FACTORS INFLUENCING ELECTRICITY DISTRIBUTION IN NYAMARAMBE DIVISION; KISII COUNTY, KENYA

BY

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DECLARATION

This research project is my original work and has never been presented for the award of any degree in any other university.

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DEDICATION

This research project report is dedicated to my dear wife Maureen Atieno whose moral support provided an enabling environment to carry out this study and to my beloved son Edwardo Majiwa who gives me the hope of living for another day.

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LIST OF ABREVIATIONS & ACRONYMS

ARE	Alliance for Rural Electrification
CEO	Chief Executive Officer
DC	Direct Current
ERS	Economic Recovery Strategy
GDC	Geothermal Development Company Limited
IEA	International Energy Agency
KENGEN	Kenya Electricity Generating Company Limited
Ketraco	Kenya Electricity Transmission Company Limited
KNBS	Kenya National Bureau of Statistics
NPEP	National Poverty Eradication Plan
REP	Rural Electrification Program
REA	Rural Electrification Authority
SO	System Operator
SSA	Sub-Saharan Africa
TPA	Third Party Access
TV	Television
US	United States
WTP	Willingness to Pay

ABSTRACT

The study on factors influencing electricity distribution in Nyamarambe Division, Kisii County was guided by the following four objectives; to establish the influence of electricity connection cost on electricity distribution in Nyamarambe Division, to examine the influence of the areas' economic background on electricity distribution in Nyamarambe Division, to establish the extent to which security of electricity distribution network influences electricity distribution in Nyamarambe Division and to assess how access to information by users and non-users of electricity influences electricity distribution in Nyamarambe Division. Literature was reviewed according to the objectives of the study. The first objective was reviewed by looking at factors influencing cost inefficiency in electricity distribution and how regulation of electricity services can make electricity accessible and affordable. The second objective was reviewed by looking at a report done by Tschirley, Irungu, Gitau, and Kariuki on Rural Incomes, Inequality and Poverty Dynamics in Kenya which found out that alleviating poverty remained one of the key challenges in many developing economies which according to Kenya Integrated Household and Budget Survey, (2006) found that 46% of the total Kenyan population is absolutely poor, whereas 49% of the rural population was absolutely poor. The third objective was reviewed by mentioning reliability factors affecting electricity infrastructure like natural causes, local history, civic projects, citizen and crew safety, inter-governmental collaboration and power outages. The fourth objective was reviewed by looking at a research done by Shibanda (2006) on Management of government information in Kenya which revealed that 50 per cent of the Kenyan imprint constitutes official publications on legal policy, education, agriculture, economic, health and environment with implication on day today lives of citizens. The study employed descriptive survey method as a research design. Data was collected by use of questionnaire and interview methods. A total population of 2293 was targeted comprising 2243 electricity users and non-users (households) and 50 electricity distributors. 20% of the target population was sampled. It was established that 35.35% of the respondents had electricity in their premises which was a good percentage as compared to Kenyas rate of just over 10% in rural areas. The study found out that cost of electricity connection was considered unaffordable and vandalism comprised security of electricity distribution network. The area's economic background was found to be favorable with businesses and farming activities predominant, about 32% of the respondents were in formal employment. Knowledge of sources of electricity information and service providers was over 90% a good indication of access to information. The study concluded that the high connection rate (35.35%) in Nyamarambe Division was as a result of favorable economic background and accessibility to information on electricity services. The connection rate could have been higher were it not for high connection cost to electricity and rampant vandalism of electricity distribution network in this area. It was therefore recommended that the Government together with the electricity service providers should consider bringing down electricity connection costs, sensitize users and non users of electricity to counter vandalism to electricity distribution network, electricity service providers should ensure that electricity service information got by users and non-users of electricity is valid and Kenyans to elect development conscious leaders since these leaders influence provision of electricity services.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Rural areas are sparsely populated areas in the country side characterized by high poverty levels, low standards of living, low employment rates, poor service delivery in terms of hospitality, education, transport, communication, health care and information technology. (Goel & Goe, 2009). Electricity distribution is the final stage in delivery of electricity to end users. In impoverished and undeveloped areas, small amounts of electricity can free large amounts of human time and labor. (Barnes & Foley, 2004). Rural electrification is the process of bringing electrical power to rural and remote areas. (Beall, 1940)

In 1981, 74.9% of Brazilian households were served by electric power, according to the IBGE's PNAD survey. In 2000, the Brazilian Federal Government, under the Fernando Henrique Cardoso administration, launched the Luz no Campo program to expand the distribution of electricity in Brazilian domiciles, with a focus on rural households. The results were as follows, according to the PNAD: by 1996, 79.9% of all households had access to an electric power supply; that proportion rose to 90.8% in 2002 and 98.9% in 2009.

In India, cheap solar technology development was considered as a potential alternative that allowed an electricity infrastructure comprising of a network of local-grid clusters with distributed electricity generation. Locally controlled generation was preferable to distant generation because the fuel, billing and controls for the generator would then be controlled by the villagers themselves, and they were thought more likely to come to an equitable arrangement among themselves. However, there was doubt that villagers could run such an installation. (Reuters, 2009; Revkin, 2008)

In Jamaica, Rural Electrification program (REP) was incorporated in 1975 with the specific mandate to expand the reach of electricity supply to rural areas, where the provision of such services would not be economically viable for commercial providers of electricity. The REP extends the national grid through the construction of electrical

distribution lines to un-electrified areas and provides house wiring assistance through a loan program to householders. (Tazhmoye, 2009).

According to the 7M construction magazine (2008), Uganda's power sector has undergone major reforms. Through a Statutory Instrument (No. 75 of 2001) the government of Uganda put in place the Rural Electrification Agency (REA) as the Secretariat of the Rural Electrification Board (REB) with a key responsibility of ensuring management of a Rural Electrification Fund (REF) for promotion of rural electricity access and connectivity in an equitable manner for the whole of Uganda. The target was to achieve at least 10% electricity access for rural Uganda by 2010 as compared to 1% in 2000. Under the new service delivery mechanism, rural electrification has made good progress in Uganda. Rural electrification has progressed in Uganda to reach 5% as at end of 2007.

Zambia is a country with abundant resources but less than 2 % of its rural population has access to electricity. Traditional rural electrification in Zambia has often failed because it is generally based on grid extension with minor off-grid investments which are expensive to rural people. The country has an installed electricity generation capacity of 1786MW and undeveloped hydropower potential of over 6000MW. Demand for electricity in Zambia has been growing and it is anticipated to outstrip supply in 2008. However, rural electrification (RE) faces many challenges such as long distances from existing power stations to targeted rural areas, low population densities, high poverty levels and low skills availability. These and other factors have contributed to continued low levels of access to electricity in rural areas of the country. (Haanyika, 2006)

Rwanda's total available capacity of electricity is 69.5MW. Access rate to electricity in Rwanda is at 7%, energy consumption per capita is at 0.17 toe by 2010, while the average in Sub-Saharan Africa it is 0.6 toe and 4.7 toe in industrialized countries. Energy cost in Rwanda is high; electricity tariff is around USD 23ct/kWh. Access to electricity is at 1% in rural areas and energy cost is very high in rural areas, subsidies are always necessary. The Rwanda government is working towards increasing access to electricity from the

current 7% (1% in rural area) to at least 16% by 2012, increase supply with 165MW (Domestic generation), transmission and distribution from 135,000 to at least 350,000 connections. (Yussuf, 2010)

According to Eng. Joseph Njoroge, Managing Director & CEO of The Kenya Power Company, the Ministry of Energy through The Kenya power Company, KENGEN and Rural Electrification Authority (REA) are at the forefront of electricity distribution in rural areas in Kenya. In the year 2009, the Kenya Power Company Limited connected more than 43,900 new customers with electricity under the rural electrification program. (J. Njoroge, personal communication, 2009).

Energy Minister Kiraitu Murungi, on his part, said the Government had set ambitious targets for scaling up electricity access in urban and rural areas with a view to achieving 50 per cent connectivity rate by 2020. The targets, Mr. Murungi noted, were attainable given that the high voltage power grid was within reach of 75 per cent of the population who only require installation of step-down transformers to access electricity. (Safari Africa, 2011)

President Kibaki said his Government is working towards ensuring that connectivity reaches 70 per cent in line with Vision 2030. The connectivity of 30 per cent includes both urban and rural average. Rural electrification is currently just over 10 per cent in Kenya which is below the 12 per cent of rural population that has access to electricity in Sub Saharan Africa. (Safari Africa, 2011).

1.2 Statement of the problem

Like most countries in Sub-Saharan Africa (SSA), Kenya is not an exception in facing energy dilemmas. One of the key obstacles to the shift to modern energy consumption is the limited access to electricity for households, particularly in the rural areas. The overall electrification rates in SSA (2000) stand at 23%, with the urban and rural area figures standing at 51% and 12% respectively. However, Kenya has electrification rates below the SSA average with 30% overall connection and a breakdown of 42% and just over 10% for urban and rural areas respectively (Safari Africa, 2011; International Energy

Agency (IEA), 2002). One reason for this low level of electrification in rural areas is the lack of available finance to cover capital and operating costs for generation, transmission and distribution of electricity, which are higher than in urban areas. Moreover, the high connection costs coupled with low consumption of electricity and low incomes among rural households are further obstacles to the electrification of these households. Most rural households consume traditional energy derived from wood fuel, charcoal, agricultural residues and cow dung. In fact, the dominant energy source for non-electrified households in Kenya is primarily wood fuel and charcoal. Wood fuel provides 70% of the energy for all sectors in the country, except for the transport and commercial sector. Its use is common among households in rural areas, because it is relatively cheap and widely available and in fact 80% of these households consume this type of fuel.

Nyamarambe Division has a population of 78,120 people translating to approximately 15,700 households according to the Gucha South District Development Office Report (2010). Going by the International Energy Agency (IEA), 2002 and Safari Africa, 2011 figures pitting rural electrification in Kenya to be just over 10 percent, the number of connected households in Nyamarambe Division is therefore expected to just over 1,700 out of the total 15, 700 households. It has been reported that households are willing and able to pay, on average, about US$3-US$10 per kWh for improved energy services based on renewable energy resources including biomass (Acker & Kammen, 1996). Given such a high willingness to pay (WTP), one of the paradoxes is why electricity suppliers are not forthcoming. (Hoffman, Scheer, & Marchionini, 2004). According to the popular version, Vision 2030, despite the concerted effort by the Kenya Government to provide electricity to the rural population, the connected rural population is still low therefore meeting the vision 2030 percentage of 70% might just be a dream if electricity distribution in rural areas is not critically looked at with a clear focus on studying factors influencing electricity distribution in rural areas in Kenya. The research is therefore meant to study and analyse factors influencing electricity distribution in Nyamarame Division, Kisii County.

1.3 Purpose of the study

The purpose of the study was to investigate electricity distribution in rural areas particularly in Nyamarambe Division, Kisii County.

