling price of electricity over the past ten (10) years is reported to have increased to almost 600% (BandFTOnline, 2016). The trend of tariffs paid by consumers is shown in Fig. 1. It shows that Ghanaians are currently paying the highest tariffs compared to previous years.

Consumers 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). The rate of electricity theft and its causes by low-income slum dwellers in urban areas of Brazil was studied by Mimmi and Ecer (2010). They found that low income earners spend a larger part of their everyday income on electricity than higher income earners. Further, Mimmi and Ecer (2010) contend that the chances that one will engage in electricity theft are not only as a result of having a low income. Other factors like poor energy provision standards and bad equipment increases the chances that urban slum dwellers will perceive authorities as not caring about them and increases their chances of engaging in electricity theft. Winther (2012) focuses on the relationship between the utility companies and their customers in identifying the reasons for customers to engage in immoral acts; they contend that social relations and technologies like appliances being used could likely influence customers' morality.

Various solutions have been prescribed in recent years to curb the electricity theft menace. Sahoo et al. (2015) proposed a predictive

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