1.4 Objectives of the study

The following objectives guided the study;

1 To establish the influence of electricity connection cost on electricity distribution in Nyamarambe Division

2 To examine the influence of the areas' economic background on electricity distribution in Nyamarambe Division

3 To establish the extent to which security of electricity distribution network influences electricity distribution in Nyamarambe Division

4 To assess how access to information by users and non-users of electricity influences electricity distribution in Nyamarambe Division

1.5 Research questions

The study had the following research questions;

1 How does cost of electricity connection influence electricity distribution in Nyamarambe Division?

2 How does the area's economic background influence electricity distribution in Nyamarambe Division?

3 How does security of electricity distribution network influence electricity distribution in Nyamarambe Division?

4 How does access to information by users and non-users of electricity influence electricity distribution in Nyamarambe Division?

1.6 Significance of the study

The study analysed factors influencing electricity distribution in Nyamarambe Division, Kisii County and it was hoped that this will in turn help the policy formulators come up with positive solutions concerning electricity distribution both in other rural areas and the country at large. The study helped the researcher as a post graduate student as far as

expansion of knowledge is concerned in this area and other related areas. It is hoped that the study will also be a source of reference for other scholars and help in starting up some projects to rectify the problems identified which would benefit the whole nation at large.

1.7 Limitations of the Study

A limitation is used to describe what test or research is not able to achieve. This supports Mulusa's (1998) argument that evaluation studies normally have limitations caused by rules and regulations which make certain information inaccessible.

The researcher had limited time to carry out the research work since he is employed and work takes a bigger part of his time. The researcher overcame time limitation by extending the research work to night hours, weekends and leave from work was sought whenever there was research backlog. The researcher could not reach the whole of Nyamarambe Division which is wide with some areas inaccessible due to poor road network and fear of insecurity. The researcher hired motorbike as transportation means to reach areas with poor road network; the researcher's personal car was also used to move around Nyamarambe Division in order to cover most areas of the Division. The researcher identified friendly locals to accompany him to avert fear of insecurity. Some people were out for work, others out for personal activities so they were not able to attend to the researcher. To this respect the researcher collected data for a period of one month on different days of the week to reduce the possibility of leaving out some respondents. Some respondents hoarded information in suspicion of the researcher and expected material benefits. The respondents that the researcher faced were not known to him and some did not cooperate and some were reluctant to answer. The researcher therefore explained clearly his intention to the respondents first before collecting data to create an understanding. Insufficiency of funds to carry out the research was a major limitation of the study and to overcome this impediment, the researcher cut down his expenditure on food, entertainment and development projects to save money for the study.

1.8 Delimitations of the study

Delimitations of a study are those characteristics that limit the scope (define the boundaries) of an inquiry as determined by the conscious exclusionary and inclusionary decisions that are made throughout the development of a study. It also identifies the constraints or weaknesses of the study which are not within the control of the researcher. (Wirt & Marshall, 1986)

The study was limited to Nyamarambe Division. The study was focused on a population consisting of electricity users and non electricity users (households) and distributors. The study was limited to this population because the population is readily available in Nyamarambe Division and this in turn assisted the researcher get as much correspondence as possible within the time limits of the study.

The study was intended to find out how and whether the following independent variables touching on cost of electricity connection, area's economic background, security of electricity distribution network and access to information by users and non users influenced electricity distribution in Nyamarambe Division. The study did not intend to cover any other factors influencing electricity distribution in Nyamarambe Division other than the ones set in the objectives. Other factors like the terrain of the area, development preference of the area and population density of the area were not considered too problematic and significant while studying factors influencing electricity distribution in Nyamarambe division though this did not imply that these factors were not worth studying in any future study. The inclusion of these other variables, while interesting, were beyond the reach of the research team, given limited time and money for conducting the study. The study was limited to a target population of just over 2, 243 households out of the total 15, 700 in order for the researcher to study a manageable population and for the researcher not to be bogged down with too much data beyond his comprehension in order to come up with a conclusive study.

1.9 Basic assumptions of the study

Research assumptions are basic premises that are accepted on faith or assumed to be true, without scientific proof or verification (Polit & Hungler, 1997). Unlike testable propositions, research assumptions often go unrecognized. Even the most introspective investigator may have difficulty uncovering sources of research assumptions because they are deeply submerged in human thoughts and actions (Bouffard, 2000).

The study assumed that the respondents were truthful and knowledgeable and answered questions truthfully and honestly. The theory and conceptual framework were assumed to be an accurate reflection of the phenomenon studied of factors influencing electricity distribution in Nyamarambe Division. The study assumed that the instruments which were used (questionnaires and interview schedule) were congruent with the study's conceptual framework and that the measurement model and data analysis adequately captured core concepts in the theory. The study further assumed that Kenya Power was the major electricity distributors in Nyamarambe Division. In as much as some residents had solar system, the study assumed that the solar distributors were not resident in Nyamarambe Division and were far flung making locating them difficult and reaching them too expensive and un-affordable to the researcher.

1.10 Definition of significant terms

Access to information: works to create an enabling environment, which is conducive to and facilitates universal access to knowledge of something.

Cost: An amount that has to be paid or given up in order to get electricity connection, electricity service, electric line maintenance and electrical wiring

Distribution: Distribution in the process of making a product or service available for use or consumption

Distribution network: The system of interconnections between the producer of electricity services and the final users.

Economic background: The general economic conditions of an area

Electricity: A general term encompassing a variety of phenomena resulting from the presence and flow of electric charge. These include recognizable phenomena such as lightning, static electricity, and a flow of electrical current in an electrical wire

Electricity distribution: Electricity connection to the end user or a final stage in the delivery of electricity to end users

Electricity users: Households connected to electricity

Non-electricity users: Households not connected to electricity

Politics: The art or science of governing, especially the governing of a nation, and the administration and control of its internal and external affairs.

Rural areas:	Sparsely populated areas in the country side characterized by high poverty levels, low standards of living, low employment rates, poor service delivery in terms of hospitality, education, transport, communication, health care and information technology
Rural electrification:	A process of bringing electrical power to rural and remote areas
Security:	The degree of protection against danger, damage, loss, and criminal activity

1.11 Organisation of the study

The study was organised into five chapters, starting with preliminary pages then chapter one giving introduction to the study. Objectives of the study were highlighted here in introduction. The study then presented literature review which was done according to the themes of the objectives of the study. Research methodology was covered in chapter three with chapter four covering data analysis, presentation, and interpretation. The study ended with chapter five covering summary of findings, discussion of findings, conclusions, recommendations and suggestions for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter electricity distribution is explored by highlighting influence of electricity connection cost on electricity distribution in terms of regulation and by assessing factors influencing cost inefficiency in electricity distribution. The chapter further covers influence of area's economic background on electricity distribution and influence of security of electricity distribution network is expounded by looking at reliability factors affecting electric infrastructure. Influence of access to information buy users and non users of electricity and factors affecting electricity distribution business are also covered. Influence of politics on electricity distribution and socio political factors influencing household electricity consumption are also looked at. The chapter finally provides conceptual framework encompassing independent variables, moderating variable and their influence on the dependent variable which is electricity distribution.

2.2 Influence of cost on electricity distribution

When you ask for a quote for a new supply, your distributor will ask you to provide details about your home, where the connection is needed and, if you know, how much power you will need. From this, the company will give you a quote which will charge you for the amount of work it will take, the materials they will have to use and the testing of the supply to make sure it is safe. (Beesley, 1992)

Each electricity distributor has a basic scale of charges for connections work which it has to make public. If you have received a quote and want to check it, contact the distributor and ask for a copy of their 'basic charging statement'. Some new electricity connections would mean the network has to deliver more power than it was originally built to cope with. In other words, the equipment that was already in place such as the cables and the transformer would not be able to bear the load of the new connection as well as the supplies that were already being taken from it. To "reinforce" the system could mean

anything from installing a few more meters of cable to installing a new substation. (Beesley, 1992).

Monopolies have little chance of being driven out of a market by more efficient new entrants, which puts customers at risk. Consequently, some form of regulation is necessary to protect the customers' rights in monopoly industries such as electricity transmission and distribution. In addition, electricity networks are crucial elements in creating an efficient market place for electricity selling, and regulatory intervention is necessary to guarantee that the terms defined for using transmission and distribution facilities do not prevent competition (Beesley, 1992).

2.2.1 Regulation

In a report done by Vickers and Yarrow 1988, they mentioned that regulation is essential to maintain the freedom of entry. They gave another reason for regulation that electricity networks were so called essential facilities, which meant that they were to be accessible and affordable to all citizens. In addition, the same tariffs were applied to similar customers within a specific network area regardless of the customers' locations in the network. The universal service obligation guaranteed that all citizens could have access to electricity networks, and were able to obtain reasonably priced services without which customers in rural areas would be at risk, because in some cases serving these areas would be found unprofitable altogether, or at least prices would be unreasonably high.

According to the report, economic regulation made sure that the affordability of electricity services was met. However, this was usually not enough, but also technical regulation was needed to ensure the acceptable quality of the services, not only on average, but also from the point of view of each individual customer. Technical regulations would address issues such as the numbers and durations of planned and unplanned interruptions, and the voltage characteristics. The best way to ensure reasonable prices and a sufficient quality of the services was to have an independent regulator who was able to respond to versatile expectations of the stakeholders of the regulated industry. In general, Vickers and Yarrow mentioned that the objective of

regulation was usually set in legislation, and the task of independent regulators was to define methods by which these objectives were met. Regulators' tasks usually included, for instance, setting the incentive schemes for the distribution companies and monitoring the overall development of the industry. Getting the necessary data from the regulated companies was found to be typically easier if the regulators' authorities were clearly defined in legislation. In other words, there had to be balances to the interests of different stakeholders of the electricity distribution business: customer needs, society needs, and distribution companies' needs must be met. (Vickers & Yarrow, 1988)

2.2.2 Factors Influencing Cost Inefficiency in Electricity Distribution

An exploration of factors influencing cost inefficiency in Swedish electricity distribution by Magnus S., 2008. (Gothenburg School of Business, Economics and Law; Sweden). Magnus found out that benchmarks based on cost frontiers had become increasingly popular as a way to regulate electricity distribution utilities. He noted that there had been an extensive research focus on how to estimate the level of inefficiency, but only limited investigation of which factors influence inefficiency. He mentioned that if the sources of inefficiency were known, then the reliability of benchmarks would increase and regulators would be able to act as active catalysts for welfare improvements. In his research Magnus found that inefficiency was sensitive to outages, transformer capacity and share of overhead lines whereas utility ownership does not affect inefficiency.

Magnus quoted Jamasb & Pollitt, (2001) who found that many regulatory agencies in many countries were already using, or plan to use, benchmarks. Developments of methods used to calculate/estimate efficiency and a realisation that benchmarks reduce the negative consequences of asymmetrically distributed information, have contributed to this development. However, in their review of benchmark studies in electricity distribution published from 1989 to 2000, Jamasb and Pollitt (ibid.) noted that on the whole there was inconclusive evidence as which factors and to what extent those factors influence inefficiency in electricity distribution. As a consequence, it was claimed that the usefulness of benchmarks was significantly reduced since unexplained data variation would either be fully attributed to inefficiency or arbitrarily divided between data noise

and inefficiency. Magnus further quotes (Irastorza 2003; Shuttleworth 2003). Shuttleworth who argued that there could be several legitimate reasons for why utility cost varied and hence, benchmarks were only valid if the sources of inefficiency could be plausibly explained. In addition, if regulators could inform utilities on how to best increase cost efficiency, they would be able to act as active catalysts to welfare improvements. This view was in line with the suggestion presented by Bartle & Vass, 2007. They encouraged regulators to take a wider societal responsibility by engaging in advice and debate in the public domain, scenario planning to assist government policy development, and public communication and education. Based on this, it seemed odd that relatively few studies had attempted to more fully explain the causes of inefficiency. It was plausible that the apparent lack of scientific contribution would be attributed to the particular challenges involved in identifying all factors having an influence on cost inefficiency in electricity distribution, and obtaining a sufficiently large data set representing the factors identified. The purpose of Magnus Söderberg study was to contribute to a deeper understanding of which factors influenced cost inefficiency in electricity distribution.

Magnus quoted from different studies as follows. Jamasb & Pollitt, (2001) noted in their review of efficiency studies published from 1989 to 2000 that utility size and ownership together with regulatory arrangement were related to efficiency. The direction of each influence was however unclear as conclusions were contradictory. Bagdadioglu et al. (1996) and Kumbhakar & Hjalmarsson, (1998) argued that privately owned utilities were more efficient in Turkey and Sweden respectively. Pollitt (1995), on the other hand, found no significant benefit of privatisation from his international comparisons, and Cote (1989) suggested that publicly and cooperatively owned utilities were more efficient. The appropriateness of transferring publicly owned utilities to private investors had also been wildly debated outside electricity distribution with no consensus reached. Economies of scale had also been reported to influence inefficiency (Filippini 1998; Kumbhakar & Hjalmarsson 1998), but the conclusions were not robust enough to serve as general policy recommendations. Pombo & Taborda, (2006) found out that ownership had no effect on efficiency whereas Kwoka (2005a, b) claimed that publicly owned utilities were more

efficient. Some contributions also claimed that market liberalization and loss reductions increased efficiency (Pombo & Taborda, 2006; Pacudan & Guzman, 2002).

In his conclusion, Magnus found out that many of the hypothesized variables affecting cost inefficiency were found to be significant. Different econometric models do however produce strikingly different estimates. In his study it was argued that a random parameter specification was more realistic compared to conventional specifications since it allowed inefficiency variance to vary both over time and firms and compensates for excluded non-linear effects. The regulator should be aware that cost and quality efficiency are contradictory. Utilities were advised to reduce their share of overhead lines and increase their transforming capacity in order to reduce cost inefficiency. This study contributed to the debate on privatisation of public utilities by concluding that private utilities were not found to be more cost efficient than publicly/cooperatively owned utilities. Given the varying conclusions presented on the relationship between ownership and cost efficiency in electricity distribution by earlier studies, it was tempting to suggest that ownership does not have a significant impact *per se,* but that the interaction between ownership and other factors (e.g. dynamic market conditions) produce apparently random outcomes. (Magnus, 2008)

2.3 Influence of area's economic background on electricity distribution

Trends in rural incomes, poverty, and inequality provide substantial insight into the heterogeneity of the rural population and the drivers of income paths. Key drivers in reducing the likelihood of ever being poor include having more than a primary education, cultivating more land and applying fertilizer on it, and having off-farm income, especially salaries. Key factors making more likely that you will be poor at some point include having an older head of household, being poor in the past and casual labour. Policy implications focus on continuing to promote primary and secondary education, creating a better investment environment to promote remunerative off-farm employment, and the potential role of safety nets in avoiding poverty traps. (Kenya National Bureau of Statistics, 2007)

In a report done by David Tschirley, Charity Irungu, Raphael Gitau, Daniel Kariuki on Rural Incomes, Inequality and Poverty Dynamics in Kenya found out that alleviating poverty remained one of the key challenges in many developing economies. In Kenya, a recent nation-wide survey, the 2006 Kenya Integrated Household and Budget Survey, (KIHBS) found that 46% of the total Kenyan population is absolutely poor, i.e. below the poverty line, whereas 49% of the rural population was absolutely poor (Kenya National Bureau of Statistics, 2007). The 1997 Welfare Monitoring Survey showed a poverty rate of 57% overall and 60% in the rural population.

Tschirley, Irungu, Gitau, and Kariuki noted in their report that after 45 years of Independence, Kenya remained a dual economy with wide disparities in economic, social and infra-structural development across regions. The late 1990s and early 2000s saw the development of the National Poverty Eradication Plan (NPEP) and the Poverty Reduction Strategy Paper (PRSP), both of which were produced under the umbrella of the United Nations' Millennium Development Goals. Though the PRSP resulted in a better understanding of poverty in Kenya, due to broad-based consultation among key stakeholders, it was not implemented in full due in part to reluctance to change by those in governance. In particular, the national budget was not changed to accommodate the poverty reduction plans, and key political and economic governance measures such as fighting corruption were also not implemented as anticipated.

Tschirley et al further noted that when the National Rainbow Coalition government came to power, it drew up the five year Economic Recovery Strategy for Wealth Creation (ERS) 2003-2008. The ERS was anchored in four pillars, namely the restoration of economic growth, strengthening the institutions of governance, the restoration and expansion of physical infra-structure (including electricity), and investment in human capital for the poor. Among the successes of the ERS were free primary education and the constituency development fund (CDF), which is a tool for redistribution and decentralisation of national resources through the constituencies. Upon the conclusion of the ERS, a long-term vision for sustained economic and social development, "Kenya Vision 2030", was formulated. It aims to make Kenya a globally competitive and

prosperous nation with high standards of living within the next 25 years. Total household income comes from four sources: net crop income, net livestock income and non-farm business income, and salary/remittances. (Tschirley, Irungu, Gitau, & Kariuki, 2007)

Rural economy, particularly agricultural production, is of primary importance to the livelihoods of most Kenyans. Rural areas can use electricity to spur growth in agriculture. The population is predominantly rural, and the majority of households rely directly on the agricultural sector for their livelihoods. Agriculture directly contributes 27 per cent to Kenya's GDP and is estimated to account for 60 per cent of total exports and 45 per cent of Government revenue. Kenya already has a relatively advanced and diversified agricultural sector, including well-established export commodities such as tea, horticulture, coffee and pyrethrum, and a highly developed dairy subsector. The livestock subsector in arid and semi-arid areas accounts for 90 per cent of employment and 95 per cent of household income among pastoralists and contributes roughly 5 per cent of GDP. The majority of Kenya's smallholders are market-oriented. It is estimated that as many as 80 per cent of all rural households sell some crops, although the degree of commercialization may range from less than 10 per cent in relatively low-potential districts to 80 per cent in high-potential districts. Arid and semi-arid lands represent an enormous potential for irrigation development and mineral exploitation. In addition, the symbiotic interaction between wildlife and pastoralism, coupled with the rich cultural heritage of pastoral and agropastoral communities, is a major tourist attraction. Although there is great potential for the development of the arid and semi-arid lands in Kenya, droughts and conflict still significantly affect lives and livelihoods in these areas. Losses and wastage of the livestock resource through disease, death and theft continues. In addition, rising population because of migration from medium-high-potential areas and the declining natural resource base pose a great challenge for the sustainability of livelihoods in arid and semi-arid lands. (Kenya National Bureau of Statistics, 2007)

2.4 Influence of security of electricity distribution network on electricity distribution

Security of electricity distribution network plays a fundamental role in ensuring safety of consumers, quality of electricity consumed, safety of distribution network, and safety of

distributor's interest. Modern power grids are extremely complex and widespread. Surges in power lines can cause massive network failures and permanent damage to multimillion-dollar equipment in power generation plants. (Marcel, 1994; Marcel, 2002)

Electricity distribution is an important business sector as such, because today's information societies are highly dependent on reliable electric power systems. Electricity distribution business, in turn, largely determines the availability of electricity within a society; the reliability of the whole electricity supply depends critically on the functioning of the distribution networks, because over 90 % of the interruptions experienced by the customers are caused by faults in medium and low voltage distribution networks. In addition, the voltage quality at customer supply terminals is completely determined by characteristics of the distribution networks. (Ibrahim, 2008)

According to a Daily Nation correspondent (Posted Tuesday, August 18 2009 at 15:14) the Kenya power Company lost more than 4 billion annually due to illegal power connection and vandalism. According to the firm's customer service manager, Mr. Joshua Mutua, the amount was lost to unscrupulous individuals who tap power and sell it to consumers, especially in slum area. Vandalism alone costs the company shs3 billion while ksh 1.2 billion goes to the pockets of illegal power distributors.
The same individuals are said to use cables and other equipment vandalized from KPLC supply system and transformers. KPLC loses four percent of the total electricity that is bought from Kengen and other generators as explained by Mr Mutua at Sinai slum in Nairobi's Donholm area, during a crackdown on illegal connections. (Nation Correspondent, Posted Tuesday, August 18 2009 at 15:14)

2.4.1 Reliability factors affecting electric infrastructure

According to a research done by the Department of Public Utilities (DPU) (2008) on Reliability Factors Affecting Electric Infrastructure; prepared in response to community inquiry for electric distribution in Los Alamos; New Mexico, USA and distributed to citizens, media and members of the Electric Infrastructure Group found out that local history, civic projects, citizen and crew Safety, weather, wildlife, technical coordination

and inter-governmental collaboration all Play a Part as factors affecting electric infrastructure.

The Department of Public Utilities (DPU) researched on factors affecting electric infrastructure with a focus on power outages as the major factor affecting electric infrastructure driven by the numerous power outages, both small and large suffered in 2008. Of the 74 outage events recorded in calendar 2008, 51 (two thirds) affected fewer than 100 ratepayers and 23 (one third) affected more than 100 ratepayers at a time. As a whole, these outages were caused by a variety of factors, many of which relate to the electric system's lifecycle and maintenance, but also to ever-present natural causes like wind, animals, lightning and trees. The mesa and canyon terrain also carried with it certain system design requirements that inhibit the kind of redundancy which could minimize an outage's scope. The research further found that in the second half of 2008 there was a confluence of activities affecting the electric distribution system, that are unique to Los Alamos and that go beyond the difficulties caused by electric system lifecycle, maintenance and natural causes.

The Department of Public Utilities (DPU) prioritized categories according to the number of Los Alamos ratepayers affected and according to solutions which can be implemented immediately with the first category being power outage category to give immediate Focus through coordination Improvements. This type of outage was found to be due to miss-coordination of over-current protective devices (OCDs) such as relays, re-closers and fuses. As a result, what should have affected 10 to 20 ratepayers was found snowballing to affect several hundred ratepayers or even several thousand ratepayers. The immediate focus was found to prevent the amplification of a small outage to affect several thousand people by doing relay-to-relay coordination at the utility power sources. The Department of Public Utilities (DPU) found out that Outages affecting several hundred people can be corrected by relay-to-recloser coordination (utility power source to feeder re-closer). Outages affecting 10-20 or 10-50 people would require re-closers-to fuse, or fuse-to-fuse coordination.

The second category was found to be preventable outages. This type of outage is one which can be prevented altogether or can be minimized if the outage is not preventable. The idea is to take a proactive maintenance or new design approach to prevent certain types of outages from occurring in the first place. The Department of Public Utilities (DPU) found out that power lines are interfered with in areas where squirrels or birds routinely live, patrol of overhead lines regularly for critical feeders, adequate cross-arm spacing, sag and guy wire tension and tree cutting along power lines were major causes preventable outages. In that regard the following were recommended by the Department of Public Utilities (DPU) that when these types of outages are prevented, the risk of snowballing outage effects was greatly reduced. Insulation guards to retrofit transformers bushings and wires on poles in the wooded areas to mitigate animal-related outages were suggested in addition, line trucks were stocked with insulation guards to use as needed in known animal problem areas. Continual patrol was found to routinely patrol critical overhead power lines through the wooded areas to ensure that tree limbs or other obstructions cannot easily fall on the power lines during inclement weather. In addition power lines still had to have the appropriate clearances, sags, and guy wire tensions to reduce the "slapping" of lines during inclement weather as well.

The Department of Public Utilities (DPU) studied a third category of power outages caused by underground cables. This type of outage is due to the deterioration and failure of underground cable that was buried directly in the soil. This type of outage problem is not unique or isolated to Los Alamos County but exist industry wide since cables have a lifespan and must be replaced after sometime. What complicates an immediate and aggressive corrective action is the high replacement cost of the cable. The Department of Public Utilities (DPU) evaluated section-areas which have been more prone to underground cable failure and allocated and found out that roughly 1,000 households and 1,000 apartment dwellers lived in neighborhoods with direct bury cable which was roughly 22 percent of the Los Alamos community comprising 9,000 households and organizations. The Electric Distribution leadership team estimated replacement costs for these neighborhoods at roughly $5,000 per household. The rough estimate for full replacement was found to be $10 million.

In conclusion the Department of Public Utilities concluded that there are still more questions than answers and the questions could not be fully answered until the electrical distribution system is digitally modeled with commercially available engineering software. The Department of Public Utilities also concluded that acquiring engineering/modeling software would establish a dynamic model of the distribution system to address all the Categories in a more significant detail, including "What-if" analysis prior to taking action. It is paramount to develop the critical path forward utilizing the engineering model for certain Category areas. This would ensure the electrical system is designed to its optimum capabilities and more importantly, it will ensure that the over-current protection (OCD) of the system is not compromised in the ever increasing demand to serve new customers and keep the lights on. (The Department of Public Utilities (DPU), 2008)

2.5 Influence of access to information by users and non users of electricity on electricity distribution

Information in rural areas can accessed from TV, Barazas, social networks, meetings, radio, letters, books, files, films, tapes and has influences on health, knowledge, production and even behavior and living standards. How access to electricity increases time spent watching TV and listening to the radio. Increased access to media increases awareness of health issues and this increased awareness results in changed health behavior which can reduce fertility, improved self awareness, increase in development and social life.

A research done by Shibanda (2006) on Management of government information in Kenya, Presented at the International Seminar on the Strategic Management and Democratic Use of Government Information in Africa revealed that more than 50 per cent of the Kenyan imprint constitutes official publications. These prints formed part of the multiplicity of Government publications emanating from ministries and departments, local governments (councils), judiciary, parastatals, commissions and government education institutions. They contained very important information on legal policy,

education, agriculture, economic, health and environment with implication on day today lives of citizens. The research mentioned that people required this information in appropriate and adequate format to keep in steps with the government thinking and directives.

In his argument Shibanda mentioned that information lie in suit and required sustainable professional efforts to bring to light all that information for common good nationally and internationally. Government publications contained very important information on legal matters, education, agriculture, economics, health and environment. Such information had immediate impact on the day today lives of Kenyan citizens. Therefore the people would normally require this information in appropriate format, adequate and timely manner just to keep in steps with government policy and directives. Acording to Shibanda, 2006; the school education sector relied on government publications to support the curriculum in terms of textbook and other educational materials. He mentioned that reports and research findings emanating from parastatal research institutions were found to be useful for further research, planning, training and extension services. The Kenyan government had therefore set up its own publishing and printing houses to produce textbooks that were relevant for schools. Information was produced as a result of the work of official bodies at all levels. Large volumes were produced every year and were important and authoritative in nature. They contained legislation, statement of government policy, debate on current topics of importance, reports of government sponsored research, official histories, statistical data, development agenda. Information appeared virtually in all subjects and is published in any format including book, periodical, map and electronic.

Shibanda further found out that Kenya Government National Development plan 1997-2001 provided for information resources and management whose objective was to have effective means of institutionalizing systematic flow of and access to information in the country. The Kenya Gazette Supplement No. 63, 2005 provided for access to information emphasizing the right to demand the correction of deletion of untrue or misleading information. The state had also to publish all important information affecting the nation

whereas Parliament was given leeway to enact legislation to provide for access to information. He mentioned that it was noticeable that while the Kenya National Development Plan 1997-2001 provided for effective means of institutionalizing systematic flow of and access to information, the official 'ball-game' is distorted with bad refereeing. Most government information was found to be confidential, not freely acquired, was inaccessible and remained untraceable. The Kenya Gazette Supplement No. 63, 2005 provided for the right of citizen to access information held by the state was not practical due to official bureaucracy and typical public ownership syndrome. Lack of civic education and political interference led to the loss of this fundamental right.

Shibanda concluded that to achieve solutions to accessing organized centers of knowledge, information systems and services, there was need to direct efforts in addressing the right to access information, put in place an information service infrastructure that looks into telecommunication deployment, digital divide, hybrid libraries (internet based services) and creation of repositories, creation of databases and development of content information, placing of content on the Internet in local languages, the implicit cost in generating/creating knowledge and information, access and use and developing village ICT centers / Tele-centers. (Shibanda, 2006)

2.6 Political factors influencing electricity distribution

Kenya's energy sector has been undergoing restructuring and reforms since the mid-90s, which culminated in the enactment of the Energy Act, No 12 of 2006 (the Act). Under the Act, The Ministry of Energy (MoE) is responsible for formulation and articulation of policies through which it provides an enabling environment to all operators and other stakeholders in the energy sector. The Energy Regulatory Commission (ERC) was established in 2007 under the Act as an autonomous, independent energy sector regulator with powers to, inter alia, formulate licensing procedures, issue licenses and permits, make recommendations for the necessary regulations to be issued by the Minister, formulate, enforce and review environmental, health, safety and quality codes and standards, set, review and adjust electric power tariffs, approve power purchase and network service contracts, examine and approve meters, investigate complaints between

parties, accredit energy auditors, ensure competition, collect and maintain energy data, protect stakeholders interests, and prepare an indicative national energy plan.(www.rea.co.ke)

2.6.1 Socio-Political Factors Influencing Household Electricity Consumption

Françoise Bartiaux did a research on Socio-political factors influencing household electricity consumption at the Institute of Demography, University of Louvain (UCL): A comparison between Denmark and Belgium. The paper compared household electricity consumption in Denmark and Belgium on the basis of survey data and national statistics and it showed that there was a higher level of electricity consumption in Belgium. Analysis showed that it was the number and use of appliances more than energy efficiency that explained which households consumed most electricity. Furthermore it showed that electricity used for television, drying clothes and for providing a comfortable indoor temperature might have been part of the explanation for the higher level of energy use in Belgium. Comparing attitudes to the environment, the study however found out that there was no reason to suggest that those would be part of the explanation; however, the general knowledge about energy seemed to be higher in Denmark. The conclusion suggested that part of the explanation would be found in differences in energy policies, with more focus on saving in Danish energy policies than in Belgian. The paper however also pointed to factors with a huge impact on electricity consumption in households that were not included in the energy policy in neither Denmark nor Belgium, including the growing size of houses, the growing proportion of single-person households and the growing number of appliances. (Françoise, 2006)

The paper compared residential electricity consumption (excluding heating) in Denmark and Belgium with a double focus on the practices at the household level and their social and cultural determinants. To elucidate the determinants of electricity consumption at the household level, the relevance and the importance of four groups of variables were assessed for both countries: household characteristics (composition, income, age of members), building characteristics (building type, area), electric appliance use and presence/absence of environmental concern. The purpose of the comparison was to

understand which social, cultural and technical factors influenced the level of household electricity consumption, and thus discuss to what extent energy policy in the two countries actually influenced those factors.

Françoise quoted previous studies that had been done on social and cultural aspects of energy consumption typically focusing on differences within a country, predominantly showing how higher social classes in a society used more than the lower classes (Kuehn, 1998; Pedersen and Broegaard, 1997). Others had extended the explanation of social classes to include studies of how technology and consumption practices in everyday life influenced the level of energy consumption (Aune, 1997; Gram-Hanssen, 2004 and 2002). Other studies also showed that electricity consumption was strongly dependent on type and size of housing, as well as on household size (Gram-Hanssen, Kofod & Petersen, 2004). Therefore the study compared these background variables for the two countries to see if differences in these factors were the main explanation for the differences in electricity consumption.

Françoise concluded that the number and use of appliances influenced electricity consumption. There were more TVs and videos per household and more time was spent watching them in Belgium. Tumble dryers were more widespread and so were electric fans and radiators. Probably more time was also devoted to preparing food and to cooking in Belgium. Time allocation for household chores, use of appliances and their implicit meanings was seen in the framework of gender systems that seemed to be more egalitarian in Denmark. Factors that did not seem to explain the difference in electricity consumption included the use of energy efficient lamps and appliances. Based on a Eurobarometer survey, it was hypothesised that attitudes and environmental concerns were probably not factors that could explain the differences observed in electricity consumption; information on environmental matters could have played a role, but that needed to be further studied. ((Françoise, 2006; Eurobarometer, 2002)

From a policy point of view Françoise noted that it was interesting to know of the differences which resulted in different levels of electricity consumption. These

differences were based on general cultural differences or if not they were to some extent influenced by differences in energy policy, including public campaigns, taxes etc. The lack of weighty explanations for the large differences in electricity consumption between the two countries, combined with the fact that Danish electricity consumption had been stable for the last decades, whereas the Belgian consumption had grown, suggested however that the stronger focus on energy saving in the Danish energy policy compared with the Belgian policy actually had had a positive result. Results in the paper however also pointed to factors with a huge impact on electricity consumption, which neither in Denmark nor in Belgium was part of energy policy, including the (growing) size of houses, the growing portion of single-person households and the growing number of appliances in all households. (Françoise, 2006)

2.7 Social Exclusion Theory

Social Exclusion Theory deals with a society which is organized as a capitalist democracy, and which is over populated in the sense that there is significant surplus labor. In this capitalist democracy, individuals participate in economic and social exchange endowed with a given set of assets. There are three types of assets: economic assets, which refer to productive resources, such as land, physical capital, financial capital and human capital; political assets, which refer to the access of people to the rights established by the society; and cultural assets, which refer to a system of social evaluations of the personal characteristics of individuals, such as their language, race, sex, education, occupation, religion and geographical origin.

Exclusion from the political process, in the context of democratic capitalism, means exclusion from citizenship rights. Democratic capitalism functions with a system of rights which, amongst other things, acts to set limits to the inequalities generated by the market system, and thus makes society viable. The factors which determine the set of rights in a particular capitalist democracy like Nyamarambe Division are various, including on the demand side: social pressure, tolerance to inequality, the culture of inequality, degree of democracy, and level of income amongst the poor; and on the supply side: the production

capacity of the economy, the preference of the ruling classes to allocate scarce resources to the production of rights in the form of public goods, and international agreements.

Exclusion from the cultural process has to do with the individual's exclusion form participation in particular social networks. Because of differences in cultural values, some people will be excluded from participating in some social networks of higher social value. Exclusion from the economic process means exclusion from market exchange. Conventional economic theory assumes that all markets are "Walrasian," in the sense that individuals can buy or sell a good or a service as much as they want at the prevailing market price. In these markets no one willing and capable of buying or selling could be excluded from exchange. People may be excluded from exchange in some particular markets, but this is because their real income, or productive capacity, is too low. In conventional economics, the markets system allows people free-entry and free-exit.

Assuming that part of the surplus labor takes the form of a peasant economy and that peasant households are endowed with the lowest amounts of economic, political and cultural assets in society, a perfect example of Kenya's rural areas. The peasant household is defined as a unit that operates with family labor. It has small endowments of land, physical capital and working capital in relation to its labor force. Innovations in this study refer to the appearance of new production methods and new consumption goods and services. The appearance of new services inform of electricity distribution in Nyamarame Divisions gives rise to the creation of new markets. Increased human capital permits the individual to adopt innovations in a faster and cheaper manner. Public goods and services do not come from private investment but rather principally from state investment and their financing is likewise exogenous. These financial resources must be supplied by the state. Hence, rural underdevelopment is the result of state failure as well. The sequence of development is first public financing and later market based financing. Thus without the government's involvement is supporting electricity distribution in Nyamarambe Division then development that comes with electric services might just be stifled.

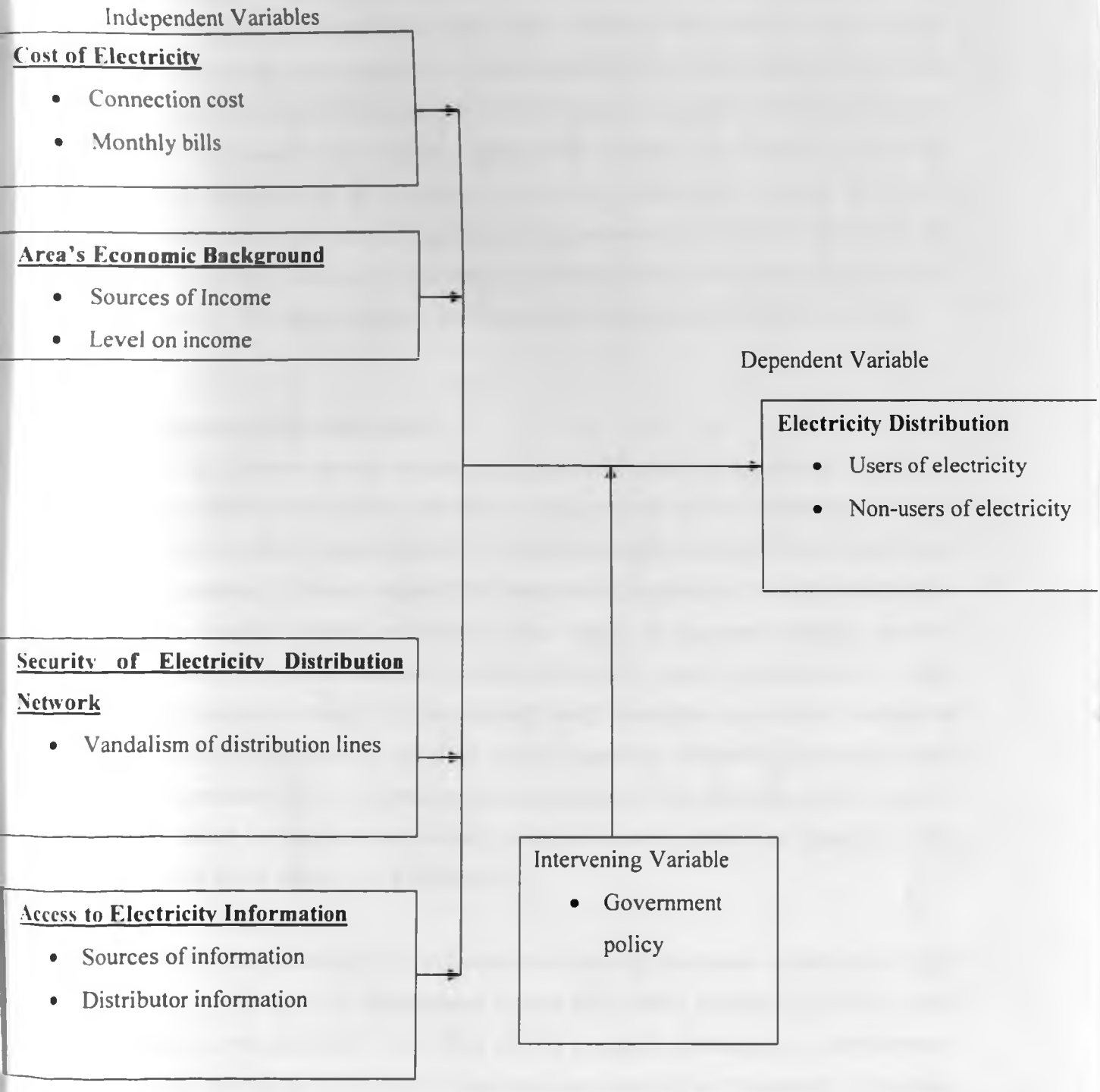
According to exclusion theory, the rural poor are not only people whose incomes are low, but also are poorly endowed with economic, political and cultural assets in the context of a capitalist society. Rural development can be achieved if the mechanisms of social exclusion are eliminated or weakened. Rural development is a question of reaching pockets of poor peasants. For a massive action, there exist only two channels: the market system and the state. But the development trap is a result of, precisely, market and state failures. We cannot expect rural development if the market and the state operate under the same logic. The policy principle would be to resolve market and state failures. This implies the generation of innovations directed to alter the mechanisms of social exclusion. These innovations refer to changes in the technology of production of new goods and in the technology to produce new institutions. Figueroa (1984)

2.8 Conceptual framework

Conceptual framework is a set of broad ideas and principles taken from relevant field of enquiry and used to structure subsequent presentations. Conceptual framework involves forming ideas about relationships between variables in the study and showing these relationships graphically or diagrammatically (Mugenda and Mugenda, 2003).

The conceptual framework of this study looks at cost, area economic background, access to information and security of the distribution network/lines are looked at as the key indicators to investigate the extent of electricity distribution, factors affecting electricity distribution, to identify problems/challenges facing electricity distributors and to explore the problems faced by the rural people/rural areas in using and receiving electricity services.

Figure1: Conceptual framework



2.8.1 Relationship among variables in the conceptual framework

The following independent variables of cost of electricity, area's economic background, security of electricity distribution network and access to information by users and non users of electricity are presented in the conceptual framework. Electricity connection cost and monthly electricity bill indicated cost of electricity. Sources of income and level of income indicated area's economic background. Security of electricity distribution network indicated rate of vandalism of electricity distribution network, sources of information and distributor information indicated access to information with government policy intervening on how the independent variables affect the dependent variable which is electricity distribution measured by the number of users and non users of electricity.

2.9 Summary of literature review

The literate covered showed that the government of Kenya has aggressively carried out rural electrification since 2002 and there has been a rise in access to electricity in Kenya to 30 per cent from 6 per cent in 2003, rural electrification is currently just over 10 per cent. According to Kenya's vision 2030, development projects are recommended that are meant to increase demand on Kenya's energy supply. Kenya must, therefore, generate more energy at a lower cost and increase efficiency in energy consumption to enable Kenyans access electricity. The Government though committed to continued institutional reforms in the energy sector, including a strong regulatory framework, encouraging more private generators of power, and separating generation from distribution, the impact of which should be seen in more people getting connected to electricity especially in the rural areas where majority of Kenyans live.

While reviewing literature it was indicated that electricity distribution in an area is a clear indicator of the level of development in that given area, therefore by making rural residents access electricity it can help address perennial challenges of unemployment especially among the youth, rapid urbanization now standing at 6% annually, low saving ratio of 16% compared to need and an even economic composition and economic distribution in rural areas. There are issues that can be addressed locally, nationally and

internationally in order to spur improved economic growth especially in rural areas, elimination of absolute poverty, improvement of equity and access to social services, promotion of private sector development, reducing cost of doing business, improved access to information among the rural residents that would make the rural people know their legal rights and put to account political leadership at all levels of government.

Vickers and Yarrow (1988) is quoted in the literature review as he puts it that regulation was usually set in legislation and regulators' tasks usually included, for instance, setting the incentive schemes for the distribution companies and monitoring the overall development of the industry. Getting the necessary data from the regulated companies was found to be typically easier if the regulators' authorities were clearly defined in legislation. In other words, there had to be balances to the interests of different stakeholders of the electricity distribution business: customer needs, society needs, and distribution companies' needs must be met. According to Kenya National Bureau of Statistics (2007), key drivers in reducing the likelihood of ever being poor include having more than a primary education, cultivating more land and applying fertilizer on it, and having off-farm income, especially salaries. Policy implications focus on continuing to promote primary and secondary education, creating a better investment environment to promote remunerative off-farm employment, and the potential role of safety nets in avoiding poverty traps.

The literature mentioned that outages can be prevented altogether or can be minimized, the idea is to take a proactive maintenance or new design approach to prevent certain types of outages from occurring in the first place.

The literature further puts forward Shibanda's argument that information lies in suit and required sustainable professional efforts to bring to light all that information for common good nationally and internationally.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology discussed the procedures and methods that were followed when the study was conducted. The chapter discussed the methodology that was adopted to carry out the investigation into factors influencing electricity distribution in Nyamarambe Division. It discussed the research design, target population, sample size and sample selection, data collection methods, data collection instruments, validity and reliability of instruments, Data collection procedure, ethical considerations, operational definition of variables and data analysis techniques.

3.2 Research Design

Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure, (Kothari, 2004; Babbie, 1991; Goddard and Melville, 2001).

The study employed descriptive survey method as a research design. Descriptive survey is a method of collecting a question by interviewing or administering a question to a sample of individuals (Orodho, 2007). This design was chosen by the researcher because it allowed the researcher effectively collect data cheaply.

3.3 Target population

The target population was Users & Non-users of electricity (Households) and electricity distributors. The area of study was Nyamarambe Division. According to Gucha South District Development Office Report (2010), Nyamarambe Division had 15,700 households (electricity users and non-users) with three locations as South Mugirango Central Location (5836 households), South Mugirango Chache Location (5662 households) and Nyakembene Location (4202 households). The 15,700 households were

clustered in groups of 7 from where one household was targeted for the study. The total households targeted were therefore 2,243 (electricity users and non-users).

Electricity distributors in Nyamarambe Division were Kenya Power Company and Rural Electrification Authority (REA). The researcher purposively chose Kenya Power Company over REA because Kenya Power Company was the major distributor of electricity in Nyamarambe Division. According to Kenya Power Company staff list (2010), it had 38 technical staff in distribution department-Kisii office. In addition there were 12 Kenya Power contractors in distribution who were active in Nyamarambe Division, giving a total of 50 staff and contractors. The targeted distributors will therefore be 50.

Table 3.3: Target population

Population	Location	Target Population
Users and Non-users of electricity (Households)	South Mugirango Central	834
	South Mugirango Chache	809
	Nyakembene	600
Electricity distributors	South Mugirango Central, South Mugirango Chache & Nyakembene	50
Total		**2293**

3.4 Sample size and Sample Selection

A sample of 10%-20% is acceptable according to Airy et al (1972). The researcher sampled at 20% which gave sample size as follows; South Mugirango Central Location (167 households), South Mugirango Chache Location (162 households) and Nyakembene

Location (120 households). The researcher used systematic sampling to select a respondent at every 35th household falling on the 5th cluster of sevens.

In order to select the distributor respondents, the researcher randomly chose one day of the week among the five working days (wednesday) to question the respondents. The first 10 distribution staff/contractors to report to work that day were selected as respondents.

Table 3.4: Target population and sample size

Population	Location	Target Population	Sample Size
Users and Non-users of electricity (Households)	South Mugirango Central	834	167
	South Mugirango Chache	809	162
	Nyakembene	600	120
Electricity distributors	South Mugirango Central, South Mugirango Chache & Nyakembene	50	10
Total		**2293**	**459**

3.5 Data Collection Instruments

The researcher used questionnaire and interview methods. Questionnaires were used because they were very cost effective especially true for studies that involved large sample sizes and large geographic areas like in this case Nyamarambe Division. Questionnaires reduced bias since there was uniform question presentation and no middle-man bias. The researcher's own opinions never influenced the respondents to answer questions in a certain manner and there were no verbal or visual clues to influence the respondents.

The researcher also used interview method for the respondents who could not write their responses. This category also included illiterate subjects or subjects who did not write as frequently as they spoke of which were common in Nyamarambe Division.

3.6 Validity of Data Instruments

The researcher constantly checked and verified questions and any other collected information during the process of data collection to ensure completeness and accuracy of data. There was pre-testing of instruments whereby the researcher administered 15 questionnaires and interview schedule to ensure that respondents were able to understand the questions correctly. The questionnaire was also given to the supervisor who determined its suitability.

3.7 Reliability of Instruments

According to Borg and Gall (1986), reliability is the level of internal consistency or stability of measuring device overtime. A measuring instrument is reliable if it provides consistent results. The instruments were reliable because they reflected the research topic, objectives and the research questions. Items which lacked in clarity were rephrased while wrong items were removed before the instruments were used to collect data.

3.8 Data Collection Procedure

The permission to collect data was sought from relevant authorities then the research assistants were trained on the use of research instruments, administration and interview conduct by taking the through a mock exercise. The researcher asked several questions requiring verbal responses that ranged from general to specific information and this enabled the researcher elicit information from key respondents and to control the flow of questions given to the respondents. The questionnaires were collected from respondents after 2 days to allow them time to fill in the questionnaires at the time of their convenience. The questionnaires included both closed and open ended questions to enable the respondents to express themselves as much as possible. The researcher then checked the returned instruments for errors before proceeding to analyse data.

3.9 Ethical Considerations

The researcher will considered the following ethical issues: confidentiality of all the information from the respondents, protection of the respondents' identities, exercise of freedom of thought, intellectual honesty and maintaining of independence from possible attempts to bias and ensuring security of data during and after completion of research

3.10 Operational definition of variables

According to Mugenda and Mugenda (2006), operational definition of variables involves description of operations that is used in measuring the study variables. Cost of electricity distribution was operationalised by looking at connection charges and electricity bills received by users. Area economic background was operationalised by exploring sources of income and levels of income of the rural residents of Nyamarambe Division. Security of electricity distribution network was operationalised by looking at vandalism of distribution lines and power interruptions. Access to information was operationalised by assessing information sources and distributor information.

Figure 2: Coherence/Operationalisation table

Research objectives	Type of variable	Indicator	Measure	Level of scale	Data collection method	Analysis
To establish the influence of cost of electricity on electricity distribution in Nyamarambe Division	Independent Cost	Connection charges Electricity bill	percentage quotation amount Average monthly bill	Ratio ordinal	Questionnaire Int erview	Quantitative/ Qualitative
	Dependent Electricity Distribution	Number of users Number of non users	Percentage of users Percentage of non users	Ordinal	Questionnaire Int erview	Quantitative
To examine the influence of the area's economic background on electricity distribution in Nyamarambe Division	Independent Area economic background	Sources of Income Level of income	Types of income sources Average monthly income	Ordinal Ratio	Survey/Interview	Quantitative/Qualitative
	Dependent Electricity Distribution	Number of users Number of non users	Percentage of users Percentage of non users	Ordinal	Questionnaire/Int erview	Quantitative
To establish the extent to which security of electricity distribution network influences electricity distribution in Nyamarambe Division	Independent Security	Vandalism of electricity network, Power interruption	Frequency of vandalism Number of accidents Frequency of power loss	Ordinal	Questionnaire/Int erview	Quantitative
	Dependent Electricity Distribution	Number of users Number of non users	Percentage of users Percentage of non users	Ordinal	Questionnaire/Int erview	Quantitative
To assess the influence of access to information by users and non users of electricity on electricity distribution in Nyamarambe Division	Independent Information	Sources of information Knowledge of service providers	Sources of information Knowledge of service providers	Ordinal	Questionnaire/Int erview	Qualitative
	Dependent Electricity Distribution	Number of users Number of non users	Percentage of users Percentage of non users	Ordinal	Questionnaire/Int erview	Quantitative

3.11 Data Analysis Techniques

Responses were classified by building themes and sub themes and qualitative and quantitative analysis used to analyze, describe and interpret data based on research questions and objectives. Data was then presented in form of frequencies, tabulations, percentages and explanatory notes.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter gave the data analysis, presentation, interpretation, and discussion. The researcher determined the suitability of the responses and respondents by establishing that over 90% of the residents had lived in the area for over 5 years and above according to table 4.4, an indication that they were well conversant with the happenings of the area. Over 70% of the respondents have had secondary education and above, which indicated that most of the respondents understood the questions well in their responses according to table 4.5 below. It was further established that 35.35% of the respondents have electricity in their premises while 64.65% have not as shown in table 4.6, a good average compared to the current Kenya's average in rural areas which is just over 10% according to Safari Africa Thursday, 2011.

4.2 Questionnaire return rate

Out of the 459 questionnaires and interview schedule given to the respondents, 449 were filled and returned representing 97.82% which was considered adequate for the study.

4.3 Demographic characteristics of the respondents

The respondents consisted of adult females and males. Heads of households were preferred whenever they were present else the instruments were administered to the next adult person present.

4.4 Years living in Nyamarambe Division

The study sought responses on the number of years the respondents have lived in Nyamarambe Division and the results were as in table 4.4

Table 4.4 Years living in Nyamarambe Division

Number of years living in the area	Frequency	%Frequency
10 years and above	300	66.81
Five years and above	109	24.28
One to 4 years	24	5.35
Less than a year	16	3.56
Total	**449**	**100**

409 respondents (91.09%) have lived in Nyamarame Division for over 5 years, while 40 respondents (8.91%) have lived in Nyamarambe Division for less than five years. The findings indicate that a clear majority of the respondents have lived in this area for over 5 years.

4.5 Level of education

The study sought to find out the level of education of the respondents, the response was as shown in table 4.5

Table 4.5 Level of education

Level of education	Frequency	%Frequency
Primary	89	19.82
Secondary	205	45.65
College and above	113	25.18
Informal education	42	9.35
Total	**449**	**100**

The findings were that 318 respondents (70.83%) had secondary education and above, 89 respondents (19.82%) had primary education while 42 respondents (9.35%) had informal education.

4.6 Electricity in premises

The study sought to find out whether the respondents had electricity in their premises and the response was as shown in table 4.6

Table 4.6 Electricity in premises

Electricity in premises	Frequency	%Frequency
Yes	159	35.41
No	290	64.59
Total	**449**	**100**

The findings were that 159 respondents (35.41%) had electricity in their premises while 290 respondents (64.59%) had no electricity in their premises.

4.7 Cost of electricity

The first objective was to establish the influence of cost on electricity distribution in Nyamarambe Division. The researcher therefore sought responses in terms of Electricity quotation amount for new connection, affordability of quotation amount, a general opinion on the affordability of electricity connection costs and the average monthly electricity bills.

4.7.1 Electricity quotation amount

The study sought to find out from the respondents the amount of electricity quotation they received and the response was as in table 4.7.1

Table 4.7.1 Electricity quotation amount

Electricity quotation amount	Frequency	%Frequency
Less than ksh35, 000	63	39.62
Ksh36, 000 to 50,000	56	35.22
Ksh51, 000 to 100,000	38	23.90
Over ksh100, 000	2	1.26
Total	**159**	**100**

Table 4.7.1 showed that 96 respondents (60.38%) got a quotation amount of ksh36, 000 and above while 63 respondents (39.62%) were quoted below ksh35, 000. The quotations were considered high when compared to the level of income whereby 209 respondents at 45.66% (table 4.8.3) earned below ksh10, 000 per month and also the general opinion among the respondents as in table4.7.3 showed that 268 respondents (59.69%) of the respondents felt that electricity costs were unaffordable. The high quotations might have been driven by what Beesley (1992) mentioned that some new electricity connections would mean the network has to deliver more power by adding new equipment and new network extensions to accommodate new load, thereby resulting in high quotations for new electricity connection.

4.7.2 Affordability of quotation

The respondents were asked about the affordability of electricity quotation they received and the results were as presented in table 4.7.2

Table 4.7.2 Affordability of quotation

Affordability of electricity quotation	Frequency	%Frequency
Yes	59	37.10
No	100	62.90
Total	**159**	**100**

37.10% of the respondents considered their quotation amount affordable while most of the respondents at 62.90% considered the quotation unaffordable as shown in table 4.7.2. The high rate of un-affordability of quotation can be attributed to low levels of income of the respondents as shown in table 4.8.3 below, whereby the majority earned below ksh10, 000 per month.

4.7.3 Affordability of connection cost

The study sought to find out the respondents' general opinion on the affordability of electricity connection cost and the results were as in table 4.7.3

Table 4.7.3 Affordability of connection cost

Affordability of electricity connection cost	Frequency	%Frequency
Yes	181	40.31
No	268	59.69
Total	**449**	**100**

Table 4.7.3 showed that 181 respondents (40.31%) considered electricity connection cost affordable while 268 respondents (59.69%) considered the cost unaffordable. The unaffordable costs were explained by the fact that the majority of the respondents at 60.38% (table 4.7.1) got a quotation amount of ksh50, 000 and above which was high as compared to the level of income as showed in table 4.8.3

4.7.4 Electricity bills

The respondents were asked how much electricity bill they pay per month and it was found out that averagely they paid ksh1, 075.00. Since the majority of the respondents earned above ksh11, 000 per month, the electricity bill of ksh1, 075.00 was considered affordable to respondents.

4.8 Economic background

The second objective of the study was to examine the influence of the areas' economic background on electricity distribution in Nyamarambe Division. The objective was studied by looking at the occupation of the respondents, the predominant weather condition of the area and the level of income of the respondents.

4.8.1 Occupation

The sought to find out the occupation of the respondents and the results were as presented in table 4.8.1 It was found that the respondents were mainly dominated by people in the informal sector such as farming and business, which represented 68.15% while the rest of the respondents were in the formal sector such as teaching, nursing and accountancy, representing 31.85%.

Table 4.8.1 Occupation of respondents

Occupation in economic sector	Frequency	%Frequency
Formal	143	31.85
Informal	306	68.15
Total	**449**	**100**

In as much as the 318 respondents at 70.83% had secondary education and above (as shown in table 4.5), most of the respondents were in the informal sector such businesses and farming. Farming was supported by favorable whether condition (rainy condition was

at 86.86%) as shown in table 4.8.2, which in turn buoyed business activities in this area, an indication that most respondents were self employed.

4.8.2 Predominant weather condition

The study sought to find out the predominant weather condition of the area under study, the responses were as in table 4.8.2

Table 4.8.2 Predominant weather condition

Predominant weather condition	Frequency	%Frequency
Rainy	390	86.86
Dry	59	13.14
Total	**449**	**100**

The findings were that 86.86% of the response was that the predominant weather condition of the area was rainy while 13.14% of the response was that the weather condition of the area was predominantly dry. Rainy conditions provided favorable weather condition for farming activities which in turn buoyed business activities in this area resulting into 68.15% of the respondents being engaged in the informal sector as shown in table 4.8.1 above.

4.8.3 Level of income

The study sought to find out the level of income per month of the respondents, the results were as presented in table 4.8.3

Table 4.8.3: Levels of income

Level of income	Frequency	%Frequency
Ksh1 to 10, 000	205	45.66
Ksh11, 000 to 30,000	179	39.86
Above ksh30, 000	65	14.48
Total	**449**	**100**

The majority, 244 respondents (54.34%) earned above ksh10, 000 which clearly indicated why 35.35% of the respondents as shown in table 4.6 had electricity in their premises, a figure higher than the Kenya's rural electrification rate of just over 10% according to Safari Africa, 2011. The favorable weather condition and the occupations where all the respondents at least had some economic activity contributed to the high level of income.

4.9 Influence of security on electricity distribution

The third objective was to establish the extent to which security of electricity distribution network influenced electricity distribution in Nyamarambe Division. In order to achieve the objective, the respondents were asked whether they experience power interruptions, about security problems experienced, and whether they had experienced vandalism of electricity distribution network.

4.9.1 Power interruptions

All the respondents were asked to state whether they normally experience power interruptions and the results were as presented in table 4.9.1

Table 4.9.1: Power interruptions

Power interruption	Frequency	%Frequency
Yes	164	36.53
No	285	63.47
Total	**449**	**100**

The results showed that 164 respondents (63.47%) experienced power interruptions while 285 respondents (36.53%) did not. Power interruption led to the following problems as shown in table 4.9.2; vandalism of electricity distribution network, theft, shock, interruption of business, damage to property and fire all which posed security risks to the respondents. Vandalism contributed negatively to the growth of electricity distribution network.

4.9.2 Security problems experienced

The study sought to find out from the respondent the security problems they experienced during power interruptions and the results were as presented in table 4.9.2

Table 4.9.2: Security problems experienced

Security problems	Frequency	%Frequency
Theft	90	20.04
Shock	50	11.14
Interruptions of business	108	24.05
Damage to property	92	20.49
Fire	23	5.12
Vandalism	75	16.70
No response	11	2.45
Total	**449**	**100**

Interruptions of business was mentioned by 108 respondents (24.05%), 92 mentioned damage to property (20.49%) and 90 respondents mentioned theft (20.04%). 75 respondents (16.70%) mentioned vandalism of electricity distribution network as a security problem experienced during power interruptions.

4.9.3 Electricity vandalism

The study sought to find out from the respondents whether they had experienced vandalism of electricity distribution network and their responses were as presented in table 4.9.3

Table 4.9.3: Electricity vandalism

Electricity vandalism	Frequency	%Frequency
Yes	320	71.27
No	129	28.73
Total	**449**	**100**

The findings were that 320 respondents (71.27%) had experienced vandalism while 129 respondents (28.73%) had not as in table 4.9.3. The results show that vandalism was very common in this area which as the name suggests contributed negatively to the growth of electricity distribution.

4.10 Influence of access to information by users and non users of electricity on electricity distribution

The fifth objective sought to assess the extent to which access to information influences electricity distribution in Nyamarambe Division. The researcher therefore sought responses in terms knowledge of electricity service providers and the sources of information on electricity services.

4.10.1 Knowledge of electricity service providers

The study sought to find out from the respondents whether they knew that there were electricity service provides in Nyamarambe Division and the results were as presented in table 4.10.1

Table 4.10.1: Knowledge of service providers

Knowledge of service providers	Frequency	%Frequency
Yes	415	92.42
No	34	7.58
Total	**449**	**100**

The findings were that 415 respondents (92.42%) were aware of electricity service providers. This was attributed to the fact that most respondents at 70.83% had secondary education and above as in table 4.5 which indeed contributed positively to the number of respondents connected to electricity in their premises at 35.41% as shown in table 4.6

4.10.2 Companies that provide electricity

The study further sought to find out knowledge of electricity service providers, and the responses were as shown in table 4.10.2

Table 4.10.2 Electricity service providers

Electricity service providers	Frequency	%Frequency
KENGEN	147	29.28
KENYA POWER	338	67.33
REA	11	2.19
NONE	6	1.20
Total	**502**	**100**

338 respondents (67.33%) knew Kenya Power, followed by KENGEN known to 147 respondents (29.28%) with REA being known to 11 respondents (2.19%) in as much as REA was directly involved in rural electrification in Kenya. 496 respondents (about 98%) of the respondents at least knew a Company that provides electricity.

4.10.3 Source of electricity connection information

The study sought to find out sources of electricity connection information the respondents received on how to get connected to electricity services and the results were as indicated in table 4.10.3

Table 4.10.3: Sources of information

Sources of connection information	Frequency	%Frequency
Media	106	20.70
Political meeting	89	17.38
Neighbours/Friends	144	28.13
Kenya Power	116	22.66
REA	52	10.16
KENGEN	0	0
None	5	0.97
Total	**512**	**100**

The findings were that 144 respondents (28.13%) got electricity connection information from neighbours and friends, 116 respondents (22.66%) got information from Kenya Power, 106 respondents (20.70%) got information from the media, 89 respondents (17.38%) got information from political meeting and 52 respondents (10.16%) got information from REA. In as much as 507 respondents (approximately 99%) had some information source, electricity distributors (Kenya Power and REA combined) accounted for only 32.82% with other sources accounting for 66.21% which gave room to inaccurate information from unverified sources. The above findings had some positive

bearing because the high access to information might have contributed to 35.41% of the respondents getting connected to electricity in their premises.

4.11 Summary

The study had a questionnaire return rate of 97.82% which was considered adequate for the study. The respondents were adult males and females. The study established that over 90% of the respondents had lived in the area for over 5 years with the respondents having high level of education. (70.83% of the respondents had secondary education and above). The study found out that over 35.41% of the respondents had electricity in their premises which the study considered a better average as compared to the current Kenya's rate of just over 10% in rural areas. Cost of electricity connection was found to be unaffordable and unfavorable while electricity bills were found to be affordable when compared to the level of income whereby 54.34% of the respondents earned ksh10, 000 and above per month. The study further found out that vandalism of electricity distribution network was rampant which might have influenced negatively electricity distribution in Nyamarambe Division. The study found out that over 90% of the respondents knew electricity service providers with almost all the respondents (98.80%) knowing electricity service providers with similar percentage of the respondents (99.03%) having had some electricity connection source.

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS, DISCUSSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter comprised of summary of findings where different findings of the study were related, discussion of findings where findings of the study were compared and contrasted to other studies as reviewed in literature review, conclusions, recommendations to policy formulators and suggestions for further studies.

5.2 Summary of findings

The general objective of the study was to investigate factors influencing electricity distribution in Nyamarambe Division. The factors were cost of electricity connection, area's economic background, security of electricity distribution network and users and non-users access to information.

From the research findings approximately 74% of the respondents received a quotation amount for new connection of ksh70, 000, while the majority of the respondents at 63.16% felt that the quotation amount was not fair. Furthermore, 59.09% of the respondents generally felt that electricity was un-affordable. The above findings were compared to the level of income of the respondents whereby the majority at 45.58% earned ksh10, 000 and below. From the above, it was found that cost of electricity negatively influenced electricity distribution in Nyamarambe Division.

Secondly, the predominant weather condition was found to be rainy thus majorly supporting farming activities. Farming and businesses were also found to thrive in this area with the respondents also engaged in formal employment at about 32%. Most of the respondents earned below ksh10, 000 per month while a good number (39.86%) earned ksh11, 000 to 30,000 and a further 14.48% earned above ksh30, 000. The area's economic background was therefore found to be favorable and to have influenced positively electricity distribution in Nyamarambe Division.

Most respondents experienced power interruptions at 63.47%. All the respondents were asked this question because power interruptions can be experienced whether you are a user or a non-user of electricity. Interestingly only 16.70% of the respondents felt that power interruptions caused vandalism problems. The majority of the respondents mentioned interruption of business (24.05%), theft to their properties (22.04%), and damage to property (20.49%) as the security problems experienced during power interruptions. When the respondents were again asked whether they had experienced vandalism of electricity distribution network, 71.40% agreed. This was a clear indication that vandalism of electricity distribution network existed in Nyamarambe Division meaning security of electricity distribution network was compromised thus negatively influencing electricity distribution in this area.

The study found out that 92.42% of the respondents knew electricity service providers, a further 97.23% knew at least an electricity service provider by name, with Kenya Power majorly known to the respondents at 67.45%. Similarly all the respondents had had some knowledge on the source of information they received on electricity services. Neighbours/friends are the leading source of information to the respondents at 28.13% followed by Kenya Power at 22.66%. REA comes in fifth at 11.16% with KENGEN at 0%. Knowledge on the sources of electricity information and service providers was over 90% a good indication that access to information positively influenced electricity distribution in Nyamarambe Division.

5.3 Discussion of findings

Most of the respondents considered the quotations they received for electricity connection unfair and generally electricity connection costs were also considered unaffordable. The high costs could be explained as Beesley (1992) puts it that some new electricity connections would mean the network has to deliver more power than it was originally built to cope with or a quote being given which charges for all the amount of work it takes to connect a customer, thus resulting in high and unaffordable quotations.

The finding that approximately 54% of the respondents earned above ksh10, 000 was compounded by the rainy weather conditions (86.86%) which favoured farming an explanation why most of the respondents (68.15%) were engaged in farming and businesses. Kenya National Bureau of Statistics (2007) also mentioned that key drivers in reducing the likelihood of ever being poor include having more than a primary education, cultivating more land and having off-farm income. Tschirley, Irungu, Gitau, and Kariuki also mentioned that rural economy, particularly agricultural production, is of primary importance to the livelihoods of most Kenyans since it is the driver of village economies.

One of the security challenges faced by the respondents during power outages at 16.70% was vandalism of electricity distribution network. Mercel (2002) also mentioned that security of electricity distribution network plays a fundamental role in ensuring safety of distribution network, safety of consumers, quality of electricity consumed, and safety of distributor's interest.

High schooling rate (70.83% of the respondents had secondary education and above) and electricity service provider information must have contributed to high electricity connection rate in Nyamarambe Division. Shibanda (2006) supports that information from ministries and departments, local governments (councils), judiciary, parastatals, commissions and government education institutions contained very important information on legal policy, education, agriculture, economic, health and environment with implication on day today lives of citizens.

5.4 Conclusions

The study's conclusions were drawn from the finding that 35.35% of the respondents had electricity in their premises, which if is compared to Kenya's average in rural areas which is just over 10% according to Safari Africa (2011), then Nyamarambe Division is electrified approximately three times the rural Kenya's average.

The study concluded that if electricity connection cost was made affordable then the majority of those connected to electricity would afford their monthly consumption bills.

The conclusion was arrived at putting into consideration that the average monthly electricity bill of ksh1, 075 was affordable to the respondents taking into account that majority of the respondents at approximately 54% earned above ksh10, 000 per month.

The study also concluded that the higher connection rate in Nyamarambe Division was buoyed by favorable economic background while taking into that all the respondents were involved in some economic activity like farming, businesses and formal employment.

The study further concluded that the connection rate could have been higher than 35.41% were it not for rampant vandalism of electricity distribution network in this area

The study finally concluded that the respondents were well informed on electricity services; in addition they were also well informed from different sources though the service providers were not outright leaders in providing information to their clients.

5.5 Recommendations

The following recommendations were made to the policy makers; the cost of electricity is still considered un-affordable by most Kenyans residing in rural areas, therefore the Government together with the electricity service providers should consider bringing it down by either lowering electricity connection costs, offering free connection to customers while making them pay for consumed electricity units only, offering soft loans for new connection, and feely doing electrical installation works to those willing to get connected to electricity in rural areas.

It is further recommended that Kenyans particularly in rural areas should elect development conscious leaders since these leaders influence provision of services like electricity that affect the electorate's lives directly.

The electricity service providers should sensitize users and non users of electricity on the effects of vandalism to electricity distribution network.

It is recommended that in as much as electricity connection information is readily available, electricity service providers should ensure that electricity service information got by users and non-users of electricity is valid and from valid sources.

5.6 Suggestions for further studies

The following suggestions were made by the researcher for further studies; there is need to investigate other factors influencing electricity distribution in Nyamarambe Division, other objective measures can be used to study factors influencing electricity distribution in Nyamarambe Division.

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Appendix I Questionnaires

QUESTIONNAIRE FOR ELECTRICITY USERS AND NON ELECTRICITY USERS

SECTION A

Questions to give general information

1. What is your name (optional)? ----------
2. When did you start living in this area?

   a) 10 years ago and above b) Five years ago

   c) Less than a year d) others/specify

3. What is your level of education

   a) Primary b) Secondary

   c) College and above d) Informal education

4. Do you have electricity in your premises.....?

SECTION B

Questions to measure electricity connection cost

5. Have you applied for electricity? If yes, what was your quotation amount in Kenya shillings (ksh)?

   a) Less than 35,000 b) 36, 000 to 50, 000

   c)51, 000 to 100, 000 d) over 100, 000

6. Was your quotation affordable?

   a) Yes b) No

7. Do you think electricity connection cost is affordable?

    a) Yes

    b) No

8. How much do you pay per month on electricity bills?

SECTION C

Questions to measure area's economic background

9. What is your occupation? ----------

10. Which of the following is the predominant whether condition of the area

    a) Dry

    b) Rainy

11. What kind of farm animals do you keep and how many? ----------
    ----

12. What crops do you grow and in how many acres? ----------

13. Roughly what is your level of income per month?

    a) Ksh1-10,000

    b) Ksh11,000-30000

    c) Above ksh30,000

SECTION D

Questions to measure security of electricity distribution network

14. Do you experience power interruptions/black outs (power going on and off)?

    a) Yes b) No

15. What kind of security problems do you experience during these interruptions (when power goes on and off)?----------
    ----

16. Do you experience vandalism, theft of electricity distribution network in this area?

    a) Yes b) No

SECTION E

Questions to measure access to information

1. Do you know who/which companies connect people with electricity?
    a) Yes
    b) no
2. If yes, which company? ----------
3. From which source did you get information on how to get connected with electricity
    a) TV, radio
    b) Political meeting, chiefs Baraza, church
    c) Village mate/neighbor/friend
    d) The Kenya Power and Lighting Company Ltd. (KPLC)
    e) Rural Electrification Authority(REA)
    f) KENGEN
    g) Others, specify

QUESTIONNAIRE FOR ELECTRICITY DISTRIBUTORS

SECTION F

Questions to measure cost of electricity

1. Which company do you work for? ----------
2. What is the approximate cost of connecting an individual with electricity in Nyamarambe Division? ----------
   ----
3. Can the cost be considered affordable, explain? ----------
   ----

SECTION G

Questions to measure area's economic background

4. What are the economic activities of rural residents in Nyamarambe Division? -----
   ----
5. In your view, what is the approximate monthly income for rural residents in Nyamarambe division----------
6. Do you think Nyamarambe Division residents can afford electricity connection costs based on their economic background? ----------
   ----

SECTION H

Questions to measure security of electricity distribution network

7. Do you think electricity service is safe to the consumers in this area? explain------
   ----
8. Are there power interruptions in Nyamarambe Division----------
9. What security problems do power interruptions cause to consumers and the company? ----------

10. What are the security challenges/problems the company is facing in the distribution exercise in Nyamarambe Division? ----------
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SECTION I

Questions to measure access to information

1. Which distributor do you work for?----------
2. Are Nyamarambe Division residents aware of how to connect themselves to electricity? Explain ----------
---
3. Which methods to you use to give information to Nyamarambe Division residents on how to connect themselves to electricity? Explain ----------
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Appendix II Interview Schedule

INTERVIEW SCHEDULE FOR ELECTRICITY USERS AND NON ELECTRICITY USERS

SECTION A

Interview schedule to measure electricity connection cost

1. In which kind of premise do you have electricity? ----------
   ----
2. Do you know that if you are within 600m from the nearest transformer then you pay ksh35, 000 to KPLC to get connected?----------
3. Is a connection fee of ksh35, 000 affordable?

a) Yes b) No

SECTION B

Interview schedule to measure area's economic background

4. What income generating activity do you do? ----------
5. Are the economic activities you do profitable?

a) Yes b) No

SECTION C

Interview schedule to measure security of electricity distribution network

6. Did you experience any security problems during the connection period? ----------
   ----
7. What kind of interference with electricity network do you experience in this area?
   ----
8. Have you heard or experienced vandalism of electricity distribution network and which areas?, explain----------

SECTION D

Interview schedule to measure access to information

9. Do you know KENGEN and what KENGEN does?----------

---

10. Do you know Rural Electrification Authority (REA) and what REA does?----------
---
---

11. Do you know The Kenya Power and Lighting Company Ltd (KPLC) and what KPLC does? ----------
---

Kennedy Ogalo

c/o University of Nairobi

P.O. Box 2461

Kisii

10/6/2011

To: The respondents

RE: CONDUCT OF RESEARCH ON FACTORS INFLUENCING ELECTRICITY DISTRIBUTION IN NYAMARAMBE DIVISION

You are kindly requested to accord me the necessary assistance while conducting research in your area in the above subject.

Your contribution will be highly appreciated and all information given will be treated with the confidentiality.

Yours faithfully

Kennedy Ogalo.

PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs/Miss/Institution
Kennedy Ogalo
of (Address)University of Nairobi
P.O. Box 2461, Kisii
has been permitted to conduct research in

Gucha South Location
Nyanza District
Province

on the topic: Factors influencing electricity distribution in Nyamarame Division; Kisii County, Kenya

for a period ending 30th September 2011

PAGE 3

Research Permit No:RRI/12/1/PHY011/06
Date of issue 29th January 2011
Fee received KES 1,000

Applicant's Signature

Secretary
National Council for
Science and Technology

CONDITIONS

1. You must report to the District Commissioner and the District Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed with-out prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2)/four(4) bound copies of your final report for Kenyans and non-Kenyans respectively.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

HARAMBEE

REPUBLIC OF KENYA

RESEARCH CLEARANCE PERMIT

GPK6055t3mt10/2011

(CONDITIONS—see back page)

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams:"SCIENCETECH", Nairobi
Telephone: 254-020-241349, 2213102
254-020-310571, 2213123.
Fax: 254-020-2213215, 318245, 318249
When replying please quote

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: **NCST/RRI/12/1/PHY011/06**

Date **29th August, 2011**

Kennedy Ogalo
University of Nairobi
P.O BOX 2461,
Kisii

Dear Sir,

RE:RESEARCH AUTHORIZATION

Following your application for authority to carry out research on **Factors influencing electricity distribution in Nyamarame Division; Kisii County, Kenya,** I am pleased to inform you that you have been authorized to undertake research in **Gucha Soth District** for a period ending **30th September 2011**

You are advised to report to **The District Commissioner, the District Education Officer and The District Development Officer Gucha South District,** before embarking on the research project.

On completion of your research project you are advised to submit **one hard** copies and **one soft** copy of your thesis/ project to this office.

P.N NYAKUNDI
FORR: SECRETARY/CEO
Copy to:

The District Commissioner
Gucha South District

The District Education Officer
Gucha South District

(41)

RECEIVED
DATE 2/6/11

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION

Telegram: "CEES"
Telephone: KARURI 32117&32021
Our Ref:

P.O BOX 30197, NAIROBI
or P.O BOX 92 KIKUYU
KENYA

31th May, 2011

TO WHOM IT MAY CONCERN

RE: KENNEDY OGALO REG. NO. L50/61082/2010

The above named is a student at the University of Nairobi, College of Education and External Studies, Department of Extra-Mural Studies, pursuing a course leading to the award of Masters Degree in Project Planning and Management. For the course to be complete, he is required to write and submit a Research Project. Therefore, the purpose of this letter is to kindly request you to accord him necessary assistance in getting information that will enable him complete the Research Project. His area of study is titled **"Factors Influencing Electricity Distribution In Nyamarambe Division".**

Thank you.

Kisii Extra Mural Centre
Centre Organizer
31 MAY 2011
P. O. Box 2461
Kisii
University of Nairobi

Mr. Sakaja Y M,
Centre Organizer,
Kisii Extra-Mural Centre.

OFFICE OF THE PRESIDENT

Telegrams "**DISTRICTER**" Nyamarambe
Telephone N0.0208003575fax0208028870
When replying please quote

REF: GCA/S/ED.12/25VOL.1/42

DISTRICT COMMISSIONER
GUCHA SOUTH DISTRICT
P.O BOX 10
NYAMARAMBE

9/6/2011

TO WHOM IT MAY CONCERN

RE: AUTHORITY TO CARRY A RESEARCH
KENNEDY OGALO REG.NO.L50/61082/2010

The above mentioned student has been duly authorized to carry out research on "**Factors Influencing Electricity Distribution in Nyamarambe Division**" For the period ending 31st Agust, 2011.

This office has no objection whatsoever to the intended research. We therefore request you to accord Kennedy Ogalo the necessary support during his research.

Upon completion, he has been asked to submit a hard copy of his research report to this office.

D.K.TEGUTWA
FOR: DISTRICT COMMISSIONER
GUCHA SOUTH DISTRICT

CC

DISTRICT EDUCATION OFFICER
GUCHA SOUTH DISTRICT

DO NYAMARAMBE DIVISION

SM/MA